

1793  
OI

BLM LIBRARY



88067768

Agriculture



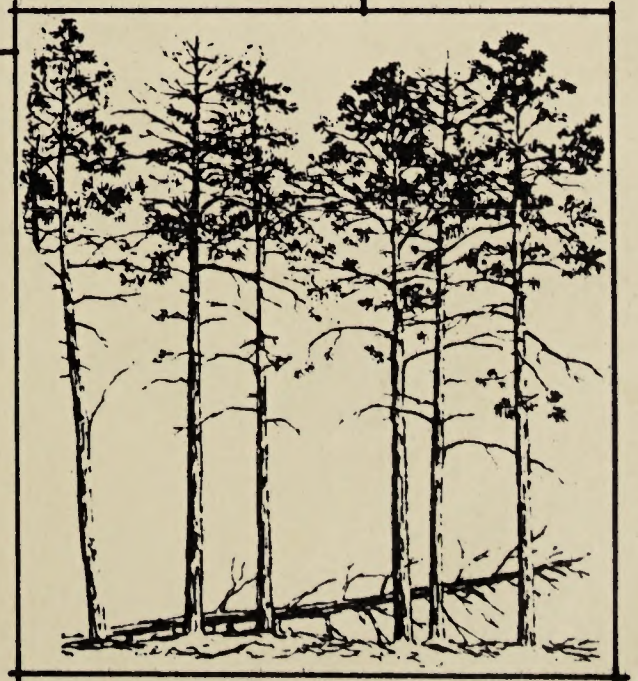
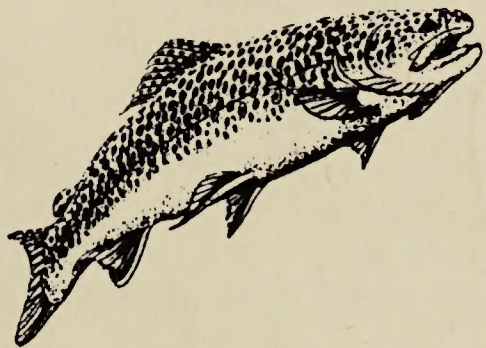
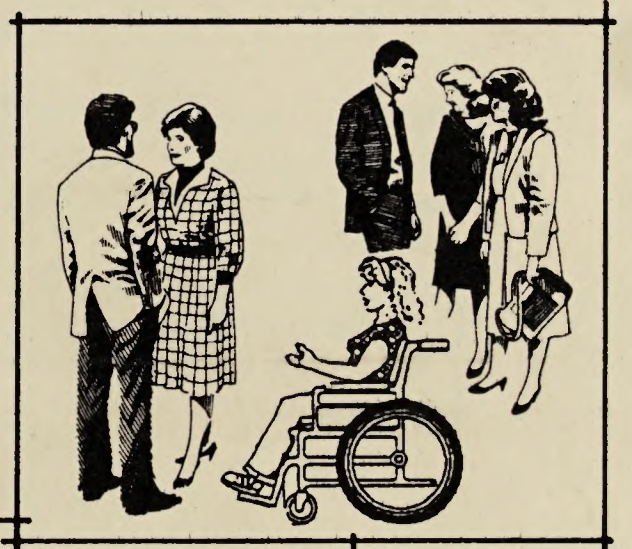
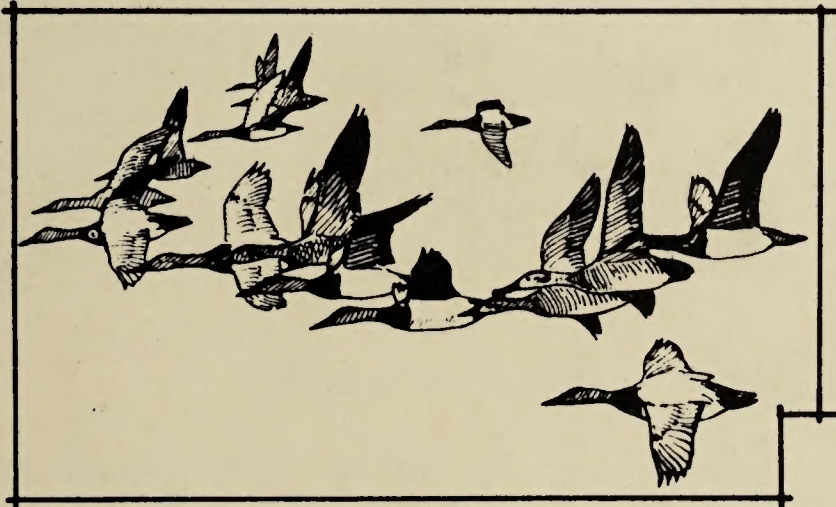
FOREST SERVICE  
Pueblo, Colorado



# OIL and GAS LEASING ENVIRONMENTAL IMPACT STATEMENT with APPENDICES

## DRAFT

PIKE and SAN ISABEL  
NATIONAL FORESTS  
COMANCHE and CIMARRON  
NATIONAL GRASSLANDS



Cooperating Agency:  
**USDI Bureau of Land Management**

BUREAU OF LAND MANAGEMENT  
CASPER DISTRICT OFFICE

~~91 JUL 24 AM 7:53~~

BLM LIBRARY  
BLDG 50, ST-150A  
DENVER FEDERAL CENTER  
P.O. BOX 25047  
DENVER, COLORADO 80225

#226398149

1088/067768

HD  
243  
.C6  
P554  
1990

## SUMMARY

This summary is provided to give an overview of the process the Forest Service is using and documenting in this Environmental Impact Statement (EIS). It provides a broad overview of the decisions that will result from this analysis and the requirements that drive it. The document and analysis being summarized is an EIS relating to oil and gas leasing activities on the Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands. The EIS describes a decision making process that is staged in order to respond to oil and gas leasing and development on National Forest System lands. The Staged decision process is being implemented according to the 1987 Leasing Reform Act.

### Land Management

The Forest Service administers the National Forests and National Grasslands. The policies determining how these lands will be administered are found in a number of federal statutes, some of which are summarized on pages I-31 through I-35 of this DEIS. These statutes have been implemented by regulations and many have been interpreted by the courts.

The National Forests and Grasslands administered by the Forest Service are managed under multiple use-sustained yield principles. To accomplish this, each National Forest and National Grassland is covered by a Forest Plan prepared in accordance with the National Forest Management Act of 1976. The Forest Plan for the Pike and San Isabel National Forests and the Cimarron and Comanche National Grasslands was approved in 1985. Management of these lands must be consistent with the Forest Plan. The Forest Plan can be amended to provide for consistency. The Forest Plan is based upon an EIS. This oil and gas EIS is tiered to the Forest Plan EIS.

### Minerals on the National Forests and Grasslands

Congress has recognized, since establishment of these federal lands, the importance of developing mineral resources on National Forests and Grasslands. The operation of some statutes makes some specific lands unavailable for mineral activities, e.g. the Wilderness Act, the Endangered Species Act, etc.

The Bureau of Land Management (BLM) is the agency that provides for the management of all federal subsurface minerals. In this case the BLM is responsible to advertise the lease, sell it, and is responsible for monitoring all subsurface activities relating to exploration and development. Their monitoring role includes administering all subsurface federal oil and gas regulations.

### Compliance with Statutes in "Stages"

#### 1. Federal Oil and Gas Leasing

The Federal Onshore Oil and Gas Leasing Reform Act of 1987, through its implementing regulations, require a "leasing analysis" to determine which National Forest System lands are available for leasing. This is a four step process described in 36 CFR 228.102(c).

The Leasing Analysis is a "programmatic" rather than a "site-specific" or "project" level activity. No rights are granted by the government to other parties when the Leasing Analysis is completed, and

the decision described in 36 CFR 228.102(d) is made. This EIS will also satisfy the requirements of the National Environmental Policy Act as applicable to the Leasing Analysis and decisions being made.

The Leasing Reform Act authorizes the Forest Service to consent to the issuance of oil and gas leases for specific lands. This decision is called a "Leasing Specific Lands Decision", and the regulations require the following before authorization will be given for any lease to be advertised by the BLM:

verify that oil and gas leasing on the specific lands has been adequately addressed according to the requirements of the National Environmental Policy Act.

verify that conditions of surface occupancy identified in section 228.102(c)(1) are properly included as stipulations in the leases.

and that operations and development could be allowed somewhere on each proposed lease, except where stipulations will prohibit all surface occupancy.

This EIS provides NEPA compliance for the decisions authorizing the leasing of specific lands. Since rights are granted when a lease is issued, there is an irreversible, irretrievable commitment of resources at this stage. This EIS provides the NEPA documentation for decisions on the following specific lands:

1. Pending lease requests
2. Renewal of existing leases
3. Anticipated leases.
4. "Split-estates"

The Forest Supervisor will document in a Record of Decision (ROD) a determination as to what lands will be available for leasing across the National Forests and Grasslands. The ROD will also identify those existing, pending and anticipated leases that will be authorized for implementation AS outlined in Chapter I beginning on page 35. A decision regarding split-estate lands managed by the BLM will also be identified in a separate Record of Decision signed by their Authorized

## **2. National Forest Management Act ("NFMA")**

The concept of compliance with specific key statutes in "stages" is an important part of this process. With respect to the Forest Plan, only certain types of decisions were made in the Record of Decision that selected one of an array of alternative plans. The Plan identifies management emphases for lands on the National Forest. In a separate NEPA process, individual projects are considered on a site-specific basis. This distinction between plan level and project level decision-making is described more fully in the Chief's administrative appeal decision #2130, August 15, 1988 (Panhandle Land and Resource Management Plan ("LRMP") p.7 and Chief's appeal decision #1467 and 1513, August 31, 1988, p.8 (Flathead LRMP). See also CFEQ v. Lyng 731 F.Supp. 970, 977-78 (D. Colo. 1989).

### **3. National Environmental Policy Act ("NEPA")**

The U.S. Supreme Court in *Robertson v. Methow Valley Citizens Council* 104 L.Ed.2d 351 (1989) accepted more than one stage of NEPA compliance after a Forest Plan is issued. In the Methow Valley situation, there was a permit stage, which authorized no ground disturbing activities, and a master plan development stage. The development of the master plan involved another NEPA process and decision by the Government before environmental effects would be experienced.

This is very similar to the process we are using for oil and gas leasing. A Leasing Analysis, a plan level decision, will determine which, if any lands will be available for leasing. The Forest Plan will be amended at the same time so that the decisions made on the basis of this EIS will be consistent with it. The plan amendment may refine the management prescriptions and Forest-wide standards and guidelines as they relate to oil and gas leasing.

A Leasing Specific Lands decision will be made as described above. Neither the Leasing Analysis or Leasing Specific Lands decisions authorize ground disturbing activities.

At a later time, one or more of the lessees may file an Application for Permit to Drill (APD). This will be reviewed in a site-specific NEPA process and a decision will be made whether to grant, condition, or deny the application.

### **4. Endangered Species Act**

Included in this compliance with NEPA, the Forest Plan process and the oil and gas leasing regulations, is compliance with the Endangered Species Act. This is accomplished in "incremental steps". In other words, compliance is accomplished in stages. The incremental step process is described in the Chief's administrative appeal decision in Appeal # 90-13-00-0192 dated October 1, 1990.

#### **Speculative Nature of the Oil and Gas Business**

When the Forest Service consents to the issuance of an oil and gas lease, the lease may never be sold and issued by the BLM. If a lease is issued, the lessee may or may not apply for an APD. If an APD is requested and granted, the well or wells authorized may or may not be drilled. If a well is drilled, it may not find gas or oil. If it does, it may not be in paying quantities sufficient to consider it part of an oil and gas field. This is a major distinction between oil and gas leasing and other activities which are authorized by the Forest Service. Most other activities are reasonably certain to proceed to development after the permit or contract is issued.

Even though there is great uncertainty at the time of lease authorization as to whether a well will be drilled and, if so, when and where, the effects of a typical well in a given location can be estimated reliably on the basis of past experience.

#### **Reasonable Foreseeable Post-Leasing Scenario ("RFD")**

Since there is such great uncertainty as to whether, when and where a well will be drilled, the regulations implementing the Leasing Reform Act utilized a process called Reasonable Foreseeable Development Scenario to estimate the number of wells that can be anticipated. This estimate provides the "cause" which is then used to estimate environmental "effects".

For analysis purposes we have assumed that we are at the APD stage on an existing lease when RFD is discussed. The proposed well locations and operations will be adjusted, when necessary, based on the alternatives. This will allow for the disclosure of anticipated effects by alternative. In actual implementation the selected alternative will disclose stipulations prior to lease advertisement and sale. This allows the lessee to adjust parcel boundaries and, at the time of APD, proposed operations in order to maximize their development opportunities and minimize resource impacts.

### **Level of Detail in the EIS ("site specificity")**

As one goes from the Forest Plan, to the Leasing Analysis, to the Leasing of Specific Lands, and, finally, to the APD stage, the site-specificity, or level of detail, increases and the number of acres which constitute the "affected environment" decreases.

### **EIS Format or Outline**

The basic outline of this EIS is established by regulation. 40 CFR 1502.10. The information provided in this EIS is in several forms. Each type of information should be related to one of the major headings in the basic outline. For example, several types of maps play a critical role in displaying information and in complying with the oil and gas leasing regulations.

#### **Maps**

Maps are the most critical part of this analysis. They are used to display the resource values being protected, the level of protection being provided, and will be used throughout the implementation process. Because of the large land base being analyzed and the intensities of the resource inventories the mapping structure of this document is complex.

The maps used for the analysis are resource mylar overlays on the Primary Base Series or PBS topographic "quads" or maps to a scale of 1:24,000. There are approximately 270 of these quads needed to cover the planning area. Resource overlays were generated for each quad and then stipulations applied based on the need for resource protection. These maps are extremely bulky and expensive to reproduce. They will not be provided with the EIS but can be reviewed at several locations. Those locations are fully detailed in Appendix F.

Full copies of the planning maps will be available at:

Pike & San Isabel, Cimarron & Comanche NF Supervisor's Office

BLM State Office

The quads that pertain to each administrative subunit of the Forest and Grasslands will have the map copies that relate to land areas they administer. Those sub-units are:

So Platte Ranger District  
Leadville Ranger District  
Pikes Peak Ranger District

So Park Ranger District  
San Carlos Ranger District  
Salida Ranger District  
Comanche National Grassland  
Cimarron National Grassland

Since these maps will not be readily available for review, printed copies of small scale, 1:500,000, resource maps have been prepared and are included in Appendix G. These are not complete copies of the quads to a different scale but are intended to provide the reader with an understanding of the information included and disclosed in the document.

The first map to be considered is the one which displays the stipulations which are a part of the proposed action which will be included in the amendment of the Forest Plan in Appendix A. This map is in Appendix F and prescriptions are displayed to a scale of 1:126,720.

Several maps help to describe the Affected Environment and are discussed in Chapter III of this EIS. The base stipulation map is based on the Forest Recreation map and is located in Appendix F. It is drawn to a scale of 1:126,000. This map is described in Chapter I pages 25 and 35, Appendix A page 1, Appendix D page 7 and Appendix F. The "geographic zones", defined on pages III-36 through III-41 of the EIS are shown in Figure D-1 at a scale of 1:500,000. The "site" for purposes of considering "site-specificity" is defined for various decisions in several locations including Chapter I pages 17-24, Chapter III pages 1-50 and in Appendix E where leasing status is identified.

Mineral Potential Maps are used in connection with formulating the Reasonable Foreseeable Development Scenario (RFD) and can be found in Appendix K.

In connection with the Environmental Consequences analysis and discussion, maps are used to display the location of the RFD wells. "RFD wells" are wells which have been specifically located, with the assistance of the BLM. These wells represent our best projection of where drilling may be likely to occur. These wells are not meant to identify specific well locations that are being approved or authorized for occupancy but are being used to analyze the "probable" effects of leasing as identified in 36 CFR 228.102(c)(4).

See Chapter I pages 35-40, Appendix D page 7 and Appendix G. Resource mylar overlays were prepared for the PBS topo quad map, to a scale 1:24,000, to show each of the resources which would be affected. Lands withdrawn from mineral activity are shown in Figure I-2 and Table I-1 which are in Chapter I of this EIS. Large maps used for the analysis are not included in this EIS, but examples of them have been provided in Chapter I page 37 and Appendices F and G, that display the distribution of mitigation requirements (lease stipulations).

## **Chapters**

Chapter I describes the purpose and need for this document. It gives a fairly detailed description of the oil and gas program on the Unit and also describes the role of the Oil and Gas Leasing Reform Act and its promulgating regulations. It is designed to familiarize the reader with the reasons behind the analysis and the analysis process itself.

Chapter II discusses the management alternatives for a "Forest-wide Leasing Program". It describes how that program might look based on the management alternative. The descrip-

tion is based on "Reasonable Foreseeable Post-Leasing Activity" (RFD) as developed with the BLM. RFD is a planning tool required by the regulations to assess the possible impacts of a leasing program.

Chapter III discusses the environment being affected by the management alternatives. This Chapter goes beyond the traditional "Affected Environment". Because of the need to separate land areas to meet the objectives of the regulations the Forest, mountain, grassland, Cimarron, Comanche will all be discussed. Specific sites where wells are "projected" based on RFD shall also be discussed, as will "geographic zones" which were used to display the justifications for stipulations.

Chapter IV discusses the environmental effects of the management alternatives as they are displayed through the use of RFD.

Chapter V lists the preparers of the document.

Chapter VI lists the people and agencies consulted

Chapter VII provides a glossary of terms to the reader.

## Appendices

Appendices have been developed to disclose information used in the leasing analysis and for information related to associated decisions that the Forest Supervisor might make. These appendices include:

Appendix A - Proposed Forest Plan Amendment - which provides a draft of the proposed amendment and language.

Appendix B - Mitigation - discloses the standard lease terms applied to all leases, identifies the supplemental stipulations (and their conditions) that may be applied by the Forest Supervisor in the decision document, and identifies some "Conditions of Approval" that may be identified at a later decision point.

Appendix C - Anticipated Activities - the regulations require development of reasonable foreseeable **post-leasing** activity to base the effects analysis on. The development of RFD is described in this appendix as well as the anticipated activities that will occur on the Unit that are not related to oil and gas development.

Appendix D - Site specific validation of stipulations - Displays the affected environment and effects of mitigated and non-mitigated activities on lands where activity is not expected to occur. This disclosure is designed to display the need for the identified stipulations on those lands and meet the requirements of the leasing analysis.

Appendix E - Maps of Leasing Status - this series of maps identifies those lands already leased, those that have split estates, and those identified lease parcels that the BLM has provided to us with a request for approval to issue.

Appendix F - Stipulation Base Map - this map displays the most restrictive stipulation that may be applied to land based on Alternative III.



Appendix G - Resource Maps - small scale versions of the 1:24,000 scale mylar maps that will be used by the BLM and Forest Service in implementation.

Appendix H - Issues - a more detailed description of the issues identified in Chapter I.

Appendix I - Monitoring and Evaluation - describes the monitoring the Forest Service will apply to approved activities.

Appendix J - Socio-Economic Analysis - describes the basis of the analysis that is discussed in Chapter IV.

Appendix K - Mineral Potential Maps - identifies the mineral potential of lands within the planning area.

### **Compliance with the Oil and Gas Leasing Regulations**

With respect to complying with the oil and gas leasing regulations, we are relying on the following discussions in the main body of the EIS, maps and appendices to comply with each of the following Leasing Analysis requirements:

Maps in Appendix F and the resource mylar overlays for the PBS topo quads meet the requirements to identify lands that will be open to leasing and the constraints that will be applied based on alternative.

Alternative management scenarios are described and mapped in Chapter II.

The development of RFD is described in Appendix C, its application based on alternatives is disclosed in Chapter II, and effects, based on RFD, is discussed in Chapter IV.

Compliance with the regulation on Leasing Specific Lands regarding the allowance of operations somewhere on each lease, except No Surface Occupancy leases will be displayed in the Record of Decision at the time of the final Environmental Impact Statement.

### **Using the EIS, its Maps and Appendices**

When a lease proposal is received by the BLM the requested parcel will be overlaid on the base stipulation map displayed in Appendix F to determine whether there are any restrictions to operations. If restrictions are identified the parcel request can be plotted on the PBS topo quads with the resource overlays. Based on the protection requirements the interested party may decide not to request the lease be advertised. If they show further interest the BLM may request Forest Service authorization for leasing. At that time the Forest Service will review the decisions made in this document. They will:

1. On the 1:24,000 PBS topo quad, identify the stipulations that will apply on the requested parcel. The resources being protected by the stipulations are shown on the resource overlays.
2. Field verify that the site conditions are as they appear on the stipulation map and further refined on the resource overlays of the PBS topo quads.

Review this document to:

Insure that the environment on the requested parcel has been adequately described in Chapter III or Appendix D.

Identify that the projected effects of development on the requested parcel, based on the analysis in Appendix C and D and Chapter IV, will not be exceeded. Effects disclosure identified in those appendices and Chapter IV will be considered adequate unless exploration and development effects have, or are projected to exceed, effects identified as acceptable in this document.

Validate that the stipulations identified in Appendix D and refined by the mylar 1:24,000 maps, are included in the lease.

If any of the documentation in the first two steps are inadequate further analysis will occur prior to authorization.

4. Based on field and document review, verify that the proposed lease can be occupied somewhere somewhere on the lease area unless prevented by stipulation.

This process may be used by any reader to identify anticipated effects of a leasing program as well as direct effects of well construction on ecosystems within the Planning Area.

#### **Combining the Analysis for Availability and Leasing Specific Lands**

The Forest Service is exercising discretion in combining the analysis for Leasing Availability and Leasing Specific Lands decisions for oil and gas in one EIS covering two National Forests and two National Grasslands which have been administratively combined by the agency. The approach used in preparing this EIS is based, in part, on the following:

1. Even if individual NEPA documents were prepared for each proposed lease, the Forest Service line officer making the decision to authorize the issuance of that lease would not know whether the lease would ultimately be issued. And, if it was issued, whether, when or where any well would be drilled on the lease. This is the nature of the oil and gas business.
2. NEPA documents are expensive to prepare and, in this circumstance, individual documents would provide no more benefit than a single EIS.
3. Even if a lease is issued, permission to drill is not granted until after a site-specific NEPA analysis is completed. Permission to drill can be conditioned or denied based on that later analysis.
4. Lease stipulations are mitigation measures. The effects of a typical well can be reliably estimated if the affected resources are known. If warranted, stipulations in addition to standard lease terms will be required.
5. There are really two stages in the leasing process which are irreversible, irretrievable commitments of resources. They are the Leasing Specific Lands and APD stages. This EIS has a level of detail or "site specificity" commensurate with the rights which are granted in a federal oil and gas lease. The additional NEPA process required at the APD stage is much more detailed and site-specific.

6. There will be no ground disturbing activities resulting from the Leasing Availability and Leasing Specific Lands decisions. Accordingly, no environmental effects. The site-specific NEPA analysis will occur when ground disturbing activities are proposed after a lease has been issued and a decision to develop has been made.

7. In view of the foregoing, there is no need to include additional detail in this EIS. Such detail could only be estimated or speculated about in light of the speculative nature of the oil and gas business.

8. The factors described above not only support the adequacy of site-specificity in the EIS, they also validate the exercise of discretion to combine the analysis for Leasing Availability and Leasing Specific Lands decisions on two National Forests and two Grasslands in one EIS.

This summary has been provided to assist in the understanding of the complex analysis that is disclosed in the following Environmental Impact Statement. We hope that it helps.



## TABLE OF CONTENTS

### CHAPTER I - PURPOSE AND NEED

|  |      |
|--|------|
| Purpose and Need                                 | I-1  |
| Purpose  | I-1  |
| Decisions to be Made                             | I-1  |
| Lands Involved                                   | I-2  |
| Oil and Gas Development, A Snapshot              | I-6  |
| Historical Program                               | I-6  |
| Oil and Gas Field Development                    | I-6  |
| Preliminary Investigations                       | I-6  |
| Exploratory Drilling                             | I-6  |
| Development                                      | I-10 |
| Production                                       | I-13 |
| Abandonment                                      | I-13 |
| Dry Hole Abandonment                             | I-13 |
| Abandonment of Depleted Production Wells         | I-13 |
| Background                                       | I-13 |
| A Lease  | I-13 |
| Competitive and Noncompetitive Leases            | I-14 |
| Competitive Leases                               | I-14 |
| Noncompetitive Leases                            | I-14 |
| Lease Restrictions                               | I-15 |
| Standard Lease Terms                             | I-15 |
| Supplemental Stipulations                        | I-16 |
| Federal Oil and Gas Leasing Process              | I-16 |
| Prior to the 1987 Leasing Reform Act             | I-16 |
| After the Reform Act                             | I-16 |
| The Staged Decision Process                      | I-17 |
| Stage one, Lands Available for Leasing           | I-17 |
| Stage two, Leasing Decisions for Specific Lands  | I-17 |
| Stage three, Application for Permission to Drill | I-18 |
| Stage four, Amendment to APD                     | I-18 |
| The Regulations Implementing the Reform Act      | I-19 |
| Leasing Analysis (Land availability)             | I-20 |
| Leasing Specific Lands (Consent)                 | I-23 |
| Application for Permit to Drill                  | I-23 |
| Impacts of a Lease                               | I-24 |
| Decisions for which Information is Disclosed     | I-24 |
| The Analysis Process                             | I-25 |
| Land Availability                                | I-25 |
| Reasonably Foreseeable Development               | I-26 |
| Consent  | I-27 |
| The Need for These Decisions                     | I-28 |

|  |      |
|--|------|
| Outstanding Requests for Lease   | I-28 |
| Renewal Decisions for Existing Leases                                      | I-28 |
| Anticipated Lease Requests   | I-28 |
| Context of the Decisions   | I-29 |
| Geographical Context   | I-29 |
| The Forest Plan Context  | I-29 |
| Programmatic versus Project, or Site-Specific                              | I-29 |
| Standards and Guidelines   | I-30 |
| Tiering  | I-30 |
| Current Forest Plan Direction  | I-30 |
| Forest Plan Amendments   | I-30 |
| Current Bureau of Land Management Direction                                | I-31 |
| Authority of the Forest Supervisor to Make the Decisions                   | I-31 |
| General Mining Law of 1872   | I-32 |
| Mineral Resources on Weeks Law Lands                                       | I-32 |
| Reorganization Plan No. 3 of 1946  | I-32 |
| Mineral Leasing Act for Acquired Lands of August 7, 1947                   | I-32 |
| Energy Security Act of June 30, 1980                                       | I-33 |
| The Federal Onshore Oil and Gas Leasing Reform Act<br>of December 22, 1987 | I-33 |
| Organic Act  | I-33 |
| Multiple-Use Sustained-Yield Act   | I-33 |
| National Forest Management Act   | I-34 |
| National Environmental Planning Act  | I-34 |
| The Clean Air Act of 1970  | I-34 |
| The Endangered Species Act of 1973   | I-34 |
| Clean Water Amendments   | I-35 |
| Historic Preservation Act  | I-35 |
| Forest Service Role in Implementation                                      | I-35 |
| Sample Mapping Exercise  | I-36 |
| Public Notification and Public Involvement                                 | I-45 |
| Notification of the Proposed Actions                                       | I-45 |
| Scoping  | I-45 |
| Planning Record  | I-46 |
| Significant Environmental Issues   | I-46 |
| Initial Scoping Issues   | I-46 |
| Issues Resulting from the draft<br>Environmental Impact Statement          | I-49 |
| Notes  | I-53 |

## CHAPTER II - ALTERNATIVES

|              |      |
|--------------|------|
| Introduction | II-1 |
|--------------|------|

|   |       |
|---|-------|
| Formulation of Alternatives   | II-1  |
| Considerations that Remain Constant for all Alternatives                                | II-2  |
| Reasonably Foreseeable Development (RFD)  | II-2  |
| Bureau of Land Management RFD   | II-2  |
| Concentrated RFD  | II-3  |
| Alternatives Considered and Eliminated from Detailed Study                              | II-3  |
| Alternatives Considered in Detail   | II-4  |
| Alternative I - Current Management (No Action)  | II-4  |
| Alternative II - All NFS Lands Available for Standard Development                       | II-17 |
| Alternative III - NFS Lands Available for Lease with Both Standard and Stipulated Terms | II-26 |
| Alternative IV - No NFS or Split-Estate Lands Available for Leasing                     | II-34 |
| Comparison of Alternatives  | II-35 |
| The Proposed Action   | II-37 |
| Amendment to the Land and Resource Management Plan                                      | II-37 |
| Notes   | II-39 |

### CHAPTER III - AFFECTED ENVIRONMENT

|  |        |
|--|--------|
| Introduction   | III-1  |
| Forest-Wide Description of Affected Environment (Level 1)    | III-5  |
| Location   | III-5  |
| Social and Economic Setting                                  | III-5  |
| Physical and Biological Setting                              | III-6  |
| Climate  | III-6  |
| Air Quality  | III-6  |
| Sub-Forest Description of the Affected Environment (Level 2) | III-7  |
| The Mountain Environment (National Forests)                  | III-7  |
| Vegetation   | III-7  |
| Soils  | III-7  |
| Water  | III-8  |
| Wildlife and Fishery Resources                               | III-10 |
| Riparian Resource  | III-11 |
| Threatened and Endangered Species                            | III-12 |
| Range Resource   | III-12 |
| Visual Resource  | III-13 |
| Cultural, Paleontological and Cave Resources                 | III-13 |
| Recreation   | III-17 |
| Wilderness   | III-19 |
| Special Areas  | III-20 |
| Wild and Scenic Rivers                                       | III-20 |

|  |        |
|--|--------|
| Experimental Areas                                     | III-20 |
| Research Natural Areas                                 | III-21 |
| Special Interest Areas                                 | III-21 |
| Withdrawals  | III-21 |
| Mineral Resource                                       | III-22 |
| Transportation   | III-24 |
| Special Uses   | III-24 |
| <br>   |        |
| The Grassland Environment (Cimarron and Comanche NG'S) | III-26 |
| Vegetation   | III-26 |
| Soils  | III-26 |
| Water  | III-26 |
| Wildlife and Fishery Resources                         | III-27 |
| Riparian Resource                                      | III-28 |
| Threatened and Endangered Species                      | III-28 |
| Range Resource   | III-29 |
| Visual Resource  | III-29 |
| Cultural, Paleontological, and Cave Resources          | III-29 |
| Recreation   | III-32 |
| Special Areas  | III-33 |
| Wild and Scenic Rivers                                 | III-33 |
| Experimental Areas                                     | III-33 |
| Research Natural Areas                                 | III-34 |
| Special Interest Areas                                 | III-34 |
| Mineral Resources                                      | III-34 |
| Transportation   | III-35 |
| Special Uses   | III-36 |
| <br>   |        |
| Affected Environment by Geographic Zones (Level 3)     | III-36 |
| The Mountain Environment                               | III-36 |
| Zone 1   | III-36 |
| Zone 2   | III-37 |
| Zone 3   | III-37 |
| Zone 4   | III-38 |
| Zone 5   | III-38 |
| Zone 6   | III-38 |
| Zone 7   | III-39 |
| Zone 8   | III-39 |
| The Grassland Environment                              | III-40 |
| Zone 9   | III-40 |
| Zone 10  | III-40 |
| Zone 11  | III-40 |
| Zone 12  | III-40 |
| Zone 13  | III-41 |
| <br>   |        |
| RFD Well Sites - Affected Environment (Level 4)        | III-41 |
| Introduction   | iii-41 |
| The Mountain Environment                               | III-42 |
| BLM RFD  | III-42 |
| Well 1   | III-42 |
| Well 2   | III-43 |
| Well 3   | III-43 |
| Well 4   | III-43 |



|   |           |
|---|-----------|
| Concentrated RFD (for Alternatives I and III) | III-44    |
| Well 1R                                       | III-44    |
| Well 2R                                       | III-45    |
| Well 3R                                       | III-45    |
| Well 4R                                       | III-46    |
| Concentrated RFD (for Alternatives II and IV) | III-47    |
| Well 1C                                       | III-47    |
| Well 2C                                       | III-48    |
| Well 3C                                       | III-48    |
| Well 4C                                       | III-49    |
| The Grassland Environment                     | III-49    |
| Hard Lands                                    | III-49    |
| Sandy Lands                                   | III-50    |
| Canyon Lands                                  | III-50    |
| Riparian                                      | III-50    |
| Exhibits III-1 through III-11                 | III-51-67 |
| Footnotes                                     | III-68    |

#### CHAPTER IV - ENVIRONMENTAL CONSEQUENCES

|                                    |       |
|------------------------------------|-------|
| Introduction                       | IV-1  |
| The Analysis                       | IV-2  |
| On the Mountain Districts          | IV-2  |
| On the Grasslands                  | IV-2  |
| Display of Effects                 | IV-2  |
| Analysis versus Implementation     | IV-3  |
| Analysis                           | IV-3  |
| Implementation                     | IV-3  |
| Definitions                        | IV-4  |
| Description of Alternatives        | IV-4  |
| Environmental Consequences         | IV-5  |
| Comparing Alternatives             | IV-5  |
| Disturbed Acres                    | IV-5  |
| Impacted Acres                     | IV-7  |
| Abandonment and Reclamation        | IV-7  |
| Effects Common to All Alternatives | IV-8  |
| Vegetation                         | IV-10 |
| Soils                              | IV-12 |
| Water                              | IV-15 |
| Wildlife                           | IV-18 |
| Threatened and Endangered Species  | IV-19 |
| Aquatic and Riparian               | IV-20 |
| Range                              | IV-23 |
| Visuals                            | IV-24 |
| Cultural                           | IV-25 |
| Recreation                         | IV-26 |
| Special Areas                      | IV-27 |
| Cumulative Effects                 | IV-28 |
| Vegetation                         | IV-28 |
| Soils                              | IV-29 |

|   |       |
|---|-------|
| Water                                     | IV-31 |
| Wildlife                                  | IV-31 |
| Aquatic and Riparian                      | IV-33 |
| Range                                     | IV-34 |
| Visuals                                   | IV-35 |
| Cultural                                  | IV-36 |
| Recreation                                | IV-37 |
| Special Areas                             | IV-38 |
| Wilderness and W&S Rivers                 | IV-38 |
| Minerals                                  | IV-38 |
| Human and Community                       | IV-39 |
| Transportation                            | IV-39 |
| Irreversible and Irrecoverable Impacts    | IV-39 |
| Summary by Alternatives                   | IV-40 |
| Proposed Action                           | IV-42 |
| Implementation of Site-Specific Decisions | IV-42 |

## CHAPTER V - LIST OF PREPARERS AND REVIEWERS

## CHAPTER VI - PERSONS OR AGENCIES CONSULTED AND/OR RECEIVING COPIES OF THIS ENVIRONMENTAL IMPACT STATEMENT

|  |      |
|--|------|
| Introduction   | VI-1 |
| Consultation with Others   | VI-1 |
| List of Elected Officials, Agencies, Organizations, and Individuals to Whom Copies of the Statement are Sent | VI-2 |
| Members of the Public who Provided Comment   | VI-2 |
| Comments of Government Agencies  | VI-5 |

## APPENDIX A - PROPOSED FOREST PLAN AMENDMENT

|  |     |
|--|-----|
| Introduction   | A-1 |
| Forest-Wide Management Requirements                                      | A-1 |
| Oil and Gas Leasing Stipulations, Lease Notices and Standard Lease Terms | A-4 |
| Stipulation Base Map   | A-5 |

## APPENDIX B - MITIGATION

## APPENDIX C - REASONABLY FORESEEABLE ACTIVITY

|                                      |      |
|--------------------------------------|------|
| Introduction                         | C-1  |
| Determination of RFD                 | C-1  |
| RFD Well Numbers                     | C-2  |
| Levels of Development                | C-2  |
| Probably Locations of Development    | C-2  |
| RFD Drilling using Mineral Potential | C-3  |
| Mountains                            | C-3  |
| Well Distribution                    | C-3  |
| Acres Disturbed                      | C-4  |
| Grasslands                           | C-4  |
| Cimarron                             | C-4  |
| Well Distribution                    | C-4  |
| Acres Disturbed                      | C-4  |
| Co-                                  | C-5  |
| manche                               | C-5  |
| Well Distribution                    | C-5  |
| Acres Disturbed                      | C-5  |
| Site Development                     | C-6  |
| Access and Clearing                  | C-6  |
| Facilities                           | C-6  |
| Exploratory Well                     | C-6  |
| Production                           | C-6  |
| Gas                                  | C-7  |
| Oil                                  | C-7  |
| Maintenance & Operations             | C-7  |
| Abandonment & Reclamation            | C-7  |
| Abandonment Rates                    | C-8  |
| Reclamation Rates                    | C-8  |
| Production Well Reclamation          | C-8  |
| Cimarron                             | C-8  |
| Co-                                  | C-8  |
| manche                               | C-8  |
| Anticipated Reclamation              | C-8  |
| Mountains                            | C-8  |
| Grasslands                           | C-9  |
| Cimarron                             | C-9  |
| Comanche                             | C-10 |
| Concentrated RFD                     | C-11 |
| Effects of Alternatives on RFD       | C-12 |
| Mountains                            | C-13 |
| Relocated Concentrated RFD           | C-13 |
| Grasslands                           | C-14 |
| Acres Disturbed                      | C-14 |
| Reclamation                          | C-14 |
| Cimarron                             | C-14 |
| Co-                                  | C-15 |
| manche                               | C-15 |

## APPENDIX D - VALIDATION OF SUPPLEMENTAL STIPULATIONS

|   |      |
|---|------|
| Introduction  | D-1  |
| Affected Environment by Geographic Zone               | D-8  |
| Geographic Zone 1                                     | D-8  |
| Geographic Zone 2                                     | D-11 |
| Geographic Zone 3                                     | D-15 |
| Geographic Zone 4                                     | D-19 |
| Geographic Zone 5                                     | D-22 |
| Geographic Zone 6                                     | D-26 |
| Geographic Zone 7                                     | D-29 |
| Geographic Zone 8                                     | D-33 |
| Geographic Zone 9                                     | D-37 |
| Geographic Zone 10                                    | D-40 |
| Geographic Zone 11                                    | D-43 |
| Geographic Zone 12                                    | D-46 |
| Geographic Zone 13                                    | D-49 |
| <br>  |      |
| Standard Lease Terms versus Supplemental Stipulations | D-53 |
| Geographic Zone 1                                     | D-53 |
| Geographic Zone 2                                     | D-57 |
| Geographic Zone 3                                     | D-61 |
| Geographic Zone 4                                     | D-66 |
| Geographic Zone 5                                     | D-69 |
| Geographic Zone 6                                     | D-72 |
| Geographic Zone 7                                     | D-75 |
| Geographic Zone 8                                     | D-79 |
| Geographic Zone 9                                     | D-85 |
| Geographic Zone 10                                    | D-86 |
| Geographic Zone 11                                    | D-89 |
| Geographic Zone 12                                    | D-90 |
| Geographic Zone 13                                    | D-92 |

## APPENDIX E - MAPS OF LEASING STATUS

## APPENDIX F - STIPULATION BASE MAP

## APPENDIX G - RESOURCE MAPS

## APPENDIX H - PUBLIC NOTICE AND RESPONSE TO ISSUES

|  |      |
|--|------|
| Introduction   | H-1  |
| Significant Environmental Issues from<br>the First Draft EIS | H-2  |
| Forest Resources   | H-2  |
| Social and Economic Environments                             | H-13 |
| Split-Estate Lands   | H-14 |
| Oil and Gas Leasing  | H-15 |
| Planning Process   | H-18 |

|   |      |
|---|------|
| Alternatives                                | H-20 |
| Reasonably Foreseeable Development Scenario | H-25 |
| Cost-Benefit Analysis                       | H-34 |
| Mitigation                                  | H-34 |
| Oil and Gas Lease Stipulations              | H-35 |

## APPENDIX I - MONITORING AND EVALUATION

|  |     |
|--|-----|
| Air  | I-1 |
| Vegetation   | I-2 |
| Acres Suitable for Timber Production (Mountains Only)          | I-2 |
| Reclamation Plan   | I-2 |
| Five Year Reforestation  | I-2 |
| Lease Applications in Alpine Areas                             | I-3 |
| Fishery, TE&S Fish and Riparian Resources                      | I-3 |
| Pre-Project Monitoring   | I-3 |
| Riparian Resources   | I-3 |
| Fishery Resources  | I-3 |
| Threatened, Endangered and Sensitive Fishery Resources         | I-3 |
| Implementation Monitoring                                      | I-4 |
| Riparian Resources   | I-4 |
| Fishery Resources  | I-4 |
| Threatened, Endangered and Sensitive Fishery Resources         | I-4 |
| Effectiveness Monitoring                                       | I-4 |
| Riparian Resources   | I-4 |
| Fishery Resources  | I-5 |
| Threatened, Endangered and Sensitive Fishery Resources         | I-5 |
| Recreation   | I-5 |
| Visual Resource  | I-5 |
| Cultural Resources   | I-6 |
| Experimental Forests, Research Natural Areas and Special Areas | I-6 |
| Wildlife   | I-6 |
| Threatened and Endangered Plants and Animals                   | I-7 |
| Range Resource   | I-7 |
| Watershed Resource   | I-7 |
| Soils  | I-8 |
| Transportation System  | I-8 |
| Roads (Long Term Maintenance)                                  | I-8 |
| Oil and Gas Resources  | I-8 |

## APPENDIX J - SOCIO-ECONOMIC AND COST EFFICIENCY ANALYSIS

|  |      |
|--|------|
| Social Resource Units                                | J-1  |
| Front Range Social Resource Unit                     | J-1  |
| South Platte HRU                                     | J-4  |
| Pikes Peak HRU                                       | J-4  |
| Arkansas Social Resource Unit                        | J-5  |
| Leadville HRU  | J-5  |
| Salida HRU   | J-6  |
| South Park HRU                                       | J-6  |
| Sangre de Cristo-Wet Mountain HRU                    | J-7  |
| Spanish Peaks HRU                                    | J-8  |
| Southern Plains Social Resource Unit                 | J-9  |
| Comanche HRU   | J-9  |
| Cimarron HRU   | J-9  |
| <br>   |      |
| Economic Impacts                                     | J-10 |
| IMPLAN Analysis                                      | J-10 |
| <br>   |      |
| Cost Efficiency                                      | J-11 |
| Revenues Accruing to the Treasury                    | J-12 |
| Lease Bonus Bids                                     | J-12 |
| Annual Rentals                                       | J-13 |
| Royalties  | J-13 |
| Grazing Fees   | J-14 |
| Timber Sale Revenues                                 | J-14 |
| Recreation User Fees                                 | J-14 |
| Incremental Costs to the Forest Service              | J-15 |
| Operation and Maintenance                            | J-15 |
| General Administration                               | J-15 |
| Capital Investments                                  | J-16 |
| Other Costs  | J-16 |
| <br>   |      |
| Present Net Value and Discounted Revenue-Cost Ratios | J-16 |
| Revenues   | J-16 |
| Discounted Revenues                                  | J-19 |
| Costs  | J-19 |
| Discounted Costs                                     | J-20 |
| Cost Efficiency Ranks                                | J-21 |
| <br>   |      |
| Notes  | J-22 |

## APPENDIX K - MINERAL POTENTIAL MAPS

### List of Figures

|     |                              |     |
|-----|------------------------------|-----|
| I-1 | Vicinity Map                 | I-3 |
| I-2 | Lands Excluded From Analysis | I-5 |

|         |   |         |
|---------|---|---------|
| I-3     | Phases of Oil and Gas Development                   | I-7     |
| I-4     | Drill Casing  | I-9     |
| I-5     | Commonly Seen Pumpjack                              | I-11    |
| I-6     | High Production Oil Well Site                       | I-12    |
| I-7     | Leasing Process Flow Chart                          | I-21    |
| I-8     | Lessee Rights Granted in the Process                | I-22    |
| I-9     | Land Availability Patterns                          | I-26    |
| I-10    | Stipulation Base Map                                | I-37    |
| I-11    | Working Stipulation                                 | I-38    |
| I-12    | Lease Parcel Map with Stipulation                   | I-39    |
| I-13-17 | Lease Stipulations                                  | I-40-44 |
|         |   |         |
| III-1   | Affected Environment, Levels of Analysis            | III-2   |
| III-2   | Location of Geographic Zones                        | III-4   |
| III-3   | Elevational Stages of Vegetation                    | III-51  |
|         |   |         |
| B-1     | BLM Form 3100-11 - Offer to Lease                   | B-59    |
| B-1     |   |         |
|         |   |         |
| D-1     | Geographic Zone Locations-North Portion             | D-3     |
| D-2     | Geographic Zone Locations-South Portion             | D-4     |
| D-3     | Geographic Zone Locations-Grasslands                | D-5     |
|         |   |         |
| E-1     | Leasing Status-North Portion                        | E-3     |
| E-2     | Leasing Status-South Portion                        | E-4     |
| E-3     | Leasing Status-Grasslands                           | E-5     |
|         |   |         |
| G-1     | Resource Map-North Portion_Soil & Water             | G-3     |
| G-2     | Resource Map-North Portion_Dev. Rec & Visuals       | G-4     |
| G-3     | Resource Map-North Portion_Wildlife & Special Areas | G-5     |
| G-4     | Resource Map-North Portion_Fish & Cultural          | G-6     |
| G-5     | Resource Map-South Portion_Water & Soil             | G-7     |
| G-6     | Resource Map-South Portion_Dev. Rec & Visuals       | G-8     |
| G-7     | Resource Map-South Portion_Wildlife & Special Areas | G-9     |
| G-8     | Resource Map-South Portion_Fish & Cultural          | G-10    |
| G-9     | Resource Map-Grasslands-Water & Soil                | G-11    |
| G-10    | Resource Map-Grasslands-Dev. Rec & Visuals          | G-12    |
| G-11    | Resource Map-Grasslands-Wildlife & Special Areas    | G-13    |
| G-12    | Resource Map-Grasslands-Fish & Cultural             | G-14    |
|         |   |         |
| K-1     | Mineral Potential-North Portion                     | K-3     |
| K-2     | Mineral Potential-South Portion                     | K-4     |
| K-3     | Mineral Potential-South Portion                     | K-5     |

#### Listing of Tables

|     |                              |     |
|-----|------------------------------|-----|
| I-1 | Lands Excluded From Analysis | I-4 |
|-----|------------------------------|-----|

|        |   |        |
|--------|---|--------|
| II-1   | RFD for the National Grasslands   | II-3   |
| II-2   | Alternative I-Well Disturbance Acres, National Forests  | II-17  |
| II-3   | Alternative I-Well Distribution and Disturbance Acres,<br>National Grasslands                           | II-17  |
| II-4   | Alternative II-Land Distribution by Management Requirement<br>National Forests and National Grasslands  | II-25  |
| II-5   | Alternative II-Well Disturbance Acres, National Forests   | II-25  |
| II-6   | Alternative II-Well Distribution and Disturbance Acres,<br>National Grasslands                          | II-25  |
| II-7   | Alternative III-Land Distribution by Management Requirement<br>National Forests and National Grasslands | II-33  |
| II-8   | Alternative III-Well Disturbance Acres, National Forests  | II-33  |
| II-9   | Alternative III-Well Distribution and Disturbance Acres<br>National Grasslands                          | II-34  |
| II-10  | Alternative IV-Land Distribution by Management Requirement,<br>National Forests and National Grasslands | II-35  |
| II-11  | Comparison of Land Acreage Being Analyzed for Oil and Gas<br>Leasing by Alternative                     | II-36  |
|        |   |        |
| III-1  | Vertebrate Species - Mountains  | III-10 |
| III-2  | Acres by ROS Class  | III-18 |
| III-3  | Special Interest Areas, P&SI National Forests   | III-21 |
| III-4  | Withdrawals III-22  |        |
| III-5  | Forest Road Summary, Miles  | III-24 |
| III-6  | Vertebrate Species - Grasslands   | III-27 |
| III-7  | 1990 Grazing Use  | III-29 |
| III-8  | BLM RFD Well Descriptions   | III-42 |
| III-9  | Concentrated RFD Well Descriptions,<br>Alternatives I & III   | III-44 |
| III-10 | Concentrated RFD Well Descriptions,<br>Alternatives II & IV   | III-47 |
| III-11 | Inventoried Visual Quality Objectives   | III-58 |
|        |   |        |
| IV-1   | Site-specific Well Location by Alternative  | IV-6   |
| IV-2   | Grassland Well Distribution by Alternative  | IV-6   |
| IV-3   | Grassland Disturbed Acres by Alternative  | IV-7   |
| IV-4   | Reclaimed/Unreclaimed Acres by Alternative  | IV-8   |
| IV-5   | Predicted Soil Loss - RFD Wells - Unit  | IV-13  |
| IV-6   | Total Delivered Sediment  | IV-16  |
| IV-7   | Cumulative Effects with Concentrated RFD  | IV-30  |
| IV-8   | Cumulative Effects with Grassland RFD   | IV-30  |
| IV-9   | Summary of Effects by Alternative   | IV-41  |
|        |   |        |
| B-1    | Limitations or Prohibition of Surface Activity in Areas<br>with Resource Sensitivity                    | B-4    |
| B-2    | (Table does not exist - typographical error in document)  |        |
| B-3    | FLUR Report Identifying Protected Recreation Special Uses   | B-15   |
| B-4    | Seasonal Operating Restrictions to Resource Development<br>Activities - Big Game Critical Winter Range  | B-19   |
| B-5    | Seasonal Operating Restrictions to Resource Development<br>Activities - MIS                             | B-21   |



|      |   |      |
|------|---|------|
| C-1  | Anticipated Levels of Development             | C-2  |
| c_2  | Mineral Potential Levels                      | C-3  |
| C-3  | Expected Well Distribution-NG's               | C-4  |
| C-4  | Disturbed Acres-Cimarron NG                   | C-5  |
| C-5  | Expected Well Distribution-Cimarron NG        | C-5  |
| C-6  | Disturbed Acres-Comanche NG                   | C-5  |
| C-7  | Anticipated REclamation-Mountains             | C-9  |
| C-8  | RFD Wells by Soil/Ecosystem-Cimarron NG       | C-9  |
| C-9  | Reclamation Figures-Cimarron NG               | C-10 |
| C-10 | RFD Wells by Soil/Ecosystem-Comanche NG       | C-10 |
| C-11 | Reclamation Figures-Comanche NG               | C-11 |
| C-12 | Concentrated RFD Well Locations               | C-11 |
| C-13 | Reclamation of Concentrated RFD               | C-12 |
| C-14 | Effects of Alternatives-Mountains             | C-12 |
| C-15 | Locations of Relocated Concentrated RFD Wells | C-13 |
| C-16 | Reclamation Figures-Mountains                 | C-13 |
| C-17 | Acres Disturbed-GL's                          | C-14 |
| C-18 | RFD Wells by Soil/Ecotype-Cimarron NG         | C-14 |
| C-19 | Reclamation Figures-Cimarron NG               | C-15 |
| C-20 | RFD Wells by Soil/Ecotype-Comanche NG         | C-15 |
| C-21 | Reclamation Figures-Comanche NG               | C-15 |
| C-22 | Total Affected Acres-Mountains                | C-19 |
| C-23 | Total Affected Acres-Comanche NG              | C-20 |
| C-24 | Total Affected Acres-Cimarron NG              | C-20 |

|      |   |      |
|------|---|------|
| D-1  | USLE Predicted Surface Erosion for Drill Pad/Road-Site 15 | D-54 |
| D-2  | (Same) Site 18  | D-54 |
| D-3  | (Same) Site 22  | D-55 |
| D-4  | (Same) Site 24  | D-56 |
| D-5  | (Same) Site 25  | D-57 |
| D-6  | (Same) Site 44  | D-58 |
| D-7  | (Same) Site 45  | D-58 |
| D-8  | (Same) Site 46  | D-59 |
| D-9  | (Same) Site 47  | D-60 |
| D-10 | (Same) Site 48  | D-61 |
| D-11 | (Same) Site 49  | D-61 |
| D-12 | (Same) Site 50  | D-62 |
| D-13 | (Same) Site 51  | D-63 |
| D-14 | (Same) Site 52  | D-64 |
| D-15 | (Same) Site 53  | D-65 |
| D-16 | (Same) Site 54  | D-65 |
| D-17 | (Same) Site 55  | D-66 |
| D-18 | (Same) Site 56  | D-67 |
| D-19 | (Same) Site 57  | D-68 |
| D-20 | (Same) Site 58  | D-69 |
| D-21 | (Same) Site 59  | D-69 |
| D-22 | (Same) Site 60  | D-70 |
| D-23 | (Same) Site 61  | D-71 |
| D-24 | (Same) Site 62  | D-71 |
| D-25 | (Same) Site 63  | D-72 |
| D-26 | (Same) Site 64  | D-73 |
| D-27 | (Same) Site 65  | D-74 |

|      |                |      |
|------|----------------|------|
| D-28 | (Same) Site 66 | D-74 |
| D-29 | (Same) Site 67 | D-75 |
| D-30 | (Same) Site 68 | D-76 |
| D-31 | (Same) Site 69 | D-76 |
| D-32 | (Same) Site 70 | D-77 |
| D-33 | (Same) Site 71 | D-78 |
| D-34 | (Same) Site 72 | D-78 |
| D-35 | (Same) Site 73 | D-79 |
| D-36 | (Same) Site 74 | D-80 |
| D-37 | (Same) Site 75 | D-81 |
| D-38 | (Same) Site 76 | D-81 |
| D-39 | (Same) Site 77 | D-82 |
| D-40 | (Same) Site 78 | D-83 |
| D-41 | (Same) Site 79 | D-84 |
| D-42 | (Same) Site 80 | D-84 |
| D-43 | (Same) Site 81 | D-85 |
| D-44 | (Same) Site 82 | D-86 |
| D-45 | (Same) Site 83 | D-87 |
| D-46 | (Same) Site 84 | D-87 |
| D-47 | (Same) Site 85 | D-88 |
| D-48 | (Same) Site 86 | D-89 |
| D-49 | (Same) Site 87 | D-90 |
| D-50 | (Same) Site 88 | D-91 |
| D-51 | (Same) Site 89 | D-91 |
| D-52 | (Same) Site 90 | D-92 |
| D-53 | (Same) Site 91 | D-93 |
| D-54 | (Same) Site 92 | D-94 |

#### Listing of Exhibits

|        |   |        |
|--------|---|--------|
| III-1  | Major Veg Types - Forests and Grasslands  | III-51 |
| III-2  | Mountain Vegetation Types   | III-52 |
| III-3  | Grassland Vegetation Types  | III-56 |
| III-4  | Visual Quality Objectives and Evaluation Criteria   | III-57 |
| III-5  | Cultural Properties Listed on Historic National Registers   | III-59 |
| III-6  | Significant Properties/Resources - Cultural, American<br>Indian Religious Sites, Paleontological, Caves | III-60 |
| III-7  | Summary of Total Recreation Use, P&SI National Forests  | III-63 |
| III-8  | ROS Activity Characterizations  | III-64 |
| III-9  | Recreation Opportunity Spectrum Class, Composition and<br>Use; Percent Use by ROS Class and Type of Use | III-65 |
| III-10 | Long-Term Special Use Authorizations-Mountain Environment   | III-66 |
| III-11 | Long-Term Special Use Authorizations-Grassland Environment  | III-62 |
| B-1    | Standard Lease Terms  | B-57   |
| B-2    | Developed Recreation Sites on the Unit  | B-61   |
| B-3    | Active Timber Sales   | B-69   |
| B-4    | Planned Timber Sales  | B-71   |

|                               |  |       |
|-------------------------------|--|-------|
| C-1                           | BLM Evaluation   | C-21  |
| C-2                           | Analysis and BLM Concurrence                             | C-28  |
| CHAPTER 1<br>PURPOSE AND NEED |  |       |
| D-1                           | Well Site Locations                                      | D-95  |
| D-2                           | Vegetation Summaries - Mountain Environment              | D-98  |
| D-3                           | Management Indicator Species                             | D-100 |
| D-4                           | Summary of Riparian Area Acres                           | D-101 |
| D-5                           | Threatened and Endangered Wildlife Species               | D-102 |
| D-6                           | Threatened and Endangered Plant Species                  | D-103 |
| D-7                           | Suitable Acres for Range and Permitted Use-Mountain Env. | D-104 |
| D-8                           | Special Uses-Mountain and Grassland Environment          | D-105 |



## **CHAPTER I**

### **PURPOSE AND NEED**

#### **PURPOSE AND NEED**

##### **Purpose**

The purpose of this draft Environmental Impact Statement is to disclose the effects of alternative decisions the Forest Service may make to lease lands of the Pike and San Isabel National Forests and the Comanche and Cimarron National Grasslands for oil and gas exploration and development. Throughout this document we shall refer to these lands as the "Unit".

Oil and natural gas are important resources for the people of the United States. They are the primary sources of energy for most mechanical equipment, lighting, heat, transportation, communications, and production of food. Petroleum products are important components in food production, agriculture, medicine, and manufacturing of fibers and plastics. The federal government seeks to reduce its dependency on oil and gas from other nations by continuing to locate and develop its own reserves. Firms in the oil and gas industry continually seek new deposits of oil or gas, or seek to profitably extract the resources from previously uneconomical deposits.

##### **Decisions to be Made**

The Supervisor of the Unit will make three related decisions in a Record of Decision that will accompany the final Environmental Impact Statement (EIS). The first decision will identify which lands will be administratively available for leasing to private individuals or firms and the stipulations that must be applied to their respective leases. The second decision will identify the specific lands the Bureau of Land Management will be authorized to lease upon the review of an identified lease parcel. The third decision will be to make an amendment to the Forest Land and Resource Management Plan (FLRMP or Forest Plan) for the Unit.

The Bureau of Land Management (BLM) is responsible for the management of all federally owned leasable minerals. The BLM, acting for the Secretary of the Interior, may lease the National Forest System (NFS) lands identified in the decision of the Forest Supervisor. Authorized leases may include the standard terms placed on federal oil and gas leases or special stipulations designed to protect the surface resources. Special stipulations can provide a broad range of restrictions, with the most severe requiring that drilling rigs, other equipment, and roads do not occupy the surface of the lease area. The Forest Supervisor will decide what types of stipulations are required for each area of land, and what modifications are required to the Forest Plan. These modifications may include changes to the Forest Plan goals and objectives, management areas, or standards and guidelines needed to accommodate the Leasing Decisions. The proposed Forest Plan Amendment(s) is included as Appendix A.

This draft EIS describes the alternative types of management the Forest Supervisor is contemplating for oil and gas leasing on the Unit and explains their environmental effects. The Forest Supervisor will make the decisions only after circulating this draft EIS for public comment, and studying the comments received. The Forest Supervisor will respond to those comments in a Final

EIS, which will be issued several months from now. The Forest Supervisor map and describe all decisions in a Record of Decision, which will be issued with the Final EIS.

The Record of Decision will be accompanied by a series of maps that will be used in implementation. Information disclosed on the maps will include the resource values being protected and the stipulations required to provide the protection. The maps will not be generally distributed but will be available for review at several locations. Once the public review has been completed the map series will be located at the Denver office of the BLM and the Pueblo office of the Forest Service. Maps related to specific Ranger Districts will be on file at each District Office.

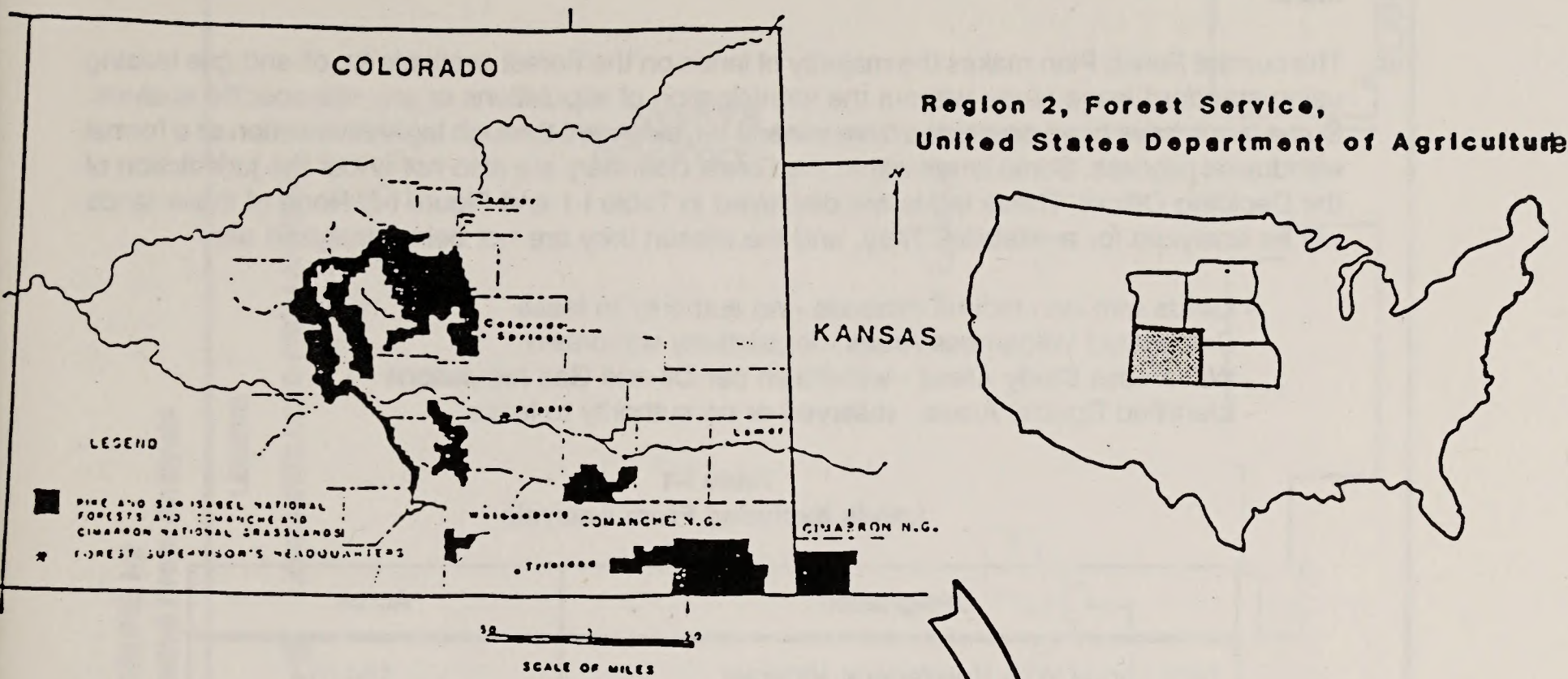
### **Lands Involved**

The Pike and San Isabel National Forests were administratively combined in 1973 and have 2,752,378 acres of NFS land. The eastern boundary of the Pike is roughly on a line along the Front Range of the Rockies between Mt Evans on the north and Pikes Peak on the south. The Forest then extends west to the crest of the Mosquito Range between Antero Jct on the south and Mt. Lincoln on the north.

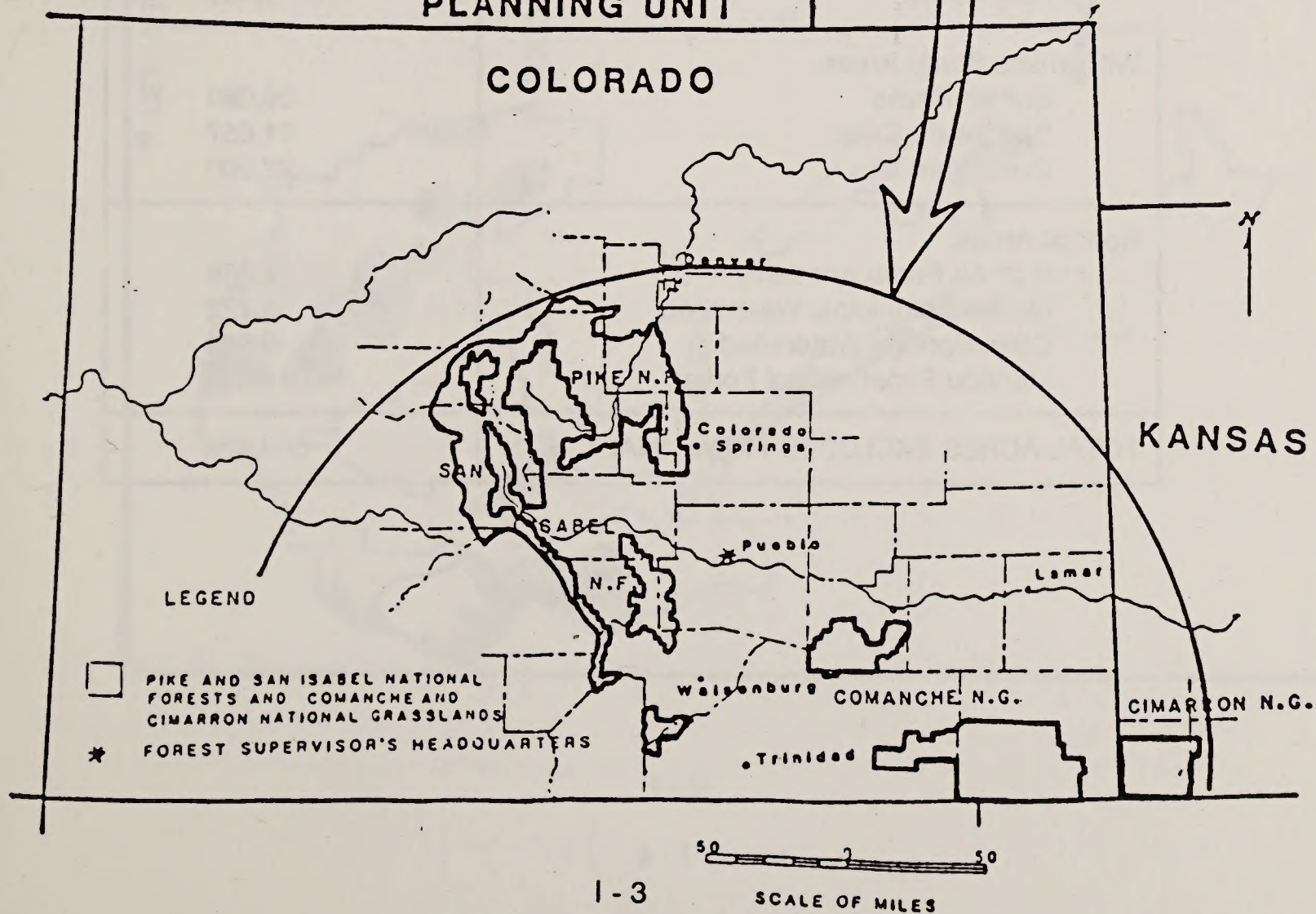
The San Isabel is in three separate blocks. The easternmost straddles the Wet Mountains from just south of Canon City to the south end of the mountain range northwest of Walsenburg. The southernmost parcel is a compact block extending from the Spanish Peaks on the east to the crest of the Sangre de Cristo range on the west. The remaining and largest parcel begins at Tennessee Pass north of Leadville and extends southward between the Continental Divide and the crest of the Mosquito Range to near Salida. From there it extends south along the east side of the Sangre de Cristo range to Blanca Peak.

Lands in southeastern Colorado and southwestern Kansas were made part of the San Isabel National Forest in 1954 and named the Comanche and Cimarron National Grasslands in 1960. The Comanche Grasslands are in southeastern Colorado from La Junta southeast to Springfield and the Kansas and Oklahoma state lines. The Cimarron Grasslands are in the southwestern part of the state of Kansas, in the vicinity of Elkhart, and are bordered by the Colorado and Oklahoma state lines [see Figure I-1].

Figure I-1  
Vicinity Map



**GENERAL LOCATION MAP  
PLANNING UNIT**



The Forest is characterized by a large amount of intermingled ownership with adjacent landowners including private individuals, corporations, the State of Colorado and Bureau of Land Management.

The current Forest Plan makes the majority of lands on the Forest available for oil and gas leasing using standard lease terms without the identification of stipulations or any site-specific analysis. Some lands have been precluded from mineral development through legislative action or a formal withdrawal process. Some lands within the Forest boundary are also not under the jurisdiction of the Deciding Officer. These lands are displayed in Table I-1 and Figure I-2. None of these lands will be analyzed for availability. They, and the reason they are not being analyzed are:

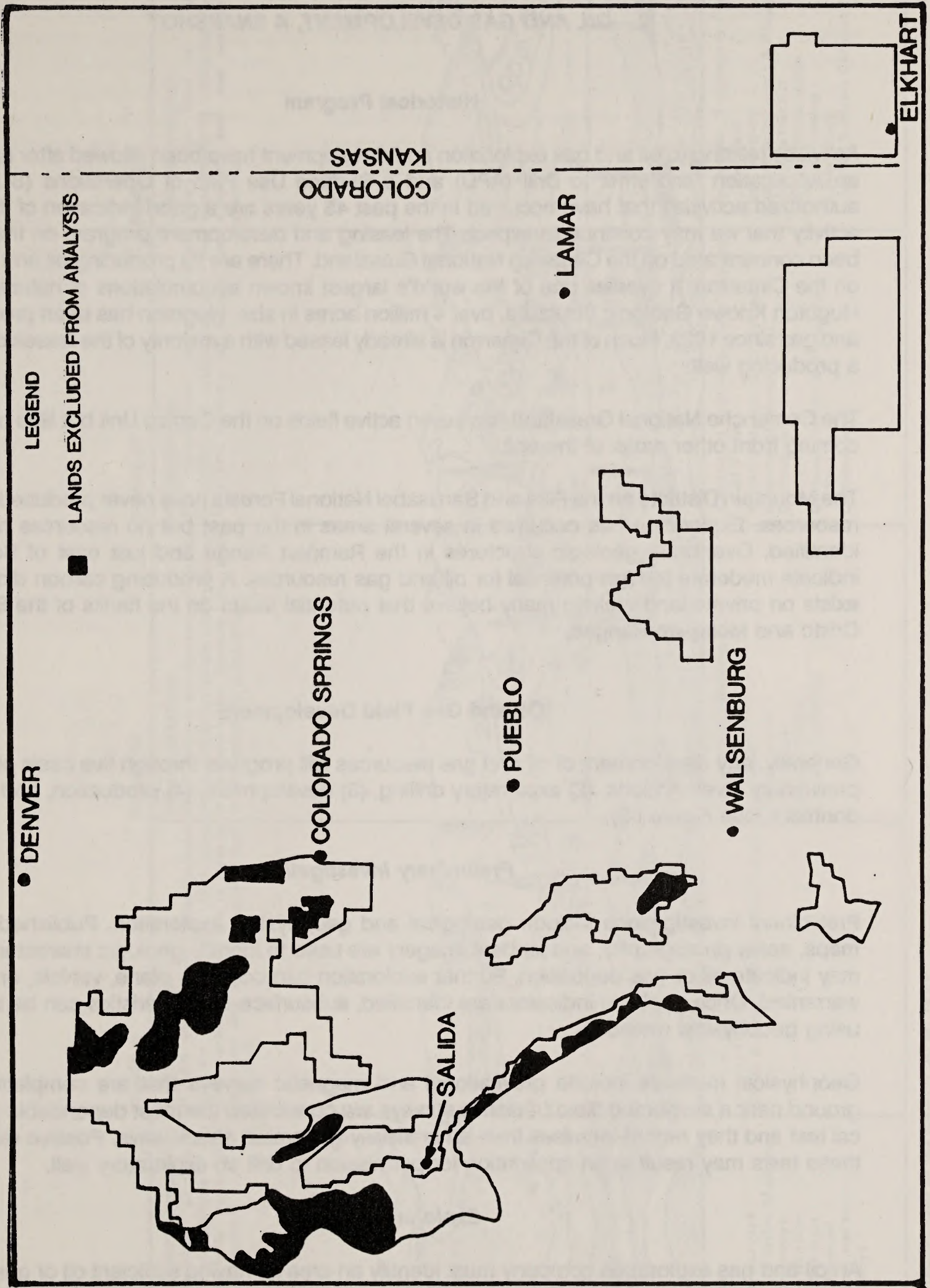
- Lands with non-federal minerals - no authority to lease
- Designated Wilderness Areas - legislatively withdrawn
- Wilderness Study Areas - withdrawn per Oil and Gas regulations
- Identified Special Areas - reserved or no authority to lease

**Table I-1  
Lands Excluded From Analysis**

| Designation                               | Acres          |
|---|----------------|
| NFS Lands With Non-federal Minerals       | 134,014        |
| Designated Wilderness:                    |                |
| Collegiate Peaks                          | 82,248         |
| Mt. Massive                               | 27,980         |
| Lost Creek                                | 105,090        |
| Mt. Evans                                 | 34,127         |
| Holy Cross                                | 9,489          |
| Wilderness Study Areas:                   |                |
| Buffalo Peaks                             | 36,060         |
| Sangre de Cristo                          | 61,657         |
| Greenhorn Mtn.                            | 22,300         |
| Special Areas:                            |                |
| U.S. Air Force Academy                    | 8,859          |
| Manitou Municipal Watershed               | 4,722          |
| Colo. Springs Watershed                   | 9,514          |
| Manitou Experimental Forest               | 14,812         |
| <b>TOTAL ACRES EXCLUDED FROM ANALYSIS</b> | <b>550,872</b> |



**FIGURE I-2**  
**Lands Excluded From Analysis**



## **OIL AND GAS DEVELOPMENT, A SNAPSHOT**

### **Historical Program**

Activities relating to oil and gas exploration and development have been allowed after approval of an Application for Permit to Drill (APD) and a Surface Use Plan of Operations (SUPO). The authorized activities that have occurred in the past 45 years are a good indication of the level of activity that we may continue to expect. The leasing and development program on the Unit has been concentrated on the Cimarron National Grassland. There are 23 producing oil and gas fields on the Cimarron. It overlies one of the world's largest known accumulations of natural gas, the Hugoton Known Geologic Structure, over 4 million acres in size. Hugoton has been producing oil and gas since 1923. Much of the Cimarron is already leased with a majority of the leases containing a producing well.

The Comanche National Grassland has seven active fields on the Carrizo Unit but little production coming from other areas of the unit.

The Mountain Districts on the Pike and San Isabel National Forests have never produced oil or gas resources. Exploration has occurred in several areas in the past but no resources have been identified. Overthrust geologic structures in the Rampart Range and just east of South Park indicate moderate to high potential for oil and gas resources. A producing carbon dioxide area exists on private land making many believe that potential exists on the flanks of the Sangre de Cristo and Mosquito Ranges.

### **Oil and Gas Field Development**

Generally, any development of oil and gas resources will progress through five basic phases: (1) preliminary investigations, (2) exploratory drilling, (3) development, (4) production, and (5) abandonment (see Figure I-3).

#### ***Preliminary Investigations***

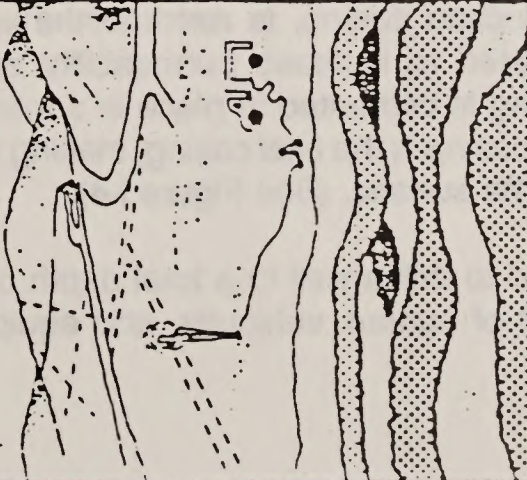
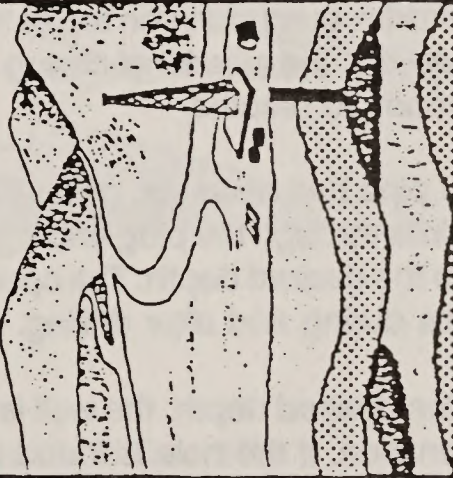

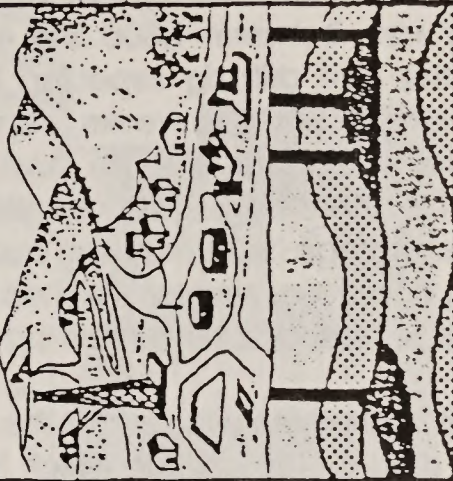
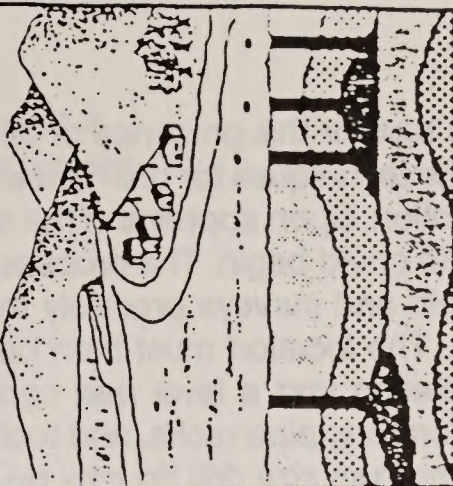
Preliminary investigations include geological and geophysical exploration. Published geologic maps, aerial photography, and landsat imagery are used to identify geologic characteristics that may indicate oil or gas deposition. Further exploration can occur by plane, vehicle, or on foot if warranted. Once geologic indicators are identified, subsurface characteristics can be measured using geophysical methods.

Geophysical methods include gravitational and magnetic surveys that are completed on the ground near a suspected "field." Seismic surveys are considered the most dependable geophysical test and they record impulses from an artificially-generated shock wave. Positive results from these tests may result in an application for permission to drill an exploratory well.

#### ***Exploratory Drilling***

An oil and gas exploration company must identify an area as having sufficient oil or gas potential to warrant further exploration. Once the company has obtained the proper leases and other legal permits, drilling operations may begin. To some degree, all of the exploration and leasing is speculative; only by drilling a hole in the ground can the existence of petroleum actually be verified.

**Figure 1-3  
Phases of Oil and Gas Development**

| PHASE I  | PHASE II  | PHASE III   | PHASE IV   | PHASE V   |
|--|---|---|--|---|
| <p><b>PRELIMINARY INVESTIGATION</b><br/>(Unknown Geologic Structure)<br/>Preliminary investigations are carried out over large areas from aircraft and on the ground.</p>  | <p><b>EXPLORATION</b><br/>If the preliminary investigations indicate that geologic structures may contain oil and gas, a lease is obtained and an exploratory well is drilled.</p>  | <p><b>DEVELOPMENT</b><br/>If oil and gas are discovered during the exploration phase and recovery is economically feasible, the field is developed for production.</p>  | <p><b>PRODUCTION</b><br/>The production phase involves operation and maintenance of the field and recovery of oil and gas.</p>  | <p><b>ABANDONMENT</b><br/>When the field is abandoned, equipment is removed, wells are plugged, and the surface is reclaimed.</p>  |
| <p>Airborne Surveys<br/>Surface Surveys<br/>Geotechnical Surveys<br/>Stratigraphic &amp; Other Mapping<br/>Geophysical Surveys<br/>Explosive Method<br/>Thumper Method<br/>Vibrator Method<br/>Gravity &amp; Other Methods<br/>Geologic Surveys</p>            | <p>Wildcat Well Drilling<br/>Access Roads<br/>Camp &amp; Buildings (Remote Areas)</p>   | <p>Development Drilling<br/>Access Roads<br/>Pipelines<br/>Utility Lines<br/>Separators<br/>Storage Tanks<br/>Camp &amp; Buildings</p>  | <p>Continued Drilling &amp; Development of Field<br/>Pressure Maintenance System<br/>Disposal of Waste<br/>Secondary &amp; Tertiary Recovery System<br/>Communication &amp; Production System<br/>Communities</p>  | <p>Equipment, Buildings &amp; Facilities Removal<br/>Field Cleanup<br/>Well Abandonment &amp; Plugging<br/>Surface Reclamation<br/>Landscaping<br/>Reseeding<br/>Other Erosion Control</p>                          |

SOURCE: U.S. Department of the Interior, BLM, 1972.

A well drilled to test for the presence of oil or gas in a previously undeveloped area is called a "wildcat well." The techniques for drilling a wildcat well are generally the same as for wells in areas of known production. Upon approval of the application for permit to drill, construction of the access road and well site could begin. The process usually begins by staking the location. A survey crew goes into the field and surveys precisely the location which has been selected by the geologist or geophysicist. The location must then be prepared for the drilling rig. The well site would be cleared of vegetation and a level pad constructed to accommodate the drill rig, mud pumps, reserve pit, generators, pipe racks, and tool house. The drilling rig is then brought in and "rigged up." A small to medium size drill rig may be used because of the relatively shallow drilling depths common in this area, between 1,300 and 4,500 feet. A two-acre drill pad would be sufficient to accommodate the size drill rig expected to be utilized. Getting the rig operational can take anywhere from several hours to weeks, depending on how complicated the drilling equipment is. The substructure, which supports the mast, is assembled first; then the mast is brought in and raised on top of it. Other rigging-up operations including erecting or setting up stairways, walkways, guardrails, storage facilities, living quarters, and auxiliary equipment. Since water is necessary to a drilling operation, a water well has to be dug or a water supply line installed. The well is now ready to be spudded, a term referring to the process of starting the hole.

The primary drilling machine used to drill the six-to-eight-inch diameter hole is the rotary rig. Rotary drilling involves rotating the drill bit, which is attached to a long string of drill pipe. This rotating action allows for fast and efficient cutting of rock. Most rotary drill rigs utilize a fluid circulating system. The fluid, called "drilling mud", is pumped down the inside of the drill pipe and out through the bit at the bottom of the hole. The drilling mud carries the fragments of broken rock, cut by the drill bit, to the surface. It also counteracts any high pressure zones encountered in the well, and cools and lubricates the bit.

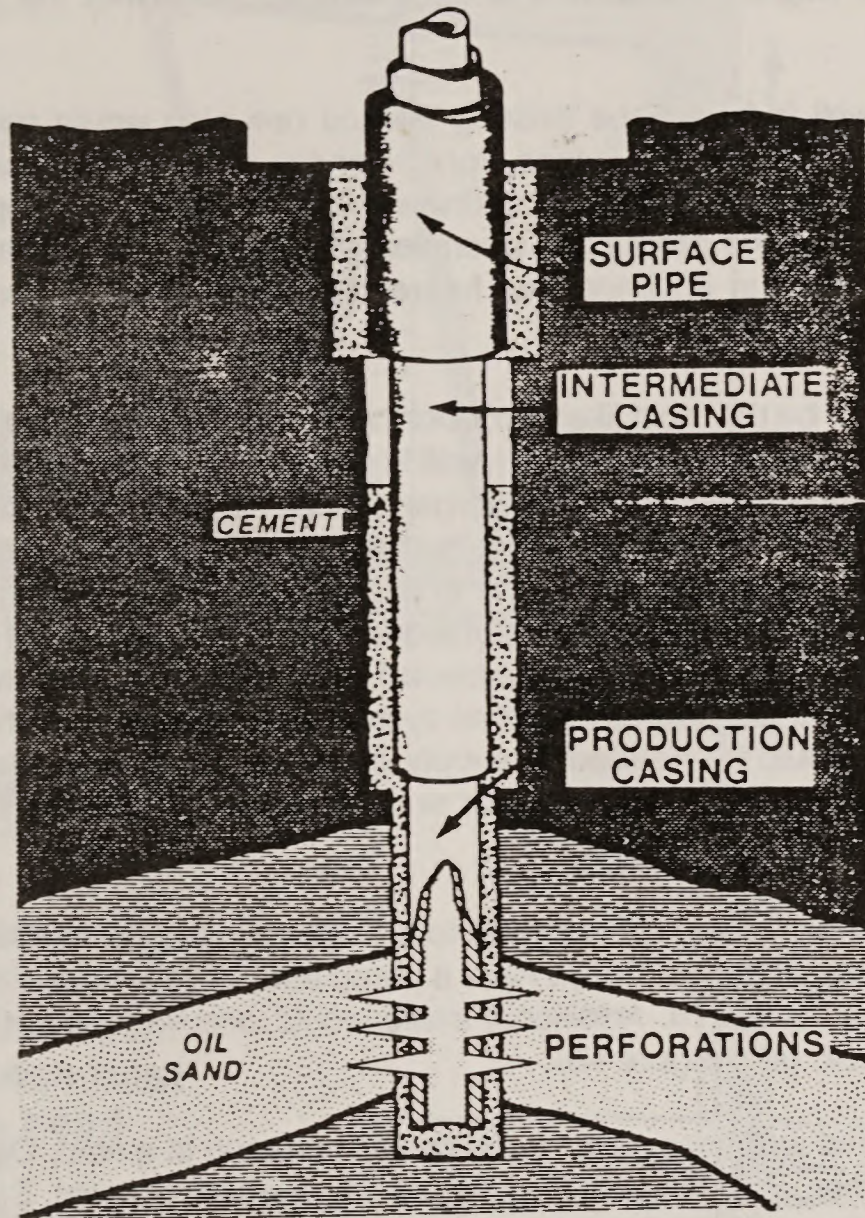
The first step in drilling is to set a "surface pipe" several hundred feet deep. A string of surface pipe or casing is inserted into the hole and cemented into place. The pipe is usually in 30 to 40 foot lengths and is screwed together as it is run into the hole. The surface pipe is 10 to 20 inches in diameter to allow the drill string and bit to pass through it for deeper drilling. Cement is pumped down the inside of the pipe, followed by a plug used to wipe the cement from the inside of the casing. Drilling mud is pumped in on top of the plug to displace the cement to the bottom and out into the space between the exterior of casing and the wellbore. Once the cement has set the drilling operations are ready to resume.

After the surface pipe has been set, deeper drilling begins. A smaller bit is run down the inside of the casing and drills through the plug and a guide shoe at the bottom of the casing. Routine drilling then continues to the desired depth. The operator would be required to seal off, protect, and isolate fresh water zones during and after drilling.

Upon reaching the desired depth, the well is evaluated to determine whether or not it has located an oil or gas formation. If the hole is found to be a potential producer, the final string of casing, called the production casing, is run into the well. The producing zone may be hydraulically fractured or treated to increase permeability and stimulate the recovery of oil and gas. The production casing is cemented in place in a manner similar to that used for all previous casing. The production casing is the final casing, making the well a permanent vehicle for the transmission of oil or gas to the surface. (See Figure I-4)

The time needed to drill a well to a total depth of 4500 feet is normally one to three weeks. The greatest amount of human, vehicular, and equipment activity and accompanying noise occurs during drilling.

Figure I-4  
Drill Casing



Used with permission of Scientific  
Software-Intercomp.

## **Development**

If the "wildcat" well accesses oil or gas resources a lessee is likely to request approval to drill additional wells and develop a field.

The development of a field would be limited by market demands, topography, reservoir characteristics, and other factors. The level of development that would occur cannot be accurately predicted. However, a typical field on the Pike and San Isabel National Forest, Comanche and Cimarron National Grasslands might consist of 5 to 20 individual wells with the associated roads and facilities.

Once a producing well is found, the existing surface use plan would need to be amended to address the production phase. The lessee, Forest Service, and BLM representatives would formulate this amended surface use plan to address roads, well site development, and additional facilities needed to make the production operation effective. The amendment of the surface use plan is an important step in ensuring that future operations meet oil company objectives and minimize environmental effects.

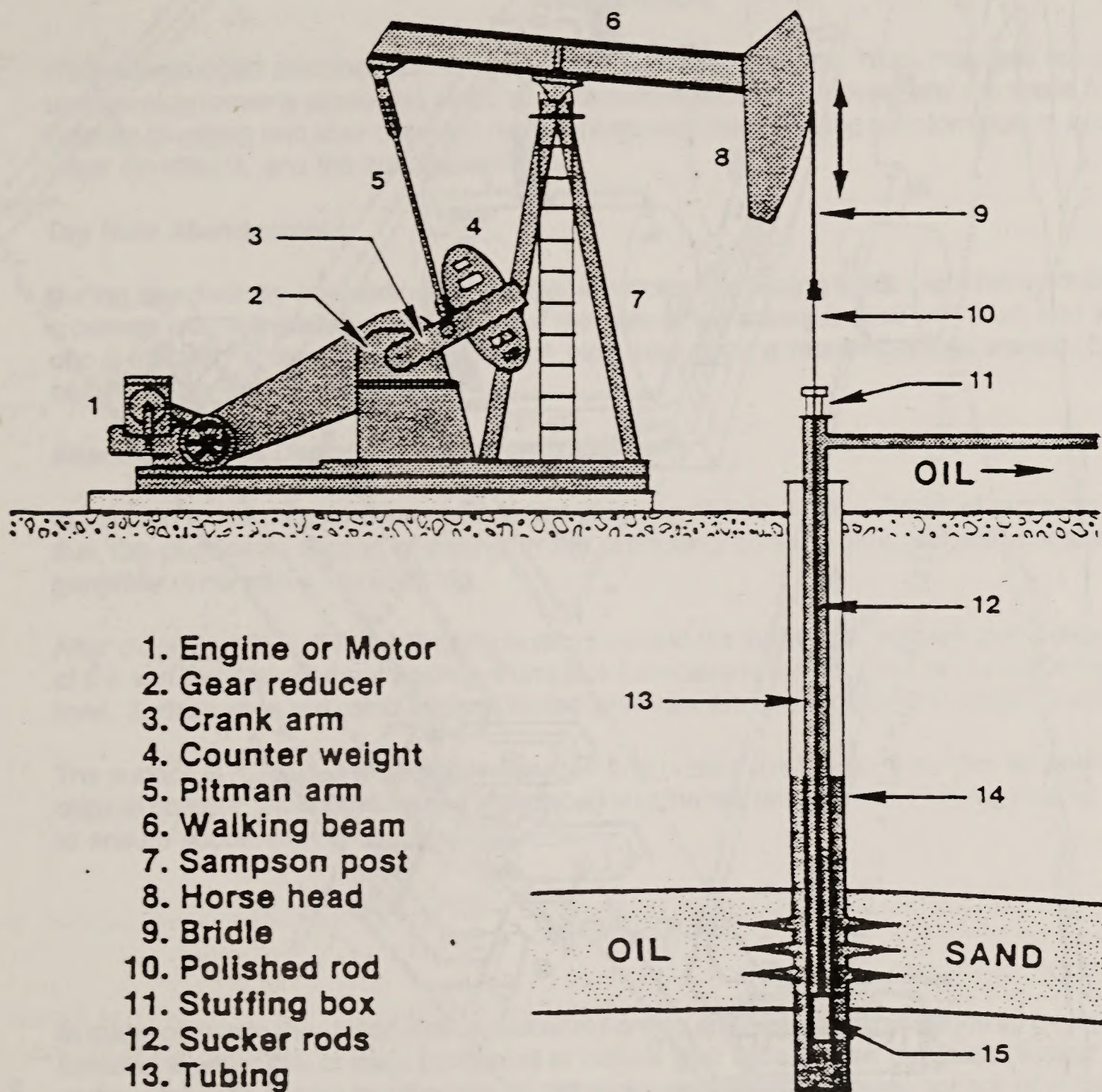
Natural gas appears to be the most likely product that would come from wells in the analysis area. The surface area required for a flowing gas well is usually a 20' by 20' fenced area together with an access road and turnaround area. A valve/gauge assembly (referred to as a "Christmas tree") to control gas flow, metering and treatment facilities, and compressor equipment would be installed on the well. In some instances water in association with the gas may enter the well and choke off the gas flow. A pump would be needed to remove the column of water (see Figure I-5). Flowlines are installed when the well is to be placed into production. The flowlines would transport the gas from the wellhead to a collector pipeline system which would carry the gas to the gas plant. An electrical system would be needed to supply electricity to the well sites and other facilities. Flowlines, collector lines and powerline cables would be buried to the extent practicable within the roadways to minimize surface disturbance.

Development of an oil producer is very similar to the natural gas producer described. Oil wells, at some time during production, will always have a pump and, in general, the surface facilities would include storage tanks for the oil. Additional traffic would occur to drain the storage tanks and remove the oil by truck. (see Figure I-6).

In addition to the actual well sites, other facilities are common in a field. Oil treatment facilities to remove water and other contaminants from the oil are normally present. Saltwater disposal wells are sometimes drilled and maintained to allow for disposal of saltwater that is generated during production. Occasionally additional wells are drilled in a field to aid in recovery of oil and gas. These wells are used to inject water, steam, carbon dioxide, polymers and micellar fluids into the reservoir to increase production.

An oil and gas field is a busy place. Wells are checked daily to ensure that all equipment is working properly. Tanker trucks are often present somewhere in the field, removing and transporting oil from the storage tanks. Wells are maintained numerous times during their life. Workover rigs are a common site in the field. These rigs are similar to, but smaller than, drilling rigs. The workover rigs are used to perform down-hole maintenance, and other activities that stimulate oil production.

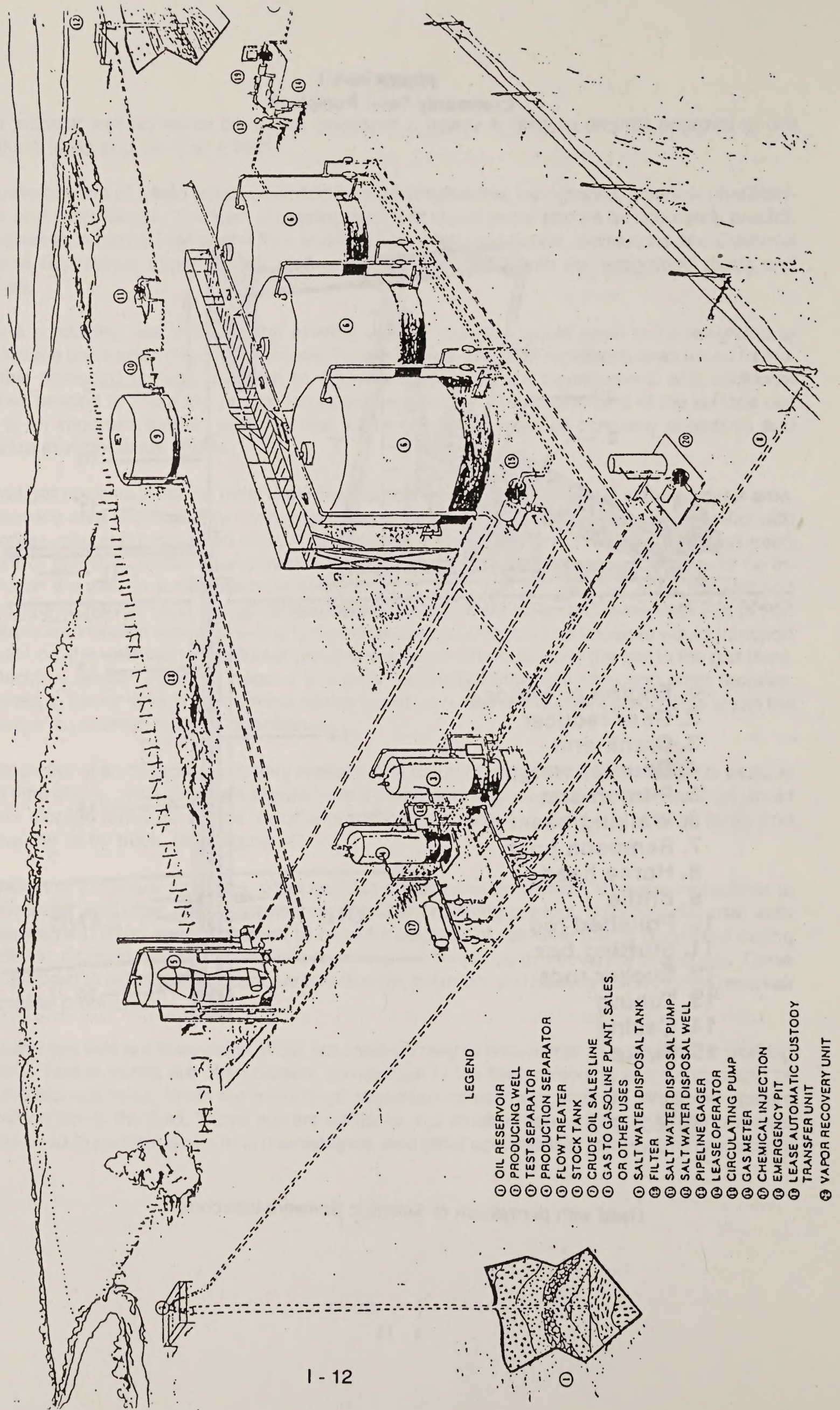
Figure I-5  
Commonly Seen Pumpjack



1. Engine or Motor
2. Gear reducer
3. Crank arm
4. Counter weight
5. Pitman arm
6. Walking beam
7. Sampson post
8. Horse head
9. Bridle
10. Polished rod
11. Stuffing box
12. Sucker rods
13. Tubing
14. Casing
15. Pump

Used with permission of Scientific Software-Intercomp.

Figure I-6  
High Production Oil Well Site



LEGEND

- ① OIL RESERVOIR
- ② PRODUCING WELL
- ③ TEST SEPARATOR
- ④ PRODUCTION SEPARATOR
- ⑤ FLOW TREATER
- ⑥ STOCK TANK
- ⑦ CRUDE OIL SALESLINE
- ⑧ GAS TO GASOLINE PLANT, SALES, OR OTHER USES
- ⑨ SALT WATER DISPOSAL TANK
- ⑩ FILTER
- ⑪ SALT WATER DISPOSAL PUMP
- ⑫ SALT WATER DISPOSAL WELL
- ⑬ PIPELINE GAGER
- ⑭ LEASE OPERATOR
- ⑮ CIRCULATING PUMP
- ⑯ GAS METER
- ⑰ CHEMICAL INJECTION
- ⑱ EMERGENCY PIT
- ⑲ LEASE AUTOMATIC CUSTODY TRANSFER UNIT
- ⑳ VAPOR RECOVERY UNIT



## **Production**

During production little activity would occur at the well site except for periodic maintenance and daily to weekly visits to assure the well is operating properly. The estimated life of a typical field is 15 to 25 years.

## **Abandonment**

Wells are plugged and abandoned upon depletion of the resource. Truck mounted equipment is used to plug formerly producing wells, all surface equipment is removed, and the site is restored.<sup>1</sup> Specific plugging and abandonment requirements vary based on the rock formations, subsurface water conditions, and the specific well site.

### ***Dry Hole Abandonment***

During standard dry hole abandonment the hole below the casing is filled with heavy drilling mud, a cement plug is installed at the bottom of the casing, the casing is filled with mud, and a cement cap is installed at the top of the casing. A pipe monument is required unless waived. Additional cement plugs may be required.

### ***Abandonment of Depleted Production Wells***

In addition to the measures required for the plugging of a dry hole, a depleted producer requires that the perforated section of casing in the producing zone be plugged with cement. This is generally done with a workover rig.

After plugging the well the drilling rig is removed and the surface is restored to the requirements of the surface management agency. Pumpjack foundations are removed or buried below ground level. Surface lines are removed and buried pipelines are left in place and plugged at intervals.

The surface is reshaped to allow revegetation and restore the landform as near as possible to its original contour. Stockpiled topsoil is replaced and the site revegetated. Fencing may be provided to ensure successful revegetation.

## **BACKGROUND**

In many places in the United States, National Forests and National Grasslands lie over geological formations which do, or may, contain oil or natural gas. Private firms purchase "leases" on many of these lands to search for oil or gas, to drill exploratory wells, and to extract any oil or gas located below them.

### **A Lease**

The government conveys limited rights to the purchaser of a lease. The lessee has the right to apply for permission to drill and to disturb an approved surface area in order to explore for oil or gas. The government conveys to the purchaser of a lease the exclusive right to: (1) drill for, mine, extract, remove and dispose of all the oil and gas (except helium) in the leasehold, and (2) build and maintain necessary supporting facilities for the term of the lease. The oil and gas lease does not convey the right to build housing, cultivate the land, or remove any minerals other than oil and gas. Lease rights provide that drilling and development take precedence over rights the govern-

ment may subsequently grant other users of the area, such as ranchers or recreationists. If the government has previously granted privileges by permit to others such as ranchers, those granted by the earlier permit will take precedence over the lease rights. A lease is normally issued for a period of five or ten years and is extended if it is producing oil or gas in "paying" quantities (43 CFR 3107).

Individuals, associations of citizens, and corporations organized under the laws of the United States, or any state, are entitled to lease federal lands for these purposes under authority of the Mineral Leasing Act of 1920 as amended, and the Mineral Leasing Act for Acquired Lands of 1947 unless the lands have been specifically withdrawn by the responsible federal agency. Leases also may be issued to a legal guardian or trustee on behalf of a minor. Aliens, whose country of origin does not deny similar privileges to U.S. citizens may hold interest in leases, but only through stock ownership of United States corporations that hold leases. Aliens may not hold interest in federal oil and gas leases through units in publicly-traded limited partnerships.

### ***Competitive and Noncompetitive Leases***

*Competitive and noncompetitive* leases may be obtained for oil and gas exploration and development on lands owned or controlled by the federal government. The Leasing Reform Act requires all public lands available for oil and gas leasing to be offered first by competitive leasing at an oral auction. Noncompetitive leases may be issued only if the competitive process results in no bids. Competitive leases are issued for a period of five years, while noncompetitive leases are issued for a ten-year period. Both are extended for the duration that they are producing oil and gas in paying quantities. The maximum competitive lease size is 2,560 acres in the lower 48 states and 5,760 in Alaska. The maximum noncompetitive lease size is 10,240 acres in all states.

#### ***Competitive Leases***

The Bureau of Land Management conducts oral auctions for oil and gas leases on at least a quarterly basis, when there are available parcels of land. A Notice of Competitive Lease Sale lists lease parcels to be offered at auction. The Sale Notice is published at least 45 days before the date of the auction. The Sale Notice identifies any lease stipulations to uses or restrictions on surface occupancy. There are three sources for federal lands available for lease:

- (1) Existing leases which have expired, and leases which have been terminated, canceled, or relinquished.
- (2) Parcels identified by informal expressions of interest from either the public or BLM for management reasons.
- (3) Lands included in offers filed for noncompetitive leases (effective January 3, 1989).

On the day of the auction, successful bidders must submit a properly executed lease bid form and make a payment consisting of a share of the sale costs (\$75 per lease), one year advance rental (\$1.50 per acre), and not less than the \$2.00 per acre minimum bonus. The balance of the bonus bid must be received within 10 working days of the auction.

The bid form constitutes the legally binding lease offer.

#### ***Noncompetitive Leases***

Noncompetitive leases may be issued only for parcels which have been offered competitively and failed to receive a bid. Lands in expired, terminated, canceled or relinquished leases are not

available for noncompetitive leasing until they have been offered competitively. After an auction, all lands that were offered competitively without receiving a bid are available for issuance of noncompetitive leases for a period of two years.

Noncompetitive offers must be submitted on a BLM-approved form, and they must include a \$75 filing fee, and one year advance rental (\$1.50 per acre).

Noncompetitive lease offers filed on the first business day following the auction are considered as having been filed simultaneously. The priority among multiple offers received on the first business day for the same parcel are determined by drawings open to the public.

### **Lease Restrictions**

A lease does not convey an unlimited right to explore or an unlimited right to develop any oil or gas resources found under the land. Leases are subject to terms and conditions. These are restrictions derived from legal statutes and measures to minimize adverse impacts to other resources and are generally characterized in a lease as *stipulations*. Stipulations modify the rights the government grants to a lessee. The stipulations are known by potential lessees prior to any sale, and must be applied at the time of APD.

### **Standard Lease Terms**

The *standard lease terms* include standard stipulations and are contained in Form 3100-11, Offer to Lease and Lease for Oil and Gas, U.S. Department of Interior, Bureau of Land Management, June 1988 [See Appendix B]. The standard lease terms provide the lessee the right to use the leased land as needed to explore for, drill for, extract, remove and dispose of oil and gas deposits located under the leased lands. Operations must be conducted in a manner that minimizes adverse impacts to the land, air, water, cultural, biological, and visual elements of the environment, as well as other land uses or users. Federal environmental protection laws such as the Clean Water Act, Endangered Species Act, and Historic Preservation Act, will be applied to all lands and are included in the standard lease stipulations. If threatened or endangered species, objects of historic, cultural or scientific value, or substantial unanticipated environmental effects are encountered during construction, all work affecting the resource will stop and the land management agency will be contacted. Operations which would destroy or harm these species or objects are prohibited.

Standard lease terms provide for reasonable measures to minimize adverse impacts to surface resources. These include, but are not limited to, modifications to the siting or design of facilities, timing of operations, and specifications of interim and final reclamation measures. Standard lease terms may not require the lessee to relocate drilling rigs or supporting facilities by more than 200 meters, require that operations be sited off the leasehold, or prohibit new surface-disturbing operations for more than 60 days each year (43 CFR part 3101.1-2).

The lease requires that the lessee meet stipulation conditions or avoid activities within all, or an identified part, of the leasehold. All leases on National Forest System lands contain the "Stipulation for Lands of the National Forest System Under Jurisdiction of Department of Agriculture," requiring the lessee to comply with the rules and regulations of the Department of Agriculture. All leases are subject to regulations and formal orders of the Secretaries of the Interior and Agriculture in effect at the time of issuance.

## ***Supplemental Stipulations***

The standard lease terms can be modified by special, or supplemental, stipulations, which may be attached to the lease. (See *Forest Service Manual 2820 - Timing Of Operations, Conditional Surface Uses, No Surface Occupancy and 43 CFR 3101.1-2 through 3101.1-4.*) Additional special stipulations can be developed specifically to meet resource concerns that cannot be mitigated by existing stipulations. All stipulations which may be applied when implementing the Forest Supervisor's decisions are detailed in Appendix B.

## **Federal Oil and Gas Leasing Process**

### ***Prior to the 1987 Leasing Reform Act***

The Secretary of the Interior, through the Bureau of Land Management, was responsible for authorizing the sale of leases for all available federal lands, including the lands of the National Forest System. The Mineral Leasing Act for Acquired Lands of August 7, 1947, (USC 351-359) provided for oil and gas leases on various lands acquired by the federal government. National Grasslands (NG's) were authorized by the Bankhead-Jones Act. These two acts identified that all leases and operations had to be approved by the Forest Service prior to sale.

Individuals and firms wishing to lease parcels of the National Forests or Grasslands would make a "Request For Lease" for a specific parcel of land to the Bureau of Land Management. The BLM would then ask the Forest Service to make a recommendation regarding sale of the lease subject to provisions of the 1920 Mineral Leasing Act or the 1947 Act for Acquired Lands. Officers of the Forest Service would determine the stipulations necessary to protect the resources. However, only the Secretary of the Interior possessed the authority to determine which stipulations to place on the lease for minerals reserved from public domain. The final decision was appealable to the BLM.

### ***After the Reform Act***

In 1987, Congress passed the Federal Onshore Oil and Gas Leasing Reform Act (P.L. 100-203). (We will refer to this as the "Leasing Reform Act" throughout the remainder of this document.) The Leasing Reform Act makes leasing on public domain lands very similar to that of acquired lands. It made two significant changes in the way leasing decisions are reached. First, the Leasing Reform Act expanded the role of the Secretary of Agriculture in the leasing decision process. The Secretary was authorized to identify the National Forest System lands for which leases could be sold. Also, he or his officers were authorized to determine the appropriate stipulations to apply to a lease to protect the surface resources.

The Leasing Reform Act also established a statutory requirement for processing the Surface Use Plan of Operation prior to ground-disturbing activities. This established a staged decision process for sale of a lease and approval of a permit to drill and operate. That is, before a firm can drill an exploratory well or extract oil or gas from National Forest System lands, the Forest Service must first authorize sale of a lease (the preliminary decision), and then must approve or disapprove a detailed Surface Use Plan of Operation at the time of an application for permit to drill (the substantive decision). The lease decision is based on, among other things, an environmental analysis in accord with the requirements of the National Environmental Policy Act (NEPA) (40 CFR part 1502) that identifies stipulations needed to protect the environment. The approval of drilling (the substantive decision) is also based on an environmental analysis in accord with NEPA, which is specific to the proposed plan of operation.

## ***The Staged Decision Process***

The legally required, staged decision process is designed to accommodate the tentative nature of oil and gas exploration and development. Exploration for oil and gas resources is costly and speculative. Firms must commit costly equipment, purchase a variety of land rights and use expensive environmental protection technologies to begin exploration for oil or gas. Driven by pressures to be efficient and minimize risk, the nature of the enterprise has evolved over decades into a form in which exploration and development requires long-term planning by many loosely associated, mutually-dependent industries. There is no guarantee that the expensive commitment of exploratory resources will result in a discovery of oil or gas as only about 15 percent of exploratory wells drilled in the United States result in a paying discovery of oil or gas.<sup>2</sup>

Consequently, firms or individuals pursuing oil and gas must be able to plan in advance to most efficiently utilize their exploratory resources. One tactic they rely on to stage commitments of their own resources is the purchase of public land leases. Developers want to know what lands are available for exploration and development and they want to be assured of continued future opportunities. Leasing of public lands is a way to do this.

Those purchasing leases, however, do not automatically or immediately drill exploratory wells on these leaseholds. In any given time period, exploration firms must match geologic characteristics with the commitment of technology, capital, available equipment, and market conditions in a decision to risk a drilling operation. As a result, federal land leases are bought, relinquished, expire, and may be bought and sold again many times without ever being drilled upon.

The federal government wants to respond to industry concerns but must ensure that future activities will neither unduly harm the environment nor unduly interfere with other uses of these public lands. A regulatory framework has been created to meet industry's needs while protecting other resources. The regulations include staged permitting of oil and gas exploration and development. Those stages include public disclosure at the following decision points: (1) the determination of lands available for leasing, (2) the leasing specific lands decision, (3) Application for Permit to Drill (APD), and (4) amendment of the permit to drill if field development occurs. The staged process is designed to minimize the risk of making a decision that could lead to undisclosed irreversible or irrevocable environmental impacts. Each decision is based on environmental analysis and disclosure of the probable effects in accord with the National Environmental Policy Act. Each decision is appealable to the responsible federal agency.

### **Stage one, Lands Available for Leasing**

The decision regarding lands available for leasing is based on disclosure and analysis provided in a "Leasing Analysis." The Leasing Analysis is a "programmatic" rather than a "site-specific" or "project" level activity. No rights are granted by the government to other parties when the Leasing Analysis is completed and the decision described in 36 CFR 228.102(d) is made. This EIS is being prepared to satisfy the requirements of the National Environmental Policy Act for the Leasing Analysis.

### **Stage two, Leasing Decisions for Specific Lands**

The Leasing Reform Act also provides for consent by the Forest Service for the issuance of oil and gas leases for specific lands. The regulations implementing the Leasing Reform Act require the following before consent can be given for one or more leases to be issued by the Bureau of Land Management:

- (1) Verifying that oil and gas leasing on the specific lands has been adequately addressed in a NEPA document, and is consistent with the Forest Land and Resource Management Plan.
- (2) Ensuring that conditions of surface occupancy identified in section 228.102(c)(1) are properly included as stipulations in resulting leases.
- (3) Determining that operations and development could be allowed somewhere on each proposed lease, except where stipulations will prohibit all surface occupancy.

### **Stage three, Application for Permission to Drill**

This document, and its Record of Decision, does not authorize any ground-disturbing activities. Those activities will be identified at the time an APD and surface use plan of operations has been provided to the Forest Service for approval. The Forest Service will analyze the proposed operations and issue a decision document.

### **Stage four, Amendment to APD**

If oil or gas resources are found through exploratory activities, industry may request a change to their approved surface use plan of operations to allow for development facilities. At that time the Forest Service must analyze the effects of these proposed changes and issue a decision document.

The U.S. Supreme Court in *Robertson v. Methow Valley Citizens Council*, 104 L.Ed.2d 351 (1989), upheld the use of more than one stage of NEPA compliance after a Forest Plan is issued. In the Methow Valley situation, there was a permit stage (which allowed no ground-disturbing activities) and a faster development plan stage which involved another NEPA process and decision by the Government before environmental effects would be experienced. This is very similar to the situation that is involved here.

A Leasing Analysis or plan level decision will determine which, if any lands will be identified as available for leasing. The Forest Plan will be amended at the same time so that the decisions made on the basis of this EIS will be consistent with the Forest Plan. A Leasing Specific Lands decision will be made as described above. Neither of these two decisions authorizes ground-disturbing activities. At a later time, one or more of the lessees may file an Application for Permission to Drill. This will be reviewed in a site-specific NEPA process and a decision will be made whether to grant, condition, or deny the application.

When the Forest Service consents to the issuance of an oil and gas lease, the lease may ultimately not be issued by the BLM. If a lease is issued, the lessee may or may not apply for an APD. If an APD is requested and granted, the well or wells authorized may or may not be drilled. If a well is drilled, it may not find oil. If oil is found, it may not be in paying quantities or quantities which would make it part of an oil and gas field. This is a major distinction between oil and gas leasing and other activities which are authorized by the Forest Service. Most activities are reasonably certain to proceed to development after the permit or contract is issued.

Even though there is great uncertainty at the time of lease authorization as to whether a well will be drilled and, if so, when and where, the effects of a typical well in a given location can be estimated reliably on the basis of past experience.

## **The Regulations Implementing the Reform Act**

The Leasing Reform Act modified the authorities of the Secretaries of Interior and Agriculture and established the foundation for staged decision-making, but the procedures to be used were defined in implementing *regulations*. The Forest Service developed those regulations over a two-year period and published the "Final Rule" in the Federal Register on March 21, 1990. (36 Code of Federal Regulations, Part 228, 100 et. seq.; 55 FR 10423.)

In the implementing regulations, the Secretaries of Agriculture and Interior have caused the **leasing decision** to be made based on a level of information appropriate to the speculative nature of oil and gas exploration. The text of the regulations which describes this decision process is as follows:

*(c) Leasing Analyses: ... the authorized Forest officer shall:*

*(1) Identify on maps those areas that will be:*

*(i) Open to development subject to the terms and conditions of the standard oil and gas lease form (including an explanation of the typical standards and objectives to be enforced under the standard lease terms);*

*(ii) Open to development but subject to constraints that will require the use of lease stipulations such as those prohibiting surface use on areas larger than 40 acres or such other standards as may be developed in the plan for stipulation use (with discussion as to why the constraints are necessary and justifiable) and;*

*(iii) Closed to leasing, distinguishing between those areas that are being closed through exercise of management direction, and those closed by law, regulation, etc.*

*(2) Identify alternatives to the areas listed in paragraph (c)(1) of this section including that of not allowing leasing.*

*(3) Project the type/amount of post-leasing activity that is reasonably foreseeable as a consequence of conducting a leasing program consistent with that described in the proposal and for each alternative.*

*(4) Analyze the reasonable foreseeable impacts of post-leasing activity projected under paragraph (c)(3) of this section.*

*(d) Area or Forest-wide Leasing decisions (Lands Administratively Available For Leasing)*

*Upon completion of the leasing analysis, the Forest Supervisor [as designated by the Regional Forester] shall promptly notify the Bureau of Land Management as to the area or Forest-wide leasing decisions that have been made, that is, identify lands which have been found administratively available for leasing.*

*(e) Leasing Decisions for Specific Lands*

*At such time as specific lands are being considered for leasing, the Forest Supervisor shall review the area or Forest-wide leasing decision and shall authorize the BLM to offer specific lands for lease subject to:*

*(1) Verifying that oil and gas leasing on the specific lands has been adequately addressed in a NEPA document, and is consistent with the Forest land and resource management plan.*

*(2) Ensuring that conditions of surface occupancy identified in section 228.102(c)(1) are properly included as stipulations in resulting leases.*

*(3) Determining that operations and development could be allowed somewhere on each proposed lease, except where stipulations will prohibit all surface occupancy.*

*36 Code Of Federal Regulations, part 228.102  
Leasing Analysis and Decisions.*

Figure I-7 is a graphic depiction of the process that the Forest Service will use to implement the regulations and identifies decision points in the leasing, exploration, and development phases of the program. The steps displayed in that figure are briefly described here and detailed on the following pages.

The Leasing Analysis is the first step in the process mandated by the regulations. The Forest Service has decided to administratively combine it, and its resultant decision notice, with the second step, the Leasing Specific Lands Decision. Both of these decisions will be documented in a single Record of Decision. Once these decisions have been made and provided to the BLM they will work with industry to provide specific lease parcels to the Forest Service. The Forest Service will implement the decision and authorize or deny the lease parcel advertisement. After purchase a lessee may propose to develop the lease and will request approval for construction in an Application for Permit to Drill. That proposal will be analyzed in a NEPA document prior to approval, modification, or denial. If the proposal is approved ground disturbing activities will occur, if not the lessee may make another proposal.

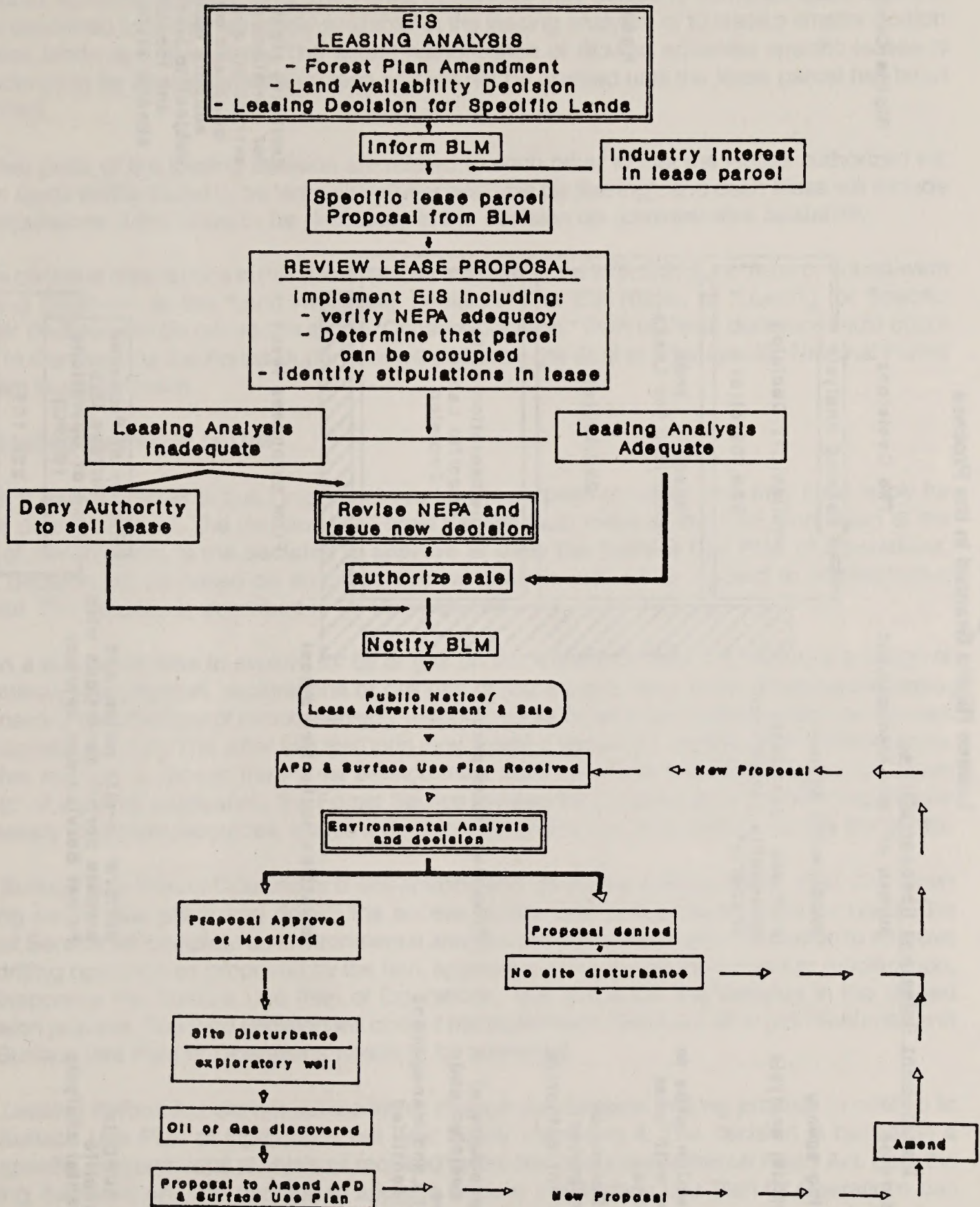
Figure I-8 further displays the roles of the BLM and Forest Service in the process and identifies the rights granted to the lessee at the decision points. The BLM and Forest Service as cooperating agencies entered into the Leasing Analysis. At the time that a Record of Decision is signed for the availability and specific lands decision there is no authority granted to the BLM to authorize a lease. That authority is granted after the lease proposal has been received and reviewed by the Forest Service. Once the Forest Supervisor authorizes the BLM to lease a specific parcel and it is sold the rights to apply for permission to drill are granted to the lessee. It is only after the APD is received, analyzed, and approved that the lessee receives the right to generate ground disturbing activities.

### ***Leasing Analysis (Land Availability)***

Note that the leasing decision itself is constructed in two parts. The first is a decision on which lands to make administratively available for leasing and under what circumstances. This decision enables the oil and gas industry to know which National Forest System lands may be available now or in the future for leasing, and under what kinds of circumstances. Forest Service publication of these decisions is intended to enable the oil and gas industry to undertake long-range planning. At the same time, the Forest Service makes no irreversible or irrevocable decisions to lease these lands.



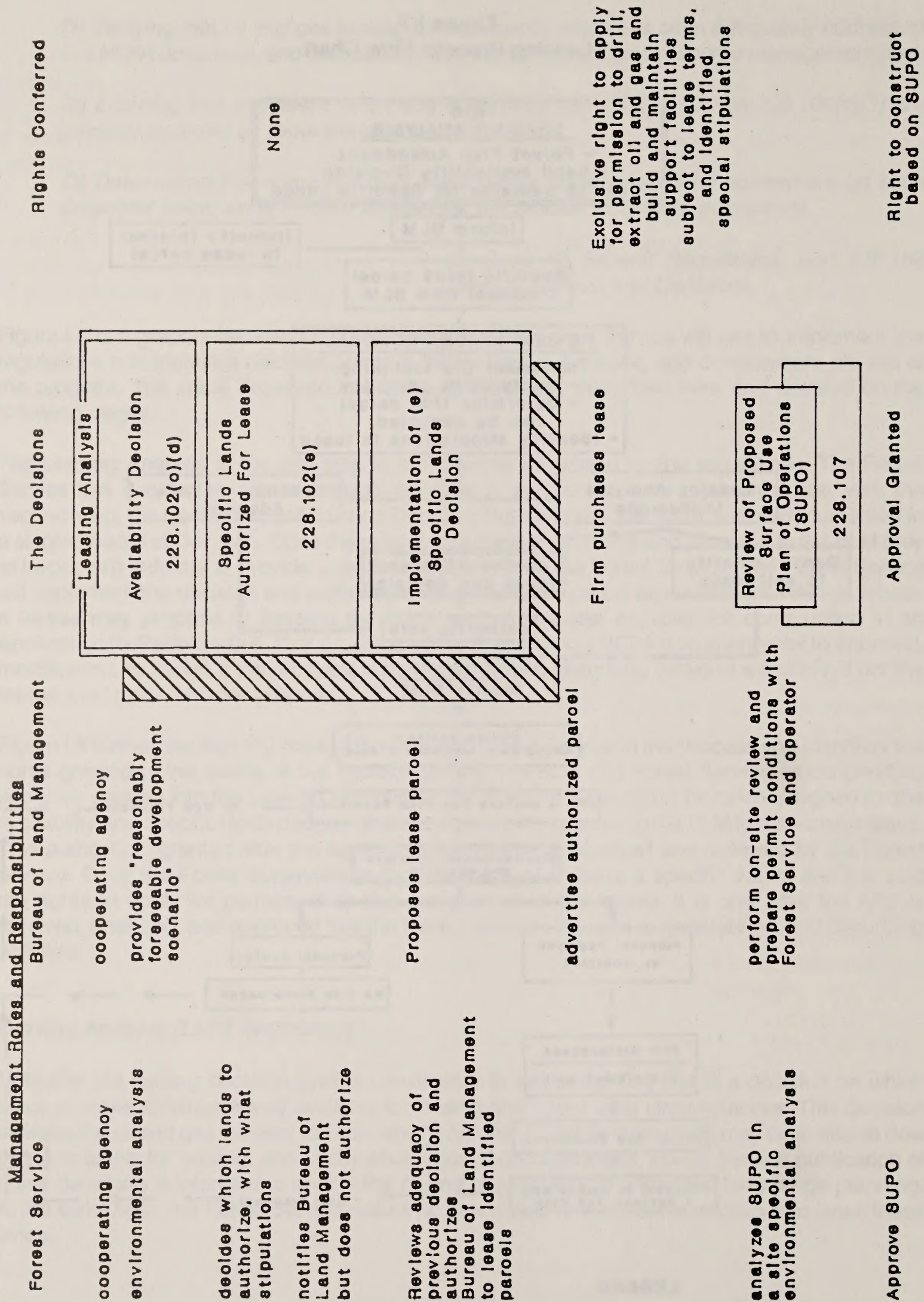
Figure I-7  
Leasing Process Flow Chart



**LEGEND**

- BLM Authority
- Administrative Appeal Point

**Figure I-8  
Lessee Rights Granted in the Process**



### ***Leasing Specific Lands (Consent)***

In the second part, the Forest Service does make general decisions to authorize leases on individual, specified areas of land. The Forest Supervisor may decide to authorize lease of all the lands described as "administratively available" in the leasing analysis, or to lease a smaller portion of these lands at a given time. The actual authorization of BLM to advertise specific leases is considered to be an implementation step and will not be granted until the lease parcel has been identified.

The two parts of the leasing decision are related to each other in that the leases authorized will be on lands earlier found to be "administratively available for leasing", and each lease will include the stipulations determined to be necessary in the decision on administrative availability.

As we continue discussions in this document we will refer to the 228.102(d), or "Area or Forest-wide Leasing Decision" as the "Land Availability Decision." The 228.102(e), or "Leasing for Specific Lands" decision will be referred to as the "Consent Decision." Both of these decisions must occur prior to the time that the Forest Supervisor will authorize the BLM to offer specific National Forest System lands for lease.

### ***Application for Permit to Drill***

When a lessee desires to build improvements for the purpose of exploration they must apply for a use permit to do so. The decision the Forest Service must make at that time, and again at the time of development, is **the decision to approve or deny the Surface Use Plan of Operations.** That decision will be based on an environmental analysis and will be subject to administrative appeal. The process is described in 36 CFR 228.107.

When a lessee decides to explore for oil or gas on the leasehold, they may conduct a range of preliminary, geophysical, explorations or drill one or more exploratory wells. Geophysical explorations may take the form of remote sensing, mapping rocks or outcrops, seismic reflection surveys or magnetic surveys. The latter two methods may create a temporary environmental disturbance. If either method is chosen the Forest Service must authorize it via a prospecting permit. Upon receipt of a permit application, the Forest Service reviews the proposal to determine stipulations necessary to protect resources, issues a decision document, and approves or denies the permit.

The Surface Use Plan of Operations is site-specific and describes exactly where, how, and when drilling would take place and details the access, equipment, and procedures to be used. The Forest Service will complete an environmental analysis of the proposal and may decide to approve the drilling operation as proposed by the firm, approve drilling operations subject to modification, or disapprove the Surface Use Plan of Operations. This is the second decision in the staged decision process. The third decision will come if the exploration discovers oil or gas resources and the Surface Use Plan of Operations needs to be amended.

The Leasing Reform Act did not substantively change our decision-making process in relation to the Surface Use Plan of Operations but now legally mandates it. The decision is based on a site-specific environmental analysis as required by the National Environmental Policy Act. Both the leasing decisions and the decision to approve or deny the Surface Use Plan Of Operations can be administratively appealed.

## Impacts of a Lease

The authorization of a lease does not, in itself, create any environmental effects. However, authorization implies that oil and gas development may take place at a future time with identified restrictions. The regulations direct the Forest Service to consider the subsequent actions which would be authorized by a lease, and their potential environmentally disturbing effects, as *connected actions*. This includes all activities described earlier in this chapter. These actions also meet the definition of connected actions in the procedural requirements for the National Environmental Policy Act. (40 CFR 1502.)

These expected actions are the basis of the environmental analysis from which the leasing decisions will be made. The decision on the lands that will be administratively available, and the subsequent decision authorizing leases, are based upon analysis of the likely environmental effects of the connected actions.

### **DECISIONS FOR WHICH INFORMATION IS DISCLOSED**

Before the Forest Service issued the implementing regulations, the Forest Supervisor began to analyze which National Forest System lands should be available for oil and gas leasing. The Supervisor's analysis was completed prior to the publication of the regulations and was published as a draft *Oil and Gas Leasing EIS with Appendices*, in March of 1990, shortly after publication of the draft regulations. Because the final regulations changed the decision-making responsibilities of the Secretaries of Agriculture and Interior the Forest Supervisor set his original analysis aside and began a new study.

This document, the new *Draft Oil and Gas Leasing Environmental Impact Statement with Appendices*, describes and explains the complete set of leasing decisions the Forest Supervisor will make. It explains how the Forest Supervisor and the State Director of the BLM will implement the decisions to authorize and sell leases and how future decisions will be made to issue permits to drill and develop fields of oil and gas. The environmental significance of each of these decisions, and measures the Forest Service will use to assure protection of the quality of the human environment will also be displayed. The document will also include a proposed Forest Plan Amendment that will modify current direction for oil and gas leasing activities on the Unit.

It is important to explain the decisions required by the Leasing Reform Act, but the basic purpose of this document is to disclose the environmental effects of decisions the Forest Supervisor is considering for managing the oil and gas leasing and development programs on the Pike and San Isabel National Forests and the Comanche and Cimarron National Grasslands. This EIS describes:

- the significant environmental issues involved in these decisions,
- the nature of the lands and environmental conditions of the Unit,
- alternative patterns of land which could be available for leasing based on resource protection levels,
- stipulations to be applied based on resource values, and
- the direct, indirect and cumulative environmental consequences of these alternatives.

## THE ANALYSIS PROCESS

The decisions identified above will be based on the following information.

### Land Availability

Looking at all the lands of the Pike and San Isabel National Forests and the Comanche and Cimarron National Grasslands, the Forest Supervisor and his staff specialists will display the resources and environments of the Unit and the technology of oil and gas exploration and extraction.

To comply with the procedural requirements of both the regulations and the National Environmental Policy Act, the Supervisor and staff will develop a set of alternative patterns of lands available for leasing on the Unit. Maps will include the stipulations that will apply to all available land areas and the resource values driving the need for the stipulations. A generalized stipulation map will be included in each copy of the EIS. Site-specific maps at a 1:24000 scale will be available at the Forest Service office in Pueblo, the BLM office in Denver, and at each Ranger District for the lands they administer.

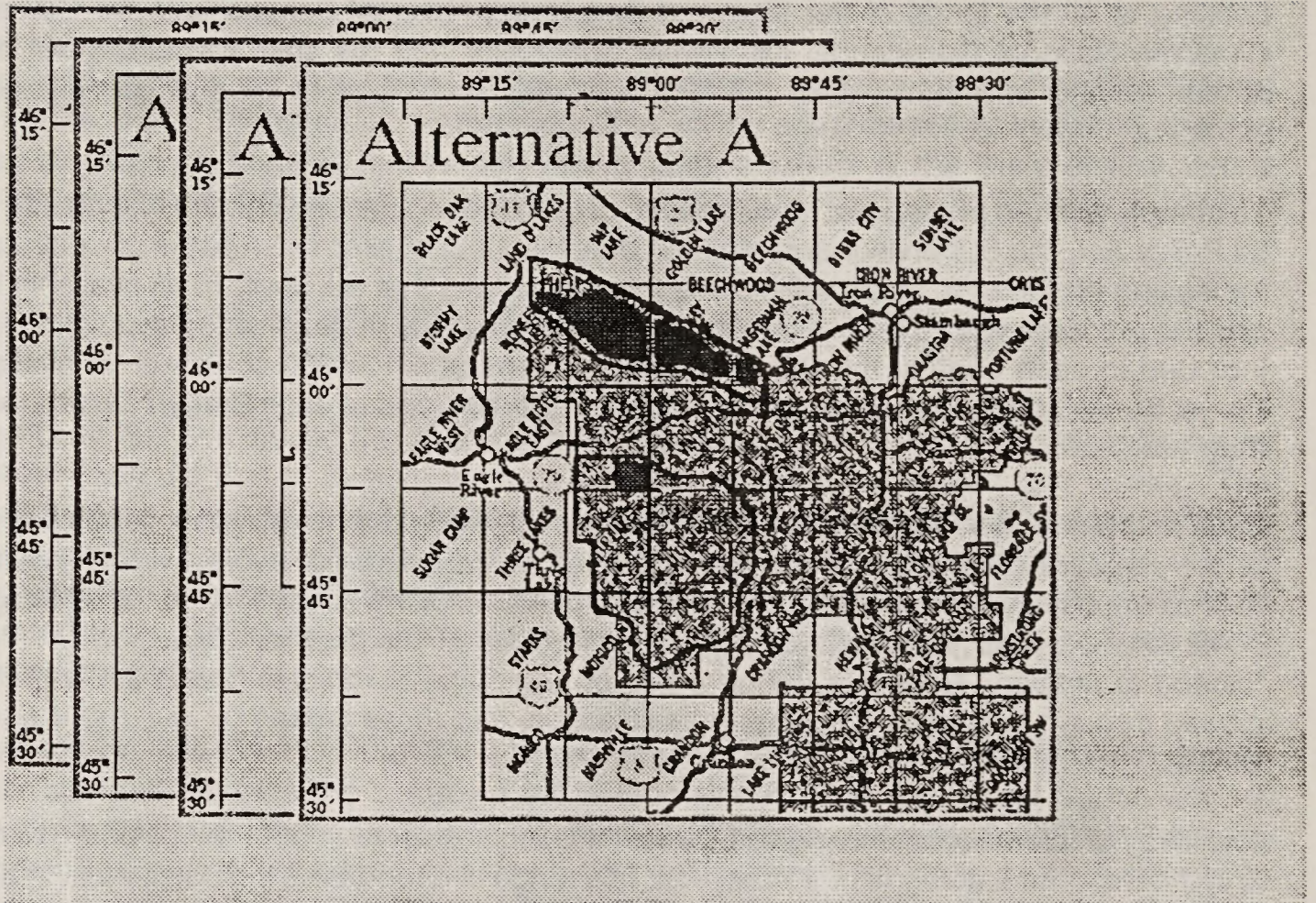
Each alternative map will show the areas *"open to development subject to the terms and conditions of the standard oil and gas lease form, open to development but subject to constraints that will require the use of lease stipulations such as those prohibiting surface use on areas larger than 40 acres or such other standards as may be developed in the plan for stipulation use,"* and areas *"closed to leasing."* Notations will be made on the maps to indicate *"those areas that are being closed through exercise of management direction, and those closed by law, regulation, etc."* (36 CFR 228.102(c))

The array of alternatives is designed to meet the requirements of both the oil and gas regulations and the National Environmental Policy Act. The range of alternatives includes: making all lands *not available* for leasing; making all lands available with standard stipulations; and making some lands available with mixtures of standard and supplemental stipulations. (See Figure I-9)

The text in Chapter II of this EIS which accompanies these maps will *"include an explanation of the typical standards and objectives to be enforced under the standard lease terms."* (36 CFR 228.102(c)(1)(i))

Chapters III and IV of this EIS will describe the expected environmental effects of these alternative land leasing availability patterns, and *"discuss why additional constraints are necessary and justifiable."* (36 CFR 228.102(c)(1)(ii))

Figure I-9  
Land Availability Patterns



### Reasonably Foreseeable Development

The regulations, in 36 CFR 228.102(c)(3 and 4), require the Forest Service to "Project the type/ amount of post-leasing activity that is reasonably foreseeable as a consequence of conducting a leasing program consistent with that described in the proposal and for each alternative and analyze the reasonable foreseeable impacts of post-leasing activity under (c)(3) of this section" as a part of the analysis. This, then, becomes the direction to predict the activity that we will be implementing.

The staff specialists of the BLM have expertise to project the probable amount and pattern of future exploration and development. They have provided a "reasonably foreseeable development" (RFD) scenario [see Appendix C] to describe when and where oil and gas activities may take place. The anticipated activity during the 15-year period analyzed in the draft EIS includes 4 exploratory wells on the Pike and San Isabel National Forests, 45 mixed exploratory and production wells on the Comanche National Grassland, and 165 production wells on the Cimarron National Grassland.

The RFD is the "estimated cause" of the "estimated direct, indirect, and cumulative effects" that will result from the leasing activities and must be displayed in this document. The Forest Supervisor will use this RFD scenario in the analysis to estimate the net environmental effects of the leasing program on all lands, determine land availability, and then decide which lands to authorize for lease.

For analysis purposes we have assumed that we are at the APD stage on an existing lease. We will adjust the proposed well locations and operations, when necessary, based on the alternatives. This will allow for the disclosure of anticipated effects by alternative. In actual implementation the selected alternative will disclose stipulations prior to lease advertisement and sale. This allows the lessee to adjust parcel boundaries and, at the time of APD, proposed operations in order to maximize their development opportunities and minimize resource impacts.

Chapter IV of this document displays the range of possible environmental effects of the land availability opportunities on the National Forests and Grasslands.

The RFD information provided by the BLM clearly indicates that there is little likelihood of exploratory drilling and no expectation of development on the Mountain Districts. In order to implement the regulations the Forest Supervisor must make decisions about land availability and lease authorizations on lands including those where exploration and development are not anticipated. In order to disclose the information the Forest Supervisor needs to make those decisions, we have identified and mapped the critical geologic zones on the Unit. This will help ensure that the environmental effects of leasing, need for stipulations, and opportunity to occupy leases once they are identified have all been adequately addressed. We address the impacts of a well on potentially available lands and slope classes to validate the need for stipulations on lands not represented by RFD wells. These effects, and the validation of stipulations are disclosed in Appendix D of this analysis. This satisfies the disclosure requirements of the Leasing Reform, National Environmental Policy, and National Forest Management Acts.

#### **Consent**

(Leasing Specific Lands 36 CFR 228.102(e))

Having selected the lands that are "administratively available for leasing", the Forest Supervisor will proceed to the second decision, which is to determine which of those available lands to specifically authorize for leasing.

The Consent Decision will be made on the basis of knowledge of the possible environmental effects gathered from the availability analysis and the ability of the Forest Supervisor to "verify that oil and gas leasing on the specific lands has been adequately addressed according to the requirements of the National Environmental Policy Act, that conditions of surface occupancy identified in section 228.102(c)(1) are properly included as stipulations in the leases," and that "operations and development could be allowed somewhere on each proposed lease, except where stipulations will prohibit all surface occupancy."

The Forest Supervisor will now use the information disclosed in this EIS to make the "Land Availability and Consent Decisions" described in the implementing regulations for the Leasing Reform Act.

The Supervisor will decide which lands to make available for leasing, and what stipulations to apply should those lands be leased. The decision to lease or not lease land areas will be made. The time period the decisions will be in effect, and processes for review, revision, implementation, and monitoring will be identified.

The information and decisions disclosed in this document and Record of Decision will be incorporated into the *Land and Resource Management Plan for the Pike and San Isabel National Forests and the Comanche and Cimarron National Grasslands* as an amendment to the Plan.

### **THE NEED FOR THESE DECISIONS**

There are legal and practical needs for these decisions. The legal needs for these decisions have been described above. The Forest Supervisor has several factual reasons to make these decisions at this time, they are as follows.

#### **Outstanding Requests For Lease**

During the two-year period between passage of the Leasing Reform Act and publication of the final implementing regulations, firms applied to the BLM for approximately 400 leases on portions of the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands. Those lease requests have been mapped and are found in Appendix E. The BLM and the Forest Service could not properly act upon these "Requests For Lease" prior to the regulations. The Forest Supervisor needs to determine which lands are available for leasing, and which of the 400 outstanding lease requests to authorize.

#### **Renewal Decisions For Existing Leases**

The Unit currently has 450 existing leases. Forty percent of these leases are expected to expire within the fifteen year planning horizon. The others are not expected to expire within that fifteen years because they are currently producing oil or gas resources and have been extended. We are analyzing all lands, including those currently leased so that, when they do expire, the decision has been made whether or not to offer them for sale and the required stipulations are known. It is possible that currently-leased lands would not be available for resale or would be available with stipulations that are not in the current lease.

#### **Anticipated Lease Requests**

Based on past experience, the Forest Supervisor can expect to receive approximately 90 Requests For Lease on the Unit each year.

Under present circumstances, the Forest Supervisor must react to each request individually. This involves documentation of as many as 90 individual environmental analyses per year for which the Forest Service is neither staffed nor funded. When each lease request is studied on an individual basis, it is difficult for the Forest Supervisor and staff to study the aggregate and cumulative



environmental effects of these operations. In order to plan for the orderly management of National Forest System lands, resolve potential conflicts in land or resource use in a meaningful way, and study the aggregate and cumulative effects of oil and gas leasing, the Forest Supervisor has chosen to disclose the analysis leading to the availability and consent decisions on a Forest-wide basis.

## **CONTEXT OF THE DECISIONS**

### **Geographical Context**

The Pike and San Isabel National Forests and the Comanche National Grassland are located in southeastern Colorado. The National Forests lie along the eastern slope of the central and southern Rocky Mountains. The Comanche National Grassland is in the high plains area of southeastern Colorado near the Kansas and Oklahoma borders. The Cimarron National Grassland is located in Kansas, near the town of Elkhart. It also is located in the high plains environment.

The two National Forests and the two National Grasslands were combined into a single administrative unit of the National Forest System in 1973. That is, one Forest Supervisor administers these National Forests and National Grasslands.

The majority of the Forest's lands are available for oil and gas leasing at the current time. A few areas of the Forest (designated wildernesses, Manitou Experimental Forest, Congressionally designated Wilderness Study Areas (WSA's), and several special areas) will not be studied at this time. Most have been declared unavailable by Congressional action and/or withdrawn from mineral leasing by action of the Forest Service or Department of Agriculture. The Forest Supervisor does not have the authority make leasing decisions on the Experimental Forest. The unavailable lands total 550,872 acres in comparison to the 2,201,603 acres of the Unit available for analysis.

Split-estate lands, that is, lands for which the federal government holds mineral rights but has no surface ownership, are included in this document, and constitute 107,973 acres.

The lands being analyzed can be segregated based on areas which are already leased, currently unleased lands that have been identified by industry in lease requests, and currently unleased lands that have not been identified by industry on the Unit.

### **The Forest Plan Context**

Each administrative unit of the National Forest System (one or more National Forests or National Grasslands) is governed by a Land and Resource Management Plan (Forest Plan). The existing Forest Plan includes general decisions to make lands administratively available for oil and gas leasing, but does not include decisions for leasing specific lands. Decisions the Forest Supervisor will make, including refinement of availability, will be used to develop a programmatic amendment to the Forest Plan.

### ***Programmatic versus Project, or Site-specific***

Forest Plans provide broad, programmatic direction for management of a National Forest. This direction is in the form of multiple-use goals and objectives, area-specific management prescriptions, and standards and guidelines to be applied to individual projects. Forest Plans normally do not make site-specific decisions; that is the role of project-level environmental analysis.

The first step in the land management planning process is the Forest Plan, which determines land management emphasis areas, and provides the requirements for site-specific activities. The second step is the analysis of individual projects, which includes applying the standards and guidelines in the Forest Plan to site-specific activities.

Project-level decisions require site-specific environmental analysis. An environmental analysis document, such as an EIS or environmental assessment (EA), precedes these decisions unless they are categorically excluded from documentation. Project-level planning provides an additional opportunity for public participation. In the case of the oil and gas program management this site-specific planning is done when applications for permission to drill for exploration and development are processed. This level of planning may result in further amendment to the Forest Plan at some time in the future.

#### ***Standards and Guidelines***

The Forest Plan contains management standards for oil and gas exploration and development. The Plan also provides other Forest-wide standards for the protection coordination of other resources. Both the Forest Plan and the Forest Plan EIS are incorporated into this document by reference. Some standards and guidelines may be amended as a result of this analysis.

#### ***Tiering***

This EIS is directly tiered (40 CFR Parts 1502.20 and 1508.28) to Chapters I, III, IV and VI and Appendices B, C, and F of the Forest Plan FEIS. Copies of the Forest Plan FEIS are available for review in the Forest Supervisor's Office and at all Ranger District Offices on the Forest, in the Regional Forester's Office, 11177 West 8th Ave., Lakewood, Colorado, in the Forest Supervisor's Office of all National Forests contiguous to this Forest and in most public libraries in or near this Forest. Mailing addresses of these offices can be found in Chapter VI or by calling the Forest Supervisor's Office at (719) 545-8737.

#### ***Current Forest Plan Direction***

The current Forest Plan directs managers to conduct site-specific analysis of available lands for oil and gas leasing. Negative recommendations or concent denials will be based on the following criteria:<sup>3</sup>

- Slopes steeper than 60 percent.
- High erosion hazard soil ratings.
- High geologic hazard ratings.
- Low visual absorption capacity that prevents reclamation to established visual quality objectives.
- Conditions jeopardize the survival or recovery of federally, or state listed threatened and endangered wildlife or plant species.

#### ***Forest Plan Amendments***

When a change to the Forest Plan is needed the Forest Supervisor will prepare an amendment and conduct an environmental analysis. Non-significant amendments may be approved by the Forest Supervisor. Significant amendments must be approved by the Regional Forester, and the development and approval of a significant amendment must follow the same procedures as were

required for developing and approving the current Forest Plan. "Significance" is defined, in this case, by the National Forest Management Act regulations, and is different than "significance" as defined by the National Environmental Policy Act.

The Forest Supervisor may amend, or recommend to amend, the Forest Plan at any time. An amendment may result from:

- (1) Recommendations of an interdisciplinary team, based on the results of monitoring and evaluation.
- (2) Decisions by the Forest Supervisor that existing or proposed permits, contracts, cooperative agreements, or other instruments authorizing occupancy and use are appropriate, but are not consistent with the Forest Plan.
- (3) Changes in proposed implementation schedules, resulting from differences between Forest Plan projected funding levels and actual funds appropriated.
- (4) Administrative appeal decisions.
- (5) Planning errors found during plan implementation.
- (6) Changes in physical, biological, social, or economic conditions.
- (7) Implementation of new legislation.

The Forest Supervisor will determine whether the proposed changes are significant or non-significant. If the Forest Supervisor decides that the leasing availability decision is a non-significant change to the Forest Plan the reasoning will be explained in the decision document. If the Supervisor feels the decision results in a substantial change to the Forest Plan the Regional Forester must decide how the plan will be changed. The Regional Forester will prepare a decision document based on environmental analysis and public disclosure.

This document will disclose the information needed for the Forest Supervisor to determine if a Forest Plan Amendment is required, and whether or not that amendment is significant. The Supervisor may refine the availability determinations made in the Forest Plan, identify specific mitigation requirements to be applied at the time of leasing and allows more specific mitigation to be identified at the time a Surface Use Plan of Operations is being analyzed.

#### **Current Bureau of Land Management Direction**

The BLM's District's Royal Gorge Resource Management Plan (currently under revision) will cover "severed mineral estates" within and adjacent to NFS boundaries in the eastern plains of Colorado and of the Pike and San Isabel National Forests. The BLM will incorporate information from this EIS into their management plan.

#### ***AUTHORITY OF THE FOREST SUPERVISOR TO MAKE THE DECISIONS***

The authority of the Forest Supervisor to make these decisions is conferred by the Leasing Reform Act as described above. The implementing regulations gave the authority to make these decisions

to Regional Foresters. The Regional Forester has delegated that authority to the Supervisor of the Pike and San Isabel National Forests and the Comanche and Cimarron National Grasslands.<sup>4</sup>

A series of statutes prior to the Leasing Reform Act further establish and define the authority of the Supervisor to make these decisions. These are:

**General Mining Law of 1872  
(later amended by the Mineral Leasing Act of 1920)**

Public lands, including National Forest System lands, valuable for oil deposits were open to entry and placer mining claims under the General Mining law. (See Act of Feb. 11, 1872, 29 Stat. 526.) The General Mining Law of 1872 (30 USC 22-54) preceded the Organic Act and the establishment of the Forest Reserves and National Forests. The General Mining Law governs mining activity on public lands and National Forest System lands.

So many claims were filed under the General Mining Law that the President issued a Proclamation in 1909 withdrawing public lands from such entry, pending the enactment of legislation to protect such lands. (See *U.S. v. Midwest Oil Co.*, 59 L.Ed. 673 (1915), and *Udall v. Tallman*, 13 L.Ed. 2d 616, 628 (1965)). However, protective legislation was not enacted until the Mineral Leasing Act of 1920. (See *Boesche v. Udall*, 373 US 472, 10 L.Ed. 2d 491, 497 (1963).) This Act authorizes the Secretary of the Interior to issue leases for disposal of certain minerals (currently applies to coal, phosphate, sodium, potassium, oil, oil shale, gilsonite, and gas). The Act applies to National Forest System lands reserved from the public domain.

**Mineral Resources on Weeks Law Lands**

Act of March 4, 1917 (39 Stat. 1150, as supplemented; 16 U.S.C. 520). This act authorizes the Secretary of the Interior to prescribe general regulations to permit prospecting, development, and utilization of the mineral resources of the lands acquired under the Act of March 1, 1911, known as the Weeks Law, for the best interests of the United States.

**Reorganization Plan No. 3 of 1946**

Part IV, Section 402 (60 Stat. 1097, 1099; 5 USC Appendix). This Plan provides that development of mineral deposits in certain lands pursuant to provisions of the Mineral Resources on Weeks Law Lands Act of March 4, 1917 (Ch. 179, 39 Stat. 1134, 1150, 16 USC 520) shall be authorized by the Secretary of the Interior only when he is advised by the Secretary of Agriculture that such development will not interfere with the primary purposes for which the land was acquired and only in accordance with such conditions as may be specified by the Secretary of Agriculture in order to protect such purposes.

**Mineral Leasing Act for Acquired Lands of August 7, 1947**

Ch. 513, 61 Stat. 913; 30 USC 351, 352, 354, 359. This Act provides that all deposits of coal, phosphate, oil, oil shale, gas, sodium, potassium, and sulphur which are owned or may be acquired by the United States and which are within the lands acquired by the United States may be leased by the Secretary of the Interior under the same conditions as contained in the leasing provisions of the mineral leasing laws. No mineral deposit covered by this section shall be leased except with the consent of the head of the executive department, independent establishment, or

instrumentality having jurisdiction over the lands containing such deposit, or holding a mortgage or deed of trust secured by such lands which is unsatisfied of record, and subject to such conditions as that official may prescribe to ensure the adequate utilization of the lands for the primary purposes for which they have been acquired or are being administered.

### **Energy Security Act of June 30, 1980**

P.L. 96-294, 94 Stat. 611; 42 USC 8801 (note), 8854, 8855. This Act directs the Secretary of Agriculture to process applications for leases and permits to explore, drill and develop resources on National Forest System lands, notwithstanding the current status of the land and resource management plan.

### **The Federal Onshore Oil and Gas Leasing Reform Act of December 22, 1987**

30 USC 181, et seq.; P.L. 100-203. The 1987 Reform Act expanded the authority of the Secretary of Agriculture in the management of oil and gas resources on National Forest System lands and directed the Secretary to issue rules on bonding and reclamation standards. Under the Act, leases for oil and gas on NFS lands cannot be issued by the BLM without the approval of the Forest Service. All surface-disturbing activities on NFS lands must be approved by the Forest Service before operations commence. The Act also provides for inspections and enforcement of operations once commenced. Regulations implementing this statute were published in the Federal Register by the U.S. Forest Service on March 21, 1990. (55 FR 10423, et. seq.) The regulations were codified in 36 Code of Federal Regulations 228.100 et. seq.

### **Organic Act**

The Organic Act of June 4, 1897 (16 USC 475) established the system of Forest Reserves, which later became the National Forest System. This act defines and describes the basic purposes for which National Forests (and later, National Grasslands) are to be managed.

The Act provides in part that *"..it is not the purpose or intent of these provisions, or of said section, to authorize the inclusion therein of lands more valuable for the mineral therein, or for agricultural purposes, than for forest purposes."* (Chapt. 2, Sec. 1, (30 Stat. 34)) Provision is made for regulations allowing free use of timber and stone for bona fide miners and prospectors in 16 USC 477. Authority for regulations providing access for prospecting, locating, and developing mineral resources is found in 16 USC 478.

The General Mining Law of 1872 (30 USC 22-54) preceded the Organic Act and the establishment of the Forest Reserves and National Forests.

### **Multiple-Use Sustained-Yield Act**

The Multiple-Use Sustained-Yield Act of 1960 (16 USC 528) extended the purposes for which lands of the National Forest System could be managed. It also declared that these lands be be managed for multiple uses, rather than for individual uses in individual places. Management of the individual natural resources of the lands is declared to be according to the principle of sustained yield in perpetuity.

This Act provides, in part, that, *"Nothing herein shall be construed so as to affect the use or administration of the mineral resources of national forest lands ..."*

### **National Forest Management Act**

This statute (16 USC 1600, et. seq.) and its implementing regulations (36 CFR Part 219) define additional principles for management of the lands and resources of the National Forest System. This Act also directs the Forest Service to create Land and Resource Management Plans for each administrative unit of the National Forest System. The Plans are *"to provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes net public benefits in an environmentally sound manner."* (36 CFR 219.1(a)). The Act describes required management of renewable resources, but indicates that mineral exploration and development must be considered in the planning and management relating to the renewable resources. (36 CFR 219.22).

These authorities, and the discretion of the Forest Supervisor in making these decisions, are conditioned by several other statutes. The basic laws which limit the discretion of the Supervisor to make these decisions are the following.

### **National Environmental Planning Act**

This statute (40 USC 4331 et. seq.) and its implementing regulations (40 Part 1500) apply to federal actions relating to oil and gas leasing on the National Forests. This statute requires the Forest Supervisor to perform an environmental analysis and disclose the effects of his decisions on the quality of the human environment. The law further requires the Forest Supervisor to identify and describe the significant environmental issues associated with his decision and to develop alternatives to his proposed action (including the alternative of no action). The Supervisor must disclose the direct, indirect and cumulative effects of the decisions, and adverse environmental effects which cannot be avoided, the relationship between short-term uses of man's environment and the maintenance of long-term productivity, and any irreversible or irretrievable commitments of resources made by the decision.

### **The Clean Air Act of 1970**

91 Stat. 685; 42 U.S.C. 7401 et. seq. The Clean Air Act provides that each state is responsible for ensuring achievement and maintenance of air quality standards within its borders.

### **The Endangered Species Act of 1973**

Public Law 93-204; 16 USC 15311, et. seq. As amended, this law requires special protection and management on federal lands for threatened or endangered species. The U.S. Fish and Wildlife Service (USFWS) is responsible for administration of this act. Federal agencies proposing an action or processing an action proposed by a third party which "may affect", in any way, the existence of an identified species must consult with the USFWS to determine if, and how, the proposed action will affect those species. Mitigation measures will be developed through the consultation process and are put forth as suggested conservation measures included in the "FWS Biological Opinion."<sup>5</sup>

## **Clean Water Amendments**

Federal Water Pollution Control Act Amendments of 1972; Act of October 18, 1972 (P.L. 92-500, 86 Stat. 816, as amended; 33 USC 1251, et seq.) The act puts forth national standards to restore and maintain chemical, physical and biological integrity of the Nation's waters. Upon passage of Environmental Quality Acts and adoption of water quality standards, state agencies were empowered to enforce water quality standards.

## **Historic Preservation Act**

The National Historic Preservation Act is Public Law 89-665, 80 Stat. 915 (16 USC 470) as amended. Section 106 of the Act requires a federal agency planning an undertaking to consider the effects of the action on cultural sites eligible to, or listed on, the National Register of Historic Places. Prior to the approval of the undertaking the agency must afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking.

## **FOREST SERVICE ROLE IN IMPLEMENTATION**

The decisions identified in the Record of Decision shall be implemented in the following manner:

- (1) The Forest Supervisor will amend the Forest Plan and notify the BLM as to the decision made. This will include:
  - Lands available for leasing
  - Resource and stipulation maps
  - Lands the Forest service intends to authorize for leasing
- (2) When the Forest Service receives a lease request and parcel identification from the BLM they will overlay the lease boundaries on the resource and stipulation maps (samples in Appendices F and G) and review the leasing analysis, availability determination, and consent decision. The maps in the appendices are small scale versions of the 1:24000 scale base maps and overlays that will be used for project implementation.
- (3) If occupancy can be provided based on the map comparison, the Forest Service will notify the BLM and authorize the advertising of the parcel.
- (4) If occupancy cannot be provided based on the review, the BLM will deny the request for leasing and work with the interested party and the Forest Service to determine if the parcel boundaries can be redefined to allow for occupancy.
- (5) The Forest Supervisor will monitor the identified stipulations with the BLM. Any adjustments will be documented and supplementation or amendment to this document will occur when warranted. The conditions that will warrant these actions are as follows:

When conditions on the ground are not consistent with the disclosure in this document and allowable mitigation is not sufficient to protect the resources.

When analysis at the time of APD discloses effects that were not identified here.

- (6) Lessee will submit an "Application for Permit to Drill" an exploratory well. The BLM will forward the application and the proposed Surface Use Plan of Operations to the Forest Service. An environmental analysis will be completed on the proposed plan. The analysis will tier to this document and must be consistent with it. The Deciding Officer may:

- Approve the plan as submitted,
- Approve the plan subject to specified conditions, or
- Disapprove the plan with stated reasons [See Figure I-7].

- (7) If oil or gas are found the Surface Use Plan of Operations may be supplemented to reflect the needs for further development. All supplements will be analyzed and approved or disapproved based on an appealable decision document.

### Sample Mapping Exercise

A sample lease parcel is provided on the next two pages. This parcel is located in the Rampart Range near Palmer Reservoir. The first map, figure I-10, Represents the stipulation base map that is a part of the Forest Plan Amendment and can be found in Appendix F. The second map, figure I-11, represents a partial quad map. On it are the stipulations that would be applied on the specific lands mapped. The stipulations were identified based on the resource inventories, which are overlays on the quad maps, and analysis. This is the level of information to be used in implementation.

When a lease parcel is identified the Forest Service will take that parcel and impose it on the stipulation maps (figure I-11). The combined map, displayed in figure I-12, is the lease parcel with the stipulations that will be applied following field review. The resource overlays must be referenced to identify the specific resource value driving the stipulation.

The lease parcel map would be included with the lease as would the identified, applicable, lease stipulations. The stipulations that would be applied to this lease parcel are displayed in figures I-13 through 17.



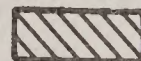
Figure I-10  
Stipulation Base Map



LEGEND

SCALE 1/2" = 1 MILE

- 1 NO LEASE FORMALLY WITHDRAWN FROM LEASING
- 3 NO SURFACE OCCUPANCY (NSO)
- 5 CONTROLLED SURFACE USE (CSU)



LEASED AREA

- 2 DISCRETIONARY NO LEASE
- 4 TIMING LIMITATION
- 6 STANDARD STIPULATIONS

Figure I-11  
Working Stipulation Map

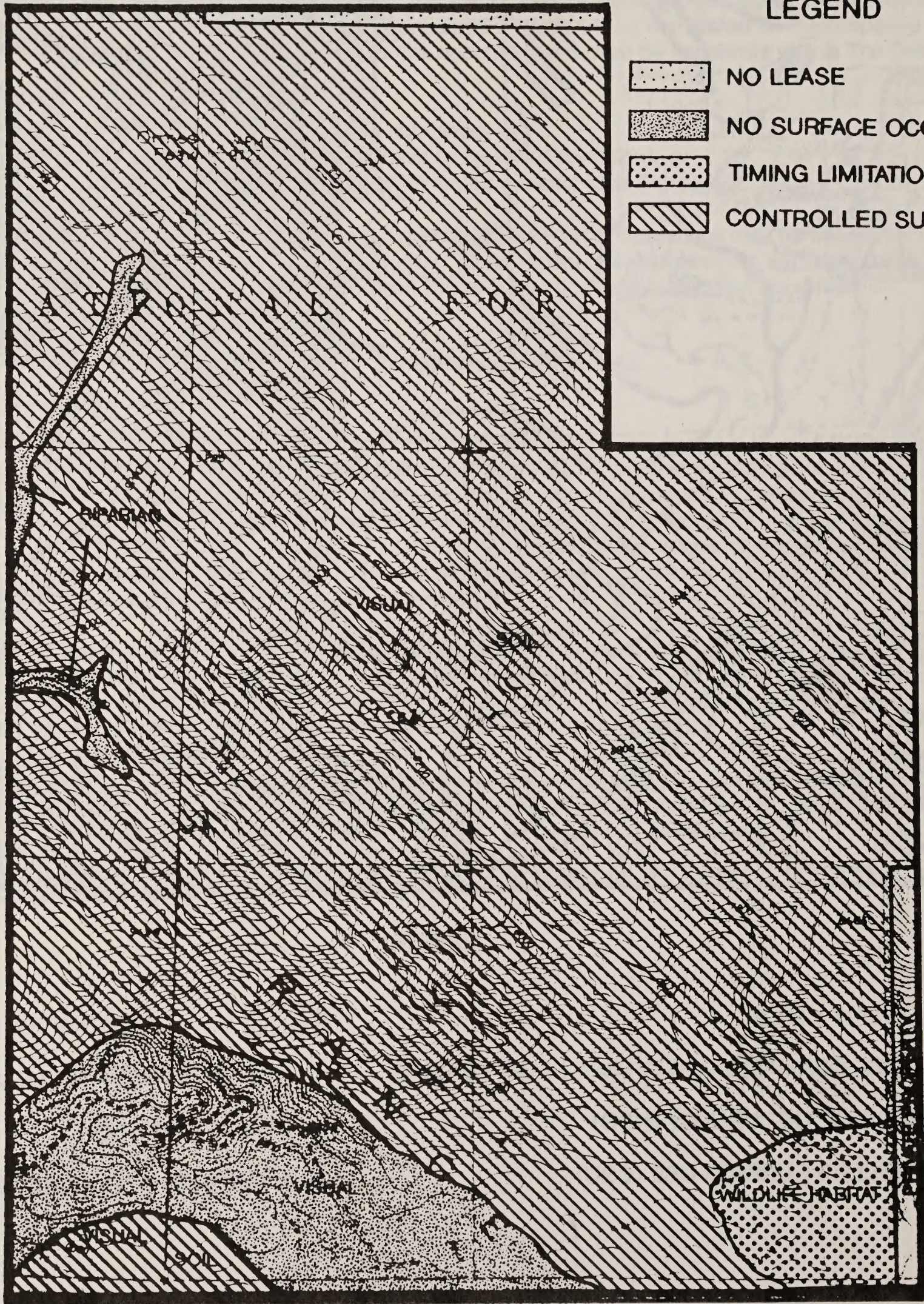
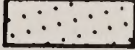

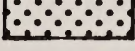

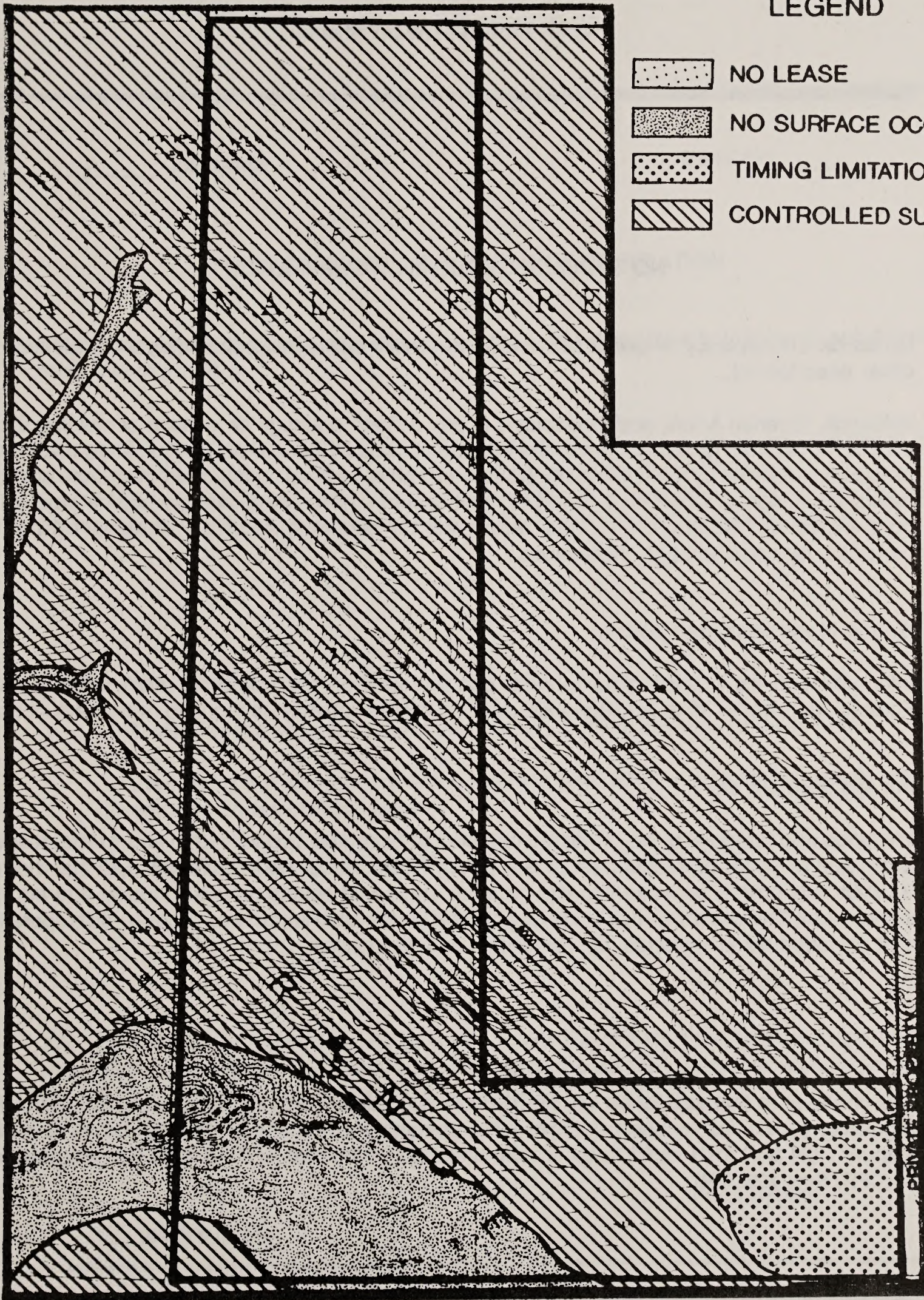


Figure I-12  
Lease Parcel Map with Stipulation

LEGEND

-  NO LEASE
-  NO SURFACE OCCUPANCY
-  TIMING LIMITATION
-  CONTROLLED SURFACE USE



**Figure I-13  
Lease Stipulation**

NSO - Riparian/Water/Fisheries

---

Serial No. \_\_\_\_\_

**NO SURFACE OCCUPANCY STIPULATION**

**No surface occupancy or use is allowed on the lands described below (legal subdivision or other description).**

Wetlands, Riparian Areas, and Floodplains of any defined drainage or location containing these specific ecosystem types. Access roads may be allowed in these areas only if alternative roads have been reviewed by the appropriate personnel, and have been rejected as being more environmentally damaging. When road locations must occur in these areas, streams will be crossed at right angles and access across other areas will be held to a minimum. Streams will not be paralleled by roads through these areas.

**On the lands described below:**

Information on the location of these areas can be found on 1:24,000 scale maps located at the Forest Supervisor's Office. Additional site-specific information may be required due to lack of data.

**For the purpose of:**

Wetlands and floodplains are protected pursuant to Executive Orders 11990 and 11988, respectively, and all policy or direction proceeding from those orders. Also it is recognized that there is a direct relationship between impacts on such areas and effects on water quality and aquatic ecosystems. There is a high risk of irreversible and irretrievable impacts on the latter with operation and development in wetlands, riparian areas, and floodplains.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820, and 2526, and FS Oil & Gas Regulations, 36 CFR, Sec. 228.104)

Form #/Date

---

**Figure I-14  
Lease Stipulation**

NSO - Visual

---

Serial No. \_\_\_\_\_

**NO SURFACE OCCUPANCY STIPULATION**

**No surface occupancy or use is allowed on the lands described below (legal subdivision or other description).**

Foreground visual zones of the Forests and Grasslands that have an inventoried visual quality objective of Fg1A. (May include Turquoise Lake, Twin Lakes, Rampart Range Road, Pikes Peak, Elevenmile Canyon, South Platte River, Jefferson Lake, Guanella Pass and Highway of Legends Scenic Byways, area surrounding the Point of Rocks and Cimarron River overlooks.)

**For the purpose of:**

1. Protecting the natural, cultural and historical scenic qualities of these areas.
2. Preventing the siting of collection facilities, well sites or exploration activity within the foreground zones of these areas.
3. Providing Forest and Grassland visitors with quality experiences.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Form #/Date

---

**Figure I-15  
Lease Stipulation**

TIMING - Wildlife (MIS)

---

Serial No. \_\_\_\_\_

**TIMING STIPULATION  
(Management Indicator Species)**

**No surface use is allowed during the following time period(s):** this stipulation does not apply to operation and maintenance of producing wells:

**Seasonal Wildlife Stipulation for Management Indicator Species**

No surface use is allowed during the periods listed under purpose below.

Elk calving, Bighorn Sheep lambing, Pronghorn and Deer fawning areas:

Goat kidding areas:

Prairie Chicken Dancing grounds and nesting areas:

Critical Raptor nesting areas:

Bald Eagle and Turkey Winter Habitat:

Curlew, and Mountain Plover Nesting, Resting, Staging areas:

Abert's squirrel winter habitat:

(Forest Plan Gen. Direction and Management area prescriptions).

**For the purpose of:**

These areas have been identified by the CDOW and KDGP. Disturbance during the reproductive season may reduce herd productivity. For nesting species, surface disturbance and associated human activity could disrupt breeding and/or cause nest abandonment. Winter habitat for the Bald Eagles and turkey are important for roosting, perching or feeding. Human disturbance would produce increased stress, leading to poor physical condition, winter mortality and/or reduced reproduction. Areas and dates of Timing Stipulations are:

Elk calving, Bighorn Sheep lambing, Pronghorn and Deer fawning areas:

Activities could not occur from April 15 to July 1.

Prairie Chicken Dancing grounds and nesting areas: Activities could

not occur from March 1 to June 1.

Critical Raptor nesting areas (area includes buffer zones): Activities

could not occur from March 1 to July 31.

Bald Eagle and turkey Winter Habitat: Activities could not occur from

November 15 to April 15.

Curlew, and Mountain Plover Nesting, Resting, Staging areas: Activities

could not occur from March 1 to July 1.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Form #/Date

---

**Figure I-16  
Lease Stipulation**

CSU - Visual

---

Serial No. \_\_\_\_\_

**CONTROLLED SURFACE USE STIPULATION**

**Surface occupancy or use is subject to the following special operating constraints.**

Site clearings, collection facilities, site developments, utilities, roads and pipelines may require relocation further than 200 meters to meet adopted visual quality objectives. At the time of APD a visual site analysis will be completed to determine if vegetation, topography and distance are sufficient to mitigate visual impacts. If not, site will be relocated.

**On the lands described below:**

Lands with the following visual resource classification, Fg1B, Fg1C, Fg2A, Fg2B, Mg1A, Mg1B. This includes land seen along Federal and State Highways, nationally designated trails, major water features, recreation complexes, and High use Forest Service Roads. Visual Quality Maps are on file in the Supervisor's Office, Pueblo, Colorado.

**For the purpose of:**

1. Protecting the natural, cultural and historical scenic values of these areas.
2. Preventing the placement of collection facilities, well sites or exploration activity within the foreground and middleground zones of these areas, to meet Visual Resource Management guidelines.
3. Providing Forest and Grassland visitors with quality experiences.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Form #/Date

---

**Figure I-17  
Lease Stipulation**

CSU - Soils

---

Serial No. \_\_\_\_\_

**CONTROLLED SURFACE USE STIPULATION**

**Surface occupancy or use is subject to the following special operating constraints.**

On land areas identified with **any** of the following characteristics, the activity will be relocated to suitable soil types and /or stable slope conditions.

1. Slopes steeper than 60 percent.
2. Fragile soils with High (severe) erosion potential on slopes of 40 percent or greater.
3. Fragile soils with High (severe) erosion potential, soil depth to bedrock is less than 20 inches, and slopes of 35 percent or greater.
4. Lands identified as riparian areas, wetlands and floodplains.

**For the purpose of:**

1. Preventing significant or permanent impairment of soil productivity.
2. Protecting off-site areas by preventing impacts from accelerated soil erosion.
3. Maintaining or improving water quality to meet Federal or State standards.
4. Preventing detrimental impacts such as gully erosion, streambank failure, soil compaction, and severe rutting which could cause long-term damage or permanent impairment to soil productivity.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101, FS Oil & Gas Regulations, 36 CRF, Sec. 228.104.)

Form #/Date

---



## **PUBLIC NOTIFICATION AND PUBLIC INVOLVEMENT**

### **Notification Of The Proposed Actions**

The Forest Service invited written comments and suggestions about issues pertaining to this action in a Notice of Intent to Prepare an EIS, published in the Federal Register, Volume 53, No. 249, Wednesday, December 28, 1988 (please see Chapter VI, Record of Public Notice, Other Agency and Public Participation and Forest Service Response to Issues for discussions of public participation pertaining to this EIS). The notice, in part, stated:

*"To satisfy requirements of the 1987 Reform Act, the Forest Supervisor, Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands will prepare an EIS which will analyze and disclose expected environmental impacts including possible cumulative effects when consenting or not consenting to issuance of oil and gas leases on the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands.*

*The scope of the analysis for the EIS will include: identifying areas where the Forest Service will consent or deny consent to issuance of oil and gas leases on National Forest System lands within the Pike and San Isabel National Forests (Colorado), the Comanche National Grassland (Colorado) and the Cimarron National Grassland (Kansas); determining site-specific and cumulative effects resulting from leasing decisions; determining stipulations to protect surface resources; and, satisfying requirements of the 1987 Reform Act."*

A revised notice of intent to prepare an EIS was published in the Federal Register, Volume 54, No. 110, Friday, June 9, 1989. The revised notice, in part, stated:

*"The EIS has been expanded to include analysis and disclosure of expected environmental impacts, including possible cumulative impacts on split-estate lands where the minerals are federally owned and the surface estate is owned or managed by parties other than the Forest Service, where such lands are within the administrative boundaries of the Pike and San Isabel National Forests and Comanche National Grassland, Colorado, and within the administrative boundary of the Cimarron National Grassland, Kansas. The analysis and EIS will be used for a final decision by the BLM to lease or not lease these lands."*

All issues that were identified during the scoping and public notification processes have been documented. Those that were not considered significant, or which have been covered by prior environmental review, are not discussed in this EIS but are referenced in Appendix H (40 CFR Part 1501.7 (a)(3)).

### **SCOPING**

To perform the environmental analyses for these leasing decisions, the Forest Supervisor assembled a team of soil scientists, wildlife biologists, cartographers, archaeologists, hydrologists, forest ecologists, engineers, and other resource specialists, social scientists, and landscape architects. This group of people are the Supervisor's *Interdisciplinary Team (IDT)* for this study.

This team reviewed the scientific literature associated with oil and gas exploration and production and the literature associated with environmental impacts of these activities. They made field studies of on-going oil and gas drilling, production, and reclamation activities, and consulted with

experts in the Bureau of Land Management, the Colorado Division of Wildlife, the U.S. Fish and Game Service, and other federal and state agencies. They also consulted with the public to learn about possible environmental, social and economic issues associated with such activities. Finally, they identified and mapped the environmental characteristics of the National Forest System lands to learn how these lands might be affected by these activities.

These various background study activities are termed *scoping* in the National Environmental Policy Act procedural regulations. These scoping activities were conducted to help the Interdisciplinary Team and Forest Supervisor identify the elements of the environment likely to be affected by the leasing decisions, determine what the significant environmental issues are associated with these decisions, and to determine what information and analyses are needed to make these decisions. [See Appendix H.]

### **PLANNING RECORD**

This EIS will refer the reader to other chapters, appendices, or information included in other documents. All of the documents and files, or planning record and administrative record, that chronicle the planning process will be available for public review at the Forest Supervisor's Office in Pueblo, Colorado. These documents are assembled and maintained to satisfy the requirements of 36 CFR 219.01(h), and are hereby incorporated by reference.

There are additional records in the Forest Supervisor's Office that are relevant to the development of the Forest Plan. The interdisciplinary nature of land and resource management planning makes it difficult to assemble every document used in the entire planning process. The Forest Planning Staff Officer will assist anyone requiring specific information that may not be in the planning record for this document.

### **SIGNIFICANT ENVIRONMENTAL ISSUES**

The issues identified in the public scoping process, through the development of management concerns, and as a result of review of the initial draft EIS have been collected. A full list of the issues can be found in Chapter VI, Persons or Agencies Consulted and/or Receiving This Environmental Impact Statement. The Forest Supervisor determined that the significant issues (40 CFR Part 1501.7 (a)(2)(3)) to be analyzed in depth in this EIS are:<sup>2</sup>

#### **Initial Scoping Issues**

Effects of oil and gas leasing activities on wildlife, fish, vegetation, soils, water quality, air quality, recreation, wetlands, floodplains, and threatened and endangered plant and animal species.

*Issue Explanation:* Potential adverse effects on Forest resources (resource examples are listed above) resulting from oil and gas leasing are at issue. People are concerned that if the Forest Service consents to oil and gas leasing, resultant exploration for and possible development of oil and gas resources could adversely affect other resources on NFS lands. People want to know what effects leasing, drilling, and construction activities will have on wildlife habitat, wildlife breeding areas, and wildlife migration patterns, and what the effects on rare and endangered plants and animals will be. People are concerned that adverse

impacts could occur to water quality, air quality, recreation opportunities and to wetlands and floodplains on the Forest.

Effects of drilling on surface and groundwater supplies, erosion and run-off, stream bank destabilization and potable water.

*Issue Explanation:* Some people are concerned that oil and gas exploration and development activities could result in water pollution. Others feel that surface and groundwater protection measures will not be effective or may not be enforced. Some respondents are concerned that drinking water supplies will not be protected from oil and gas development activities. Others are concerned that stream degradation (bank failure, erosion, accelerated sedimentation) may occur as a result of oil and gas development activities. Others are concerned that drilling for oil and gas and subsequent field activities will adversely impact riparian areas and associated recreational opportunities along river corridors. Some people recommended that river and stream corridors on NFS lands be closed entirely to leasing.

Effects on areas of designated wilderness and those being considered for designation (Sangre de Cristo, Spanish Peaks, Greenhorn Mountain and Buffalo Peaks Wilderness Study Areas).

*Issue Explanation:* Some people are concerned about potential adverse effects to the four wilderness study areas on the Forest. They are concerned that wilderness characteristics may be harmed if the Forest Service consents to oil and gas leasing within wilderness study areas or too near existing wilderness. Some people pointed out that lease applications currently blanket portions of some wilderness study areas (the eastern slope of the Sangre de Cristo Wilderness Study Area) and leasing could have disastrous effects on the wilderness characteristics of such an area. Spanish Peaks Wilderness Study Area has exceptional geologic characteristics and should not be leased.

Hazardous waste disposal.

*Issue Explanation:* Some people are concerned that the physical, chemical and infectious characteristics of wastes (e.g., well blow-out and release of hydrogen sulfide) could substantially threaten human health. Others are concerned about disposal of wastes and measures to be taken to prevent adverse environmental impacts associated with waste product disposal.

Social and economic effects.

*Issue Explanation:* Some people feel that oil and gas development could adversely affect economic investments in property near the Forest. Others are concerned that lack of leasing opportunity will have negative effects on the economy. Some people are concerned that further delays in responding to leasing applications for NFS lands may create loss of revenue for the Federal Treasury, as well as a lack of leasing and development opportunities for industry. Liability in situations involving saltwater disposal wells on NFS lands is at issue with some people. Others have a concern that social and economic impacts, both direct, indirect, site-specific and system or area wide need to be addressed. Some people want to know what the cost-benefit analysis shows for this proposed action (Section 102(2)(B) of NEPA). Some people want to know if leasing represents the best possible use of our national resources as a benefit to the interest of citizens.

Cumulative effects of full-field development as determined by reasonably foreseeable levels of oil and gas development.

*Issue Explanation:* Connected actions and cumulative effects associated with leasing and drilling are at issue. How the Forest Service determines cumulative impacts of reasonably foreseeable oil and gas development is a concern with some people. Some people asked how opportunities to explore for and develop oil and gas resources will be affected by other surface resource management decisions. Others are concerned about impacts from oil and gas exploration and development activities affecting opportunities for other resource management decisions. Impacts associated with "full-field development" for all areas opened to leasing is at issue. Some people feel that a "worst case scenario" analysis should be conducted.

Mitigation (40 CFR Part 1508.20) of impacts.

*Issue Explanation:* Measures for restoration of leased areas upon expiration of the lease are at issue. They feel necessary mitigation may be overlooked or not included (Section 1502 of the Council on Environmental Quality regulations on the National Environmental Policy Act). Some people feel that if an area is leased it must be assumed that the site will be developed for oil and gas to the fullest extent possible and that sufficient mitigation for that development must be developed. Others asked to what extent the Forest Service will identify available mitigation measures to minimize or avoid possible impacts which could result from future oil and gas activities. Some asked that mitigation discussions describe the Forest Service policy on compensatory wetland mitigation, and those measures that are outside Forest Service jurisdiction.

Areas identified where leasing should be precluded include: the Platte River Corridor (including from Elevenmile Canyon to Waterton); Aspen Ridge; Tarryall Mountains; the former Tanner Peak Roadless Area; Tennessee Pass and the area southwest of there to Turquoise Lake; Halfmoon Creek drainage; Mt. Elbert and vicinity; Quail Mountain and vicinity; Cottonwood Creek drainage; Special Interest Areas; Research Natural Areas; Natural Areas; Manitou Experimental Forest; Recreation, Wild and Scenic River candidates; the Kenosha Range; highly scenic areas; areas with extremely fragile plant and animal communities; critical winter range or calving areas; developed recreation areas; municipal watersheds; and, areas with high potential for Wilderness designation.

*Issue Explanation:* Many respondents recommended not allowing issuance of oil and gas leases based on potential harm to: potential wilderness areas, potential wild and scenic rivers, high scenic values, fragile plant and animal communities, high value recreational opportunities. Some people feel that there should only be non-consumptive rather than consumptive uses on NFS lands and that some parts of the Forest should be completely exempted from leasing. Some feel that because the Pike and San Isabel National Forests are so close to large population centers, from where many people escape to the quite solitude of the undeveloped places, that this benefit is immeasurable and essential to the well-being of our society and that leasing should not be allowed. Others are concerned that large tracts of NFS lands eliminated from leasing may create hardships to industry if unreasonably applied.

Areas recommended for a no surface occupancy (NSO) stipulation include: all NFS lands within 1/2 mile of all public highways; all NFS lands within 1 mile of developed recreation areas; all areas of the Pike and San Isabel National Forests; scenic vistas and Scenic Areas; Research Natural Areas; Experimental Forests; and, riparian areas.

*Issue Explanation:* Some people recommended specific areas for NSO. Others feel that where NSO applies to oil and gas leasing it should also apply to other resource development proposals and activities. Some people are concerned about impacts on adjacent land resources and users as a result of NSO decisions. Others feel that NSO is necessary to allow

for protection of scenic values along highway corridors. Some people stated that recreation is Colorado's most important economic resource and oil and gas development can destroy recreational potential of an area.

Identification of adequate lease stipulations to protect the environment (to minimize impacts).

*Issue Explanation:* Some people identified resources they feel need protection through lease stipulations, such as: fragile soils, steep slopes, wildlife winter range, calving areas, migration routes, threatened or endangered species, cultural sites, waterfowl areas, perennial streams, municipal watersheds, and developed recreation sites. Some people feel the reasons for stipulations must be fully explained. Others are concerned that the public and federal agencies do not understand NEPA requirements regarding stipulations as interpreted in recent court decisions.

Loss of flexibility needed for the continued development of known oil and gas reserves as well as undiscovered reserves.

*Issue Explanation:* Restrictions developed in this EIS which may limit federal lessees in their ability to act or react to a competitive lease situation is at issue. Some people feel a federal lessee should not be limited due to constraints in this EIS and that there should be enough flexibility to allow for continued development of known oil and gas reserves as well as undiscovered reserves in the future.

Concern of adjacent landowners of the impacts of oil and gas developments on private lands within or adjacent to the Forests or Grasslands.

*Issue Explanation:* Split estate lands where federally owned minerals underlie the privately owned surface estate are at issue. Tracts of land with reversion of privately owned mineral rights to the Federal government is also at issue. Some people are concerned about potential impacts resulting from leasing on these kinds of lands.

#### **Issues Resulting from the Draft Environmental Impact Statement.**

*Bureau of Reclamation (BR) Projects* - The BR has project reservoirs located on lands identified in the low potential for mineral development (Twin Lakes Reservoir and Turquoise Lake). Should any proposals to lease or drill be received by the Forest Service, the BR should be consulted on the leasing stipulations and/or drilling plan so that they can evaluate the activity in relation to protection of BR structures, water quality, water operations, and protection of terrestrial and aquatic life.

*Adjacent National Park Service Lands* - Several units administered by the National Park Service (NPS) may be impacted by project actions on NFS lands. Oil and gas activities on the ridgeline of the Sangre de Cristo Mountains, located near the eastern boundary of the Great Sand Dunes National Monument, could adversely impact Monument scenic views and wildlife populations. The NPS is concerned about impacts to Monument visitors' perceptions and experiences because of oil and gas activities. These monuments should be identified in the FEIS "Affected Environment" chapter and possible impacts to them addressed in the "Environmental Impacts" chapter. Any oil and gas development activities proposed in the vicinity of the Santa Fe National Historic Trail should be fully evaluated in the FEIS to assess impacts to this trail and its users, and adequate mitigation measures should be identified. Two National Natural Landmarks (NNL's), Spanish Peaks and Lost Creek Scenic Area, are located in the San Isabel and Pike NF's. There is no

reference to these NNL's in the DEIS. Careful consideration of the values of these significant resources should be included in the FEIS.

*Social and Economic Future* - Colorado's economic future will be grounded in the success of its two largest industries, manufacturing and tourism. Manufacturing will increase its share of the state's gross product as we attract more business to Colorado. To do that we must protect the primary asset that brings people here - Colorado's natural beauty. Oil and gas industry's role in the long term economic health of Colorado and the United States is not perceived to be critical.

*Adjacent Private Lands* - Oil and gas leasing near adjacent private lands is of concern because of the environment in general.

*Special Area Identification* - Provide special protection through discretionary no lease on the following areas:

The South Platte River corridor, north of Cheesman Reservoir, in Waterton Canyon, within one-quarter mile of either bank of the River between Elevenmile Reservoir and Stontia Springs Dam and along the North Fork from Grant to the town of South Platte.

Roadless areas adjacent to BLM WSA's: Tanner Peak, Aspen Ridge, and Little Fountain Creek Canyon. The Forest Service needs to protect these areas from development until after Congress considers Colorado BLM wilderness legislation.

The Cimarron, Arkansas, Huerfano, and Badger Creek waterways.

Hayden Pass, Medano Pass, S. Colony Lakes Rd., Hermit Pass, and Cloverdale Basin, Lost Creek Further Planning Area, the Platte River and Kenosha Mountains areas visible from high 285, especially the stretch between Bailey and Kenosha Pass, the Marshall Pass/Ouray Mountain area, Venable Pass road, Blanca Peak, area directly east of Buffalo Peaks WSA, Spanish Peaks, the Wet Mountains including Lake Isabel, the Cisneros Trail area, St. Charles Peak, Chute Park, Curley Peak areas, and 1 mile on either side of the So. Platte Canyon. A one mile buffer zone around all wilderness areas is proposed.

Manitou Experimental Forest.

Areas to make available to leasing:

*Manitou Experimental Forest* - The recently completed EA on Oil and Gas Leasing in the Experimental Forest contained a decision to allow leasing with restrictive stipulations. Changes should be fully documented in the DEIS. The Forest Service is required by law to formally withdraw for Congressional action all tracts over 5,000 acres which are deemed unavailable for oil and gas leasing.

*Maps* - The maps are in violation of 40 CFR section 1502.8, which states that graphics need to be readily understandable by the public. The maps fail to show overlapping between timing and controlled surface use (CSU) stipulations. The public is unable to tell if all resources are being protected and if the Forest Service is in compliance with the plan when leases are issued in the future. The maps fail to show where the different types of stipulations and controlled surface use stipulations are to be used. The public is provided with only a general map grouping the various timing, NSO, and CSU stipulations into single categories which is inadequate for monitoring activities.

*Consent to Lease Decision* - We strongly urge the Forest Service to make specific decisions in the Record of Decision on the Leasing EIS indicating where leases will be issued and with what types of stipulations. The point at which an appeal may be filed must be limited to the step at which the planning documents are formally adopted by the Forest Service, rather than when parcels are forwarded to the BLM accompanied by a decision notice to object or not object to lease issuance. It is crucial that the decision to lease or not to lease be made in the planning documents, before recommendations are formally submitted to the BLM.

*Alternatives:*

*Range* - The Forest Service fails to provide an adequate range of alternatives. Each alternative is based on a certain level of leasing and development, regardless of the status of other resources and the direction of the Forest Plan. The consideration of oil and gas in isolation from other resources results in a lack of site-specific analysis. Suitability for leasing and development must be based on all resources and values for a specific area, not just the level of mineral potential.

*Maximum Oil and Gas Production Alternative* - The Forest Service eliminated from detailed study a maximum oil and gas production alternative, under which all lands would be leased with standard terms and conditions. The manner in which the maximum production alternative was written is highly suspect because it includes lands legally withdrawn from mineral activity, such as designated wilderness. A full range of alternatives is required by the National Environmental Policy Act (NEPA). This requirement was not met.

*Mineral Potential Alternatives* - It is contrary to current policy and law to make leasing decisions by analyzing alternatives based upon mineral potential. Moreover, federal laws and policies dictate that all lands not withdrawn are to be made available to oil and gas leasing subject to specific resource concerns. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA) specifies which federal lands are unsuitable for leasing: wilderness and WSA's. Nothing in the law indicates that oil and gas leasing should be prohibited in areas considered to have low or moderate potential.

*Development Assumptions* - The Forest Service needs to develop criteria on what areas should be offered for lease based on four concerns: (1) Is the area in a known geological structure? (2) Is drainage occurring to the federal mineral estate? (3) Is there interest from industry? (4) Are there public concerns regarding to maintaining the existing qualities of the area?

The projection of reasonable foreseeable development on forest lands is in error. The BLM's projection of one wildcat well every four years is accurate, but would accept a maximum of one wildcat per year. If future activity exceeds that analyzed in the EIS, an amendment can be done. The reasonably foreseeable development scenarios for the NG's are also inaccurate. According to the BLM, 2 wells per year were forecast. The Forest Service must have some valid reason for increasing the projection to 30 wells per year.

*Positive Effects* - There was little or no mention of the possible positive impacts to the surface resources from oil and gas exploration and development. With the use of appropriate controls during exploration and development and innovative reclamation, net beneficial impacts can be obtained for certain resources in certain areas (i.e., stabilization of natural erosion conditions, improvements in wildlife habitat and habitat diversity, access for recreation and other resource uses. The FEIS should include a discussion and analysis of these points.

*NEPA Adequacy* - The DEIS completely fails to address the impacts from oil and gas development on site-specific areas of the Forest. This lack of information, coupled with maps that accompany the DEIS that fail to show what specific stipulations are in place for a forest parcel, makes public involvement, and well-informed decisions by land managers, nearly impossible. This document fails to comply with NEPA. No leasing on the Forest should take place until the site-specific and cumulative impacts in a particular area are documented and adequate protection measures against impacts are in place.

*Worst Case Scenario* - The document has failed to specifically justify the need for special lease stipulations and other mitigation measures, particularly in conjunction with Forest Plan management area resource goals and objectives. The DEIS studies a "worst case scenario" that has no basis in fact. The DEIS does not acknowledge standard requirements. The impact analyses are predicated upon what could happen if no restrictions at all were placed on activities. Only potential effects that are not covered by standard terms and conditions should be addressed, as well as effects which could not be mitigated through the use of special stipulations and operating standards.

*Impacts on Wildlife* - The auditory environment and noise pollution are not addressed in the main part of the document since visual resources are mentioned throughout. Playa lake beds need special protection on the Grasslands. They are important water sources for wildlife, and when full, are important waterfowl habitat for breeding, feeding and nesting. The impacts of transmission lines, including raptor mortality from collisions and electrocutions, ought to be mentioned in the EIS. Reserve pits contribute to more mortality of water birds (through oiling and subsequent poisoning/drowning) and needs to be pointed out.

*Global Weather System* - The effect of fossil fuels on our global weather system must be taken into consideration in order for your actions to be in compliance with the NEPA. It is ridiculous to allow the possibility of large-scale development of additional hydrocarbon-fossil fuels which will lead to CO<sup>2</sup> releases, increasing potential global warming.

*Waiver of Stipulations* - The Forest Service opens the door for making waivers without properly amending the Forest Plan or involving the public with the provision as the bottom of most stipulations: "any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes." This statement would allow district level waivers without public involvement or plan amendment.

*Grassland Stipulations* - None of the canyon areas have CSU/NSO designation. These areas have scenic, cultural and biological values that make them the primary destination of many visitors to the Comanche NG. I appreciate the economic impact that oil and gas development has had on the area. It would seem ill-advised to take the short-term benefits offered by oil and gas over the long-term benefits of recreation.



## NOTES

<sup>1</sup> "Environmental Assessment for Oil and Gas Leasing in the Escalante Known Geologic Structure", Dixie National Forest and Cedar City District (BLM), Garfield County, Utah, undated. Probable date 1988, pp 14-16.

<sup>2</sup> "Environmental Assessment for Oil and Gas Leasing in the Escalante Known Geologic Structure", Dixie National Forest and Cedar City District (BLM), Garfield County, Utah, undated. Probable date 1988, pp 14-16.

<sup>3</sup> Forest Land and Resource Management Plan

<sup>4</sup> Region 2 Forest Service Handbook Supplement No. 2800-90-2. Effective August 15, 1990. 2822.04(C).

<sup>5</sup> FWS Biological Opinion in Chapter 4



## **CHAPTER II**

### **ALTERNATIVES**

#### **INTRODUCTION**

Alternatives are an essential aspect of any analysis process. A broad range of management options enable resource managers to select actions that will achieve the desired outcome while minimizing negative results. The importance of alternatives for oil and gas leasing decisions is reflected by requirements in the recent Oil and Gas Regulations, the National Environmental Policy Act (NEPA), and the National Forest Management Act (NFMA).

Oil and Gas Leasing Regulations (36 CFR 228.102(c)) require that environmental document(s) prepared for leasing decisions on NFS lands identify alternatives as to the lands to be made administratively available. Likewise, NEPA regulations (40 CFR Part 1502.14) require rigorous evaluation of all reasonable alternatives, including "no action", to minimize possible environmental effects. NFMA directs the Forest Service to develop specific management direction for oil and gas activities on the Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands.

Alternatives presented in this chapter describe a broad range of leasing availability options, from leasing all available NFS lands with standard lease terms, to total denial of any new oil and gas leases. Each alternative provides varying levels of resource protection through the use of stipulations. This set of alternatives that addresses both leasing availability and resource protection, complies with all federal regulations, and provides necessary information to the deciding officer in making the three related decisions described in Chapter I, page 1.

Alternatives discussed in this document comply with NEPA requirements as well as the specific requirements of the Oil and Gas Regulations. The Forest Plan contains specific management requirements necessary to protect the affected environment and to achieve the goals and objectives for multiple-use management. With the exception of the "no action" alternative, each of the alternatives considered in this DEIS requires an amendment to the Forest Plan to ensure "consistency" as required by 36 CFR 219.10(e). The effects of these alternative amendments are disclosed in Chapter IV of this DEIS. The Forest Plan amendment necessary to implement the proposed action in this DEIS is included in Appendix A.

#### **FORMULATION OF ALTERNATIVES**

Alternatives used in the leasing analysis and documented in this EIS are designed to meet requirements of the Oil and Gas Regulations (36 CFR 228.102 (c)) to provide a range of leasing availability and protection options. Significant issues which surfaced during the scoping process for the first DEIS were used to develop the stipulations found in some alternatives. These stipulations best describe needed resource protection measures. Issues were brought forth from a variety of sources including: state and federal agencies, environmental groups, the oil and gas industry, and interested individuals. A compilation of the major issues used to develop alternative stipulations can be found in Appendix H, and a summary of these issues is in Chapter I, pages 36-42.

## **CONSIDERATIONS THAT REMAIN CONSTANT FOR ALL ALTERNATIVES**

Management direction in the Forest Plan identifies baseline conditions that must be maintained throughout the Forest in management of all resources, including minerals. The management direction defines requirements for environmental quality in specific management areas, as well as mitigating measures that apply to all NFS lands. With exception of the Management Direction on pages 54 - 61 of the current Forest Plan the management direction provided by the plan is remaining constant. Management Direction for oil and gas leasing must be modified to be consistent with the Leasing Reform Act implementing regulations. The proposed amendment of the Forest Plan to create that consistency is included in Appendix A of this DEIS.

Standard lease terms in BLM lease form 3109-11 provide the basic protection for the affected environment, and are the minimum requirements for mitigation of environmental impacts. All alternatives include these standard lease terms in the leasing of NFS lands for oil and gas. Additional resource protection stipulations have been added to some alternatives.

Monitoring and Evaluation guidelines described in Appendix I are a basic component of all alternatives, and do not vary between alternatives.

### **REASONABLY FORESEEABLE DEVELOPMENT (RFD)**

Oil and gas regulations (36 CFR 228.102(c)(3&4)) require a disclosure of reasonable foreseeable post-leasing activity, which will be termed reasonably foreseeable development (RFD) throughout the rest of this document. This prediction of future post-lease development allows for site-specific evaluation of environmental consequences to the full extent possible at the leasing stage, when there is no proposed development plan. The analysis period is 15 years, 1991 through 2006. For analysis purposes there are two separate predictions of reasonably foreseeable development: (1) Bureau of Land Management RFD, and (2) Concentrated RFD. Appendix C describes these separate predictions in detail. It is extremely important to recognize the differences between these two predictions when reviewing this EIS.

#### **Bureau of Land Management RFD**

As a starting point the BLM provided predictions of reasonably foreseeable development for the Mountain Districts and the Grasslands. This prediction was based upon industry interest, past exploration, and U.S. Geological Survey estimates. In general, the BLM predictions for development on the Mountain Districts is minimal. A maximum of 4 exploratory wells were estimated to be drilled during the analysis period. The wells were located, on projected sites, in cooperation with the BLM within the 1.7 million acres of land currently available on the mountain districts. Only four wells in fifteen years would not significantly affect natural resources. Locations of BLM RFD wells are shown in Figures II-1 and II-2 for the Mountain Districts. Estimates of activity on the National Grasslands include 45 wells on the Comanche NG and 165 wells on the Cimarron NG during the planning period. The BLM did not define specific locations for the Grassland wells, but rather identified the major landforms where they were expected to be located. General location descriptions for the BLM RFD wells on the National Grasslands are shown in Table II-1.

**Table II-1  
RFD For the National Grasslands**

|             | Major Landforms |                |              |              |
|-------------|-----------------|----------------|--------------|--------------|
|             | Sandy Lands     | Hard Lands     | Canyon Lands | Riparian     |
| Comanche NG | 67% (30 wells)  | 29% (13 wells) | 2% (1 well)  | 2% (1 well)  |
| Cimarron NG | 61% (101 wells) | 35% (57 wells) | 0%           | 4% (7 wells) |

**Concentrated RFD**

The low number and scattered distribution of exploratory wells on the Mountain Districts, as estimated by the BLM RFD, does not allow for an examination of the full range of possible effects of oil and gas development on sensitive resources in the mountains. In order to allow for disclosure of effects that may be greater than those identified by the BLM RFD, the Interdisciplinary Team developed the concept of "Concentrated RFD". Under the Concentrated RFD scenario, the four scattered mountain wells were relocated to the most environmentally-sensitive watershed on the Unit. This allowed for a more in-depth analysis of possible environmental effects on sensitive resources, and assisted in developing the needed stipulations to mitigate resource impacts. The range of effects provided by looking at both the BLM RFD and the Concentrated RFD should provide disclosure of all impacts that could occur from oil and gas development consistent with the anticipated number and type of wells projected to occur on the Unit. Locations of concentrated wells are shown in Figures II-1 and II-2.

In summary, the Concentrated RFD relocates the predicted mountain wells to one environmentally sensitive area. The site-specific nature of the analysis of the Concentrated RFD also discloses as much, or more, information, based on the use of RFD, as is possible at the time of leasing. Further analysis will be completed when a site-specific development proposal is received at the time of APD. Distribution of Grassland wells remain the same with the Concentrated RFD as they are with the BLM RFD.

**ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY**

- (1) **LEASE ALL AVAILABLE NFS LANDS WITH A DEGREE POTENTIAL OF MODERATE TO HIGH FOR OIL AND GAS RESOURCES, AND LANDS CURRENTLY LEASED WITH LOW MINERAL RESOURCE POTENTIAL.**

Under this alternative, the Forest Service would consent to lease available lands identified as containing a degree potential of moderate to high for oil and gas resources, and continue consent to lease lands currently under federal lease with a low degree potential for oil and gas resources. The BLM would issue leases on split-estate lands with federal minerals within Forest boundaries. This alternative would allow oil and gas exploration and development to occur subject to the terms and conditions identified.

This alternative was eliminated because of the public issues resulting from the DEIS review that identified the lack of information for determining accurate mineral potential of NFS lands legally available for oil and gas leasing.

- (2) **LEASE ALL AVAILABLE NFS LANDS WITH A DEGREE POTENTIAL OF HIGH FOR OIL AND GAS MINERAL RESOURCES, AND LANDS CURRENTLY LEASED WITH LOW TO MODERATE MINERAL RESOURCE POTENTIAL.**

Under this alternative, the Forest Service would consent to lease available lands identified as containing a high degree potential for oil and gas resources, and continue consent to lease lands currently under federal lease with a low degree potential for oil and gas resources. The BLM would issue leases on split-estate lands with federal minerals within Forest boundaries. This alternative would allow oil and gas exploration and development to occur subject to the terms and conditions identified.

This alternative was eliminated because of the public issues resulting from the DEIS review that identified the lack of information for determining accurate mineral potential of NFS lands legally available for oil and gas leasing.

- (3) **CONTINUE TO LEASE AVAILABLE LANDS CURRENTLY UNDER AN OIL AND GAS LEASE.**

Under this alternative, the Forest Service and BLM would continue to allow future leasing only on available lands where federal leases currently exist without regard to the degree potential for oil and gas resources. Consent to lease on other lands not formally withdrawn from mineral leasing on the Forest would be denied. This alternative would allow oil and gas exploration and development to occur subject to the terms and conditions identified. This alternative was eliminated because of an administrative decision based on validity under Oil and Gas Regulations.

### **ALTERNATIVES CONSIDERED IN DETAIL**

This section provides a narrative description of the four alternatives considered in detail in this EIS. Alternatives display acres available for leasing, describe effects of reasonably foreseeable development, and dictate how mitigation measures will be applied. RFD wells are used as if they are actual well proposals contained in applications for permit to drill (APD). Perceiving the RFD wells as actual well proposals should give a clear indication of the differences in effects and mitigation between the four alternatives. The various alternatives require different stipulations, thus RFD Well locations change between alternatives.

#### **ALTERNATIVE I Current Management (No Action)**

Under this alternative, the Forest Service will continue current management for oil and gas leasing on NFS lands with federal minerals. NFS lands identified in Table II-11 are available for oil and gas leasing in compliance with the approved Forest Plan. There are no discretionary no lease areas in this alternative. The BLM will issue leases on split-estate lands with federal minerals within Forest boundaries. This is a "No Action Alternative" because there will be no deviation from the existing management direction in the Forest Plan. The National Environmental Policy Act requires us to study the No Action alternative in detail and use it as a baseline for comparing the effects of the other alternatives.

Administratively this alternative calls for site-specific environmental analysis and decisions in response to individual lease applications. The Forest Service will conduct site-specific environmen-

tal analysis as required by NEPA on a case-by-case basis as lease applications are received. The Oil and Gas regulations require a full disclosure of available lands that can be leased, and the environmental effects from a projected RFD across all NFS lands. Since current management does not address leasing availability or potential environmental consequences across all NFS lands, this alternative does not comply with the Oil and Gas Regulations.

When a new lease parcel is proposed, that parcel will undergo a site-specific environmental analysis as required by NEPA. The analysis will determine if development can be allowed somewhere on the parcel, and what stipulations are necessary to protect resource values. The Forest Supervisor will authorize the Bureau of Land Management to offer the parcel for lease, subject to stipulations deemed necessary to protect the environment. To evaluate effects of this alternative, the assumption is made that site-specific environmental analysis has been accomplished on the lease parcels containing the RFD wells, and leases issued subject to supplemental stipulations (similar to Alternative III). RFD wells are treated as actual well site proposals submitted in an application for permit to drill (APD).

Based upon the stipulations applied to the individual leases, the RFD well site proposals will be made in areas that can be occupied with minimal negative effects on resource values.

Implementation of this alternative will not require a Forest Plan amendment since there are no Discretionary No Lease Areas.

The environmental consequences resulting from the leasing analysis conducted for this alternative based on the projected RFD are discussed in Chapter IV, Environmental Consequences, of this EIS. Based upon the RFD's (BLM and Concentrated), Figures II-3 through II-8 and Tables II-2 and II-3 describe environmental effects of Alternative I.

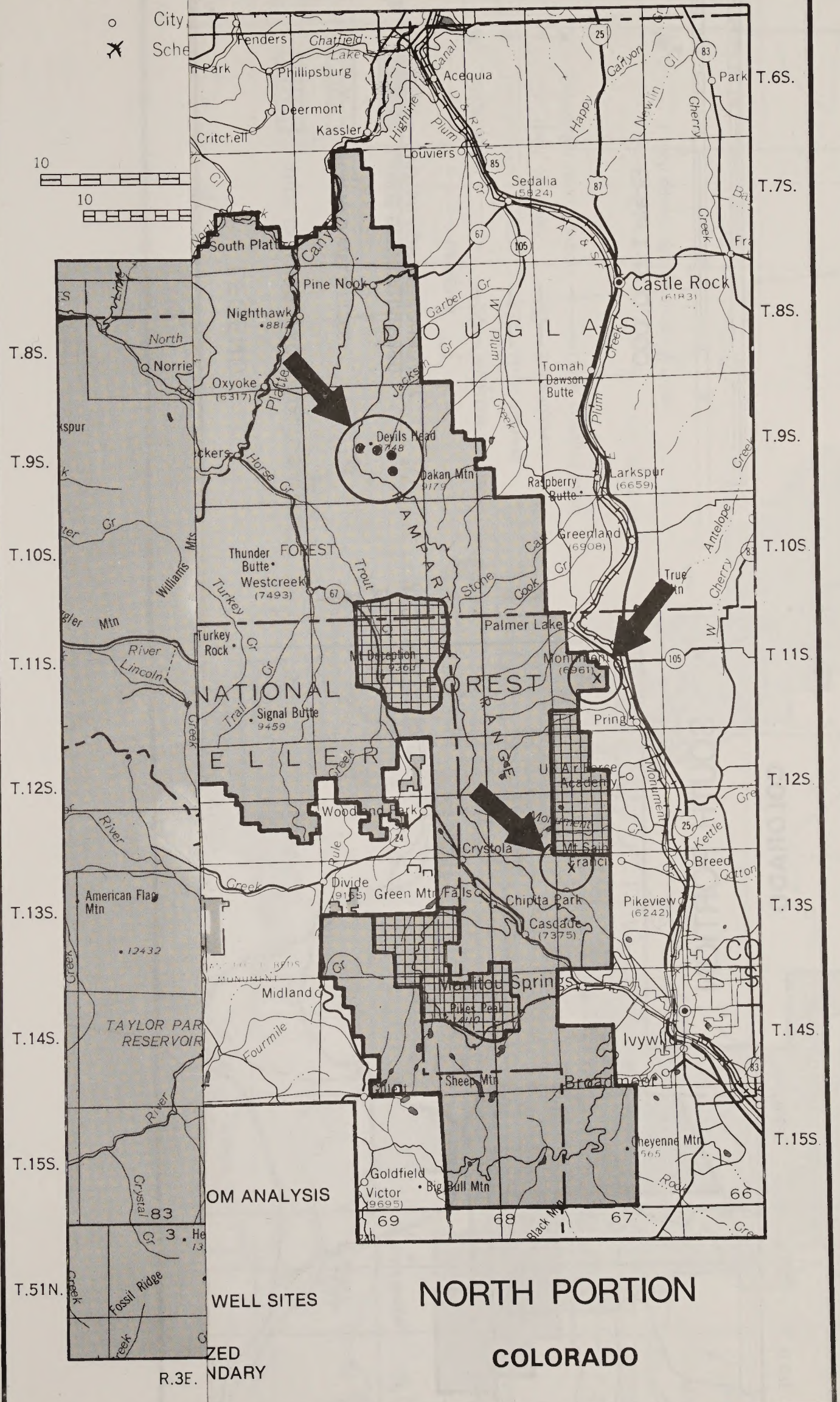




Figure II - 1  
BLM/Concentrated RFD Well Locations

# ISABEL NATIONAL FOREST

- ⊛ State
- County
- City
- ✕ Scheme



Faint, illegible text covering the upper half of the page, possibly bleed-through from the reverse side.

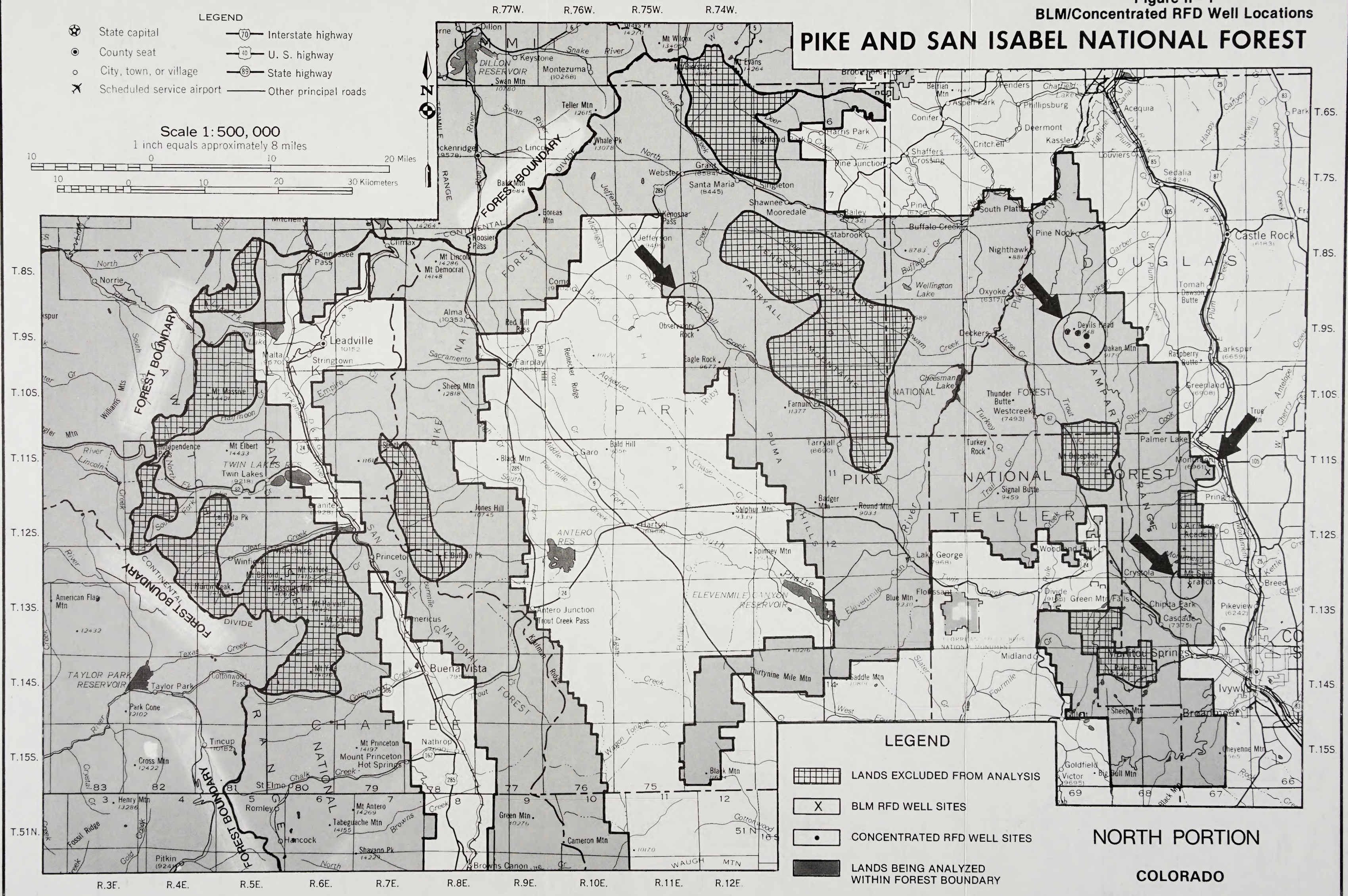
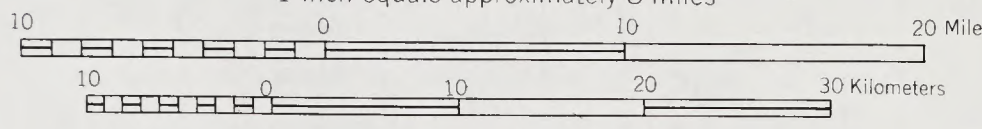
Faint, illegible text covering the lower half of the page, possibly bleed-through from the reverse side.

Figure II - 1  
BLM/Concentrated RFD Well Locations

# PIKE AND SAN ISABEL NATIONAL FOREST

- LEGEND**
- ⊛ State capital
  - ⊙ County seat
  - City, town, or village
  - ✈ Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

Scale 1:500,000  
1 inch equals approximately 8 miles



- LEGEND**
- [Grid Pattern] LANDS EXCLUDED FROM ANALYSIS
  - [X] BLM RFD WELL SITES
  - [Dot] CONCENTRATED RFD WELL SITES
  - [Shaded Area] LANDS BEING ANALYZED WITHIN FOREST BOUNDARY

NORTH PORTION  
COLORADO

# PIKE AND SAN ISABEL NATIONAL FOREST

**Figure II-2  
BLM/Concentrated RFD Well Locations**

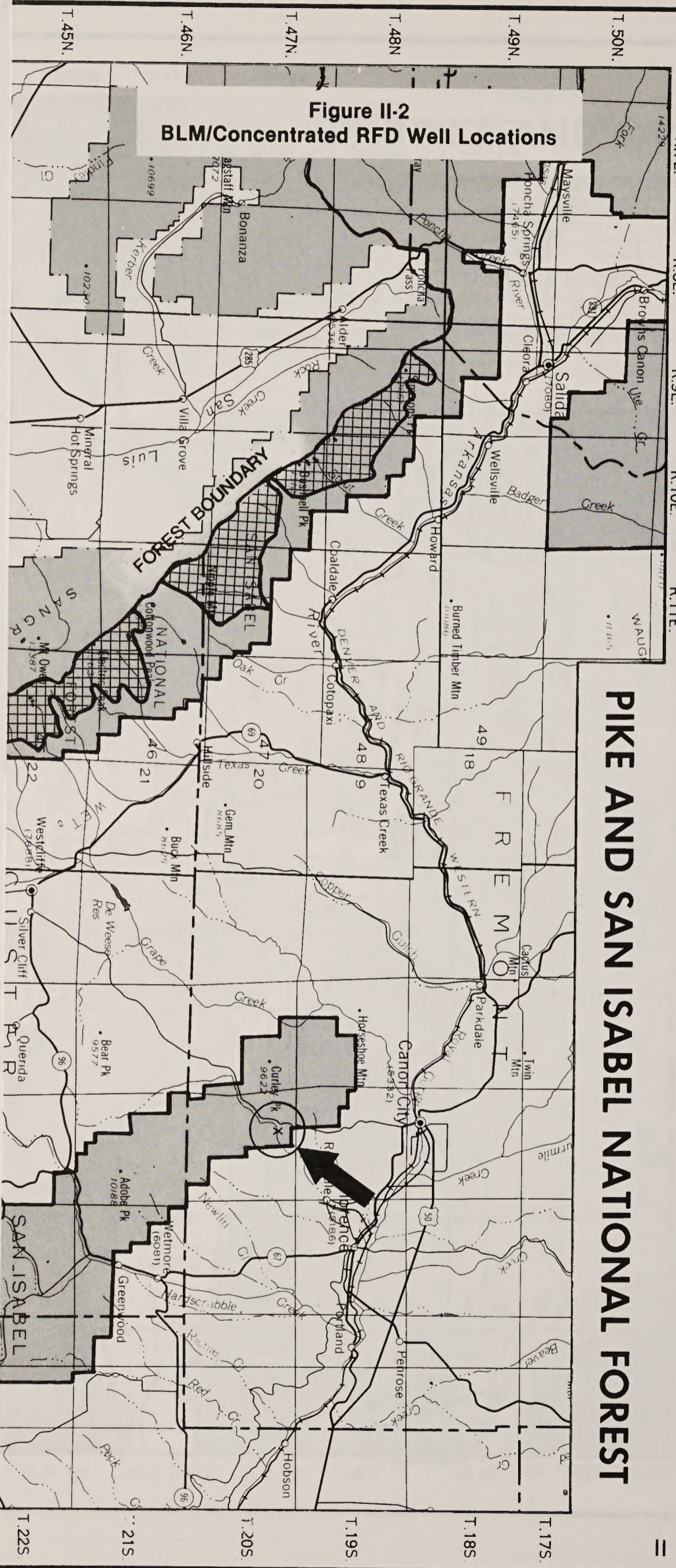
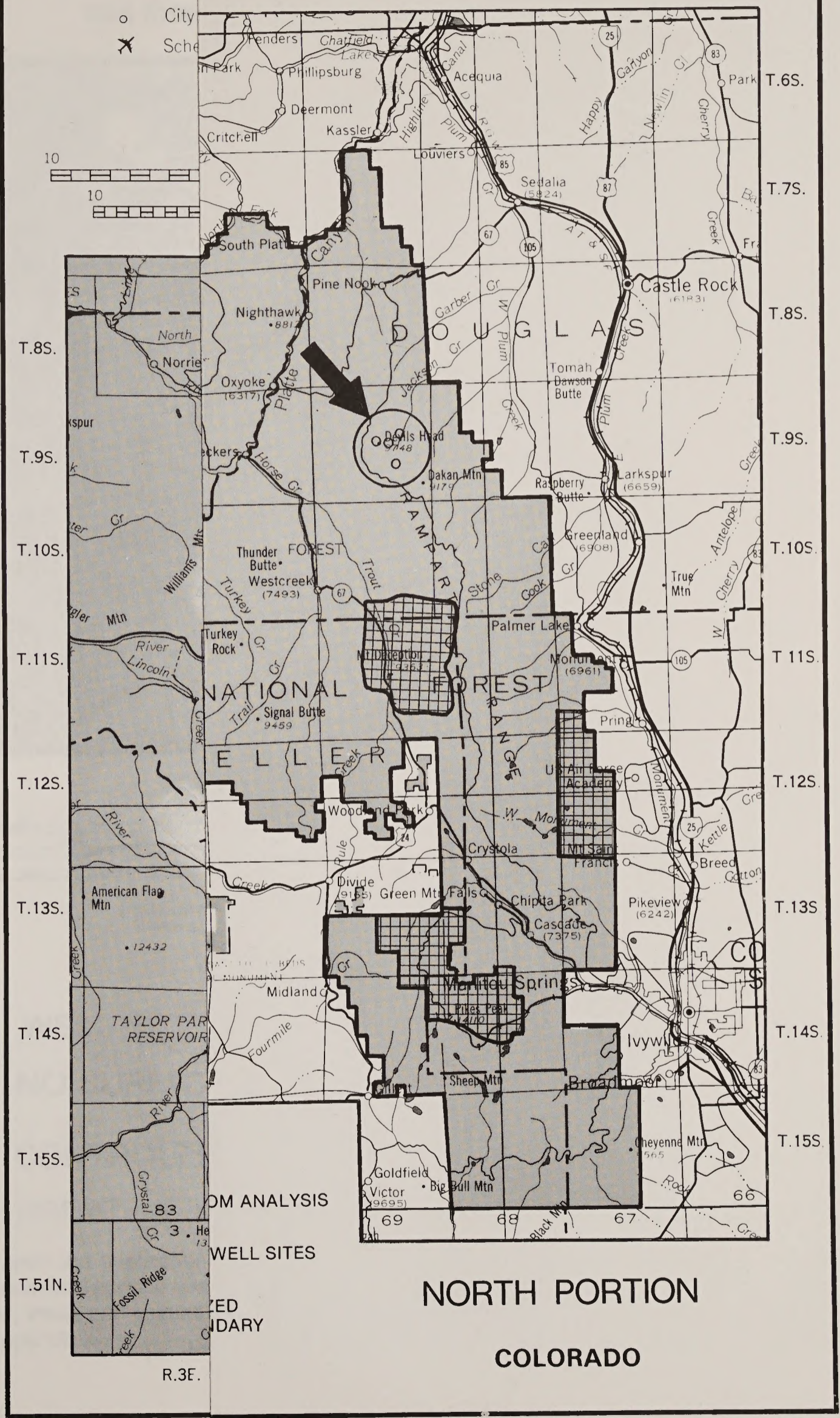


Figure II - 3  
Alternative I - Concentrated RFD Well Locations

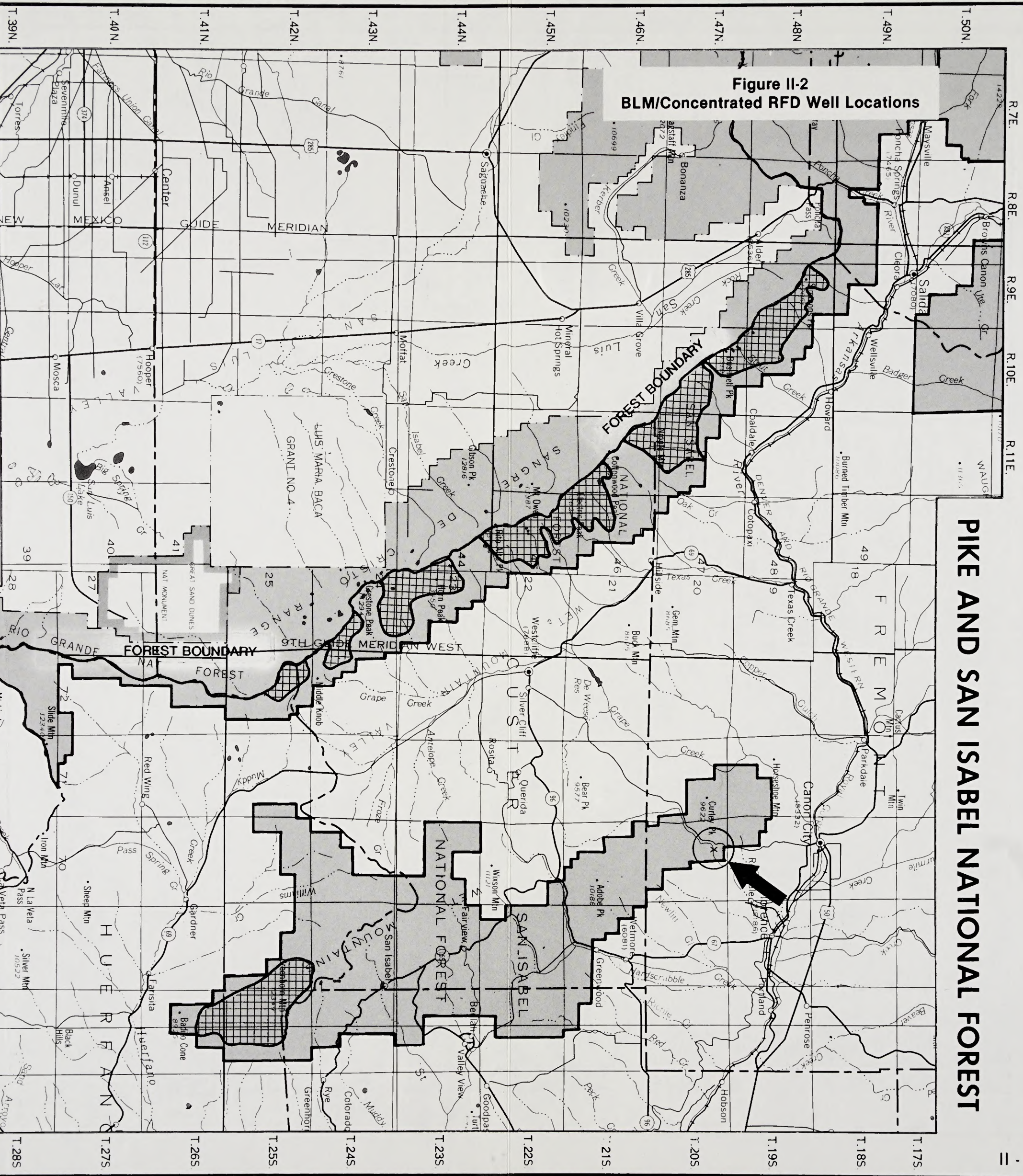
# ISABEL NATIONAL FOREST

- ★ State
- County
- City
- ✈ Scheme



# PIKE AND SAN ISABEL NATIONAL FOREST

### Figure II-2 BLM/Concentrated RFD Well Locations



**LEGEND**

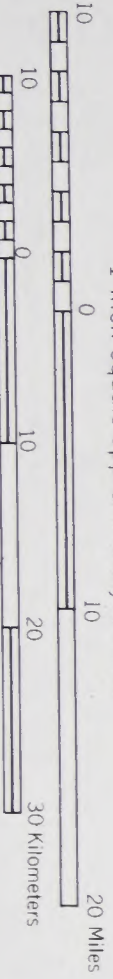
- LANDS EXCLUDED FROM ANALYSIS
- BLM RFD WELL SITES
- LANDS BEING ANALYZED WITHIN FOREST BOUNDARY

**LEGEND**

- State capital
- County seat
- City, town, or village
- Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scale 1:500,000

1 inch equals approximately 8 miles



## SOUTH PORTION

## COLORADO

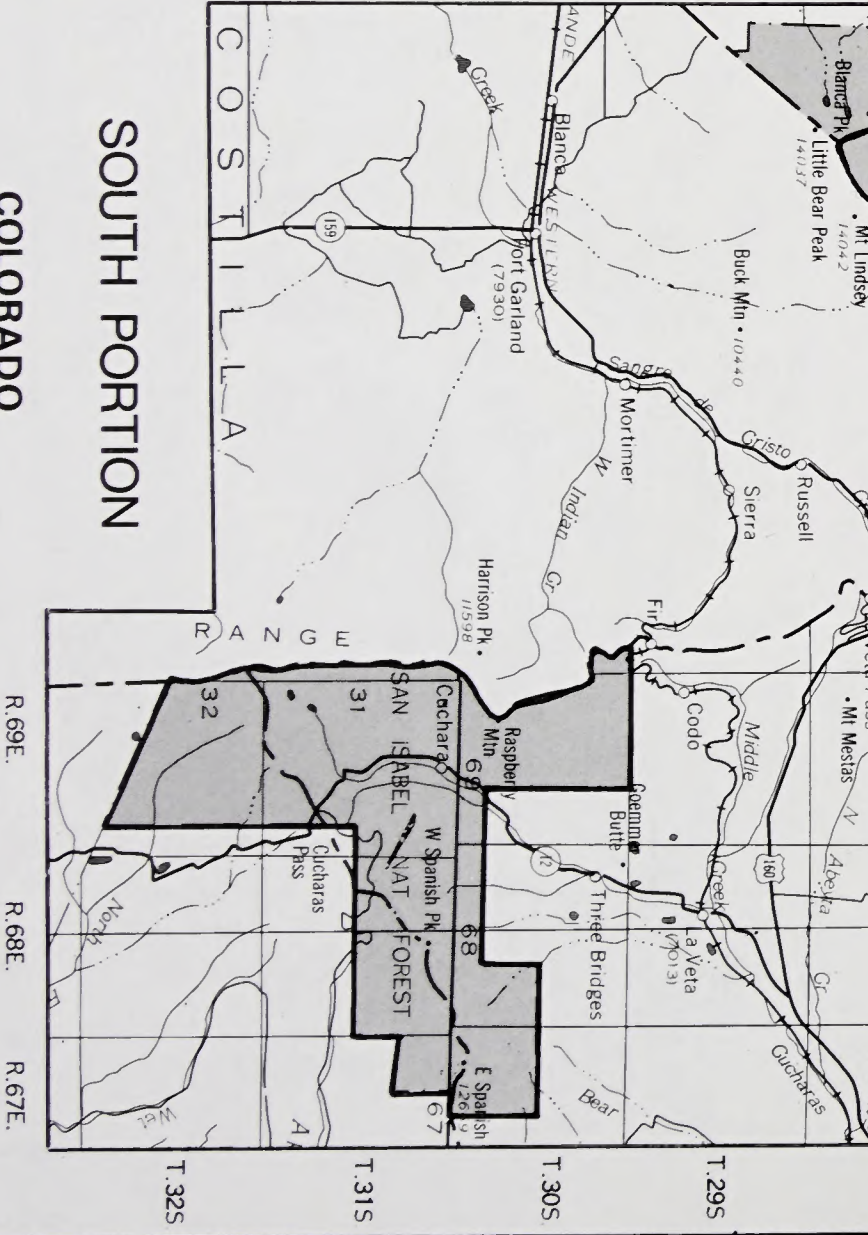
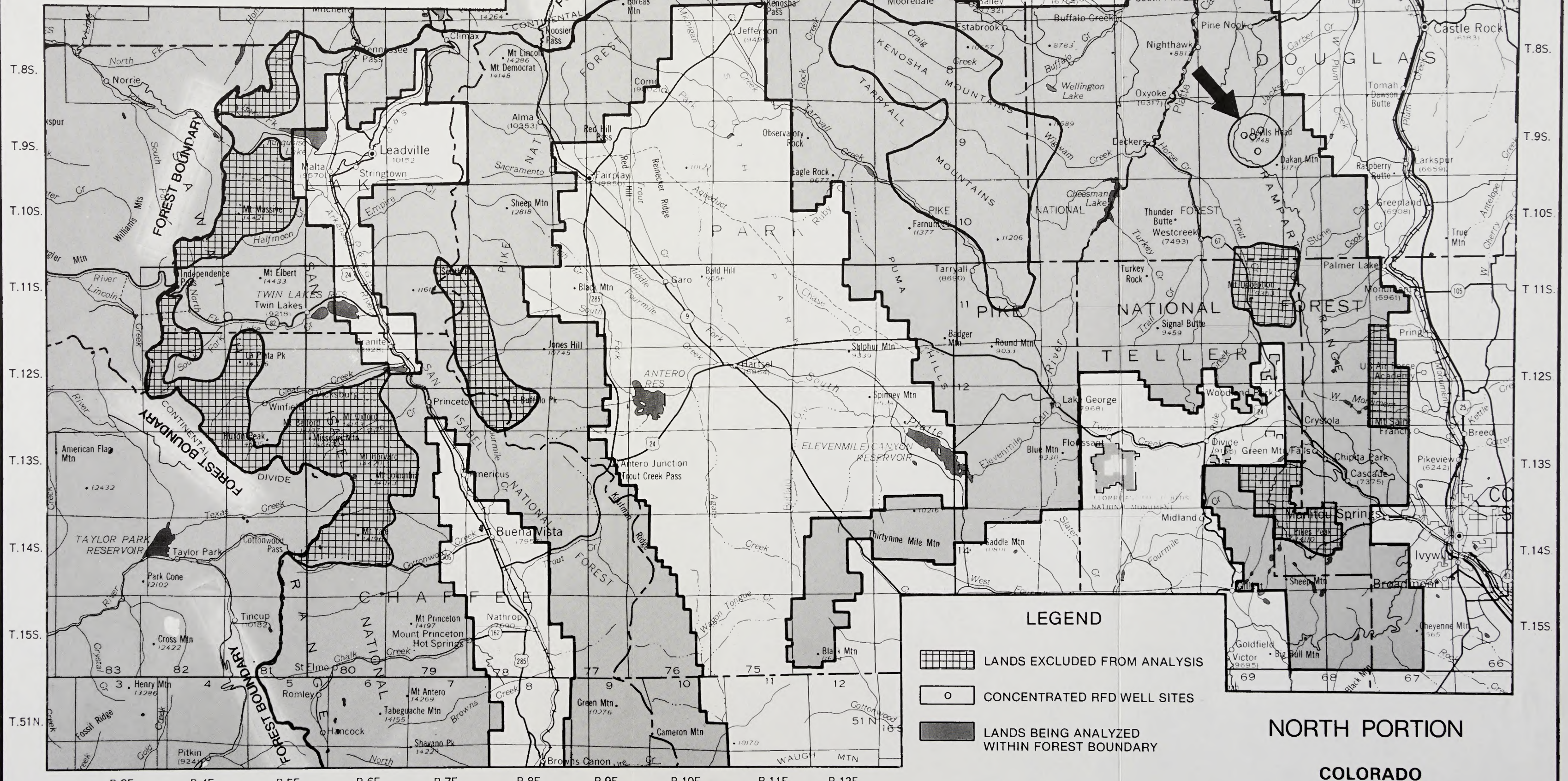
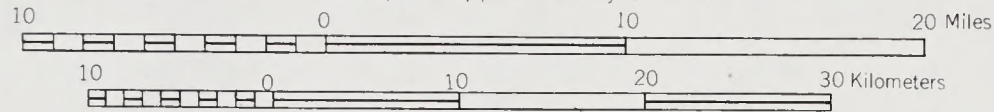


Figure II - 3  
Alternative I - Concentrated RFD Well Locations

# PIKE AND SAN ISABEL NATIONAL FOREST

- LEGEND**
- ⊛ State capital
  - ⊙ County seat
  - City, town, or village
  - ✈ Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

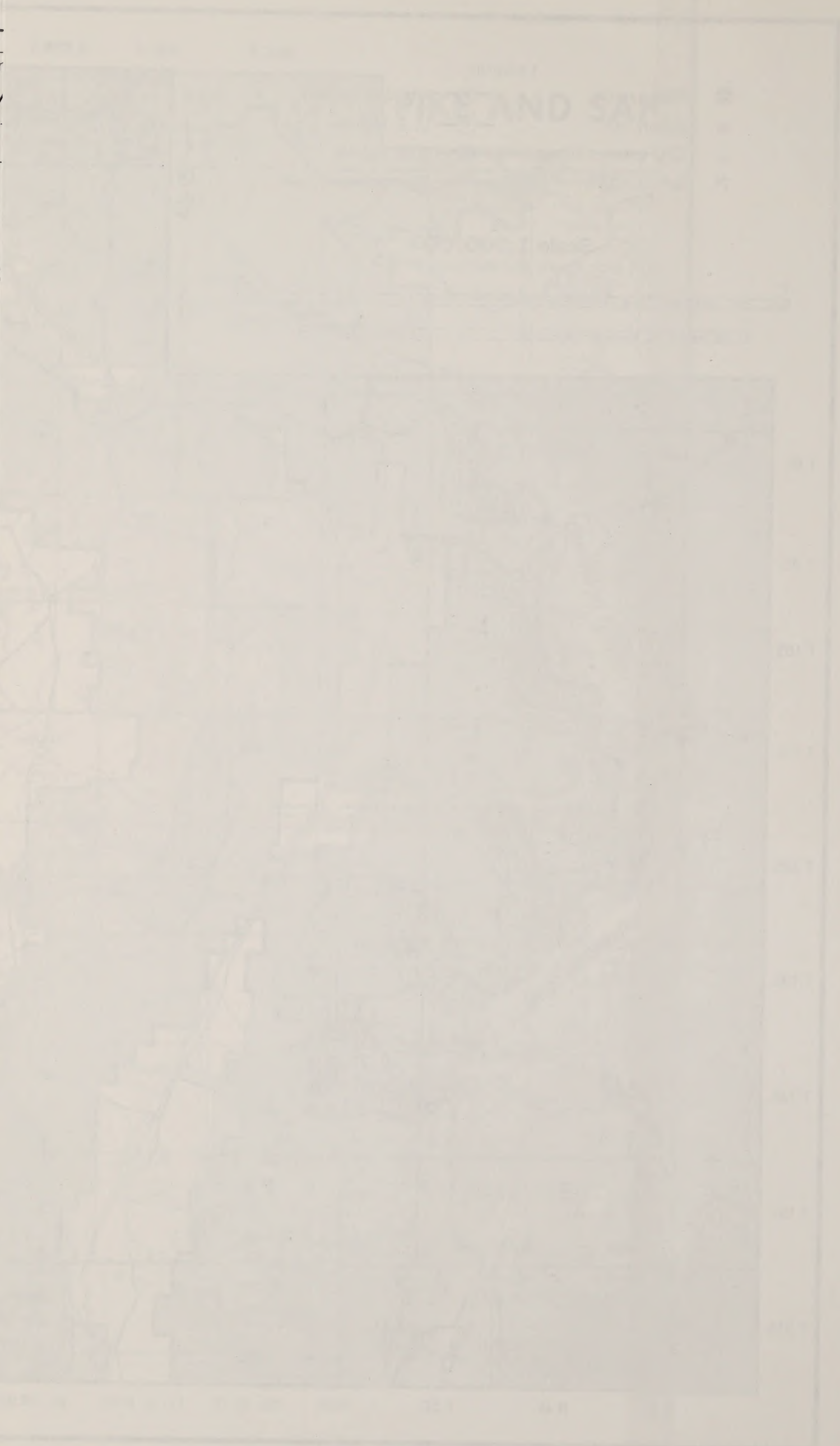
Scale 1:500,000  
1 inch equals approximately 8 miles



- LEGEND**
- ▨ LANDS EXCLUDED FROM ANALYSIS
  - CONCENTRATED RFD WELL SITES
  - LANDS BEING ANALYZED WITHIN FOREST BOUNDARY

NORTH PORTION  
COLORADO

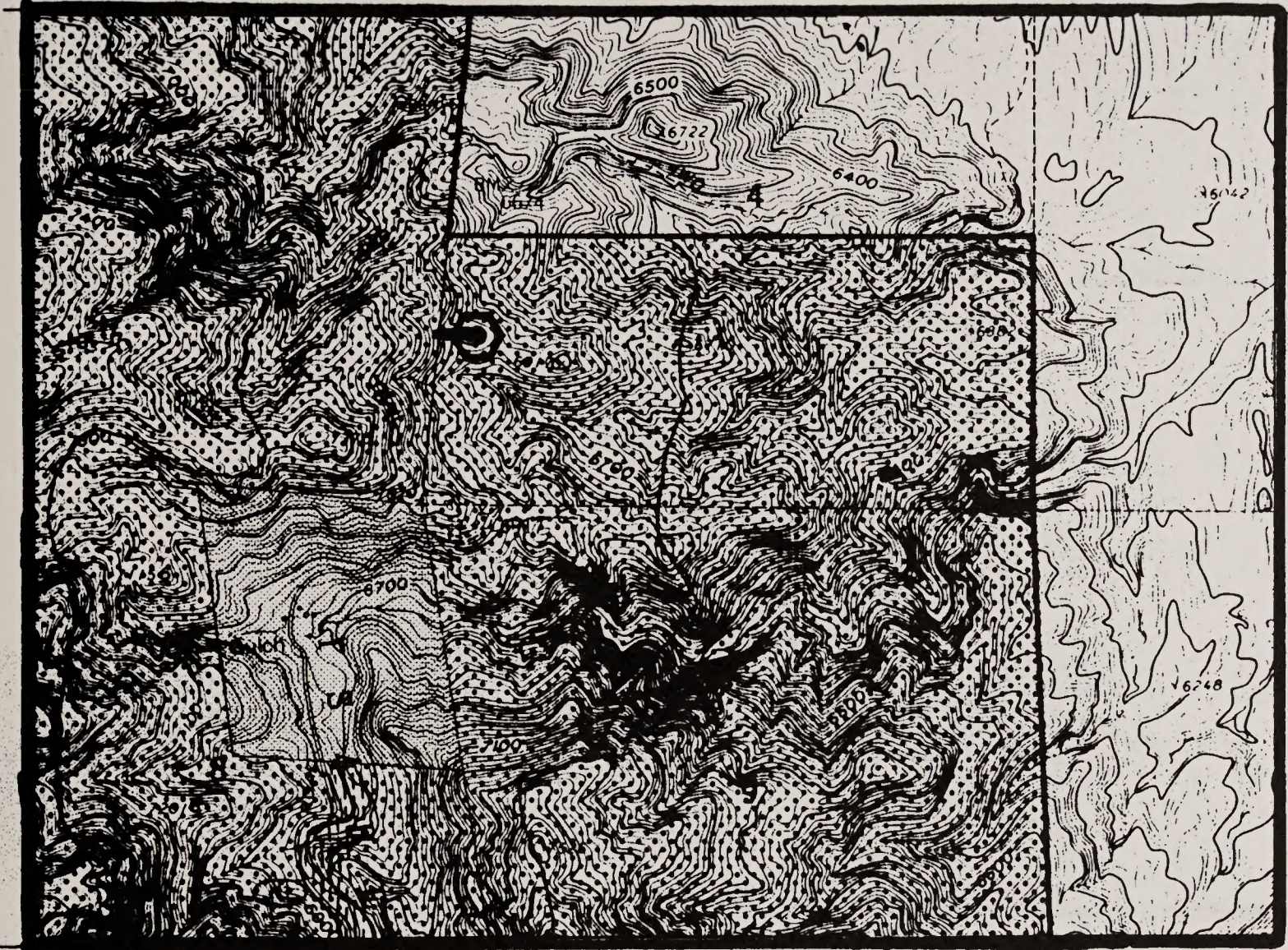
PIPE AND SAW



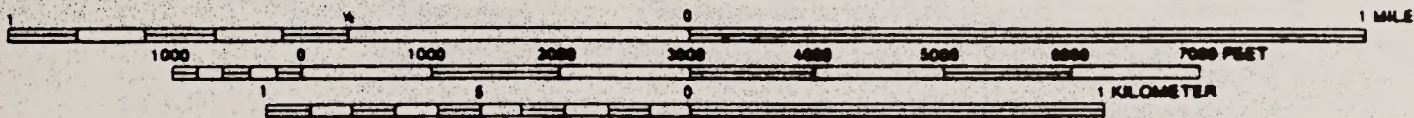


**Figure II-4  
Alternative I - BLM RFD Well Site 1**

**T20S R70W Sec. 04 NWSW**

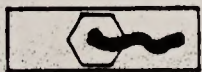


SCALE 1:24 000



CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

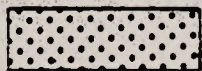
LEGEND



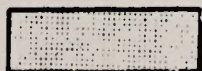
WELL SITE & ROAD



NO SURFACE OCCUPANCY (NSO)



CONTROLLED SURFACE USE (CSU)



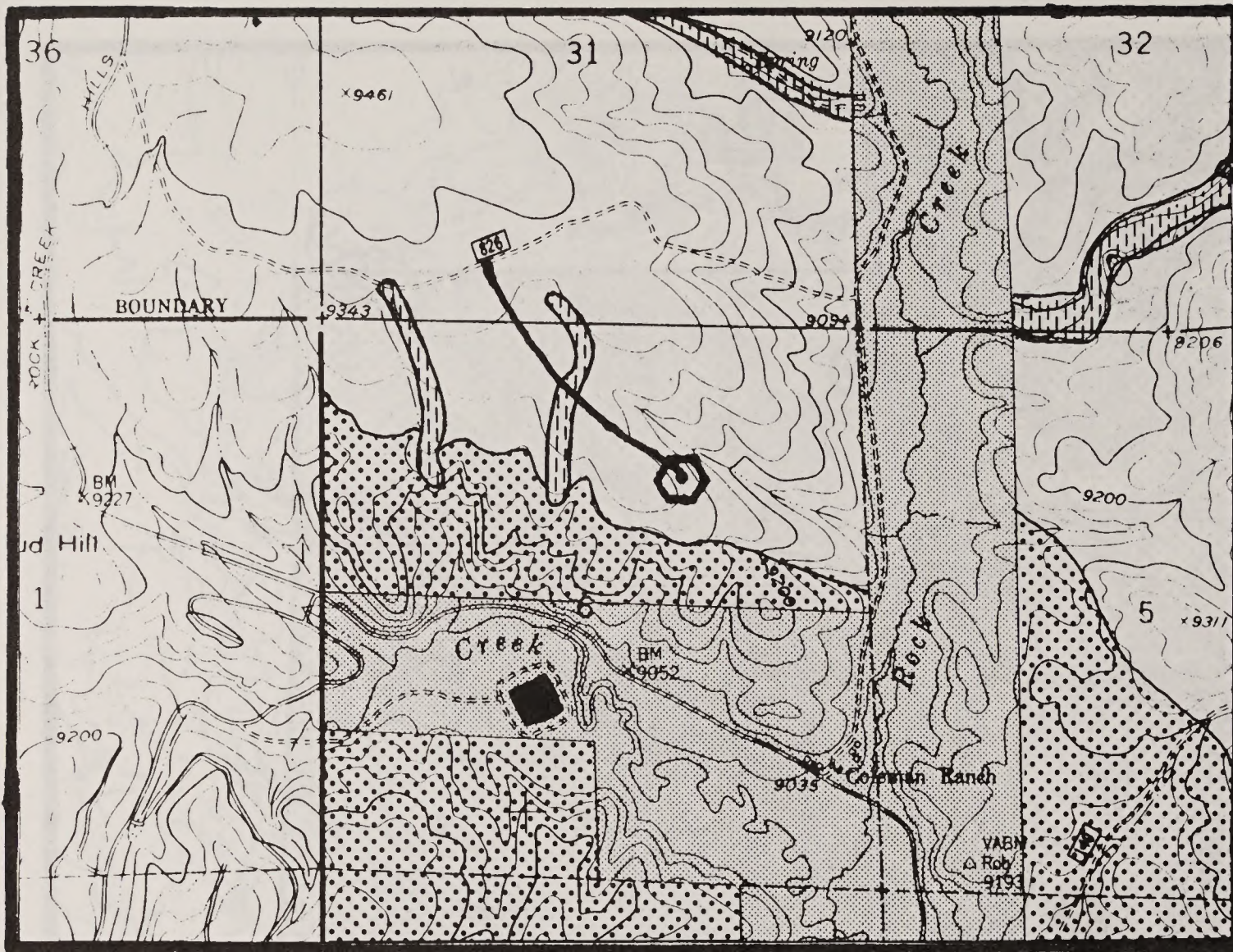
PRIVATE PROPERTY



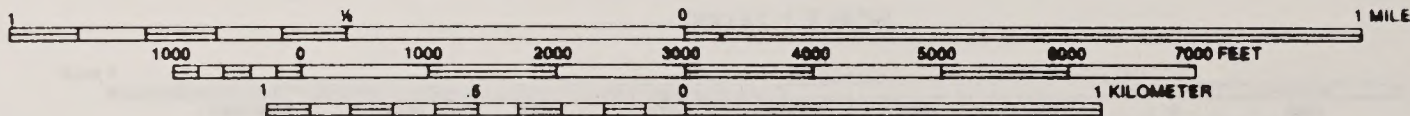
**Note:** Based upon the application of supplemental stipulations, BLM RFD well site 1 is located in a controlled surface use area. Special operating constraints will be applied to protect the soil, visual and cultural resources as described in Appendix B and displayed on maps in Appendix G.

Figure II-5  
Alternative I - BLM RFD Well Site 2

T9S R74W Sec. 06 SWNE



SCALE 1:24 000



CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

LEGEND



WELL SITE & ROAD



NO SURFACE OCCUPANCY (NSO)



CONTROLLED SURFACE USE (CSU)



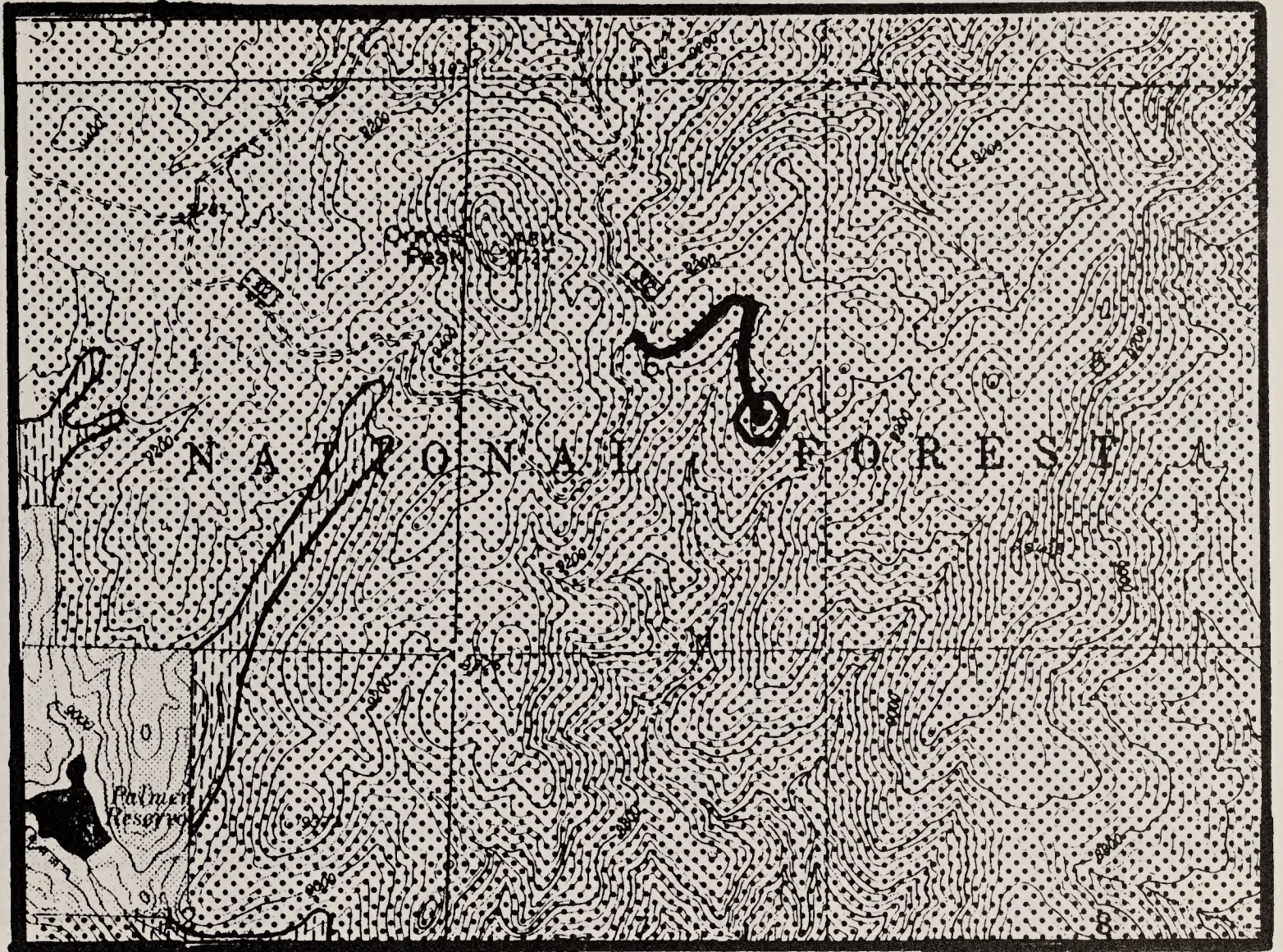
PRIVATE PROPERTY



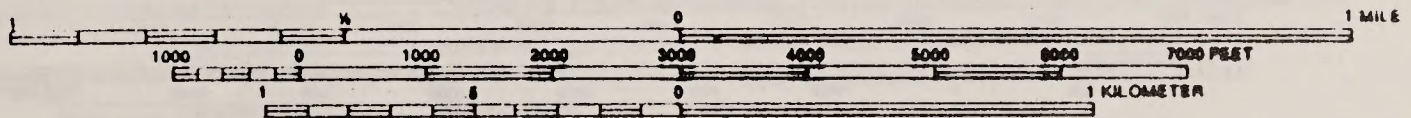
**Note:** Standard lease terms as identified by BLM will be sufficient to protect resource values on BLM RFD well site 2. No supplemental stipulations apply.

Figure II-6  
Alternative I - BLM RFD Well Site 3

T13S R67W Sec. 06 NESE

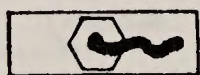





SCALE 1:24 000



CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

LEGEND

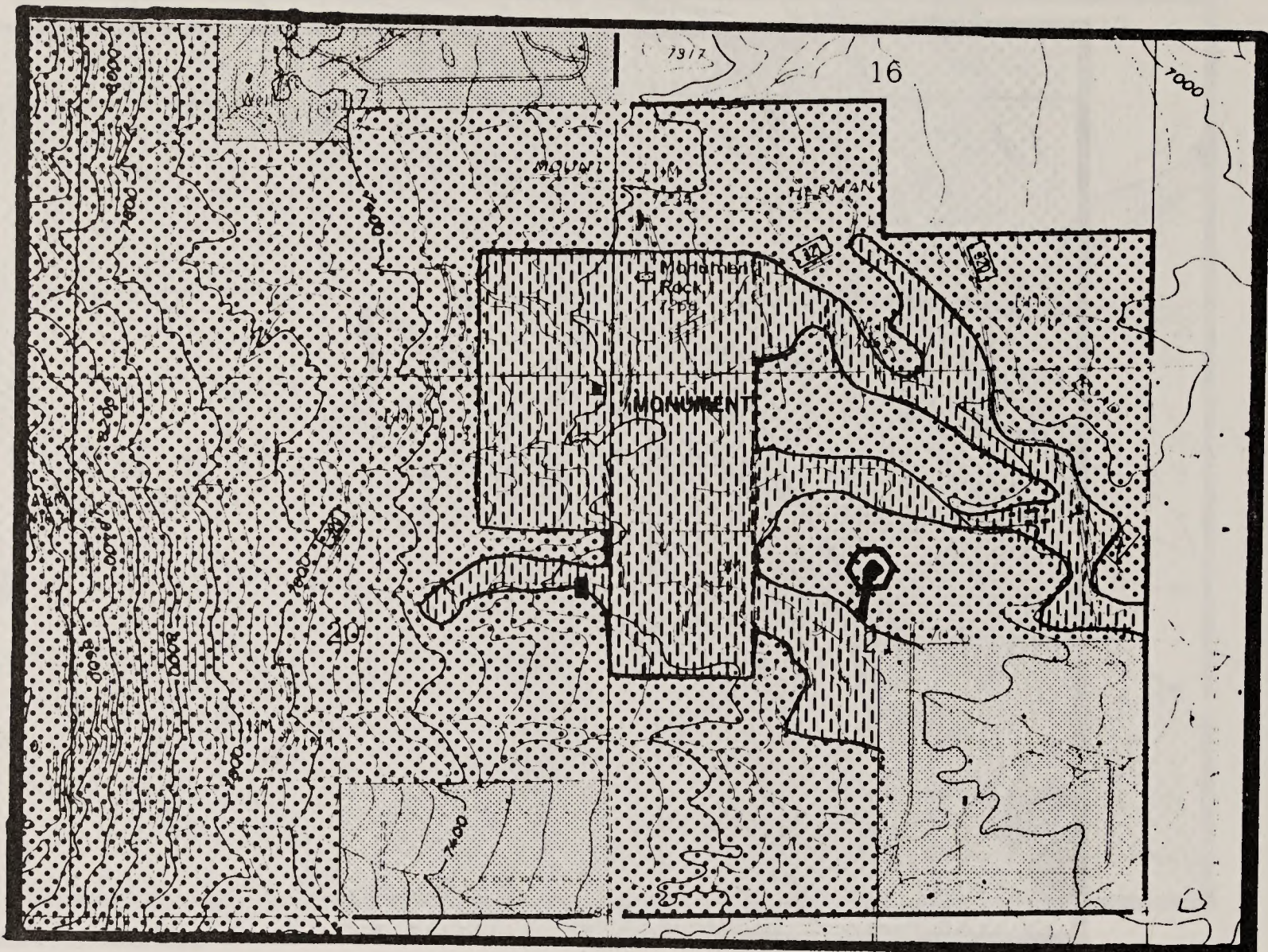
-  WELL SITE & ROAD
-  NO SURFACE OCCUPANCY (NSO)
-  CONTROLLED SURFACE USE (CSU)
-  PRIVATE PROPERTY



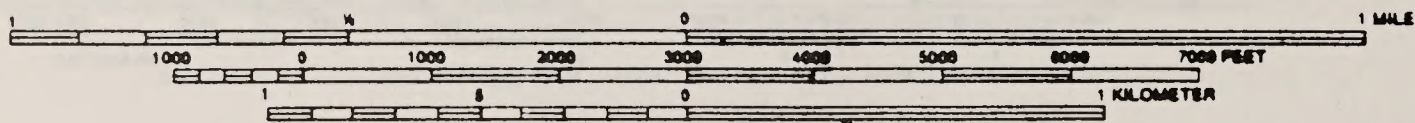
**Note:** Based upon the application of supplemental stipulations, BLM RFD well site 3 is located in a controlled surface use area. Special operating constraints will be applied to protect the soil and watershed resources as described in Appendix B and displayed on maps in Appendix G.

Figure II-7  
Alternative I - BLM RFD Well Site 4

T11S R67W Sec. 21 SWNE

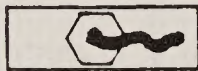


SCALE 1:24 000



CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

LEGEND



WELL SITE & ROAD



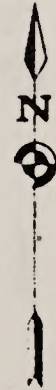
NO SURFACE OCCUPANCY (NSO)



CONTROLLED SURFACE USE (CSU)



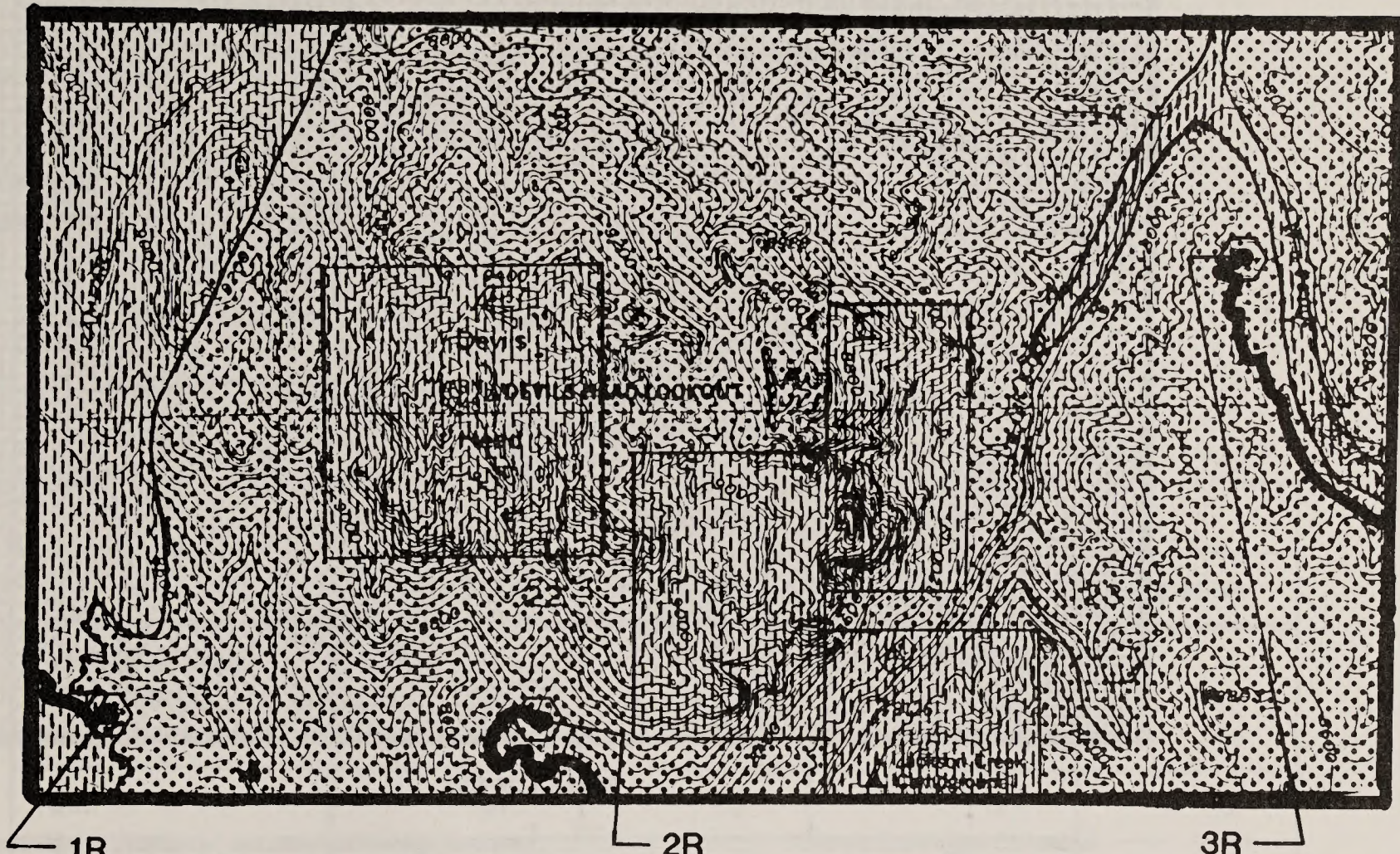
PRIVATE PROPERTY



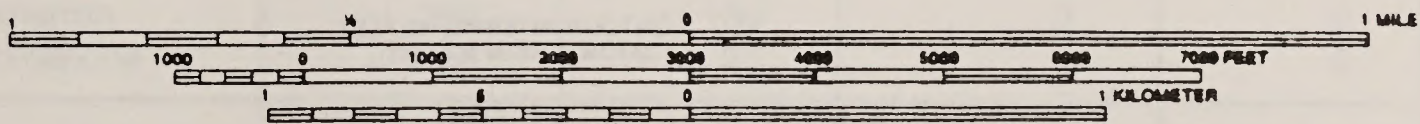
**Note:** Based upon the application of supplemental stipulations, BLM RFD well site 4 is located in a controlled surface use area. Special operating constraints will be applied to protect the watershed resources as described in Appendix B and displayed on maps in Appendix G.

**Figure II-8**  
**Alternative I - Relocated Concentrated RFD Well Sites 1R-3R**

Site 1R - T9S R69W Sec. 21 SWSE  
 Site 2R - T9S R69W Sec. 22 NESW  
 Site 3R - T9S R69W Sec. 14 SWSE

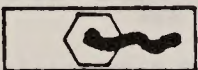

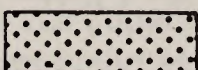



SCALE 1:24 000



CONTOUR INTERVAL 40 FEET  
 DATUM IS MEAN SEA LEVEL

LEGEND

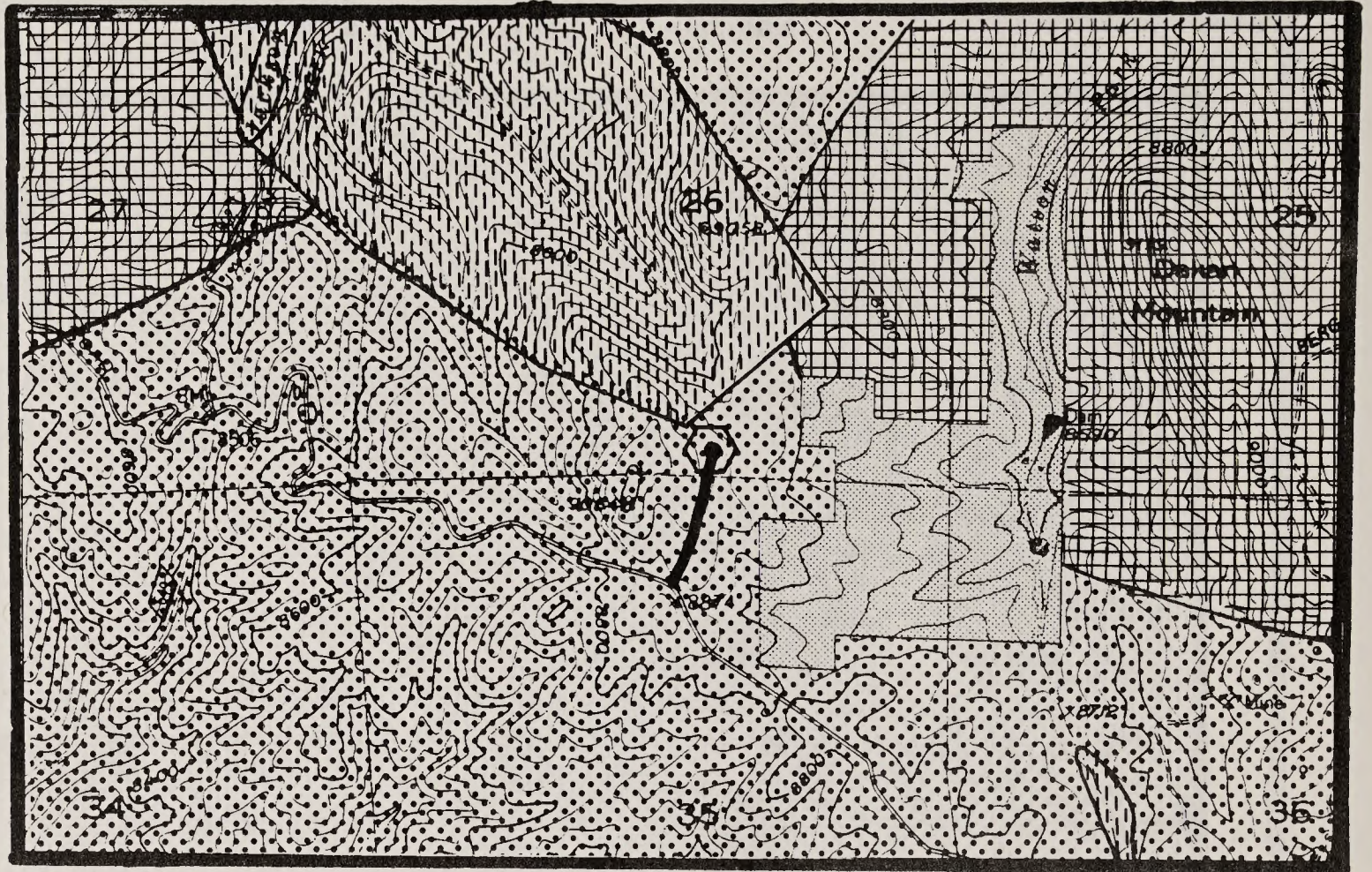
-  WELL SITE & ROAD
-  NO SURFACE OCCUPANCY (NSO)
-  CONTROLLED SURFACE USE (CSU)
-  PRIVATE PROPERTY



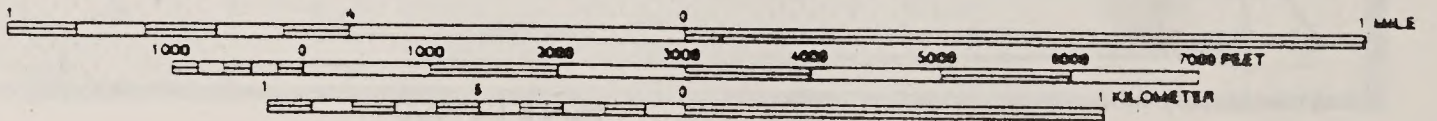
**Note:** Based upon the application of supplemental stipulations, Concentrated well sites 1R, 2R and 3R are located in a controlled surface use area. Special operating constraints will be applied to protect the soil, visual and watershed resources as described in Appendix B and displayed on maps in Appendix G.

Figure II-9  
Alternative I - Concentrated RFD Well Site 4R

T9S R69W Sec. 26 SWSE

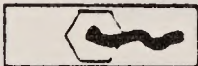

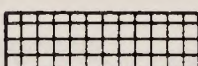
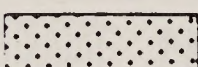
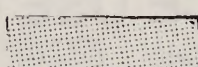


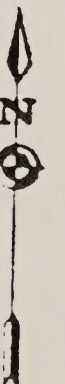
SCALE 1:24 000



CONTOUR INTERVAL 40 FEET  
DATUM IS MEAN SEA LEVEL

LEGEND

-  WELL SITE & ROAD
-  NO SURFACE OCCUPANCY (NSO)
-  TIMING LIMITATION (SEASONAL)
-  CONTROLLED SURFACE USE (CSU)
-  PRIVATE PROPERTY



**Note:** Based upon the application of supplemental stipulations, Concentrated well site 4R is located in a controlled surface use area. Special operating constraints will be applied to protect the soil, visual and watershed resources as described in Appendix B and displayed on maps in Appendix G.

**Table II-2  
Alternative I - Well Disturbance Acres  
National Forests**

| BLM RFD |           | Concentrated RFD |           |
|---------|-----------|------------------|-----------|
| Well    | Disturbed | Well             | Disturbed |
| 1       | 4         | 1C               | 8         |
| 2       | 5         | 2C               | 9         |
| 3       | 5         | 3C               | 8         |
| 4       | 4         | 4C               | 4         |
| Total   | 18        | Total            | 29        |

**Table II-3  
Alternative I - Well Distribution and Disturbance Acres  
National Grasslands**

|                 | Major Soil/Ecosystem Type |            |              |          |
|-----------------|---------------------------|------------|--------------|----------|
|                 | Sandy Lands               | Hard Lands | Canyon Lands | Riparian |
| Number of Wells |                           |            |              |          |
| Cimarron        | 107                       | 58         | 0            | 0        |
| Comanche        | 30                        | 15         | 0            | 0        |
| Total           | 137                       | 73         | 0            | 0        |
| Disturbed Acres |                           |            |              |          |
| Cimarron        | 256                       | 138        | 0            | 0        |
| Comanche        | 54                        | 27         | 0            | 0        |
| Total           | 310                       | 165        | 0            | 0        |

**ALTERNATIVE II  
All NFS Lands Available for Standard Development**

Under this alternative, all NFS lands that are legally available for oil and gas leasing will be leased as shown in Table II-11. There are no discretionary no lease areas in this alternative. The BLM will issue leases on split-estate lands. The Oil and Gas Regulations require the Forest Service to analyze potential impacts from post-leasing activities as a result of the projected RFD. All NFS lands being analyzed as a result of the projected RFD will be available subject to the terms and conditions of the standard oil and gas lease form. Protective measures for post-leasing activities will be determined at the time of APD subject to approval of a surface use plan of operations.

This alternative is not consistent with management requirements for issuance of leases as required by the Forest Plan. Special stipulations will not be used, therefore adequate mitigation cannot be

achieved in all cases. Mineral exploration, discovery and development activities will occur subject to the terms and conditions of the lease, the operating requirements of the BLM 3160 Regulations and all applicable Notices to Lessees and Operators (NTL). The standard lease terms will be used to mitigate impacts on the affected environment. The BLM standard lease terms provide for protection of the environment with operating restrictions applied and enforced at the time of an APD.

The application of standard lease terms will conflict with Forest-wide standards and guidelines on some lands. A Forest Plan Amendment will be needed to implement this alternative.

The environmental consequences resulting from the leasing analysis conducted for this alternative based on the projected RFD are discussed in Chapter IV, Environmental Consequences, of this EIS. Based upon the RFD's (BLM and Concentrated), Figures II-9 through II-14 and Tables II-4 through II-6 describe environmental effects of Alternative II.

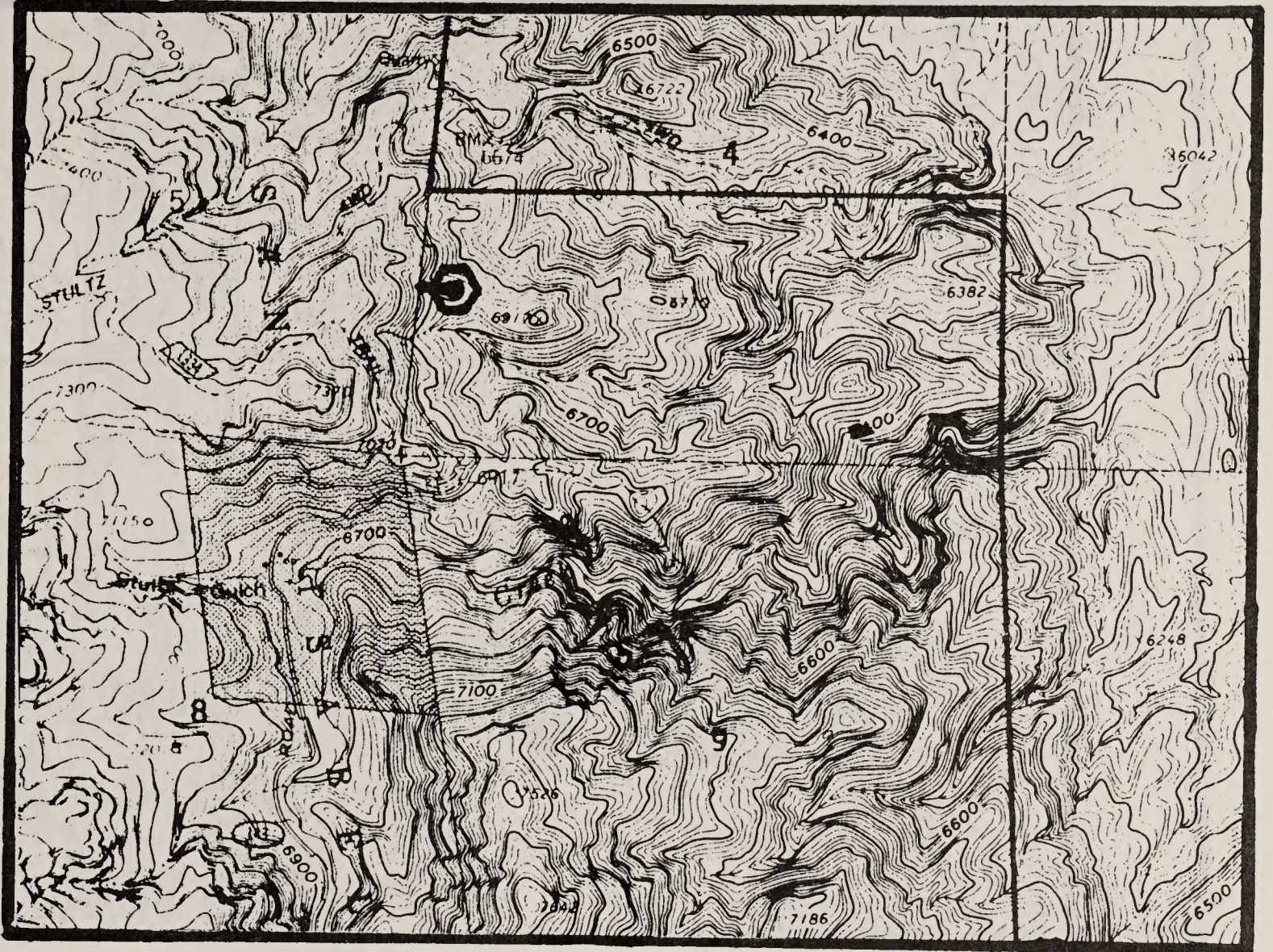
Because there are no additional stipulations required to protect resource values, original well locations (BLM and Concentrated) will remain as first proposed.

| Category   | BLM | Concentrated | Total |
|------------|-----|--------------|-------|
| Well Sites | 0   | 0            | 0     |
| Roads      | 0   | 0            | 0     |
| Other      | 0   | 0            | 0     |
| Total      | 0   | 0            | 0     |

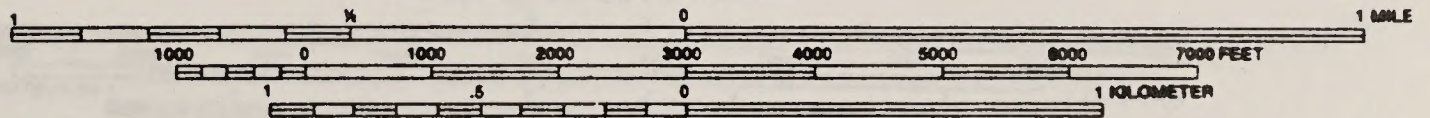


Figure II-10  
Alternative II - BLM RFD Well Site 1

T20S R70W Sec. 04 NWSW



SCALE 1:24 000



CONTOUR INTERVAL 20 FEET  
DATUM IS MEAN SEA LEVEL

LEGEND

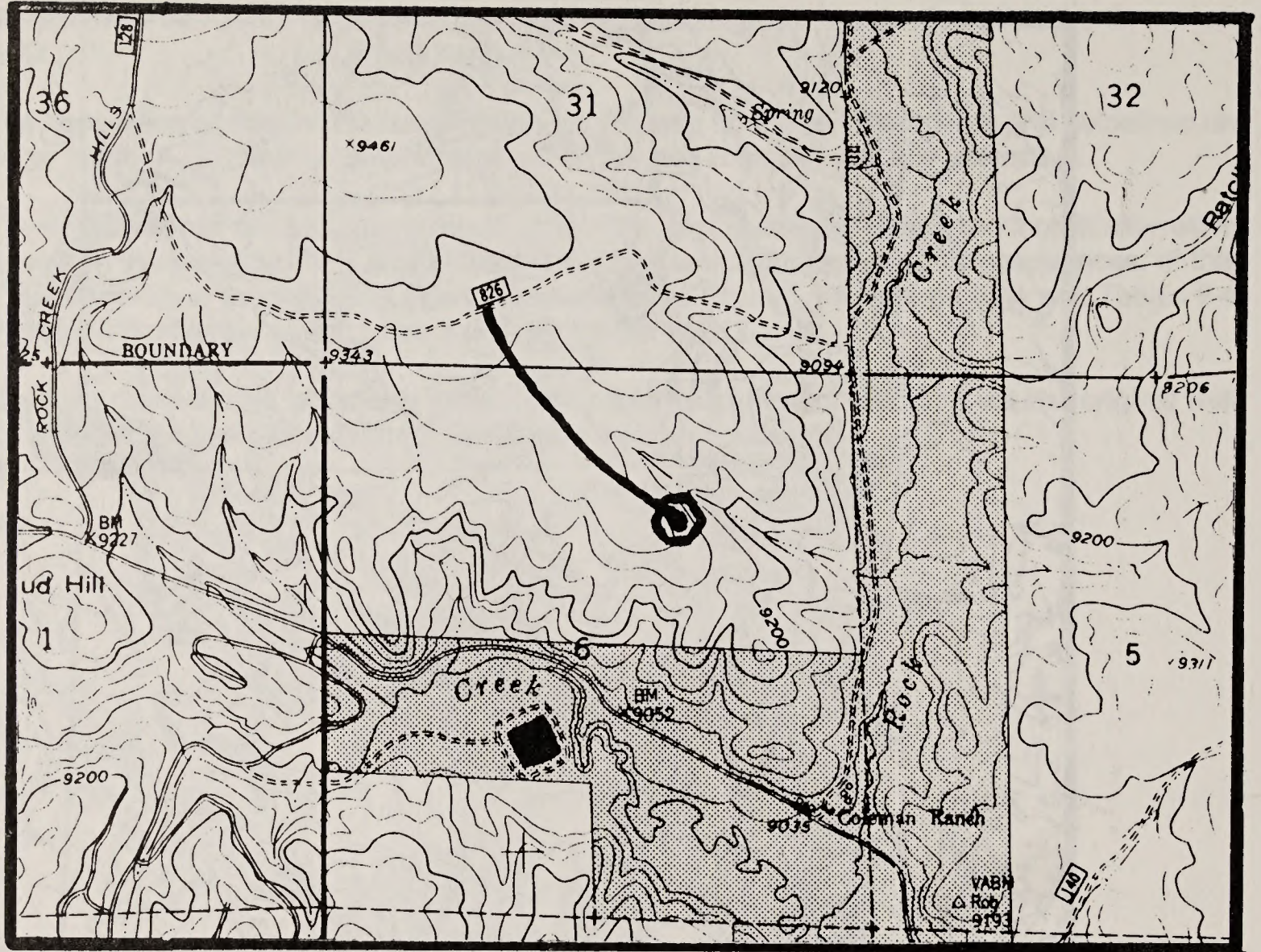


WELL SITE & ROAD

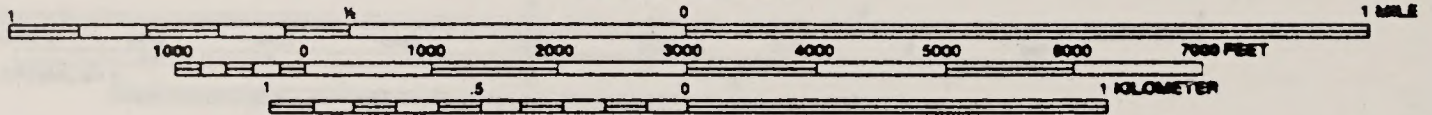
**Note:** Standard lease terms will be used to mitigate impacts in the affected environment.

Figure II-11  
 Alternative II - BLM RFD Well Site 2

T9S R74W Sec. 06 SWNE

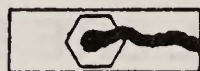


SCALE 1:24 000



CONTOUR INTERVAL 20 FEET  
 DATUM IS MEAN SEA LEVEL

LEGEND

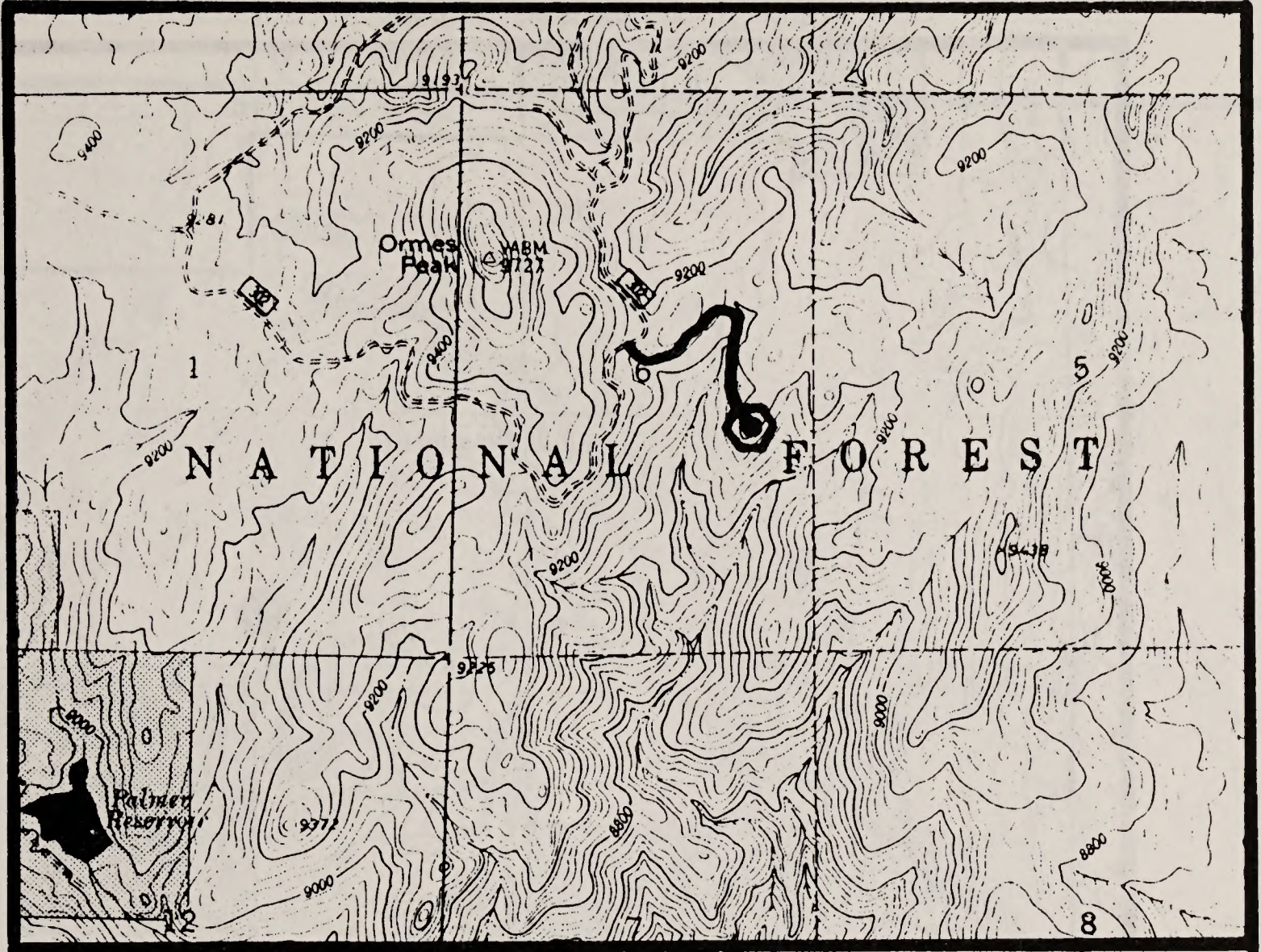


WELL SITE & ROAD

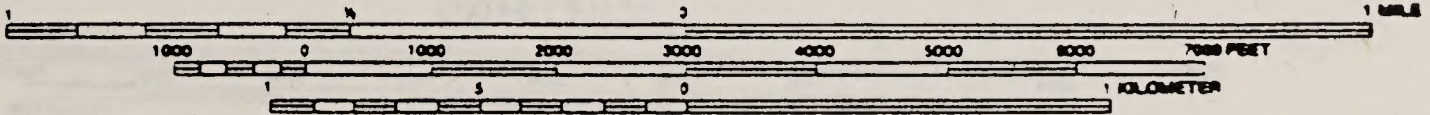
Note: Standard lease terms will be used to mitigate impacts in the affected environment.

Figure II-12  
 Alternative II - BLM RFD Well Site 3

T13S R67W Sec. 06 NESE

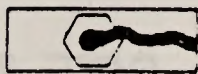


SCALE 1:24 000



CONTOUR INTERVAL 20 FEET  
 DATUM IS MEAN SEA LEVEL

LEGEND

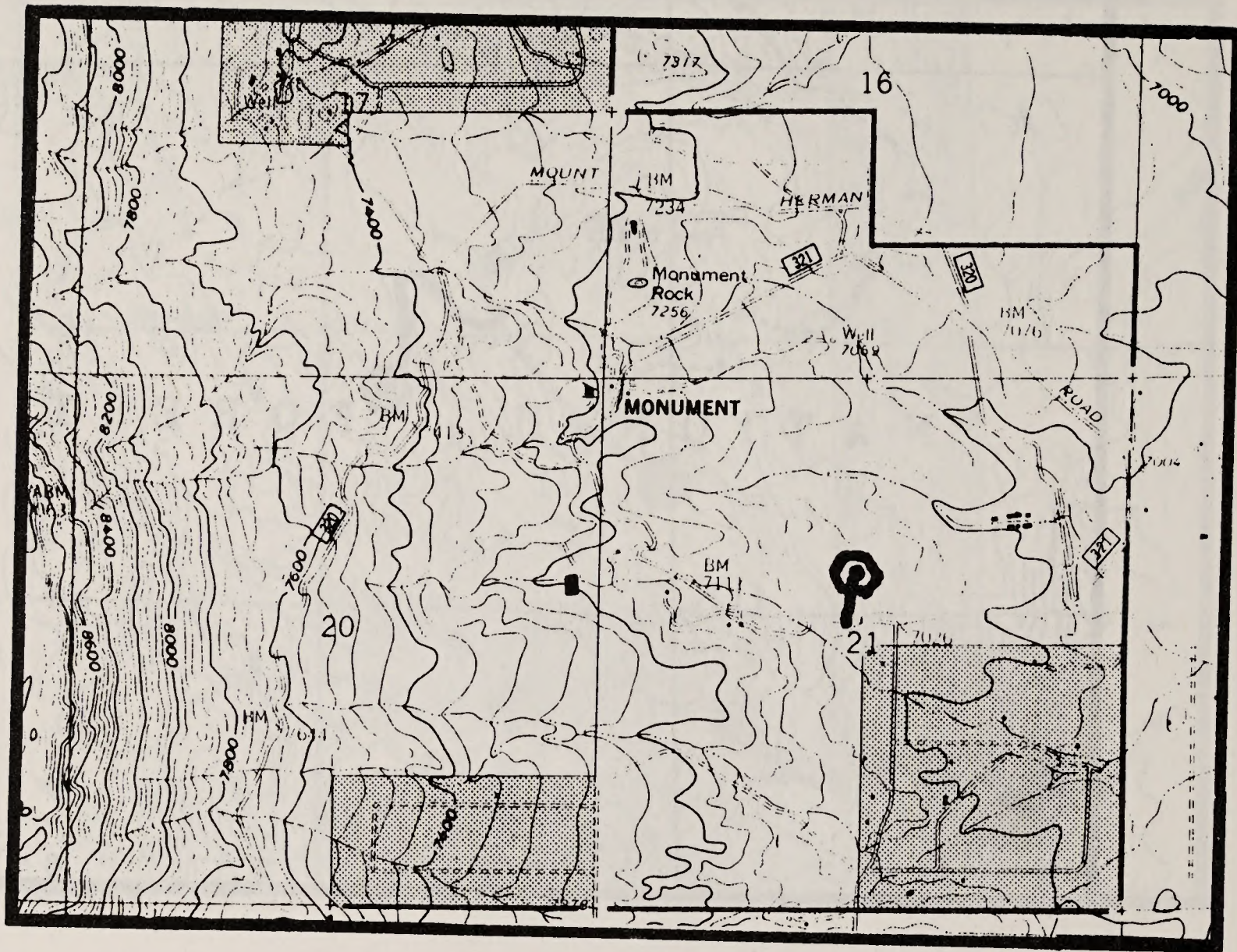


WELL SITE & ROAD

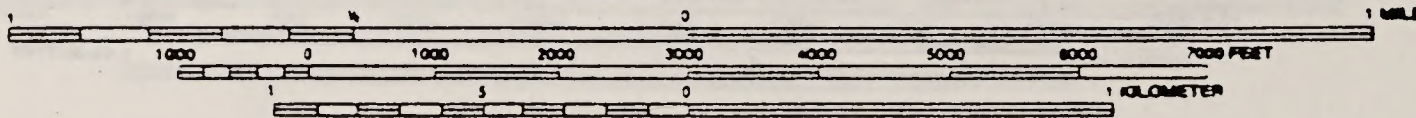
**Note:** Standard lease terms will be used to mitigate impacts in the affected environment.

Figure II-13  
 Alternative II - BLM RFD Well Site 4

T11S R67W Sec. 21 SWNE



SCALE 1:24 000



CONTOUR INTERVAL 20 FEET  
 DATUM IS MEAN SEA LEVEL

LEGEND



WELL SITE & ROAD

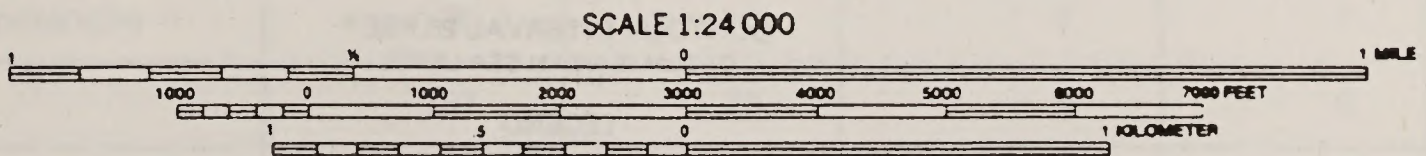
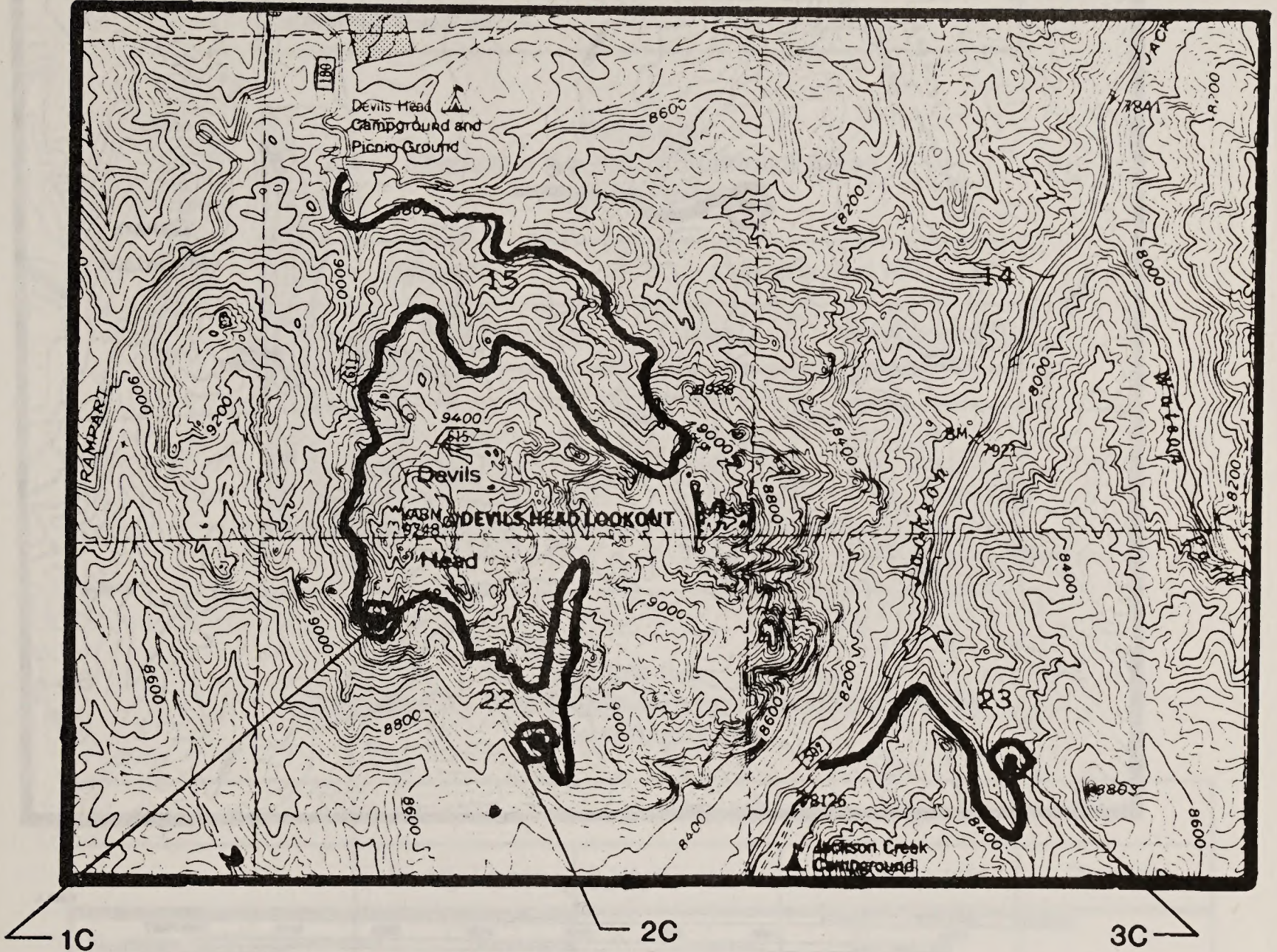
Note: Standard lease terms will be used to mitigate impacts in the affected environment.

**Figure II-14**  
**Alternative II - Concentrated Well Sites 1-3**

**Site 1C - T9S R69W Sec. 22 NWNW**

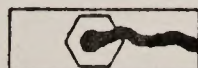
**Site 2C - T9S R69W Sec. 22 SWNE**

**Site 3C - T9S R69W Sec. 23 NWSE**



CONTOUR INTERVAL 20 FEET  
 DATUM IS MEAN SEA LEVEL

LEGEND

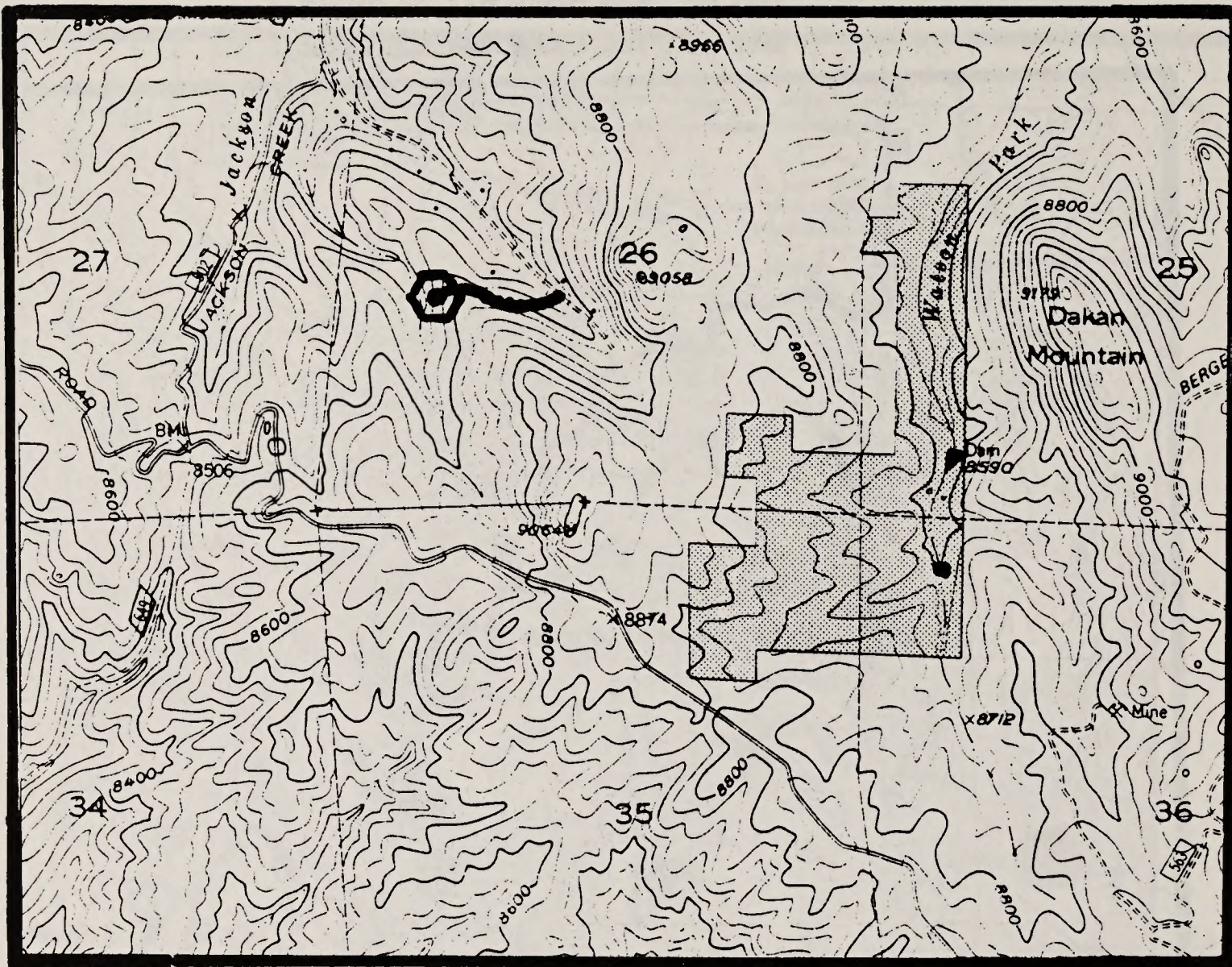


**WELL SITE & ROAD**

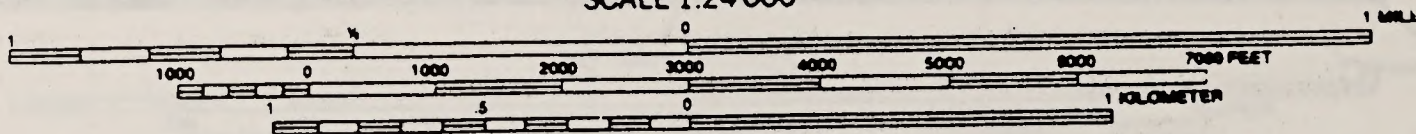
**Note:** Standard lease terms will be used to mitigate impacts in the affected environment.

**Figure II-15**  
**Alternative II - Concentrated Well Site 4C**

**T9S R69W Sec. 26 NWSW**

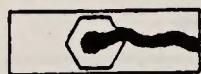


SCALE 1:24 000



CONTOUR INTERVAL 20 FEET  
 DATUM IS MEAN SEA LEVEL

LEGEND



**WELL SITE & ROAD**

**Note:** Standard lease terms will be used to mitigate impacts in the affected environment.

**Table II-4**  
**Alternative II - Land Distribution by Management Requirement**  
**National Forests and National Grasslands**

| Management Requirement | Acres Leased |
|------------------------|--------------|
| Standard lease terms   | 2,229,506    |

**Table II-5**  
**Alternative II - Well Disturbance Acres**  
**National Forests**

| BLM RFD |           | Concentrated RFD |           |
|---------|-----------|------------------|-----------|
| Well    | Disturbed | Well             | Disturbed |
| 1       | 4         | 1C               | 13        |
| 2       | 5         | 2C               | 11        |
| 3       | 5         | 3C               | 11        |
| 4       | 4         | 4C               | 9         |
| Total   | 18        | Total            | 44        |

**Table II-6**  
**Alternative II - Well Distribution and Disturbance Acres**  
**National Grasslands**

|                        | Major Soil/Ecosystem Type |            |              |           |
|------------------------|---------------------------|------------|--------------|-----------|
|                        | Sandy Lands               | Hard Lands | Canyon Lands | Riparian  |
| <b>Number of Wells</b> |                           |            |              |           |
| Cimarron               | 101                       | 57         | 0            | 7         |
| Comanche               | 30                        | 13         | 1            | 1         |
| <b>Total</b>           | <b>131</b>                | <b>70</b>  | <b>1</b>     | <b>8</b>  |
| <b>Disturbed Acres</b> |                           |            |              |           |
| Cimarron               | 241                       | 136        | 0            | 17        |
| Comanche               | 54                        | 23         | 2            | 2         |
| <b>Total</b>           | <b>295</b>                | <b>159</b> | <b>2</b>     | <b>19</b> |

**ALTERNATIVE III**  
**NFS Lands Available for Lease**  
**with Both Standard and Stipulated Terms**

Under this alternative, NFS lands will be made available for oil and gas leasing subject to supplemental lease stipulations. Supplemental stipulations are designed and implemented in this alternative to assure necessary protection of critical resources in the affected environment including the human environment. The value of the critical resources may be based on social or environmental issues. The BLM will issue leases on split-estate lands subject to standard lease terms and supplemental stipulations as necessary to protect the affected environment. Stipulations may be applied that reduce the amount of land available for leasing with surface occupancy.

This alternative is in conformance with the requirements of the Reform Act and the Forest Service Oil and Gas Regulations. The Reform Act requires full disclosure of potential environmental consequences from a projected RFD on NFS lands available for leasing. The Forest Service Oil and Gas Regulations requires the Forest Service to conduct leasing analysis based on a projected RFD. The Regulations require that environmental documents supporting the leasing analysis identify NFS lands available for leasing, disclose potential environmental consequences as a result of the RFD, and display protective stipulations for sensitive resources and the human environment on maps.

Supplemental stipulations that have been developed by the individual resource specialists on the interdisciplinary team are shown in Appendix B (Mitigation). Appendix B also discusses why the supplemental stipulations are needed to protect resource values. Maps in Appendix F show the stipulations that are applied to various areas on the Unit.

In conformance with the management direction of the Forest Plan, supplemental site-specific stipulations will be applied when necessary for the protection of surface resources and the human environment. Protective restrictions imposed by supplemental stipulations exceed the standard lease terms and may further restrict surface activities. For example, a supplemental stipulation may require longer timing restrictions when the standard lease term of 60 days is insufficient to protect the use of critical habitat during critical periods.

Under this alternative, as justified by the impact analysis discussed in Chapter IV, Environmental Consequences, of this EIS, 157,773 acres of critical environments are removed from leasing availability. These areas have been removed from availability through the Discretionary No Lease authority granted to the Secretary of Agriculture by the Reform Act. A map identifying NFS lands removed from availability as a result of discretionary authority is found in Appendix F and Table II-11 on page II-34 displays them.

The proposed term of the discretionary removal of these areas vary. The lands removed because they are Wilderness Study Areas are removed until legislation is passed designating them as wilderness or releasing them to multiple-use management. Aspen Ridge and Tanner Peak are adjacent to areas being studied by the BLM for inclusion as wilderness. Due to topographical features these lands might logically be included if the BLM were to propose the areas be wilderness so they will be removed until legislation is passed. The South Platte River and Badger Creek proposed wild and scenic river corridors shall be removed until studies and management plans have been completed. There are also many diverse cultural resource sites that can be developed to increase public education and interpretation of US history. These sites are known but specific management objectives have not yet been identified for them. They will be removed until the Forest Plan revision, when they will be studied and identified for special management or released to



multiple-use. Oil and gas activities allowed upon release of those lands to multiple-use management will be consistent with the Record of Decision for this document.

Implementation of Alternative III will require a Forest Plan amendment. The proposed Forest Plan amendment is included as Appendix A to this DEIS.

The environmental consequences resulting from the leasing analysis conducted for this alternative based on the projected RFD are discussed in Chapter IV, Environmental Consequences, of this EIS. Supplemental stipulations imposed for sensitive and critical environments are justified by the analysis. Information on specific supplemental stipulations imposed and required for post-leasing activities for surface resource protection and the human environment are discussed in Appendix B of this EIS. A map with delineation of supplemental stipulations is found in Appendix F.

This alternative allows for the disclosure of lease stipulations for any parcel prior to lease advertisement and sale. This will allow the potential lessee to locate their proposed lease boundaries according to resource needs. Lease stipulations will also allow lessees, at the time of APD, to propose well locations that maximize their development opportunities and minimize resource impacts.

The difference between Alternatives I and III are primarily in administrative processes. This alternative allows us to make the availability determination and disclose the total effects of anticipated development in one document. Alternative I provides for the analysis and documentation of the effects of individual leases only on a site-specific case-by-case basis as lease applications are received.

Figures II-15 through II-17 show the locations of Discretionary No Lease areas on the Unit. Alternative III is the only alternative that removes discretionary no lease lands from availability.

BLM RFD and Concentrated RFD well locations are the same as in Alternative 1. Reference Figures II-3 through II-8 to review these well locations. Well locations are different then in Alternative II because of the supplemental stipulations applied.

Tables II-7 through II-9 describe the environmental effects of Alternative III.

multiple that the end goal is to have a single...  
next will be organized with the following structure for the document...

Implementation of Alternative II requires a Forest Plan amendment. The proposed Forest Plan amendment is attached as Appendix A to this EIS.

The environmental consequences of the proposed Forest Plan amendment are discussed in this section. The proposed Forest Plan amendment is attached as Appendix A to this EIS. The proposed Forest Plan amendment is attached as Appendix A to this EIS.

The proposed Forest Plan amendment is attached as Appendix A to this EIS. The proposed Forest Plan amendment is attached as Appendix A to this EIS. The proposed Forest Plan amendment is attached as Appendix A to this EIS.

The proposed Forest Plan amendment is attached as Appendix A to this EIS. The proposed Forest Plan amendment is attached as Appendix A to this EIS. The proposed Forest Plan amendment is attached as Appendix A to this EIS.

Figure 8-12 through 8-17 show the location of the proposed Forest Plan amendment in the study area. The proposed Forest Plan amendment is attached as Appendix A to this EIS.

**Table 8-1 through 8-5 contain the environmental effects of Alternative II.**

Table 8-1 through 8-5 contain the environmental effects of Alternative II. Table 8-1 through 8-5 contain the environmental effects of Alternative II. Table 8-1 through 8-5 contain the environmental effects of Alternative II.

The proposed Forest Plan amendment is attached as Appendix A to this EIS. The proposed Forest Plan amendment is attached as Appendix A to this EIS. The proposed Forest Plan amendment is attached as Appendix A to this EIS.

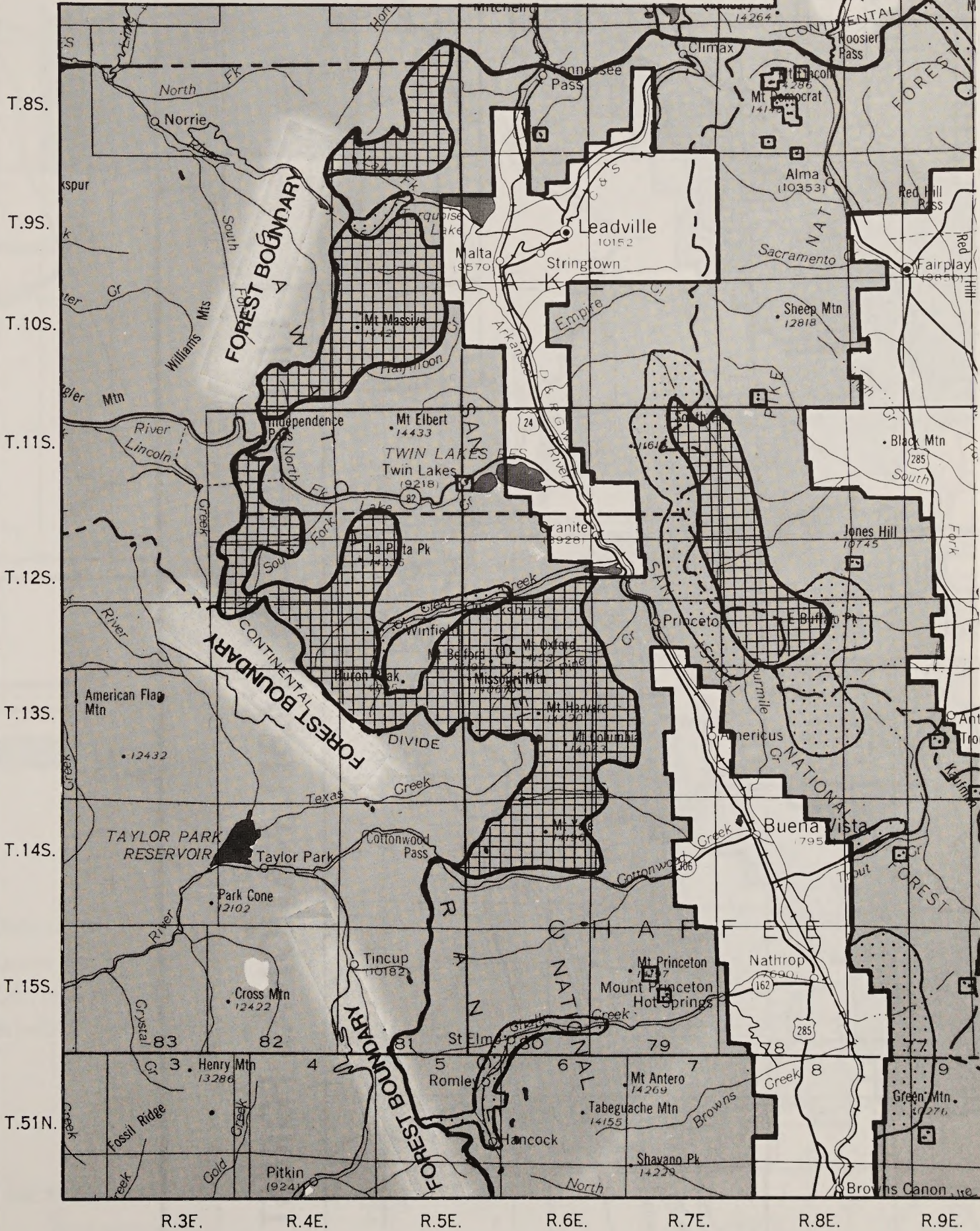
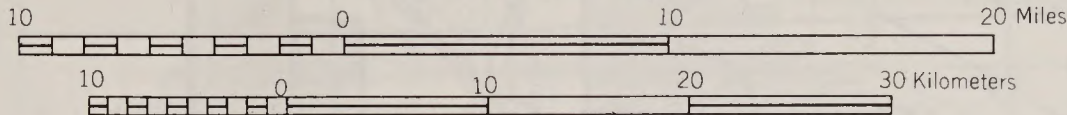
R.77W.

LEGEND

- ⊛ State capital
- ⊙ County seat
- City, town, or village
- ✈ Scheduled service airport
- (70)— Interstate highway
- (40)— U. S. highway
- (89)— State highway
- Other principal roads

Scale 1:500,000

1 inch equals approximately 8 miles



...and the ... of these ... to ...

...the ... of the ...

...the ... of the ...

...the ... of the ...

...the ... of the ...

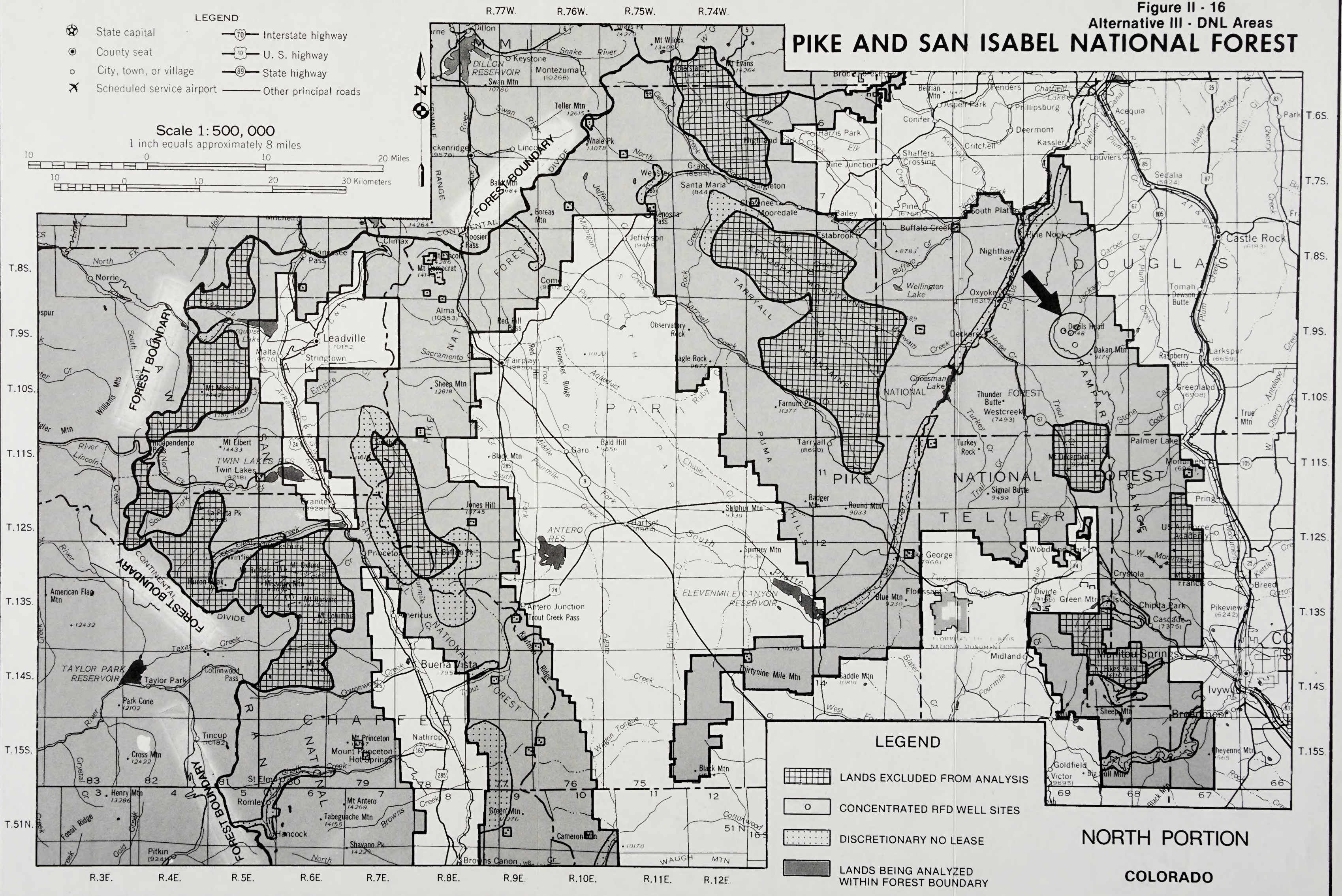
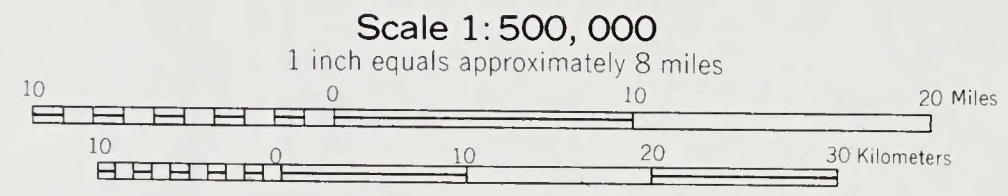
...the ... of the ...

...the ... of the ...

...the ... of the ...

Figure II - 16  
Alternative III - DNL Areas  
**PIKE AND SAN ISABEL NATIONAL FOREST**

- LEGEND**
- State capital
  - County seat
  - City, town, or village
  - Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads



- LEGEND**
- LANDS EXCLUDED FROM ANALYSIS
  - CONCENTRATED RFD WELL SITES
  - DISCRETIONARY NO LEASE
  - LANDS BEING ANALYZED WITHIN FOREST BOUNDARY

**NORTH PORTION**  
**COLORADO**

# LEGEND



LANDS EXCLUDED FROM ANALYSIS



DISCRETIONARY NO LEASE



LANDS BEING ANALYZED  
WITHIN FOREST BOUNDARY

## LEGEND



State capital



County seat



City, town, or village



Scheduled service airport

— Interstate highway

— U. S. highway

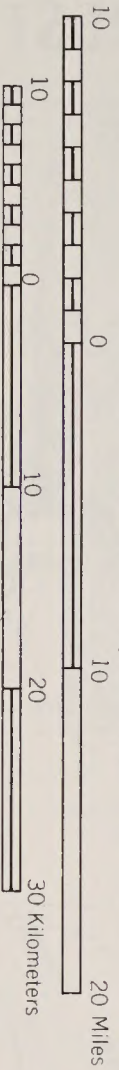
— State highway

— Other principal roads



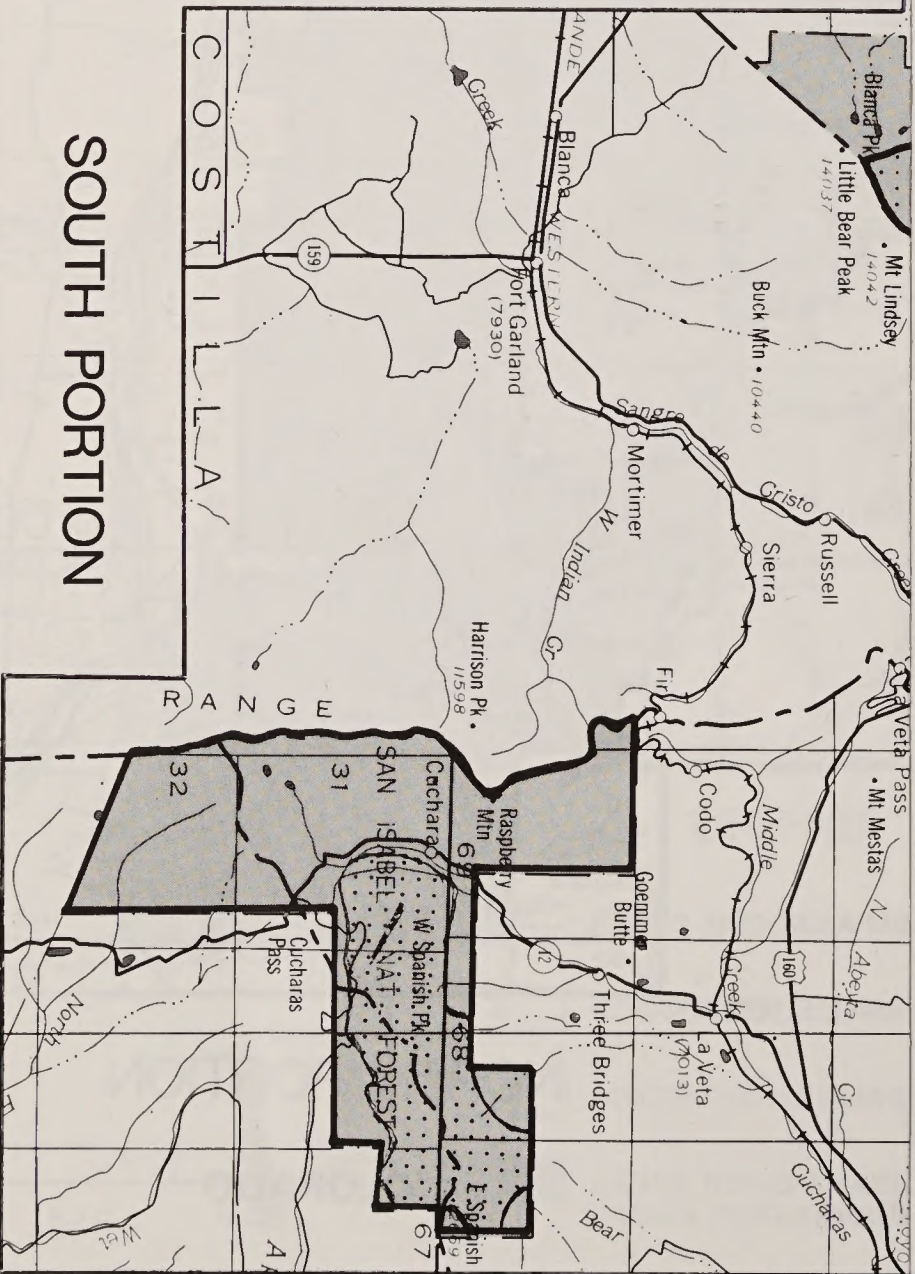
Scale 1:500,000

1 inch equals approximately 8 miles



# SOUTH PORTION

## COLORADO



T. 325

T. 315

T. 305

T. 295

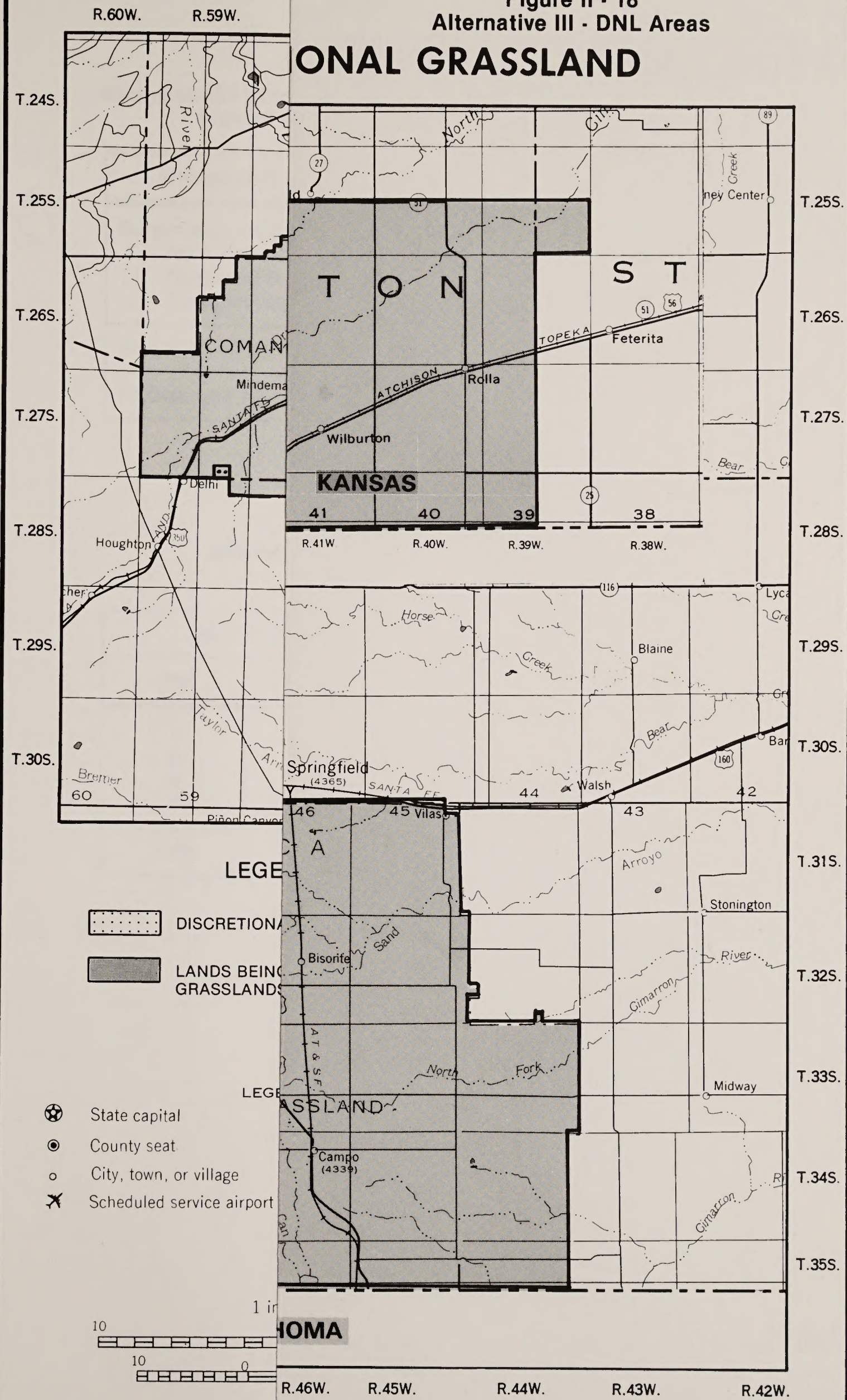
R. 69E.

R. 68E.

R. 67E.

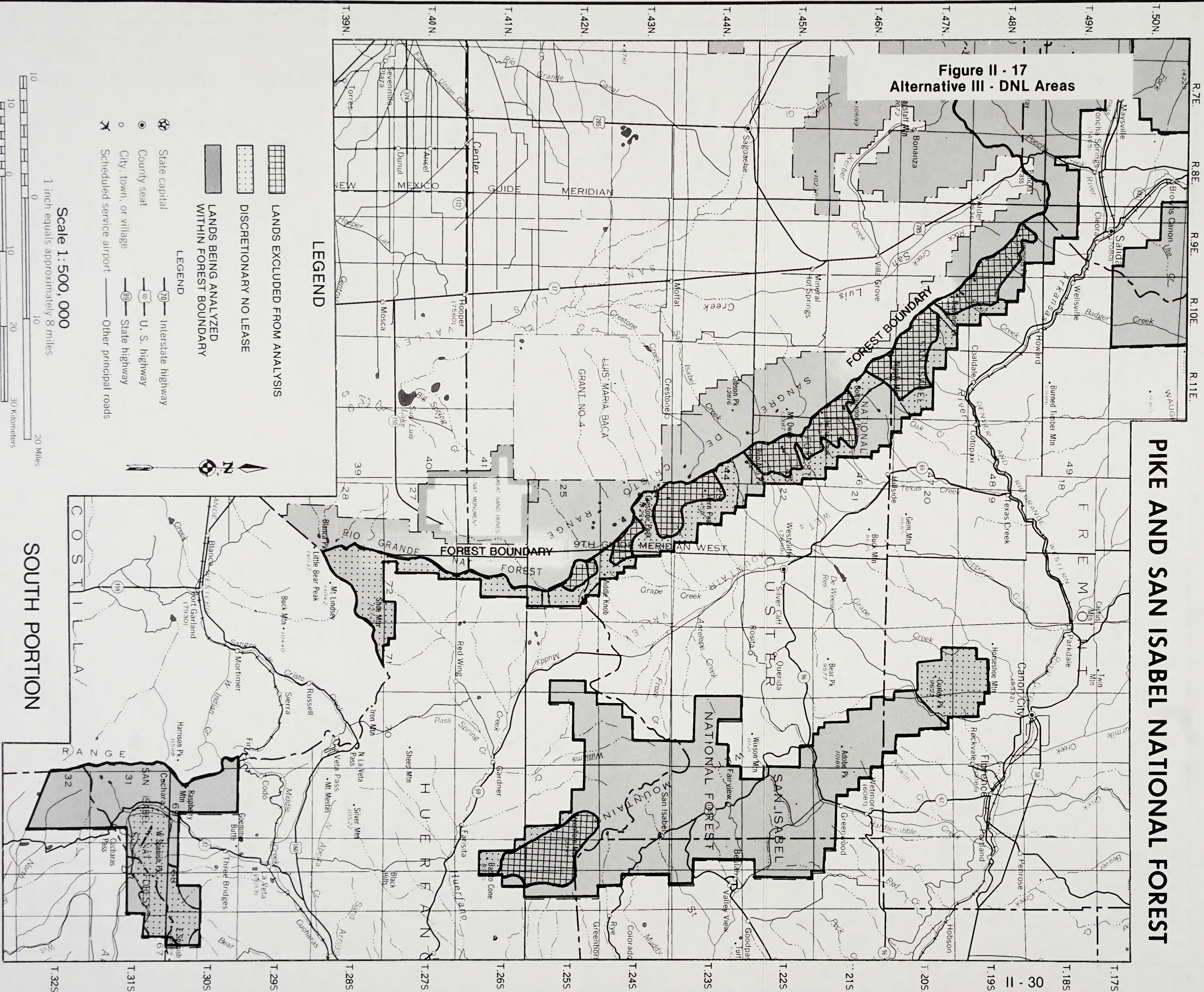
Figure II - 18  
Alternative III - DNL Areas

# REGIONAL GRASSLAND



# PIKE AND SAN ISABEL NATIONAL FOREST

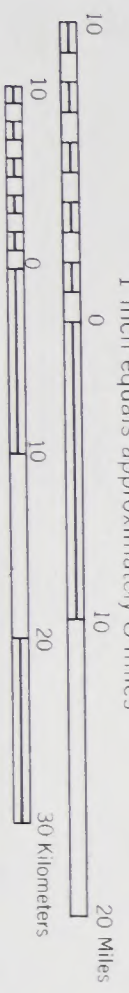
Figure II - 17  
Alternative III - DNL Areas



- LEGEND**
- LANDS EXCLUDED FROM ANALYSIS
  - DISCRETIONARY NO LEASE
  - LANDS BEING ANALYZED WITHIN FOREST BOUNDARY
  - State capital
  - County seat
  - City, town, or village
  - Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

Scale 1:500,000

1 inch equals approximately 8 miles



SOUTH PORTION

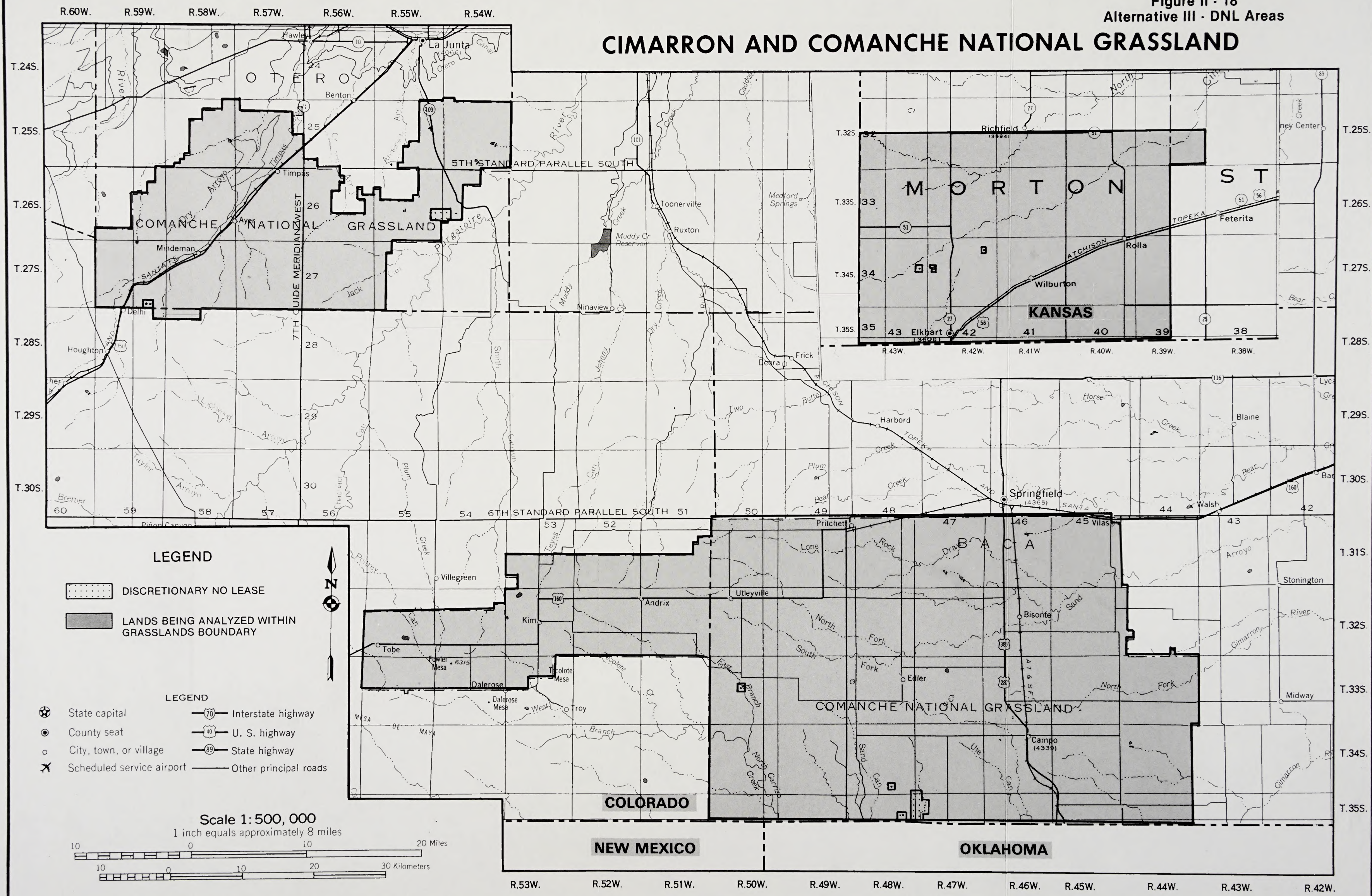
COLORADO

R. 69E. R. 68E. R. 67E.

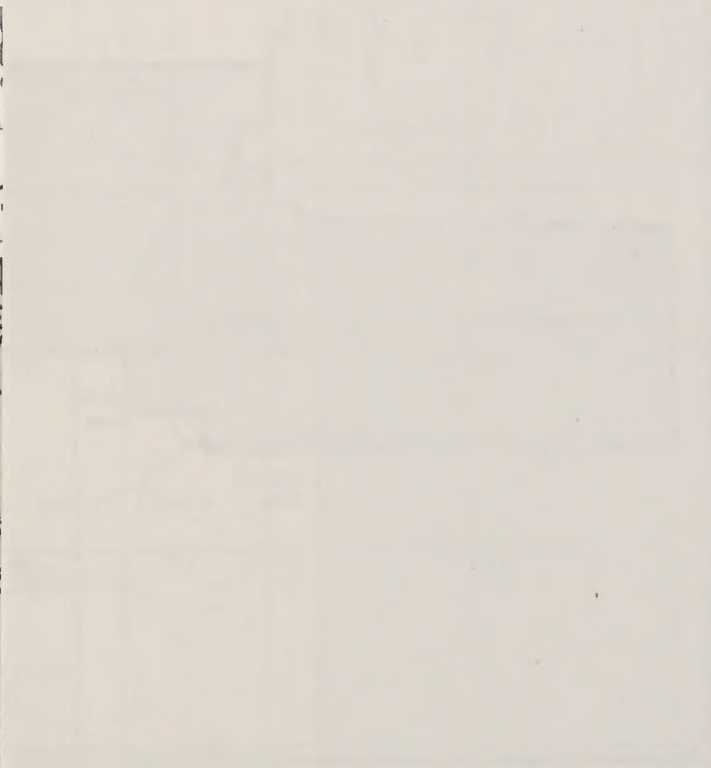


Figure II - 18  
Alternative III - DNL Areas

# CIMARRON AND COMANCHE NATIONAL GRASSLAND



1900 1910 1920 1930 1940 1950 1960



Legend

- (solid line) Cimarron River
- - - (dashed line) Tributaries
- (white box) Towns
- (shaded box) Indian Reservations

Scale: 1 inch = 20 miles

Map of Cimarron River Basin, Oklahoma Territory, 1900-1960

**Table II-7**  
**Alternative III - Land Distribution by Management Requirement**  
**National Forests and National Grasslands**

| Management Requirement     | Acres   |
|----------------------------|---------|
| Supplemental Stipulations: |         |
| No Surface Occupancy       | 259,437 |
| Controlled Surface Use     | 777,962 |
| Timing Limitation          | 674,610 |
| Standard Lease Terms       | 704,326 |
| Discretionary No Lease     | 198,703 |

**Table II-8**  
**Alternative III - Well Disturbance Acres**  
**National Forests**

| BLM RFD |           | Concentrated RFD |           |
|---------|-----------|------------------|-----------|
| Well    | Disturbed | Well             | Disturbed |
| 1       | 4         | 1C               | 8         |
| 2       | 5         | 2C               | 9         |
| 3       | 5         | 3C               | 8         |
| 4       | 4         | 4C               | 4         |
| Total   | 18        | Total            | 29        |

**Table II-9**  
**Alternative III - Well Distribution and Disturbance Acres**  
**National Grasslands**

|                 | Major Soil/Ecosystem Type |            |              |          |
|-----------------|---------------------------|------------|--------------|----------|
|                 | Sandy Lands               | Hard Lands | Canyon Lands | Riparian |
| Number of Wells |                           |            |              |          |
| Cimarron        | 107                       | 58         | 0            | 0        |
| Comanche        | 30                        | 15         | 0            | 0        |
| Total           | 137                       | 73         | 0            | 0        |
| Disturbed Acres |                           |            |              |          |
| Cimarron        | 256                       | 138        | 0            | 0        |
| Comanche        | 54                        | 27         | 0            | 0        |
| Total           | 310                       | 165        | 0            | 0        |

**ALTERNATIVE IV**  
**No NFS or Split-Estate Lands Available for Leasing**

Under Alternative IV no NFS lands, or split-estate lands, will be available for future oil and gas leasing. The Oil and Gas Regulations require the Forest Service to analyze potential impacts from post-leasing activities as a result of the projected RFD on the Forest. The Regulations require that one of the alternatives to be analyzed is for NFS lands "*closed to leasing, distinguishing between those areas that are being closed through exercise of management direction, and those closed by law,...*".<sup>1</sup> Existing federal oil and gas leases which are not extended by production will be allowed to expire. Exploration and development could occur on existing leased lands subject to standard lease terms and COA's and applicable supplemental stipulations. Information on NFS lands currently under lease is available at the Forest Supervisor's Office, 1920 Valley Drive, Pueblo, Colorado. A map of leased lands is found in Appendix E of this EIS.

Implementation of Alternative IV would require a Forest Plan amendment to remove lands from mineral leasing.

The projected RFD is not affected by this alternative because the most probable location for drilling is on currently leased lands. There are 135,031.95 acres of NFS lands currently under federal lease.

**Table II-10**  
**Alternative IV - Land Distribution by Management Requirement**  
**National Forests and National Grasslands**

| Management Requirement                        | Acres Leased |
|---|--------------|
| Total acres available for Oil and Gas Leasing | 0            |
| NFS Acres Currently Leased                    | 135,031.95   |
| Split-Estate Acres Currently Leased           |              |
| Federal Land/Private Minerals                 | 13,588.09    |
| Federal Minerals/Private Land                 | 10,018.75    |
| Total Acres Currently Leased                  | 158,638.79   |

### **COMPARISON OF ALTERNATIVES**

The NEPA (40 CFR Part 1502.14) requires a comparison of alternatives to provide a clear basis for choice among options. This section includes summaries of environmental effects that are developed in more detail in Chapter IV, Environmental Consequences.

A comparison of the total acres available for oil and gas leasing in Table II-9 indicates a considerable difference by alternative, ranging from a leasing extreme to no leasing. Alternatives I and II allow for the greatest number of acres to be leased on land with federal minerals. None of the available lands are removed from leasing under these alternatives.

Under Alternative I current management would continue with leases evaluated and approved on a case-by-case basis.

Under Alternative III the number of acres for mineral leasing decreases because of the removal of Discretionary No Lease areas from available acres.

Alternative IV would allow no leasing on any lands currently available for leasing on the Forest. Existing leases will continue until expiration and/or termination but will not be re-issued under this alternative. Exploration and development activities could occur on leased lands, subject to the COA's and applicable stipulations of the lease.

Alternatives II, III, and IV will require an amendment to the Forest Plan.

**Table II-11  
Comparison of Land Acreage Being Analyzed  
for Oil and Gas Leasing by Alternative**

|   | Alt. I<br>Acres  | Alt. II<br>Acres | Alt. III<br>Acres | ALT. IV.*<br>Acres |
|---|------------------|------------------|-------------------|--------------------|
| Total Acres with Fed. Minerals that are being considered in this leasing analysis | 2,229,506        | 2,229,506        | 2,229,506         | 2,229,506          |
| <i>Not Available For Leasing</i><br>Discretionary No Lease:*<br>Unroaded Areas:   |                  |                  |                   |                    |
| WSA-not recommended   |                  |                  |                   |                    |
| Sangre de Cristo  | 0                | 0                | 25,643            | 0                  |
| Buffalo Peaks   | 0                | 0                | 20,890            | 0                  |
| Spanish Peaks   | 0                | 0                | 19,570            | 0                  |
| Lost Creek FPA  |                  |                  | 11,000            | 0                  |
| Outside RARE II or WSA  | 0                | 0                | 44,300            | 0                  |
| Aspen Ridge   | 0                | 0                | 18,420            | 0                  |
| Tanner Peak   | 0                | 0                | 18,000            | 0                  |
| Wild & Scenic Rivers  |                  |                  |                   |                    |
| South Platte  | 0                | 0                | 14,700            | 0                  |
| Badger Creek  | 0                | 0                | 2,560             | 0                  |
| Cultural Resources  | 0                | 0                | 23,620            | 0                  |
| Lands Withdrawn from Mineral Entry  | 0                | 0                | 0                 | 2,229,505          |
| Acres Not Available   | 0                | 0                | 198,703           | 2,229,506          |
| <b>TOTAL ACRES AVAILABLE FOR OIL AND GAS LEASING:</b>                             | <b>2,229,506</b> | <b>2,229,506</b> | <b>2,030,803</b>  | <b>0</b>           |

\* NFS lands removed from leasing as justified by Impact Analysis.

The regulatory and standard lease terms requirements of an APD assure safety for protection of the human environment from fire, dust, pollution, and other hazards by severely restricting unsafe activities. Special stipulations (CSU, NSO, Timing, and Lease Notices) provide additional protection to surface resources and the human environment. Under Alternatives I and III, as required by NEPA for lands that the Forest Service consents to lease, (Forest Plan, Chapter III, page 60), application of a No Surface Occupancy stipulation, as necessary, will provide protection of: (1) current and future planned research projects; (2) developed recreation sites and high investments; (4) soils possessing high geologic hazard potential; (4) visual resources which have a low visual absorption capacity; (5) known cultural and paleontological resources; (6) wilderness characteristics; and, (7) protection of the human environment from potential hazards which could result from oil and gas activities. There is no less restrictive stipulation that provides sufficient surface resource protection that can be used in place of the NSO stipulation on these lands.

Under Alternatives I and III, the Forest Service may deny consent to occupy a lease, based upon stipulations to protect the resource. Stipulations will prohibit occupation where: (1) operation damages to surface resources, including the impacts of surface based access, product transportation and ancillary facilities necessary for production and related operations would be irreversible and irretrievable; and (2) there is no potential for reclamation to planned uses of the land;

Alternative II will allow oil and gas resource exploration and development activities to occur subject to the standard terms and conditions of the oil and gas lease, the operating requirements of the BLM 3160 regulations, and all applicable Notices to Lessees (NTL). The Forest Plan specifies that leases will include both standard and special stipulations as may be necessary on NFS lands for additional protection of surface resources. The standard lease terms on oil and gas leases may not allow sufficient protection to prevent significant environmental consequences on all lands.

The Forest Service Oil and Gas Regulations require the analysis of a "no leasing" alternative. NFMA directs management of forest resources under Land and Resource Management Plans to provide for multiple use management of Forest resources. Alternative IV does not meet current requirements of the U.S. Mineral Leasing Laws, NFMA, and the Forest Plan. Under the U.S. Mineral Leasing Laws and at the discretion of the U.S. Forest Service, private parties may enter public lands to search for leasable minerals and use the surface for mineral leasing activities. This alternative does not allow a proponent to search for leasable minerals in accordance with the mineral leasing laws. Impacts from post-leasing activities as a result of the projected RFD could occur from exploration and development on existing leases under an approved APD and SUPO.

### ***THE PROPOSED ACTION***

Alternative III is the preferred alternative. This alternative is a continuation of existing management direction with minor modification as a result of decreases in total available lands because of resource sensitivity to oil and gas leasing activities. This alternative identifies lands that will be made available for leasing and provides protection of surface resources and the human environment through enforcement of BLM standard lease terms and supplemental stipulations.

#### **Amendment To The Land and Resource Management Plan<sup>2</sup>**

Selection of an alternative resulting from this EIS other than Alternative I, Current Management (No Action), will result in a need to amend the Land and Resource Management Plan (the Forest Plan).

The Forest Plan was developed to direct management of the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands.<sup>3</sup> A revision of the Forest Plan is required every fifteen years and necessary changes may be made any time that monitoring and evaluation indicate the need for change.<sup>4</sup>

By regulation (36 CFR Part 219.10 (e)), all activities proposed for National Forest System lands must be consistent with management requirements in both the Forest Direction and Management Area Direction sections of the Forest Plan.<sup>5</sup> Amendments may be made in the management requirements and other aspects of the Forest Plan to accommodate new developments and changing social needs. Changes to the Forest Plan are made through a process of amendment which conforms to 36 CFR Part 219.10 (f).<sup>6</sup>

Oil and gas lease stipulations contained in Appendix B and other requirements described in this EIS will be incorporated into the Forest Plan by amendment upon approval of the Record of Decision relative to this document.

Appendix A describes what would be included in an amendment to the Forest Plan to incorporate new management requirements for oil and gas leasing activities. The amendment would be based on the assumption that all detailed proposals (operating plans) for oil and gas exploration and development activities will be consistent with Forest Plan Management Requirements. Any future permits, rights-of-way, or easements related to oil and gas leasing will incorporate appropriate management requirements (generally termed stipulations) and mitigation measures necessary to ensure consistency with the Forest Plan, and with State and other Federal laws and regulations.



## NOTES

<sup>1</sup> Oil and Gas Regulations, pp. 10445.

<sup>2</sup> USDA Forest Service Handbook 1909.12 - Land and Resource Management Planning Handbook: Part 219 - Planning, Subpart A - National Forest System Land and Resource Management Planning; Part 219.10 (f) Amendment (A.R. Vol. II, Part 2, p. 890).

<sup>3</sup> Code of Federal Regulations 36 Part 219 Planning - Subpart A - National Forest System Land and Resource Management Planning (A.R. Vol. II, Part 2, pp. 879-905).

<sup>4</sup> USDA Forest Service Handbook 1909.12 - Land and Resource Management Planning Handbook: Part 219 - Planning, Subpart A - National Forest System Land and Resource Management Planning; Part 219.10 (f) Amendment, and Part 219.12 (k) Monitoring and evaluation (A.R. Vol. II, Part 2, p. 890 and p. 894).

<sup>5</sup> USDA Forest Service Handbook 1909.12 - Land and Resource Management Planning Handbook: Part 219 - Planning, Subpart A - National Forest System Land and Resource Management Planning; Part 219.10 (e) Plan implementation (A.R. Vol. II, Part 2, p. 889).

<sup>6</sup> USDA Forest Service Handbook 1909.12 - Land and Resource Management Planning Handbook: Part 219 - Planning, Subpart A - National Forest System Land and Resource Management Planning; Part 219.10 (f) Amendment (A.R. Vol. II, Part 2, p. 890).



## CHAPTER III

### AFFECTED ENVIRONMENT

#### INTRODUCTION

This chapter describes the environment likely to be affected by the two leasing decisions described in Chapter I, and the anticipated post-leasing activities. The Bureau of Land Management (BLM) cooperated in the identification of Reasonable Foreseeable Post-Leasing Development, referred to here as "Reasonably Foreseeable Development" (RFD), on both the National Forests and National Grasslands. RFD includes exploratory drilling and construction of oil and gas production facilities.

This affected environment generally includes all the National Forest System lands of the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands. Post-lease activities, such as exploratory drilling or oil and gas production, are highly speculative. This is particularly true for the mountains of the National Forests, which have few known or probable oil or gas deposits. Therefore, we have limited the scope of the affected environment to that which we can reasonably expect to be impacted in a predictable way. We have not considered the effects of these leasing decisions on the entire earth or global climate change because we cannot reliably predict global effects. We have not included the cities, towns or much of the other private and public lands of the Region in our definition of the affected environment. Oil and gas drilling operations generally take place on very small areas of land (2 to 15 acres) and do not require large construction efforts. Their environmental impacts do not extend very far across the land surface, and are generally relatively short-lived. Therefore, we expect most of the direct, indirect, and cumulative environmental effects of these leasing decisions to be confined to the lands, both public and private, within and immediately adjacent to the Pike & San Isabel National Forests and Comanche and Cimarron National Grassland boundaries.

The physical, biological, social, and economic characteristics of the Affected Environment have been extensively catalogued in the Environmental Impact Statement (EIS) which accompanies the Forest Plan. We will incorporate much of that material into this document by reference. This chapter describes the affected environment in the analysis area. Chapter III of the Forest Plan EIS describes: the Physical and Biological Setting (geography, topography, climate, animal and plant life); the Social and Economic Settings; the Resource Elements (current use, management and demand trends for the Forests' resources); and the Support Elements (activities to maintain and develop resources). Projections of supply and demand for Forest resource outputs incorporated by reference in this EIS are described in the Forest Plan, Chapter II, pages 26-73. Both documents may be reviewed at the Supervisor's Office in Pueblo, at Ranger District Offices, and at many area public libraries.

We will describe the affected environment from general to specific in four "stair-stepped" tiers. Each tier analyzes a different level of environmental effects starting from the very broad Forest-wide analysis area to the site-specific analysis of RFD locations. More site-specificity will be provided on leases for which an APD is received (second NEPA process). The following chart illustrates the four levels of analysis and what Oil and Gas Regulations dictate each level of analysis.

Figure III-1  
Affected Environment  
Levels of Analysis

| LEVEL 1<br>"Unit"            | FOREST-WIDE |   |   |   |   |   |   |   |          |   |          |          |        | Regulations Requiring Disclosure |          |   |                            |   |   |
|------------------------------|-------------|---|---|---|---|---|---|---|----------|---|----------|----------|--------|----------------------------------|----------|---|----------------------------|---|---|
|                              | Grasslands  |   |   |   |   |   |   |   |          |   |          |          |        | 36 CFR 228.102 (c)               |          |   |                            |   |   |
| LEVEL 2<br>"Sub-Unit"        | Mountains   |   |   |   |   |   |   |   | Comanche |   |          | Cimarron |        | 36 CFR 228.102 (c) (4)           |          |   |                            |   |   |
|                              | 1           | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10       |   | 11       |          | 12     |                                  | 13       |   | 36 CFR 228.102 (c) (2) (1) |   |   |
| LEVEL 3<br>"Geographic Zone" |             |   |   |   |   |   |   |   | Hard     |   | Riparian |          | Hard   |                                  | Riparian |   | 36 CFR 228.102 (c) (4)     |   |   |
|                              |             |   |   |   |   |   |   |   | Canyon   |   | Canyon   |          | Canyon |                                  | Canyon   |   |                            |   |   |
| LEVEL 4<br>"RFD Locations"   |             |   |   |   |   |   |   |   | Hard     |   | Riparian |          | Hard   |                                  | Riparian |   | 36 CFR 228.102 (c) (4)     |   |   |
|                              |             |   |   |   |   |   |   |   | Canyon   |   | Canyon   |          | Canyon |                                  | Canyon   |   |                            |   |   |
|                              | 0           | 0 | X | X | X | 0 | 0 | X | X        | X | X        | X        | X      | X                                | X        | X | X                          | X | X |

X - This area is where at least one RFD well is projected to be located for the purpose of the leasing availability analysis

0 - Activities in this area were not projected by RFD. This area was analyzed in Appendix D to validate the supplemental stipulations in this Geographic Zone.

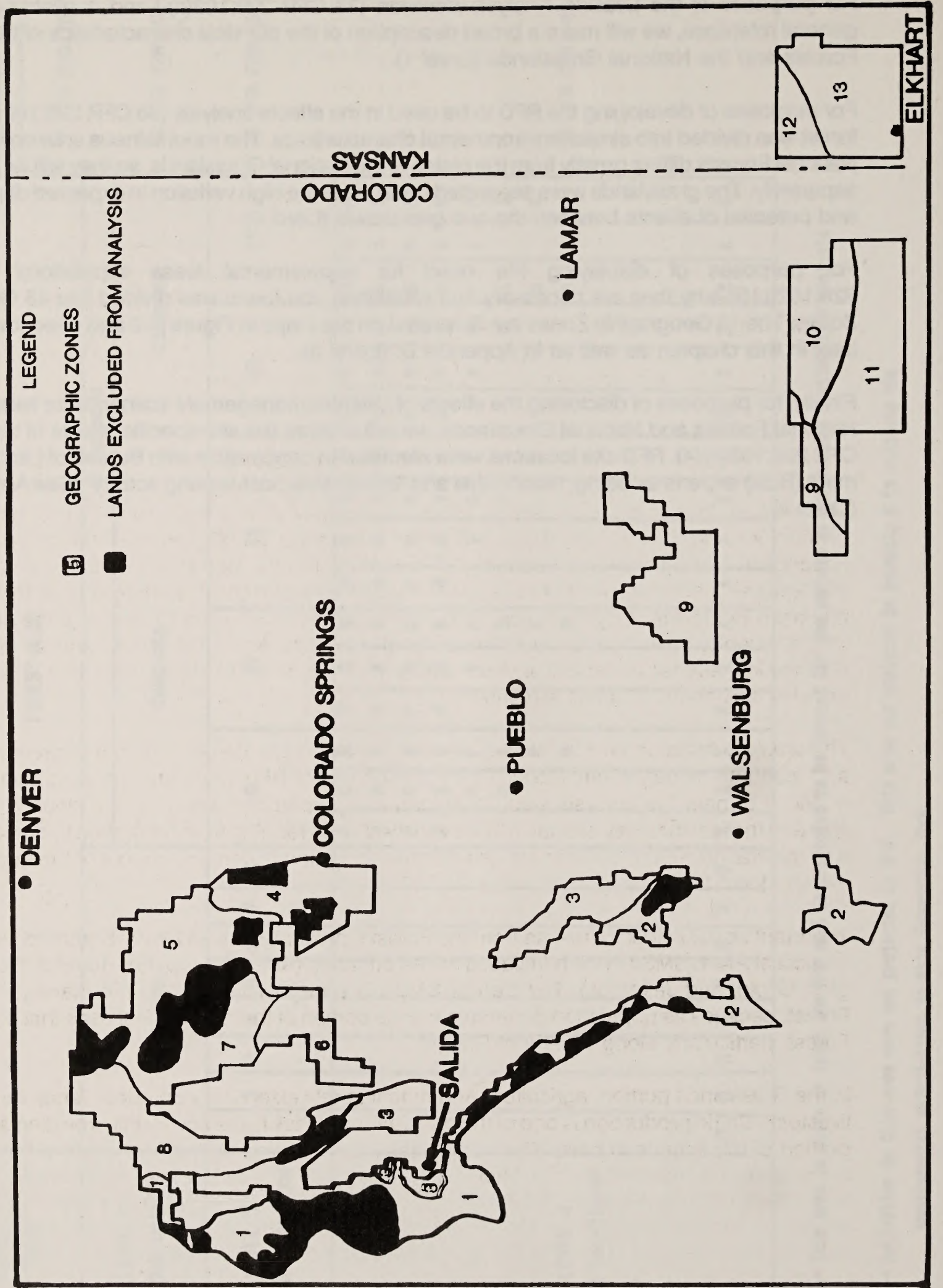
For purposes of the Leasing Analysis decision (36 CFR 228.102(c)-Land Availability), and for general reference, we will make a broad description of the physical characteristics of the National Forests and the National Grasslands (Level 1).

For purposes of developing the RFD to be used in the effects analysis (36 CFR 228.102(c)(4)), the forest was divided into similar environmental characteristics. The mountainous environment of the National Forests differs greatly from the plains of the National Grasslands, so they will be described separately. The grasslands were separated because of the high variation in expected development and potential of effects between the two grasslands (Level 2).

For purposes of displaying the need for supplemental lease stipulations (36 CFR 228.102(c)(ii)-why they are necessary and justifiable), the forest was divided into 13 Geographic Zones. The 13 Geographic Zones are illustrated on the maps in Figure III-2 and described in detail later in this chapter, as well as in Appendix D. (Level 3).

Finally, for purposes of disclosing the effects of different management scenarios for leasing on the National Forests and National Grasslands, we will analyze the site-specific effects of the RFD (36 CFR 228.102(c)(4). RFD site locations were identified in cooperation with Bureau of Land Management (BLM) experts as being "reasonable and foreseeable post-leasing activity" [See Appendix C]. (Level 4).

Figure III-2  
Geographic Zones



## **FOREST-WIDE DESCRIPTION OF THE AFFECTED ENVIRONMENT (LEVEL 1)**

### **Location**

The Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands (Unit) are located in central and southeastern Colorado, with the Cimarron located in southwestern Kansas. National Forest System (NFS) lands are intermingled with other public lands and privately-owned land.

The Unit lies in parts of nineteen counties. The seventeen in Colorado are Baca, Chaffee, Clear Creek, Custer, Douglas, El Paso, Fremont, Huerfano, Jefferson, Lake, Las Animas, Otero, Park, Pueblo, Saguache, Summit, and Teller. The two in Kansas are Morton and Stevens. The Unit has eight Ranger District offices located in Canon City, Colorado Springs, Fairplay, Lakewood, Leadville, Salida, and Springfield, Colorado, and Elkhart, Kansas.

### **Social and Economic Setting<sup>1</sup>**

This section describes the social environment of the area in or near the administrative boundaries of the Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands. A description of the social and economic setting of the Forest contained in Chapter II of the Forest Plan (pages II-1 through II-14) and in Chapter III of the Forest Plan FEIS (pages III-15 through III-52) has been incorporated by reference. These documents are available for review at the Supervisor's Office, Pueblo, at Ranger District Offices on the Forests and Grasslands, and at many public libraries in the area. The social environment is made up of about 50 small to medium-sized towns or cities and about 65 small settlements.

The area's cultural and economic survival and development are tied to some degree to NFS land and resource management. Dependency on and use of NFS lands are important to much of the public in or near the analysis area. They form a large part of the community identity. Their large size and the fact that they provide a large variety of uses ranging from recreation to timber, grazing, and mineral development account for extensive attraction of people from out of the region, as well as from local areas.

Important social influence results from the Forest's proximity to the Denver Standard Metropolitan Statistical Area (SMSA) which includes seven counties (Adams, Arapaho, Boulder, Denver, Douglas, Gilpin, and Jefferson). The Denver SMSA is a major influence on the management of the Forest, because its population generates a large portion of the recreational uses that occur on the Forest, particularly along the "Front Range".

In the Grasslands portion, agriculture and ranching rely extensively on public lands for grazing of livestock. Cattle production is one of the principal industries in the social unit providing a significant portion of the economic base. The oil and gas industry plays an important role in the use of the Grasslands and provides large quantities of energy fuels for the nation. The Grasslands are important wildlife habitats generating large amounts of hunting-related revenue for the area's economy.

Additional information on the social characteristics of the analysis area in this EIS is found in Appendix J, Socio-economic and Cost Efficiency Analysis.

## Physical and Biological Setting

The analysis area lies in two physiographic provinces, the Great Plains Physiographic Province on the east which includes the Comanche and Cimarron National Grasslands, and the Rocky Mountains Physiographic Province on the west which includes the Pike and San Isabel National Forests, the BLM lands, and parts of the Rio Grande and Arapaho National Forests. Additional information pertaining to the geology of the analysis area is found in the Forest Plan, Chapter III. Maps of specific resource areas are found as Exhibits 1 through 4 of that chapter.

The health, distribution, and diversity of the vegetation on the Forests and Grasslands affects most other Forest and Grassland resources. Changes to the existing vegetation situation will correspondingly have some effect on other resources of primary concern for this analysis, notably wildlife habitat, visual quality, soils and water.

On the Forests and Grasslands there are hundreds of individual species, each with its own utility to the environment and to society. Grouping vegetation into broad vegetation types of similar attributes will allow reasonable brevity in assessing environmental effects from disturbance or change. Similar plant communities will be grouped into forest vegetation types or non-forest vegetation types, hereafter referred to as forest types or non-forest types, or collectively as vegetation types.

Refer to Exhibit III-1 in this chapter for listings of the major vegetation types found on the Forests and Grasslands.

### Climate

The analysis area covers a broad range of elevations, from 14,433 feet at Mt. Elbert to 3,150 feet where the Cimarron River leaves the Cimarron National Grassland in southwest Kansas. This wide elevation range partly accounts for extreme differences in climate. Average growing season extends from about 170 days in the lower Arkansas Valley to about 82 days in the Leadville area. Average mean temperatures range from 52 degrees to 37 degrees for those respective areas.

The high mountains of the Continental Divide dominate and influence year-long precipitation patterns. Moist air flowing from the west rises over the Rocky Mountains and in the process loses much of its moisture to the western slope. Although higher elevations of forest land receive over 30 inches of precipitation per year, other areas such as the South Park or Upper Arkansas Valley areas lying in the "Rain Shadow" of the mountains receive only 10 inches or less per year. Average snowfall ranges from 125 inches at Leadville to about 24 inches or less in the eastern part of the analysis area and summer thunderstorms are common. High winds, occurring usually in the spring and early summer across the plains, contributed to the dust bowl conditions of the 1930's and are still considered a threat when accompanied by drought, high temperatures, and the absence of cover vegetation.

### Air Quality

The Clean Air Act (Prevention of Significant Deterioration provisions) designated those Wildernesses over 5000 acres, established as of August 7, 1977, as Class I airsheds.<sup>2</sup> Other lands not meeting these criteria, but meeting air quality standards, were designated Class II airsheds. The Forest has both classifications.



Specific data about Forest air resources is lacking. The biggest sources of air pollution on the Forest are fire, both prescribed and unplanned, and dust from unpaved roads. Out-of-state airborne acid precursors may affect air quality; however, we do not know those effects. Expectations of Forest users and of people who reside or recreate adjacent to the Forest partly define the demand for quality air. State and Federal standards that concern not only ambient air, but also related values such as visibility, water quality and vegetation productivity further define the demand. Sensitivity to air pollution is a public issue in large urban areas on the Colorado Front Range. This influences attitudes of those who recreate on the Forest.

## ***SUB-FOREST DESCRIPTION OF THE AFFECTED ENVIRONMENT (LEVEL 2)***

### **The Mountain Environment (The Pike and San Isabel National Forests)**

#### ***Vegetation***

Forest vegetation types (80%) are intermixed with non-forest vegetation types (20%). Coniferous forests are often 90 to 130 years old; aspen forests are typically 70 to 100 years old. Older vegetation persists in areas which were not affected by wildfires or cleared by large-scale logging operations near the turn of the century. The mountain environment is broken up into 11 vegetation types (Aspen, Lodgepole Pine, Douglas-Fir, Engelmann Spruce/Subalpine Fir, Ponderosa Pine, Pinyon-Juniper, Bristlecone Pine, Mountain Mahogany, Gambel Oak, Sagebrush, and Mountain Grasslands) and 2 special ecosystems (Riparian and Alpine). Refer to Exhibit III-2 in this chapter for more detailed descriptions of vegetation types on the mountain districts.

#### ***Soils***

The kind of soil that develops in any given place depends on the interaction of parent material (geology), climate, living organisms, topography, and time. Significant variations in any one of these five soil-forming factors can cause large differences in soil properties. This is especially true in mountainous terrain where it is common to find variations in one or more of these factors within short distances. Each kind of soil or miscellaneous landtype feature is associated with a particular topographic position on the landscape.

Soils of the Rocky Mountains, including the Pike and San Isabel National Forests, have developed in response to extreme physiographic differences in slope, aspect, and elevation. Subsequently, soil properties are highly variable in depth, texture, inherent fertility, and age. Soil depth varies from shallow (less than 20 inches) on ridges and steep side slopes to deep (greater than 40 inches) in valley floors. Coarse to medium soil textures have generally developed from intrusive-igneous and metamorphic parent materials. Much of the rugged topography contains young soils that are weakly developed and have low inherent fertility. Shallow, infertile soils are especially evident on steep south and west facing aspects with sparse vegetation and limited ground cover protection. Young soils are also found in drainageways and unstable slopes where erosion has taken place. On steep slopes, natural erosion may practically keep pace with soil development, and soils may remain immature because of the removal of surface materials and deposition of relatively unweathered parent materials. The steeper areas are often difficult to reclaim when disturbed because soil productivity is limited by depth, the physical and mineralogical composition of the parent materials, and harsh climatic conditions. Older, more productive soils typically occur on stable uplands and gently sloping landforms in areas with higher precipitation. Soils with deep, well-developed profiles typically reflect dense vegetation and optimum surface protection. There are no prime farmlands identified within the mountain environment according to the Forest Plan, Chapter IV, p. 80.

The combinations of certain soil-forming factors produce "fragile" soils that erode severely when the natural cover is removed. Major areas of highly erosive soils have been identified along the Front Range that pose special problems in planning, designing, and implementing projects. If surface erosion becomes concentrated it may develop into gully erosion. Broad areas of the Forests have topography and soil types that are conducive to gully initiation, and widespread evidence of this type of impact makes it a significant management concern.

Mass movements of earth (geologic hazards) include slumping, slope failures, and debris flows. Potentially unstable soils exist on slopes exceeding 60 percent along the mountain peaks of the Continental Divide.

Concave landscape positions such as swales and areas with fine textured soils are especially vulnerable to compaction problems. This type of detrimental impact commonly occurs when soils are moist; soils are most susceptible to damage during the spring thaw.

Modern soil surveys describe the properties, potentials, limitations, and hazards of many different kinds of soils. The fundamental purpose of a soil survey is to make predictions that can help avoid soil-related failures for different land use activities. Information about soils and other ecological components can be used to adjust land uses to the limitations and potentials of natural resources and the environment.

Soil inventory information has been collected as part of the National Cooperative Soil Survey process for approximately 90 percent of the Pike and San Isabel National Forests. An integrated approach was used to describe and map biotic and abiotic features of geology, landform, climate, vegetation, and soils. Publication of this data is scheduled for 1993. Soil-specific information about soils and other landscape features is available for a variety of purposes from the U.S. Forest Service, Pueblo, Colorado.

## **Water**

### **Surface Water**

Streams, lakes and wetlands provide habitat for certain plants and animals, as well as water for drinking, irrigation, recreation, etc. The streams and lakes on the Pike and San Isabel National Forests are the headwaters to two major river systems, the Arkansas River and the South Platte River.

The amount of water and sediment carried by a stream determines width, depth, velocity, slope, sediment size and roughness or size of channel material in relation to water depth.<sup>3</sup> The amount of sediment being carried in the stream is one factor in determining the quality of the stream (i.e., fish habitat, etc.). Streams with too much sediment (they are at their Sediment Threshold Limit, or within 10% of it) on the forest are: Badger Creek, South Platte River (from Elevenmile to confluence with North Fork of the South Platte River), Trail Creek, Thirtynine Mile Mountain, Twin Creek, Jackson Creek, Stark/Gove Creek, Beaver Creek, Fourmile Creek, Link Creek, Kaufman Ridge, West Creek, Spinney Mountain, Elevenmile, Bailey, Elk Creek, Bear Creek, Rampart, East Beaver Creek, Spruce Grove, Pulver Gulch, Hackett Gulch, Newlin Creek, and North Fork Purgatoire River.

Streams in the Pike and San Isabel National Forests are very similar to other streams in mountainous areas. Many small headwater tributaries begin in the alpine and subalpine zones. Their channels usually have steep gradients and the bed material is mostly boulders and cobble with some gravel. The streams are fairly straight and have a stepped appearance caused by a fairly regular sequence of riffles dropping into pools. The channels are usually confined with very little

floodplain development evident. The streams are narrow and deep, usually with a depth ratio of less than 10.

When the streams reach the flatter valleys, whether they are high alpine valleys or the lower main stream valleys, the channel material decreases in size. Cobble and gravel predominate although a few boulders may be present. The channels become more sinuous and change from a riffle-drop pool sequence to meandering channel type. The pools are located in meanders near the concave banks and the riffles are located in the straight reaches between the meanders. The streams are wider than they are deep, with a width to depth ratio greater than 10. The streams are not confined and they have obvious floodplain development. These are the reaches that have the greatest amount of riparian area. They are also more sensitive to impacts due to the finer material making up the bed and banks. Eroded banks are more evident in these reaches.

There are also stream reaches that have characteristics between the steep stream types and the flat stream types. These reaches have moderate gradients, usually between 1.5 to 4 percent. They are moderately confined, are slightly sinuous and have a width to depth ratio between 5 and 20. The channel material is usually cobble and gravel with small boulders.

Most of the stream segments within the Pike and San Isabel National Forests carry the State's recreation and cold water aquatic life classifications.<sup>4</sup> They have few pollutants associated with human activities such as industrial chemicals, sewage, petroleum, etc., unless they have been impacted by mining activity or are located in heavily mineralized zones. The alkalinity levels are low, usually around 35-50 parts per million (ppm). Low alkalinity levels interfere with buffering effects on heavy metals which can be extremely toxic to aquatic life. The pH rate for the streams is from 7 to 8 which is neutral to slightly alkaline. Streams that are impacted by mine drainage or are in heavily mineralized zones are acidic; they have low pH levels, usually around 5 to 6 and sometimes lower. Dissolved oxygen levels tend to be high in these streams.

### **Groundwater<sup>5</sup>**

Most public land watersheds provide important groundwater recharge and discharge areas. These areas contribute significantly to baseflow to the local streams and rivers. The majority of the groundwater resources have not been developed, although municipalities and agricultural interests have developed some of them.

Groundwater salinity is generally higher than surface water because it moves slower and is in contact with soluble minerals much longer. As an example, the Eagle River receives 34 percent of its annual discharge from groundwater inflow and 58 percent of its salt load from that same groundwater inflow.

The National Forests have two major groundwater regions: the South Platte River Basin and the Southern High Plains. The South Platte River Basin is comprised of two very dissimilar regions: the high, rugged mountainous headwaters to the west and the low-precipitation plains to the east. The relative lack of surface water in these two regions and the abundance of groundwater have resulted in extensive development of this resource throughout the area.

It has been estimated that over 130 million acre feet of recoverable groundwater is within the South Platte River Basin. However, due to the large size and varying structural conditions found within the basin, the amounts of water recovered from any one aquifer can vary considerably within short distances.

Oil and gas activity can affect water quality. Road construction and pad development associated with the exploratory drilling phase and full development phase will cause an increase in the

sediment yield. Drilling fluids contain toxic substances that can pollute surface water and ground-water if not properly contained. Salt water is also found in association with oil and gas in the underground formations, and it can cause serious degradation to water quality if it is not handled properly. The oil and gas products themselves are also a threat to water quality.

### **Wildlife and Fishery Resources**

#### **Wildlife**

The Forest Plan, Chapter III, provides the goals, direction and Standards and Guidelines for management for wildlife and fish resources. Some of the Forest Plan goals include:

- Increase diversity for wildlife and fish habitat improvement.
- Increase winter range habitat capacities for deer and elk.
- Improve fish habitat on suitable streams and low elevation ponds and lakes.
- Protect riparian areas and wetlands from degradation.

The number of vertebrate species which occur on the Pike and San Isabel National Forests are as follows:

**Table III-1**

| <b>Vertebrate species</b> | <b>Number</b> |
|---------------------------|---------------|
| Amphibians                | 6             |
| Birds*                    | 273           |
| Fish                      | 22            |
| Mammals*                  | 86            |
| Reptiles                  | 10            |
| <b>Total</b>              | <b>397</b>    |

\* Includes migratory species.

Certain wildlife species were selected as Management Indicator Species (MIS) for the Forest. They have been selected to be the focus of habitat management on the Forest, and to assess the effects and influences of land uses on wildlife and fish (36 CFR Part 219.19 (a)(1)). These species and the reason for their selection as an indicator species can be found in Exhibit D-3 of Appendix D.

Approximately 280,000 acres of critical deer and elk winter range have been identified on the Forest by the Colorado Division of Wildlife using their Wildlife Resources Information System (WRIS). Refer to Geographic Zone narratives in Appendix D for a more complete description of winter range conditions and population estimates.

Management Indicator Species (MIS) represent broad ecological niches on the Forest and Grasslands and do not necessarily represent the needs of all other wildlife species. However, by providing habitat for the designated MIS, the habitat needs for a wide range of species is provided. Forest Direction requires that a minimum of 40 percent of potential habitat be maintained for every native vertebrate wildlife species.

## ***Fishery Resources***

Numerous streams, lakes, and reservoirs in the analysis area provide habitat for a variety of game as well as non-game fish. Several different trout species, including brown, brook, cutthroat and lake trout are the most abundant and intensively managed game fish in the mountain areas. However, several other gamefish (e.g., northern pike, kokanee salmon and arctic grayling) are periodically planted and managed to provide angling variety. Fish are stocked in areas where natural reproduction is absent or not sufficient to support the intense fishing pressure. Stocking is coordinated with the Colorado Division of Wildlife (CDOW). The estimate is that fishing use of the Forests and Grasslands exceeds 4.5 million hours annually.<sup>6</sup> Resident anglers from major metropolitan areas on the Front Range, as well as non-resident anglers, contribute to the relatively high use. Fishing is becoming more popular, and the trend for growth of this recreational activity is expected to continue throughout the planning period. Watersheds which have been degraded due to human activities or natural phenomena are being prioritized and restored by the U.S. Forest Service in cooperation with the CDOW and various public groups.

In addition to gamefish, there are a number of less conspicuous non-gamefish. Primarily they are members of the sucker and minnow families and are important components of the aquatic ecosystem. They provide a valuable food source for mammals, birds and other fish. In addition, they are also valuable indicators of environmental conditions and many are quite colorful during some months of the year.<sup>7</sup>

## ***Riparian Resources***

Riparian areas consist of riparian ecosystems, aquatic ecosystems and wetlands.<sup>8</sup> These areas may be associated with lakes, reservoirs, estuaries, potholes, marshes, springs, bogs, wet meadows, and intermittent or perennial streams where free and unbound water is available. A variety of factors in a particular watershed, including geology, climatic conditions, gradient and basin size can singly or in combination affect the type and size of the riparian area. For example, a watershed which is located in a high elevation of the Forest may exhibit a variety of different characteristics from a lower, more arid watershed. Riparian areas are also dynamic systems, undergoing change in response to land use practices, flooding, scouring and depositions.

Three categories are included in this riparian area analysis: soil types, vegetation types, and aquatic ecosystems. Soils which are periodically saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper portion of the soil profile are considered riparian or hydric soils.<sup>9</sup> These soils can be further broken down into organic soils (histosols) which are derived from organic materials or histic epipedons, which are soils near the surface that are saturated for 30 or more days during the growing season. Riparian soils are frequently young, in terms of geologic time, and are usually formed in alluvial deposits. However, they may be found in narrow headwater and broad-valley positions as well as land depressions not associated with running water. Hydrophytic vegetation is any plant growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.<sup>10</sup> In addition, some riparian vegetation such as cottonwoods may be located in areas where the water table is close enough to the surface for root penetration but not saturation of the surface soils. Common riparian vegetation types include willows and sedges. Aquatic ecosystems include perennial streams, ponds, marshes, lakes and other areas saturated to the point of visible surface water throughout the year.

Although the relative land area is small, riparian areas are important sources of diversity within extensive upland ecosystems. Riparian vegetation stabilizes stream banks, and reduces erosion-caused sedimentation which is detrimental to aquatic life. Riparian vegetation also provides stream

shading and possible filtration of nutrients to improve water quality. Accelerated streambank erosion can reduce agricultural land and transport valuable soils downstream.

Total acres of riparian for each of the geographic zones is presented in Exhibit D-4 of Appendix D. The values calculated are from soil survey maps as well as the National Wetland Inventory (NWI) maps.<sup>11</sup> The two classifications generally overlapped where they were conducted simultaneously, with smaller isolated areas included. The relatively small percentage of riparian area found in these geographic zones is primarily the result of its restriction to narrow stream valleys and isolated standing water habitats.

The riparian ecosystem is probably the single most productive type of wildlife habitat, benefiting the greatest number of species.<sup>12</sup> After mapping significant wildlife habitats for 12 of Colorado's 63 counties, Schrupp concluded that riparian areas must be "...rated as one of, if not the most important habitat types for wildlife from the multi-species perspective."<sup>13</sup> However, Colorado's aquatic and riparian ecosystems are a limited resource which is being lost at a high rate. Riparian areas are being lost to such activities as dewatering, pollution, overgrazing, reservoir construction, mining, road construction, and channelization.

### ***Threatened and Endangered Species***

The Endangered Species Act of 1973 (Public Law 93-205) provides means whereby ecosystems on which endangered and threatened species depend may be conserved for the continued survival of these species, or improved for managed and protected habitat. Threatened and endangered wildlife species under consideration are listed in Exhibit D-5 in Appendix D.

Forest direction and standards and guidelines for the management of T&E species on the National Forests are found on pages 31, 32, 57, and 58 in Chapter III of the Forest Plan.

The mountainous areas are considered to be within the historical distribution range of the greenback cutthroat trout. Endemic to the mountainous areas of the South Platte and Arkansas River drainages, this colorful trout has been eliminated throughout most of its original range as a result of competition and hybridization with non-native species, as well as degradation of its habitat by man. The greenback cutthroat is currently listed as a federally threatened species, and has been the focus of an intensive interagency effort to reintroduce it into its original habitats.<sup>14</sup>

In addition to the greenback cutthroat trout the yellowfin trout was historically found in Twin Lakes. However, this subspecies is currently considered to be extinct, unless isolated or currently unknown populations exist.

The Pike and San Isabel National Forests have several plants that are being considered for listing either as federal or state T&E species. These species will be protected from deterioration pending completion of suitability examinations and subsequent decisions concerning listing as a T&E species. These plants and their current status are outlined in Exhibit D-6 in Appendix D.

Refer to each Geographic Zone in Appendix D for a complete discussion of T&E species.

### ***Range Resource***

There are approximately 305,401 acres of suitable range on the two National Forests. This acreage figure is based on data contained in the Forest Service Range Management Information System (FSRAMIS). Suitable range is defined as land accessible and capable of producing forage on a sustained yield basis.

There are 68 grazing allotments on the National Forests. In 1989, there were eight vacant allotments (five sheep and three cattle) that were suitable for restocking.

Refer to Exhibit D-7 in Appendix D for suitable range and permitted grazing use for each geographic zone.

### ***Visual Resource***

The diverse environment of the Forests accounts for their high visual resource value. Natural features include: high mountain peaks, unique geological formations, steep valleys, alpine meadows, canyons, aspen fall color, lakes, streams, and wildlife. Many historical and cultural features exist as well.

Because of the unique combination of features, sightseeing is the primary recreation activity on the Forests. Scenery benefits tourism directly by providing a backdrop that draws visitors to the Forests for a variety of recreational activities in addition to sightseeing itself. We expect the importance of scenery to intensify as demands for recreation and natural resources increase correspondingly with population growth.

Oil and gas developments have the potential to impact visual resource quality. Areas of primary visual importance would require more stringent protection. Examples of these areas are: Wilderness areas, Wilderness Study Areas, wild and scenic areas, scenic byways, primitive ROS (Recreation Opportunity Spectrum) class areas and National Recreation Trails.

Presently there are no oil and gas developments on the National Forests. The perceived impacts of oil and gas developments may be either positive or negative depending upon the character of the surrounding landscape. Linear clearings along roads, soil color contrasts, and site clearing are intrusions in otherwise natural settings. Impacts are a result of the contrasts to the natural landscape caused by these intrusions. Although communities in the National Forests' vicinity are not accustomed to oil and gas activity, the Forest environment has a higher visual absorption capability (VAC) than the Grasslands. This is due to the landform and vegetative cover available for screening.

See Exhibit III-4 in this chapter for information about visual quality objectives and a list of evaluation criteria that will be used to determine impacts of oil and gas development.

### ***Cultural, Paleontological, and Cave Resources***

As of September, 1990, approximately 800 cultural resource properties have been recognized and recorded on the Pike and San Isabel National Forests. These resources represent approximately 10,000 years of human use of alpine, mixed conifer forest, and foothill parkland and shrubland environments by diverse prehistoric and historic human groups. The sizes of the individual resources (sites) range from about 500 square feet to over 160 acres for point resources, although the mean size is under one acre. Linear resources (trails, railroad grades and roads) range from under 1 mile to nearly 20 miles. Of the approximate 800 known cultural properties, 10 now have official status as significant cultural resources. These include one National Historic Landmark (Pikes Peak on the Pikes Peak Ranger District) and nine properties on the National Register of Historic Places [Exhibit III-5]. In addition, approximately 100 properties have been recommended as eligible to the National Register, and an additional 150 as potentially eligible to the National Register. Additional research on properties in the last category must be done before making a certain National Register determination.

By the end of September, 1990, only about 1.8 percent of the lands administered by the Forest (45,000 acres) had been systematically investigated for cultural resources and an additional 9 percent or 250,000 acres had been surveyed for cultural properties. Therefore, the potential for discovering additional significant cultural resources is very high. There probably are more than 250 cultural properties on the Forests that are "significant" and eligible to the National Register of Historic Places.

A critical determination in evaluating cultural resources once they are discovered and recorded is "significance." Primary cultural resources laws and regulations (the National Historic Preservation Act of 1966 and the Archaeological Resources Protection Act of 1979 and their derivative regulations) do not protect all historical and archaeological locations and objects, but only those that are "significant." Significant properties are those that contribute to our national, state, and local historic heritage and that are of concern to the historic preservation community. Recommendations regarding the significance of a resource are made by the management agency; a determination is then made by the State Historic Preservation officer. Significant resources are eligible to the appropriate federal registers; non-significant resources are not eligible. The criteria for determining significance are listed in 36 CFR Part 60.4. The following summary lists categories of significant and potentially significant cultural resources that comprise the affected cultural resource environment of the Forests.

### ***Prehistoric Resources***

Prehistoric American Indian groups used the Colorado Rocky Mountains east of the Continental Divide and the eastern Colorado Piedmont since the close of the last Pleistocene Ice Age or about 10,000 years ago. Professional literature describing the prehistory of montane Colorado divides this long span of prehistoric occupations into a series of periods. The periods (stages) are based on variations in material culture and deduced lifestyles. The relationship of an individual cultural resource to this chronology influences significance determination for that resource. The major units within this chronology are as follows:

- (1) the Paleoindian Period (10,000 - 5500 BC),
- (2) the Archaic Period (5500 BC - AD 500),
- (3) the Ceramic Period (AD 500 - 1550),
- (4) the Protohistoric Period (AD 1550 - 1800),
- (5) the Contact Period (AD 1800 - 1880).

State Historic Preservation Offices have prepared overviews of the prehistoric record for each state. These documents for Colorado present research areas that are important in reconstructing the characteristics of prehistoric cultures. In terms of significance, prehistoric cultural resources that potentially contribute useful data about these archaeological research areas are important.

Prehistoric cultural resources on the Forests can be typed by their function in the cultural systems of the local American Indians. This classification is a convenient way of listing the resources and assessing significance.

Some of the cultural properties recorded on the Forests and Grasslands may be categorized as more than one type if one considers their entire use history. The types are as follows: (1) camps, (2) quarries, (3) game drives, (4) culturally scarred trees, (5) rock art, (6) trails, (7) burials, and (8) other phenomena. Significant prehistoric cultural resources currently known for the Forests are included in Exhibit III-6 at the end of this chapter. Exact locations of the known significant resources are protected by the Archaeological Resources Protection Act. A more detailed discussion of the significant prehistoric resources of the Forests is presented in the cultural resources technical report appended to this document.



## **Historic Resources**

The historic record of the Forests begins with early Spanish exploring expeditions from Mexico and New Mexico beginning in the 16th century. One famous Spanish explorer known to have visited the Forests is Bishop de Anza who passed through the San Isabel National Forest in pursuit of the Comanche leader Cuerno Verde and his tribe in the late 1700's. This was also the period of the fur traders and several of the famous mountain men including Big Bill Williams, Kit Carson, and Jim Beckwourth who trapped beaver in the Forests. The Wahatoya, now called the Spanish Peaks, were landmarks for the travelers on the Santa Fe Trail in the 19th century. Several of the early exploring expeditions commissioned by the government of the United States were directed to examine this area; the two most famous were the Pike Expedition of 1806-1807 which traveled the Arkansas Valley and the fringes of Pikes Peak, and the ill-fated Fremont Expedition which crossed the Wet Mountains and the Sangre de Cristos before meeting disaster during the winter of 1848.

The early forays by small groups left little record of their passing except the names of prominent landmarks. The true transition of prehistoric lifeways to history in the Forests is logically related to the Colorado Gold Rush of 1858-1859 and specifically to discovery of gold placer deposits at California Gulch near Leadville in the San Isabel National Forest in the latter year. The gold deposits soon played out, but richer silver ores were discovered a decade later near Leadville and all along the Sawatch and Mosquito Ranges. The Silver Boom led to the creation of overnight mining communities and was the foundation of the history of the Forests. Both forests contain a vast record of the boom times, including famous mines, mills and smelters, and ghost towns. Many subsidiary industries and subsequent history were spun off from the boom including railroad and wagon road transportation, logging (the mines needed timber supports and the railroads needed ties) and the charcoal industry. Most significant Forest historical resources are related to this boom period.

Overviews of the history of the Forests have been prepared by the responsible federal agencies and the historic preservation offices of Colorado. These documents are the basis for evaluating the significance of historic resources and are organized by dominant historic themes. In addition to being closely associated with these themes, historic resources in the Forests also may contain noteworthy engineering and/or architectural values and valuable archaeological deposits. A preliminary survey of the historic resources on the Forests suggests that as a whole, our resources can contribute strongly to some themes and weakly or not at all to others. Using the pertinent overviews the historic themes particularly relevant to the Forests and the resource or site types with potential significance are as follows:

- (1) Mining: placer and hydraulic mining areas, mines, mills and smelters, mining camps, mining cultural landscapes, and other mining resources.
- (2) Logging: sites reflecting the charcoal industry, sawmills, and sites associated with tie-hacking.
- (3) Railroads: preserved portions of railroad beds and line, features (bridges, trestles, tunnels, sidings) on the line, stations, and labor construction camps.
- (4) Trails and roads: famous mountain passes, wagon and stage roads, and stations.
- (5) Farming and ranching: mountain homesteads.
- (6) Recreation and tourism: hotels and resorts, summer homes, recreational trail and roads, Forest Service recreation developments.
- (7) Forest Service history: ranger stations, nurseries, fire lookouts.
- (8) The military: military facilities on National Forest lands.
- (9) The Depression: placer mining operation and mountain habitations of the Depression Era, prohibition stills, Civilian Conservation Camps and activity areas.

Significant historic resources currently known on the Forests are listed in Exhibit III-6 in this chapter. Exact locations are not provided and are protected by the Archaeological Resources Protection Act.

### ***American Indian Sacred Sites***

The American Indian Religious Freedom Act of 1978 declares that it is the policy of the United States to protect and preserve religious rights, practices and beliefs of the American Indian. This includes, but is not limited to, access to sites, use and possession of sacred objects and the freedom to worship through ceremonial and traditional rites. Forest Service policy, as recorded in Forest Service Manual 1563, is to administer programs and activities to address and be sensitive to traditional Native religious beliefs and practices.

Use of NFS lands for conducting religious activities may be obtained through special authorizations. American Indian groups have been using the Meadows Campground area on the Pike National Forest for ceremonial purposes regularly for the last few years; to access the area, they use the standard reservation request system.

There are presently no documented American Indian sacred sites on either Forest. However, undocumented sites may exist on both Forests. Likely locations are former places or zones where historic contact period (late 1800's) American Indian groups are known to have lived. On the Pike National Forest, this category might include locations along the South Platte River between the former town of South Platte and the Wigwam Club, the Webster Park vicinity, locations within Manitou Park, and several locations on the southern and eastern flanks of the Buffalo Peaks and southern portion of the Mosquito Range, among others. On the San Isabel National Forest possible sacred sites might include the Monarch Game Drive, the Trout Creek Jasper Quarry vicinity, the Hortense Hot Springs vicinity at the base of Mt. Princeton, and several former camping locations within the eastern slopes of the Arkansas Hills. Also, several of the spectacular mountain peaks within both forests may have been considered sacred by American Indian groups. On the Pike National Forest, possible sites include Pikes Peak itself and Takana and Kataha Mountains on the South Platte District. On the San Isabel National Forest, both Spanish Peaks and Mount Blanca are possible sacred sites, among others.

### ***Paleontological Resources***

No significant paleontological point resources have been discovered on lands administered by either the Pike or San Isabel National Forests. However, fossil-bearing geological rock formations are present within the boundaries of the Forests; therefore, the potential for discovering significant paleontological resources exists. The Florissant Fossil Beds National Monument is adjacent to Pike National Forest lands in the vicinity of Elevenmile Canyon, so the potential for discovery of significant fossils in this area is high. Rich fossiliferous deposits have been reported in the vicinity of Hayden Creek on the eastern slopes of the Sangre de Cristo Mountains, San Isabel National Forest. Other locations in the Sangres are known to contain fossiliferous deposits with yet-to-be-assessed degrees of significance. For example, the Marble Mountain area near Music Pass has large outcrops of limestone that contain crinoid fossils, but their extent or scientific worth has not been studied.

### ***Cave Resources***

Several cave systems have been identified in the mountain districts of the Forests and the potential exists to discover additional caves or cave systems in unexplored areas. Known cave systems on the Pike National Forest include the Cave Creek Caverns south of Fairplay and the Lost Creek Caves in the Lost Creek Wilderness southwest of Bailey. The Lost Creek cave system contains

many individual caves and many are interconnected. This system is especially significant because of its popularity among spelunking groups and because its internal structure is virtually unique among reported cave systems of the world. Smaller caves have been reported near Black Mountain on the south edge of South Park and on the Great West Mine claims near Fairplay.

The San Isabel National Forest also contains several large known cave systems. The most prominent is the Marble Mountain Caverns on the east flank of the Sangre de Cristos above timber line west of Westcliffe. There are seven identified major individual caves and several "potholes"; the individual caves are interconnected to form a complex labyrinthine system. According to folklore, the caverns were the site of an early Spanish gold mine, although this has never been confirmed. Caves have been reported in the eastern foothills of the Wet Mountains (San Carlos District) near the town of Beulah. The Beulah caves are situated in the local limestone cliffs which form the walls of the major canyon drainages in the area, including Spring Creek, Middle Creek and the St. Charles River. It appears that a few of the more prominent caves, such as Mace's Cave and Lamb's Cave may be on Forest Service land. Significant cave systems on the Forests are included in Exhibit III-6 of this chapter.

### **Recreation**

Outdoor recreation contributes importantly to economies in the vicinity of the Pike and San Isabel National Forests. These public lands are an important resource providing for a wide variety of recreational activities. We expect the demand for recreation opportunities to continue to increase. The popularity of recreation activities on the Forests is summarized for 1990 in Exhibit III-7 of this chapter.

Forest Service planning for recreation used the Recreation Opportunity Spectrum (ROS) as described in the *ROS Users Guide*. ROS provides a framework for defining types of outdoor recreation available on the Forests and Grasslands. ROS classes include Primitive, Semiprimitive (motorized and nonmotorized), Roaded Natural, Rural and Urban. Exhibit III-8 in this chapter shows the activity by ROS class and whether land based, water based or snow/ice based. The relationship of the Forests' and Grasslands' present ROS class composition and use is shown in Exhibit III-9 of this chapter.

Approximately 84 percent of the recreation use on the Unit occurs within the Roaded Natural, Rural and Urban classes. The remaining 16 percent takes place in Primitive and Semiprimitive classes. Exhibit III-9 in this chapter illustrates the relationship between existing ROS class and type of use.

The Forest Service manages two types of recreational situations on public lands. Most of our public lands are managed to maintain freedom of recreational choice with a minimum of regulations. There are limited facilities and supervision on these lands. Recreation opportunities on such lands are referred to as "dispersed recreation." Where resources attract intensive recreational use, we make major investments in recreational facilities and visitor assistance. Specific management direction for these areas is to provide for resource protection and for public health, safety and enjoyment. These sites are referred to as "developed recreation."

Both kinds of recreation use occur in Roaded Natural settings which include scenic drives, highways, timber harvest areas, and adjacent lands. Because Roaded Natural areas are located on relatively gentle terrain with abundant access, most of the total acreage is usable.

The acreage breakdown of the Unit according to ROS class is as follows:

**Table III-2  
Acres by ROS Class**

| ROS Class/Location                               | Acres            |
|--|------------------|
| Primitive ROS: National Forests                  | 82,552           |
| Semiprimitive Nonmotorized ROS: National Forests | 660,417          |
| Semiprimitive Motorized ROS: National Forests    | 495,312          |
| Roaded Natural ROS: National Forests             | 936,233          |
| Roaded Natural ROS: National Grasslands          | 493,590          |
| Rural ROS: National Forests                      | 35,786           |
| Rural ROS: National Grasslands                   | 33,548           |
| Urban ROS: National Forests                      | 14,298           |
| <b>Total Acreage:</b>                            | <b>2,751,736</b> |

### ***Developed Recreation***

The Forest has 263 developed recreation sites including 94 campgrounds with 1,922 camp sites, 33 picnic grounds, 10 group use sites, as well as boat ramps, trailheads, fisherman parking lots, overlooks, observation sites, and interpretive sites. The 263 developed sites have a capacity of 21,071 People at One Time (PAOT) with 9,610 PAOT's being accommodated in the family campgrounds. There are currently 61 fee campgrounds and 9 fee group sites. Campground user fees collected in 1990 were approximately \$382,000, a 32 percent increase over the 1985 season. There are 10 family campgrounds and 7 group sites available for reservations under a nationwide campground reservation system.

Many of the campgrounds are adjacent to lakes, reservoirs, and streams. Although the water is generally too cold for any water contact sports, fishing and boating are popular.

Most developed recreation sites (particularly campgrounds) are located in 0-15 percent valley bottoms slope range. Other developed sites, such as picnic grounds, fisherman parking lots, and trailheads are located in the 15-40 percent slope range, as well as valley bottoms, because smaller usable areas are adequate for such developments.

### ***Dispersed Recreation***

Dispersed recreation activities in the Forests, excluding the Wilderness areas, account for approximately 65 percent of all recreation use.

The leading dispersed recreation activity is automobile travel for scenic enjoyment which is 37 percent of total use. The high incidence of this activity can be attributed to the exceptional scenery along travel routes. Camping and hiking are the next two most popular activities, followed by picnicking and fishing.

There are over 1,200 miles of trails in a variety of settings available to nonmotorized and motorized users. The Barr Trail to the summit of Pikes Peak and Devil's Head Trail to a historic fire lookout are two National Recreation Trails on the Forests. The Continental Divide National Scenic Trail will

traverse an extensive area of the Forests when completed. About half of the 400-mile Colorado Trail is on these Forests. This nationally prominent trail extends from Denver to Durango. The Rampart Range Motorcycle Area has been specifically developed and managed for motorcycle riding. With over 120 miles of trails for all classes of riders, this area is becoming increasingly popular each year.

The Forests have almost 4,000 miles of roads with approximately 2,400 miles classified as graded or paved. Several state and federal highways through the Forests provide excellent opportunities to view and photograph the scenery. The Pikes Peak toll road, a 19 mile drive to the summit of one of the most well-known attractions on the Forest, is a popular summer drive. The Highway of Legends between Trinidad and Walsenburg and Guanella Pass between Grant and Georgetown are Colorado Scenic Byways and National Forest Scenic Byways. There are 10 passes over the Continental Divide, some of which are for four-wheel drive (4WD) vehicles only. Other 4WD roads go to historical mines, follow abandoned railroad grades or old wagon and timber roads. Beautiful fall colors of aspen and oakbrush reward those who drive Forest roads during the fall. Several areas are noted statewide and are visited annually by those seeking viewing and photographic opportunities.

Off-road vehicle (ORV) use on the Forests is seven percent of the total use. Because of the rugged terrain and lack of available challenging primitive roads, most of the users of motorbikes and 4X4's limit their use to designated routes or areas open to motorized use.

Most of the Forests' primitive and semiprimitive nonmotorized recreation use occurs within Wilderness and Wilderness Study Areas. This is because these areas possess outstanding recreational, scenic, and geological attributes, including most of the lakes and high mountain peaks. Dispersed recreation settings include forest roads, highways and trails, backcountry areas, rivers and streams, and Wilderness. The ROS settings include the semiprimitive (motorized and nonmotorized), roaded natural, and rural classifications.

Semiprimitive settings include areas managed for both motorized and nonmotorized uses. Those open to trail vehicles offer an opportunity to ride on designated routes. Semiprimitive motorized settings are generally open to vehicles designed for trail use (including snowmobiles), or they may include primitive two-track roads for 4WD's. Semiprimitive settings provide remoteness, challenge, and solitude in a backcountry setting. Location of semiprimitive areas, access, and attractions within them are some of the factors that contribute to use levels. As with developed sites throughout the Forest, some semiprimitive areas are used very lightly, and others attract enough use that crowding and user conflicts have occurred. In these settings, terrain and trail access may limit the area usable for recreation. Although the total acreage in the setting may be high, relatively little of the area is actually usable for recreation unless the terrain is unusually gentle.

Many semiprimitive areas on the Forests have desirable attractions, but use is limited largely by lack of information about them that is available to the public. Areas such as system trails, the fourteeners, fishing lakes and streams, all roads including 4WD and the areas adjoining the roads, have information readily available and these areas tend to receive the dispersed use. Development of attractive trailhead facilities and road access, signing, and publications have contributed to the use of dispersed areas.

### **Wilderness**

There are five classified Wilderness Areas (Mt. Evans, Lost Creek, Holy Cross, Mt. Massive, Collegiate Peaks) on the Forest consisting of 258,837 acres. The Wilderness Act of 1964 (P.L. 88-577) withdrew Wilderness acres from mineral leasing.

The Colorado Wilderness Act of 1980 (P.L. 96-560) designated four Wilderness Study Areas (Buffalo Peaks, Greenhorn Mountain, Sangre de Cristo, Spanish Peaks) in the Pike and San Isabel National Forests. NFS lands in three study areas (Greenhorn Mountain, Sangre de Cristo, Buffalo Peaks) consisting of 120,017 acres were recommended for Wilderness designation. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 prohibits the issuance of any oil and gas leases on those lands recommended for Wilderness allocation by the surface managing agency.

The Spanish Peaks Wilderness Study Area and portions of the Buffalo Peaks and Sangre de Cristo Wilderness Study Areas were not recommended for Wilderness designation. These lands "not recommended" remain subject to Sec. 105(c) of P.L. 96-560 which provides that, with respect to oil and gas exploration and development activities, such lands shall be administered according to the laws generally applicable to the National Forest System. Section 17 of the Act of February 25, 1920, as amended by the Reform Act of 1987, is generally applicable to the National Forest System. Section 17(h) grants the Secretary of Agriculture consent/denial authority over the issuance of any oil and gas leases on National Forest System lands reserved from the public domain. Section 17(h) is therefore applicable to the Wilderness Study Area lands that were "not recommended" as well as adjacent lands that may be considered for Wilderness designation; pursuant to this discretionary authority, the alternatives of leasing or not leasing these lands are addressed in this EIS.

### ***Special Areas***

#### ***Wild and Scenic Rivers***

A segment of the South Platte River extending 23 miles from Elevenmile Canyon Reservoir to Cheesman Reservoir has been determined to be eligible for inclusion in the National Wild and Scenic River System. Pending a suitability study and evaluation, the River and its one-half mile wide corridor is to be managed to preserve its eligibility characteristics. The eligibility study proposes nine miles of Wild and Scenic River and 14 miles of Recreational River.

Pending the completion of the suitability study, a one-half mile corridor on the remaining segment of the South Fork of the South Platte from Cheesman Dam to the forest boundary at Kassler will be managed to preserve its potential for wild, scenic or recreational river classification. The additional segment of the South Fork is approximately 25 miles.

An 8-mile segment of Badger Creek within the National Forest boundaries will be managed to preserve its potential for wild, scenic or recreational river classification.

#### ***Experimental Areas***

The Manitou Experimental Forest is located 28 miles northwest of Colorado Springs, Colorado in Teller County, and is 26 square miles. It was established by the Forest Service in 1938. By virtue of the authority vested in the President by Act of June 4, 1987, 30 Stat. 34, 36, (16 U.S.C. 473) and otherwise, and pursuant to Executive Order No. 10355 of May 26, 1952 (17 F.R. 4831), subject to valid existing rights, the Manitou Experimental Forest was withdrawn from all forms of appropriation under the public land laws including the Federal mining laws but not the general leasing laws (PLO 1137). The lands were reserved for use of the Forest Service, Department of Agriculture, in connection with research projects being conducted in furtherance of the Act of May 22, 1928, 45 Stat. 699, as amended. It was selected as an area representative of the foothills and low mountains of eastern Colorado and highly suited for research in range and watershed management.

The Chief, U.S.D.A., Forest Service withdraw consent to the BLM for leasing lands within the Manitou Experimental Forest.<sup>15</sup>

### **Research Natural Areas**

There are three Research Natural Areas designated or proposed on the Pike and San Isabel National Forests. These areas are the Hurricane Canyon, Saddle Mountain and Hoosier Ridge RNA's. These RNA's are covered in more detail in the individual Geographic Zone narratives in Appendix D.<sup>16</sup>

### **Special Interest Areas**

There are nine Special Interest Areas in existence or proposed for the Pike and San Isabel National Forests. These areas are listed in the following table:

**Table III-3  
Special Interest Areas  
Pike and San Isabel National Forests**

| Special Interest Area                    | Acres |
|--|-------|
| Windy Ridge Bristlecone Pine Scenic Area | 150   |
| Queen's Canyon Geologic Area             | 1,130 |
| Mt. Bross Botanical Area                 | 105   |
| West Hoosier Ridge Botanical Area        | 54    |
| Iron Mountain Botanical Area             | 100   |
| Lost Lake Botanical Area                 | 160   |
| Lost Park Botanical Area                 | 160   |
| Spout Lake Botanical Area                | 120   |
| Droney Gulch Botanical Area              | 20    |

Some of these areas contain plants that are being considered for listing as threatened or an endangered species. These areas are discussed in more detail in the Geographic Zone narratives in Appendix D.<sup>17</sup>

Because of the nature of Research Natural Areas and Special Interest Areas, they will be treated differently than other Forest lands. This could range from Controlled Surface Use (CSU) to No Surface Occupancy (NSO). In some cases there may be a combination of CSU's, NSO's and timing restrictions.

The San Isabel National Forest contains one area that is listed on the register of National Natural Landmarks. This is the Spanish Peaks National Natural Landmark which is located in the Spanish Peaks - Sangre de Cristo Portion of the Forest south of La Veta. The national landmark encompasses 44,160 acres of public and private lands of which 23,770 acres are National Forest System lands. The national natural landmarks program is administered by the U.S. Department of Interior National Park Service, and recognizes sites that illustrate our nation's natural heritage. The Spanish Peaks are recognized as an outstanding example of volcanically formed peaks and radiating dikes. The geological formations that are the basis for the landmark should be protected during oil and gas development on the San Isabel National Forest.

### **Withdrawals**

Withdrawals are a management action for withholding an area of National Forest System land from settlement, sale, location, or entry under some or all of the general land laws, including the mining

and mineral leasing laws. Limiting activities under those laws is for maintaining other public values in the area or for reserving the area for a particular public purpose or program.

National Forest System lands with reserved or public domain status are subject to entry under the General Mining Laws but may be withdrawn from mineral entry when a greater public value or benefit is identified.

Forest Service withdrawals have been made for the following purposes: administrative sites, developed recreation sites, natural areas, scenic areas, experimental areas, and other unique features. Other withdrawals include municipal watersheds, power withdrawals (Federal Energy Regulatory Commission), reservoir sites (Bureau of Reclamation), and military use (U.S. Air Force Academy).

The following is a tabulation of existing withdrawals:

**Table III-4  
Withdrawals**

| Withdrawal                             | Acres  |
|--|--------|
| U.S. Forest Service                    | 34,198 |
| U.S. Fish and Wildlife Service         | 2,720  |
| Department of the Air Force            | 8,858  |
| Other Federal Agencies (BOR/FERC)      | 18,850 |
| Municipal Watersheds (Act of Congress) | 14,236 |

The above are withdrawn from mineral entry under the General Mining Laws. The Air Force withdrawal and the municipal watersheds withdrawal are also withdrawn from leasing under the Mineral Leasing Laws.

Each withdrawal is reviewed periodically to determine if the withdrawal is appropriate and still required. The Federal Land Policy and Management Act of 1976 required that all withdrawals be reviewed by 1991. The Pike and San Isabel National Forests completed this review in 1989.

### **Mineral Resources**

Locatable minerals are those valuable deposits subject to exploration and development under the U.S. General Mining Law of 1872 and its amendments.<sup>18</sup> <sup>19</sup> <sup>20</sup> Commonly, locatables are referred to as "hardrock" minerals. Examples include, but are not limited to, iron, gold, silver, lead, zinc, copper, and molybdenum. Historically, mining activities often dominated employment sectors in several populated areas since settlement first occurred in Colorado. The Leadville, Salida, and South Park Ranger Districts are located within the Colorado Mineral Belt. This area is a narrow, irregularly shaped zone trending southwest from Boulder through Leadville to Durango. Most of Colorado's mining districts lie within this belt. The mineralized belt has produced significant amounts of metallic and nonmetallic minerals since the 1860's.

Current mining activities occur throughout the Forest on a small scale. Development and production activities include the several base and precious metals operations in the Alma-Como area, and the Climax and Henderson Mines. Exploration activity is centered in the Sawatch, Mosquito, and Sangre de Cristo Mountains, and the South Park area.



Information on some known mineral occurrences in the analysis area is found in Chapter III, pages 109 and 110 of the Forest Plan FEIS.<sup>21</sup>

Development of locatable minerals will play an important role in the Forests' management as demand for mineral products increases to meet the future needs of the region and the nation. We do not expect exploration and development for hardrock minerals to increase in the near future. As market prices increase, more activity is likely to occur, particularly for base and precious metals.

Salable minerals or common varieties, are generally low value deposits of sand, clay, and stone used as building materials and for road surfacing. Disposal of these materials from the National Forest System is totally at the discretion of the Forest Service. Requirements controlling salable mineral operations are similar to those for leasable minerals.

Salable minerals include refractory and clay shale deposits along the Front Range. Also, sand and gravel are available in all counties. The main sources are alluvium and terrace gravels along the South Platte and Arkansas Rivers and their tributaries.

There are numerous sources for salable products on privately owned lands in or near the analysis area which places little demand on Forest common variety products. Limestone and dolomite are used considerably for construction purposes. The Pikes Peak District possesses a valuable source of high quality limestone desired for construction and decorative purposes. The market for such products has been good.

### ***Mineral Potential***

A mineral specialist conducted a mineral potential evaluation to determine the possible existence of locatable and leasable mineral deposits on the Forest. Mineral potentials were determined for metallic and nonmetallic minerals and energy fuels. A set of general criteria established includes known favorable geology and structure, known mineral occurrences and reserves (if data available), and field activity related to mineral exploration, development and production. The "potential levels," determined as high, medium, and low, are based on today's knowledge and prices and may change, depending on the mineral economy, technological advances, or further exploration.

High mineral potential includes favorable geology and structure, known economically valuable mineral occurrences and reserves (if data available), and field activity. Medium mineral potential includes favorable geology and structure, known mineral occurrences with insufficient evidence of present economic value, or sub-economic deposits, and occasional activity. Low potential includes geology considered unfavorable at this time, no known mineral occurrences, explored or prospected sites determined non-economic, and little or no present activity. The low potential level does not infer the lack of mineral deposits, but rather insufficient knowledge at this time.

The minerals specialist developed mineral potential maps by gathering data from individuals and references, including historical production records. The mineral potential maps are a part of the planning records and are available for review in the Supervisor's Office, Pueblo, Colorado [see Appendix K]. Additional information on mineral occurrences, production, and geologic environment is found in the Mineral Potential Report for the Pike and San Isabel National Forests in Appendix H of the Forest Plan.

### ***Historical Exploration and Production***

Although oil and gas production is not currently taking place on the Pike and San Isabel National Forests, several areas have been explored. Only one stratigraphic test drilling has occurred within the Pike National Forest. There is no historical evidence that any other exploratory drilling for oil

and gas has occurred on either Forest. Potential deposits of potassium within the analysis area are in the vicinity of Antero Junction and Mosquito Lake. Potential for hydrocarbon accumulation exists in sedimentary rocks along the flanks of the Sangre de Cristo and Mosquito Ranges, and the Spanish Peaks. A producing carbon dioxide area adjacent to San Carlos Ranger District indicates potential carbon dioxide on the Forest. The Forest has two coal reserve areas, South Park Field and the Raton-Mesa Region. The South Park Field touches the Forest north of Jefferson and is inactive. The Raton-Mesa Region is a known recoverable coal resource area consisting of the Walsenburg and Trinidad coal fields. Potential for coal bed methane gas exists in these areas.

### **Transportation**

Major federal and state highways provide convenient access from population centers through the main Forest units. An extensive network of County and Forest System roads further provided access to most areas of the Forest. Forest System roads consist of the following:

**Table III-5<sup>22</sup>**  
**Forest Road Summary**  
**Miles**

| Function     |             | Surface   |             | Lanes  |             | Jurisdiction |             |
|--------------|-------------|-----------|-------------|--------|-------------|--------------|-------------|
| Arterial     | 1208        | Primitive | 1621        | Single | 2712        | County       | 1121        |
| Collector    | 928         | Graded    | 1327        | Double | 1220        | Forest       | 2706        |
| Local        | 1748        | Aggregate | 724         | Other  | 2           | Other        | 107         |
|              |             | Asphalt   | 106         |        |             |              |             |
|              |             | Other     | 156         |        |             |              |             |
| <b>Total</b> | <b>3934</b> |           | <b>3934</b> |        | <b>3934</b> |              | <b>3934</b> |

Many Forest System roads overlap County System roads and are maintained by those counties to serve local public needs. In cases of primary maintenance responsibility, the Forest Service maintains roads to meet resource management needs and to provide for public safety. Future transportation needs reflect dramatic population increases in Colorado's Front Range. County and state systems will absorb most of this impact while the Forest Transportation System will continue to meet resource management needs.<sup>23</sup> Additional information on transportation (i.e., Access, Travel Management, Demand Trends, etc.) can be found in the Forest Plan, Chapter II, pages 66-68.

### **Special Uses**

Special use authorizations allow use of National Forest System lands by federal, state, and local agencies, and private industry and individuals. Laws and regulations govern use to best serve the interest of the public and the United States.

#### **Existing Long-Term Special Uses**

Currently there are approximately 872 special use permits authorizing private and/or public use of 21,156 acres of National Forest System lands on the Pike and San Isabel National Forests<sup>24</sup>. Uses vary from a simple trail shelter or fence to highly-developed winter recreation resorts or communication sites. Investment in the sites may be a few hundred dollars for a short road to several million dollars for a winter recreation resort or a communication site complex.

### **Short-Term Special Uses**

Annually, approximately 125 permits are issued for a term of less than one year. These authorizations include outfitter/guide permits, snowmobile rallies, cross-country skiing, seismograph activities, mineral materials, rock, etc. Oil and gas exploration and development would normally have little impact on these uses.

### **Utility Corridors**

Management Prescription 1D of the Forest Land and Resource Management Plan provides for the designation of transportation and utility corridors:

- (1) Electrical Transmission - Lines 69 KV or larger.
- (2) Pipelines - Lines 10 inches in diameter or larger (Gas/Oil/Water).
- (3) Telecommunications - All microwave paths and fixed telecommunication electronic sites.
- (4) Railways - Ten miles in length or longer.
- (5) Highways - All Interstate, Federal or State Highways.
- (6) Telephone Lines - Major transcontinental systems.

Existing corridors have been identified on the Forest Land and Resource Management Plan maps.

For additional information on the various types of special uses, refer to Exhibit III-10 in this chapter.

## **THE GRASSLAND ENVIRONMENT (Comanche and Cimarron National Grasslands)**

### ***Vegetation***

On the Comanche NG, dominant grassland types include shortgrass prairie (80%) and midgrass prairie (20%). On the Cimarron NG, dominant types include midgrass prairie (70%) and shortgrass prairie (30%). Pinyon-juniper and woody draws account for small percentages of the vegetation, but often provide valuable wildlife habitat and visual diversity to landscapes dominated by grasses. These types will be noted in Appendix D, Analysis Area by Geographic Zone. Refer to Exhibit III-3 in this chapter for more detailed descriptions of the major grassland types.

### ***Soils***

Soils of the "High Plains," which include the Comanche and Cimarron National Grasslands, have properties that have been primarily influenced by differences in parent materials. In general, the grasslands are comprised of two distinct types of land that are often referred to as the "hard lands" and "sandy lands." The hard lands consist of loamy soils with variable depths that are well-developed from sedimentary, igneous, and loess deposit sources. The sandy lands are deep sandy soils with very little development from wind-deposited sands. There are no prime farmlands identified within the Grassland environment according to the Forest Plan, Chapter IV, p. 80. Current soil types have been highly influenced by the "Dust Bowl" of the early 1930's which removed most of the fertile topsoil on extensive areas of land. Dry climatic conditions coupled with over-farming and excessive grazing were primarily responsible for the Dust Bowl, and much has been learned about erosion-control management practices since that historic event. Vast areas of loose sands exist on both Grasslands, and soils are considered sensitive due to their high susceptibility to wind erosion. Rehabilitation practices are especially challenging in problem areas.

Soil survey information for the Grasslands may be found in published county reports (Baca, Otero, Morton Counties) and unpublished information (Las Animas County) prepared by the USDA Soil Conservation Service. Specific information about soils and other landscape features is available for a variety of purposes from the U.S. Forest Service, Pueblo, Colorado.

### ***Water***

#### ***Surface Water***

There are only two perennial streams on the Comanche National Grasslands. They are Timpas Creek and Carrizo Creek. There are no perennial streams on the Cimarron National Grasslands. Some man-made ponds provide additional surface water but few of these hold water throughout the year. Some of the windmills have overflow ponds associated with them. These are man-made and hold any water that overflows the stock tanks. They provide small but important riparian habitat.

Many of the intermittent drainages support riparian vegetation such as tamarisk, willow and cottonwood. They provide critical wildlife habitat.

#### ***Groundwater<sup>25</sup>***

In the Comanche National Grassland areas, wells furnish nearly all the water for domestic and stock needs. These wells vary in depth from 60 to 875 feet. Fortunately, deposits of water contained

in stream-laid sand and gravel underlie most of the area. Water yields of the wells vary from the large amount produced by wells south of Vilas and Walsh to small or moderate amounts suitable only for domestic and stock use. The quality of the water varies somewhat with the type of formation. Some have such a high sulphate content that they are unsuitable for domestic use and of poor quality for livestock. A few have such a high iron and sulphur content that pipes last only a few years.

The entire population of the Cimarron National Grassland obtains its water supply from wells. The Ogallala aquifer underlies most of the Grassland. On the upland, the depth to the water table ranges from about 30 to 225 feet. The water-bearing material, Pliocene and Pleistocene undifferentiated sediments and Cockrum sandstone formation, ranges in thickness from about 60 to 400 feet. Wells for domestic use and for livestock furnish enough water almost anywhere they are drilled in the Grassland. Irrigation wells are not so easy to locate. Test holes have to be drilled to locate gravel or sand strata that will produce a large amount of water. The water is highly mineralized but is suitable for most uses. There are a few artesian wells, but the water from these wells is high in total salts.<sup>26</sup>

### **Wildlife and Fishery Resources**

The Forest Plan, Chapter III, provides the goals (pages 3-6), direction and Standards and Guidelines for management (pages 11-241) for wildlife and fish resources. Some of the Forest Plan goals apply to the Grasslands. These are:

- Increase diversity for wildlife and fish habitat improvement.
- Utilize programs that demonstrate wildlife habitat protection and improvement.
- Perpetuate woody vegetation.
- Protect riparian areas and wetlands from degradation.

Habitat diversity on the National Grasslands is best described in terms of plant species, topography, and the amount of uncommon habitat components such as trees, shrubs, rock outcrops, cliffs and water sources. Short and midgrass prairie is the primary habitat type. Diversity is generally managed through livestock grazing, and protection and propagation of trees, shrubs and water sources.

**Wildlife.** The number of vertebrate species that occur on the Comanche and Cimarron National Grasslands are as follows:

**Table III-6  
Vertebrate Species - Grasslands**

| Species Class | Comanche<br>NG | Cimarron<br>NG |
|---------------|----------------|----------------|
| Amphibians    | 12             | 10             |
| Birds*        | 277            | 267            |
| Fish          | 19             | 16             |
| Mammals*      | 59             | 50             |
| Reptiles      | 33             | 33             |
| Totals        | 400            | 375            |

\* Includes migratory species

Refer to Exhibit D-3 in Appendix D for the Management Indicator Species found in the grassland environment by geographic zone.

Management Indicator Species (MIS) represent broad ecological niches on the Forest and Grasslands and do not necessarily represent the needs of all other wildlife species. However, by providing habitat for the designated MIS, the habitat needs for a wide range of species is provided. Forest Direction requires that a minimum of 40 percent of potential habitat be maintained for every native vertebrate wildlife species.

**Fisheries.** There are numerous native as well as non-native fish species present in the Grasslands. Many of these fish have evolved to withstand the adverse conditions associated with the changing environments encountered there. The Timpas Creek and Purgatoire River contain the highest diversity of native fish species on the Comanche National Grassland, while the Cimarron River is the only river with fish on the Cimarron Grassland.

Several warm-water ponds provide important fisheries for sunfish and catfish species on the Comanche and Cimarron Grasslands. Stocking is coordinated with the Kansas Department of Wildlife and Parks and the Colorado Division of Wildlife.

### ***Riparian Resources***

Riparian resources in the plains are largely restricted to narrow stream channels and depressions in the land which are periodically flooded. The exception is the Cimarron River, which has a relatively extensive riparian area. Woody riparian vegetation includes cottonwoods, willows and salt cedar.<sup>27</sup> Herbaceous plants which inhabit the area include those species which have evolved to withstand periodic droughts and desiccation in the semiarid conditions, as well as those that are restricted to permanent water environments. The salt cedar was introduced from Asia and has been spreading in the Arkansas Valley since the 1890's. This hardy riparian species appears to have spread rapidly throughout the plains. Diversity of herbaceous plants was found to decline in the presence of salt cedar stands, with only those species tolerant of soluble salts produced by these trees able to survive.

### ***Threatened and Endangered Species***

Exhibit D-5 in Appendix D outlines by geographic zone the T&E wildlife species found in the grassland environment.

There are currently no fish species which are formally classified as federally threatened or endangered in either of the Grasslands. However, there are several species which are sufficiently restricted in their distributions to make them a special concern, both in federal and state terms. These species are identified in Appendix D, Analysis Area by Geographic Zone, under the appropriate zones.

Those Category 2 species which are candidates for official federal listing as threatened or endangered species (Federal Register, Vol. 40, No. 181, September, 1985; and Vol. 50, No. 188, September 27, 1985), or are state listed, presently have no legal federal protection under the Endangered Species Act; however, it is within the spirit of the Act to consider project impacts to potentially sensitive candidate species. Also, all of these Category 2 species are on either one or both of the threatened and endangered lists for Colorado and Kansas. Management of these peripheral and/or candidate species involves habitat and species surveys, protection of suitable habitat and identification of opportunities where habitat requirements can be better provided.

Plants which are being considered for listing on the federal or state level can be found in Exhibit D-6 in Appendix D.

### **Range Resource**

Almost all areas on the Grasslands are open and suitable for livestock use. Grazing use for 1990 was:

**Table III-7  
1990 Grazing Use**

| Suitable Acres | Permitted numbers | AUM's   |
|----------------|-------------------|---------|
| 522,005        | 14,431            | 115,376 |

### **Visual Resource**

The visual quality of most of the Grasslands is low. This is due to a relative lack of visual variety and a high level of existing impacts. The landscapes are dotted with cattle, windmills, oil and gas developments, homes, farms and a few recreation developments. However, some plains areas, and particularly the canyons in southeast Colorado, are undeveloped, but scenic and culturally important. Such areas are vignettes of the High Plains landscapes of the "Old West" as viewed by the Indians and early explorers. The rolling topography allows visitors almost endless views, broken occasionally by buttes and wooded stream corridors. Special management designations on the Grasslands are the Santa Fe National Historic Trail and the Cimarron River corridors.

The gentle topography and lack of major vegetation result in a low visual absorption capability (VAC), meaning that landscape modifications will have a high impact, which cannot be easily mitigated. However, the communities involved are more tolerant of the impacts of oil and gas for economic reasons and may not view oil and gas developments as negatively as forest communities.<sup>28</sup>

Exhibit III-4 in this chapter has information about visual quality objectives and a list of evaluation criteria that will be used to determine impacts of oil and gas development.

### **Cultural, Paleontological, and Cave Resources**

As of the end of September, 1990, approximately 290 cultural resource properties have been recognized and recorded on the Comanche and Cimarron National Grasslands. These resources reflect approximately 10,000 years of human use of the High Plains steppe and canyon land environments common to both Grasslands. The sizes of the individual resources (sites) range from about 500 square feet to over 160 acres for point resources, although the mean size is under one acre. Linear resources (trails and historic roads) range from under one mile to nearly 25 miles. Of the known properties, the Santa Fe Trail, with branches and features on both Grasslands, is officially recognized as a National Historic Trail. Several of the prehistoric sites have been determined eligible to the National Register of Historic Places, although they are not listed. Approximately 50 more sites are potentially eligible to the National Register; a clear determination is contingent on acquiring additional data regarding the nature of the archaeological deposits present at these resources. To date, all of the Cimarron National Grassland has been systematically surveyed for prehistoric resources, but only about 15 percent has been examined for historic resources. On the Comanche, approximately 10 percent has been systematically examined for

both prehistoric and historic resources. The potential for discovering additional significant cultural resources is very high.

### ***Prehistoric Resources***

Prehistoric man is believed to have inhabited the High Plains of western Kansas and southeastern Colorado, the general locations of the Cimarron and Comanche National Grasslands, for the last 10,000 years and possibly before that time. The same general chronology presented in the cultural resources discussion for the Forests is equally applicable here:

- (1) the Paleoindian Period (10,000 - 5500 BC),
- (2) the Archaic Period (5500 BC - AD 500),
- (3) the Ceramic Period (AD 500 - 1550),
- (4) the Protohistoric Period (AD 1550 - 1800),
- (5) the Contact Period (AD 1800 - 1880).

Virtually all prehistoric resources on both Grasslands date to the time period between 3000 BC and AD 1880. There is high potential for accidental discovery of resources dating before this time (to the Paleoindian Period or the early part of the Archaic Period), but such early resources are difficult to detect because they usually are buried under several feet or more of sediment. Significance criteria for prehistoric resources as presented in the cultural resources section for the Forests are also applicable to the Grasslands; sites that are associated with important events or persons are significant. Also, prehistoric sites that contain substantial archaeological deposits are significant if the data they contain are important for scientific research and construction. These and other topics in the archaeological research of High Plains prehistoric cultures are discussed in the pertinent state overviews for this area.

High Plains prehistoric properties can be classified according to types reflecting their use by prehistoric groups and their modern manifestations. For the Grasslands, several types of properties have been recorded; the ones with the greatest potential significance are habitation sites (including open campsites, campsites in rock shelters, and sites with masonry or stone-based structures) and rock art sites. The following are the sites with the greatest potential significance, according to period, based on the current state of knowledge.

- (1) The Middle and Late Archaic Periods. Open campsites often associated with extinct or seasonal playa lakebeds. Such locations are found on both Grasslands.
- (2) The Ceramic Period. Open campsites, campsites in rockshelters, sites with stone architecture (commonly associated with the Apishapa Culture), and sites with rock art panels. These site types are found on both Grasslands; highly sensitive areas include the Middle Spring area on the Cimarron, and several canyon land and high steppe locations on the Comanche.
- (3) The Protohistoric and Contact Periods. Open campsites (often with stone rings), campsites in rockshelters, and sites with rock art panels. These site types are found in numerous locations on both Grasslands.

### ***Historic resources***

The historic record for the Grasslands begins with the Coronado Expedition seeking the golden province of Cibola in 1540 and 1541. In the course of his futile search for riches, Coronado apparently visited the Point of Rocks area on the Cimarron National Grassland. The 1600's and 1700's were marked by further Spanish and French exploration of the High Plains and the



beginning of the fur trade era. These early historic forays were by small groups who created few impacts and left little evidence of their passing. The opening of the Santa Fe Trail in the 1820's marked the beginnings of greater impacts by larger groups and the true end of the prehistoric period on the Grasslands. The traders and travelers on the Trail and the soldiers whose mission it was to protect the route were followed by various groups interested in exploiting the natural resources of the High Plains; ultimately, most of these commodity exploiters failed due to exhaustion of the targeted resources. Buffalo hunters slaughtered the large Plains herds in the 1870's. The prairie grasslands were then carved up into cattle empires in the 1880's and 1890's by a new wave of entrepreneurs. These large enterprises, dependent on the open range, dwindled with the arrival of the homesteaders a short time later. The homesteaders thrived during the first two decades of the 20th century, when annual precipitation was ample. Drought in the 1930's revealed that farmers had overextended onto marginal lands. The resulting Dust Bowl caused the loss of most of the area's population. To rehabilitate the area and to prevent further ravages, the federal government bought many of the former farms and ranches through the Resettlement Administration submarginal lands program and the Bankhead-Jones Act passed in 1937. Population is falling in some parts of the region, but is maintaining in others through new endeavors. These endeavors include oil and gas development whose beginnings can be traced to the turn of the century, and the military which has used the sparsely-settled High Plains for various training exercises and maneuvers since World War II. The themes which are most important in High Plains history and heritage are presented in the pertinent state historic society overview document. The following are the most important historic themes on the Grasslands and the resource types that commonly represent them.

- (1) The period of exploration. Resource types associated with this theme include rock inscription records of travelers. Several sites of this type are on the Comanche in the vicinity of Rock Canyon.
- (2) The Santa Fe Trail. Both Grasslands exhibit preserved sections of both main routes of the Trail (the Mountain branch on the Comanche NG and the Cimarron Cutoff on the Cimarron NG), portions of several lesser known branches, and prominent point locations along the trail routes. The main routes of the Trail have been mapped whether or not visible on the ground if they are considered significant. The point locations consist of frequently used camping spots, and "ranches" which provided food and a change of horses for stage line operators and passengers.
- (3) The Cattle Empire Era. Types of resources associated with this theme include ranch headquarters, line camps or cabins, and cattle trails.
- (4) Hispanic Settlement. The Picket Wire Canyonlands contain several resource types associated with this theme including the locations of settlements and ranches, rock art, and cemeteries.
- (5) Homesteading, the Dust Bowl and the Depression. The most common resource type associated with this theme are the remains of old homesteads occupied during the bracket date 1890-1940. When the lands were acquired by the federal government, it was the policy to destroy standing structures. Consequently, most of the homestead sites have lost their integrity and historic significance. A few homestead sites on the Comanche National Grasslands, such as the Rae-Smith homestead, were spared. Also, some homestead sites contain substantial preserved archeological deposits. Other types here include water control developments such as the Timpotero Farms dams and canals near Timpas on the Comanche National Grassland, and stills associated with Prohibition.

### ***American Indian Sacred Sites***

There are presently no documented American Indian sacred sites on the Grasslands. However, there are locations on the Grasslands which may have been of special religious or heritage significance to American Indian groups. These include several specific canyon areas documented to have been used by American Indian groups for millenia. Prehistoric and contact period rock art are common to all of these specific locations.

### ***Paleontological Resources***

Fossil-bearing deposits are common in the bedrock geology of the Comanche National Grasslands, but comparatively rare on the Cimarron. The bedrock formations of the latter are virtually all of the Ogallala Formation, consisting of unconsolidated sands and gravels dating to the Pliocene and Pleistocene Periods. These sediments are not conducive to the preservation of large, intact fossil specimens although it is possible to find small specimens on occasion. A section of mammoth tusk, measuring about 10 cm. square was recovered from a gravel pit located in sediments of the Ogallala Formation and north of the Cimarron River in the 1970's. Discoveries of buffalo bones are common on the Cimarron National Grassland, primarily in erosional contexts. The discoveries usually consist of disarticulated scattering and are not reflective of entire skeletons. These finds probably represent scavenger-scattered carcasses dating to the 19th century (100-200 years ago). They are not thought to be significant because limited scientific data could be recovered from such phenomena. However, each case is evaluated by the Grassland staff to insure more substantial remains are not present. Whole skeletons or bone beds with several individual animals present are considered significant paleontological resources.

The Comanche National Grassland has much greater potential for significant fossil finds based on published descriptions and field examinations of the bedrock deposits. The Morrison Formation exposures of Jurassic age have the most potential for significant fossil discoveries. The Purgatoire River Dinosaur Trackway Site in the Picket Wire Canyonlands area is a paleontological resource of exceptional scientific significance. This resource has been described by paleontologists as the largest recorded trackway in the world. The trackway area is proposed as a Paleontological Area on the Grassland meriting specific protection measures. This particular resource and its immediate environment are of particular concern in the event of local oil and gas development projects. Very large tree fossils (long sections of trunks) originating from exposures of this formation in the Two Buttes area north of the Grassland also have been reported. There is high potential for additional discoveries of significant resources where Morrison Formation deposits are exposed or being exposed by erosional forces. On the Comanche, there are several sensitive areas in this regard. There also are extensive Cretaceous Age exposures on the Comanche including calcareous shales and limestones of the Niobrara Formation and sandstones of the Dakota Formation. These deposits also contain fossils although they are smaller and not as spectacular as the Morrison Formation finds. Local residents have reported numerous small plant fossils and worm casts in these particular strata.

### ***Cave Resources***

No known significant caves exist on either the Cimarron or the Comanche National Grassland, and the potential for identifying significant caves on either unit is very low, based on the characteristics of local bedrock geology.

### ***Recreation***

Outdoor recreation on the National Grasslands, although smaller in range of opportunities and numbers of users than the National Forests, provides unique and important activities for visitors.

The Grasslands are comprised of the Roded Natural and Rural classes of the Recreation Opportunity Spectrum (ROS) indicating that the Grasslands are in relatively close proximity to the road system that serves the Grasslands. There are 493,590 acres in the Roded Natural ROS and 33,548 acres in the Rural class.

Total use in 1990 on the Comanche and Cimarron National Grasslands was 114,200 RVD's as compared to 50,000 RVD's reported in 1986. Approximately 75 percent of the use occurs in the dispersed sector. The Comanche NG has three small developed sites (Carrizo Picnic Ground, Picture Canyon and Vogel Canyon) that are associated with the rock art in the area. All are located in scenic canyons with steep walls and varied vegetation that includes cedar trees. Intermittent streams also add to the attraction of the sites.

The Cimarron National Grasslands has several developed sites located in the shade of the cottonwood trees along the Cimarron River valley. Additional attractions in the area are the numerous dugouts that provide warm water fishing opportunities in this semiarid region. The Santa Fe Trail (a National Historic Trail) parallels the north side of the Cimarron River, because the early day travelers also sought the shade and water to be found in the vicinity of the river valley. Recreation activities associated with the Santa Fe Trail, such as viewing the historic wagon ruts or viewing interpretive signs, are popular activities with many visitors to the Grasslands.

Activities that visitors to the Grasslands participate in include driving to view the scenery, dispersed camping and picnicking, hunting and fishing and a variety of specialized activities including bird watching and nature study. Because of the mild climate of the Grasslands, recreation use occurs on a year-round basis with spring and fall activities very popular when the weather of the Grasslands is milder and use of the National Forests is often curtailed.

### ***Special Areas***

#### ***Wild and Scenic Rivers***

The Wild and Scenic Rivers Act of October 2, 1968 provided for a National Wild and Scenic Rivers System to protect and preserve in a free-flowing condition certain rivers which possess outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural, or other similar values. In the Nationwide Inventory of Potential Wild and Scenic Rivers, the Cimarron River on the Cimarron National Grassland was listed as potentially eligible for designation. A 33-mile segment (from the Colorado-Kansas border to the point where the river exits the Cimarron National Grassland and one-fourth of a mile from each bank for the length of the stream) was identified as the study corridor.

Based on the guidelines for evaluating rivers for possible inclusion in the Wild and Scenic Rivers Act, the Cimarron River was determined not to be eligible due to lack of sufficient water to permit full enjoyment of water-related outdoor recreation activities envisioned in the Wild and Scenic Rivers Act.

#### ***Experimental Areas***

The Southeastern Colorado Research Center is located approximately nine miles southwest of Springfield, Colorado, in Baca County. The Center is under special use permit to the Colorado State Board of Agriculture for the benefit and use of Colorado State University, Fort Collins, Colorado, to: conduct applied research on methods of preventing and controlling wind erosion on crop and rangeland in southeastern Colorado; experiment with various grazing systems and conduct range management studies; evaluate these methods in terms of costs and benefits to the farmer and rancher, and; establish time-tried and economically feasible systems of crop rotation,

tillage management and reseeding which will minimize hazards of wind erosion and thereby stabilize the agricultural economy of the area.

### ***Research Natural Areas***

Two RNA's exist or are proposed on the Comanche and Cimarron National Grasslands. These RNA's are the Campo on the Comanche NG and the Cimarron on the Cimarron NG. These two areas are fully discussed in the Geographic Zone descriptions in Appendix D.

### ***Special Interest Areas***

Two Special Interest Areas occur on the Comanche NG. These are the Comanche Lesser Prairie Chicken Zoological Area and the Carrizo Botanical Area. There are no Special Interest Areas on the Cimarron NG. The two Special Interest Areas are fully described and discussed in the Geographical Zone Descriptions and the Specialist's Report.

The same applies to the Experimental Areas, RNA's and Special Interest Areas on the Grasslands as it does on the mountain areas. In most cases there will be restrictions that provide for NSO, CSU, timing or a combination of all three.

### ***Mineral Resources***

Federally-owned leasable minerals include fossil fuels (coal, oil, gas, oil shale, etc.), geothermal resources, potassium, sodium, carbon dioxide, phosphates, and sulphur in New Mexico and Louisiana. These minerals are subject to exploration and development under leases, permits or licenses granted by the Secretary of the Interior.<sup>29</sup> <sup>30</sup> <sup>31</sup> <sup>32</sup>

Oil and gas, as well as other leasable products, have been produced extensively in the Comanche and Cimarron National Grasslands. Helium and natural gas liquids are produced at several facilities. About 26 percent of the ownership of oil and gas on both the Comanche and Cimarron National Grasslands exists in outstanding rights, or non-federal ownership. Currently there are two producing and five "shut-in" gas fields on the Carrizo Unit of Comanche National Grassland. Twenty-three oil and gas fields are producing on Cimarron National Grassland. It overlies one of the world's largest known accumulations of natural gas. This field, the Hugoton Known Geologic Structure, is over four million acres and has been producing both oil and gas since 1923. In 1981 Morton County, Kansas, oil production exceeded 1.7 million barrels; gas production surpassed 49 million cubic feet.

### ***Previous and/or Existing Oil and Gas Activities***

The Forest Service has been involved with the Implementation of the Mineral Reversion Management Procedures by the Regional Forester, Region-2, dated August 11, 1983, for the Comanche and Cimarron National Grasslands. The mineral reversion program on the Grasslands pertains to the expiration of mineral reservations made during the acquisition of lands under the Bankhead-Jones Farm Tenant Act by the United States.

During the land acquisition programs of the Department of Agriculture's Resettlement Administration in the 1930's, a significant number of properties were acquired by the United States subject to a reservation of mineral interests for a specific number of years. In most cases the vendor also reserved rights to use the surface in conjunction with development, production, and marketing of the reserved minerals. A mineral reservation is a mineral right retained by a grantor in a deed conveying land to the United States. A grantor or seller in this case sold the parcels of land to the

United States and reserved their mineral holdings for a definite period, from 40 years to 100 years, with the most common term being 50 years.

In most cases, the language in the Warranty Deeds and other conveyance documents provides for a self-operative reversion of the mineral rights to the United States. A small percentage of variations were used which extended the reservation if production of oil and gas and other minerals was occurring at the agreed upon date of reversion.

The United States purchased a number of private lands under the provisions of Title III of the Bankhead-Jones Farm Tenant Act which were subject to existing outstanding minerals. An outstanding mineral right is a mineral right owned by a party other than the surface owner (grantor/seller) at the time the land surface is conveyed to the United States. Outstanding mineral rights including some producing privately-owned oil and gas leases are valid existing rights which must be verified and honored by the BLM before a lease can be issued for reverting minerals.

Many of these properties are now producing oil and gas under private leases. In accordance with the conveyance documents, all mineral development of reserved minerals was subject to rules and regulations of the Secretary of Agriculture. The first of these reserved interests began to revert to the United States in 1985 and will continue into the mid and late 1990's. There will be a significant increase in revenue credited to the general USDA Forest Service account as a result of these reversions.

Oil and gas interests have been developed extensively within the Grasslands. In 1979, Morton County oil production exceeded 45 million barrels, and gas production surpassed 67 billion cubic feet, with a value of approximately \$613 million. Formations of Permian, Upper and Lower Pennsylvania, and Upper Mississippian age are the sources for the oil and gas. The oil and gas reservoirs are found in the stratigraphic traps in this area.

Production methods vary in the Grasslands. Several fields are new while others are subject to controlled waterflooding. The number of secondary methods of recovery will continue to increase as the rates of recovery decrease.

The potential for discovery of hydrocarbons appears to be high. The Pennsylvania and Mississippian formations, which are currently producing, probably contain additional reserves. Adequate formation testing has not been conducted below the current production zones; however, these rocks do have favorable conditions and structure for hydrocarbon accumulation. Helium and natural gas liquids are produced at several local facilities. Helium is processed from gas recovered from the Greenwood Gas Area and the Sparks Field. The helium potential is considered high and extends into southeast Colorado. Natural gas liquids produced include propane, ethane, liquids petroleum gas, and natural gasoline.<sup>33</sup>

### *Transportation*

Road mileages on the Comanche National Grassland are not precise. Geographic zones 9, 10, and 11 are located on the Comanche National Grassland. These are lands acquired from homesteaders during dust bowl days of the 1930's and 1940's. Most roads are on section lines or access old home sites. Since most roads are on proclaimed county rights of way and are primarily farm to market roads, they have not been maintained on the Transportation Inventory System (TIS). Roads listed on the TIS are primarily roads in which the Forest Service has a direct interest for maintaining investment. The TIS lists approximately 613 miles of roads; road miles and densities for these geographic zones are not included since most roads are not on the inventory.

Road mileages on the Cimarron National Grassland are also not precise. Geographic zones 12 and 13 are located in Morton County, Kansas on either side of the Cimarron River. Like the Comanche Grassland, the Cimarron Grassland consists of acquired homesteads. However, the land line situation is quite confused since virtually all monumentation was lost prior to and during the Dust Bowl days of the 1930's and 1940's. Roads often are the only "monumentation" remaining. Many roads are on section lines or access old home sites. Since many roads are on proclaimed county rights of way and were primarily farm to market roads, they have not been maintained on the Transportation Inventory System (TIS). Roads listed on the TIS are primarily roads in which the Forest Service has a direct interest for maintaining investment. The Grasslands staff is presently attempting to document and enter the road system on the TIS to facilitate oil and gas development. The TIS lists approximately 225 miles of roads; road miles and densities for the geographic zones are not included since most roads are not on the inventory.

### ***Special Uses***

#### ***Existing Long-Term Special Uses***

Currently there are approximately 278 special use permits authorizing private and/or public use of 6,217 acres of National Forest System lands on the Comanche and Cimarron National Grasslands<sup>34</sup>. Oil and gas pipelines are the major type of special use on the Grasslands. Communication uses are also important.

For additional information on the various types of special uses on the Grasslands, refer to Exhibit III-11 in this chapter.

### ***AFFECTED ENVIRONMENT BY GEOGRAPHIC ZONES (LEVEL 3)***

Geographic Zones were developed for this Environmental Impact Statement (EIS) by the Interdisciplinary Team (IDT) using an ecosystem concept to delineate homogeneous areas [see Figure III-2]. The criteria used to determine and delineate these homogeneous areas was: landform, geology, climate, vegetation, and soils. The Geographic Zones were used to validate the stipulations [see Appendix D].

The following information describes the ecologic and physical characteristics for each of the 13 Geographic Zones of the mountain and grassland environments. Geographic Zones 1 through 8 are contained within the mountain environment, Geographic Zones 9 through 13 are contained within the grassland environment. [See Appendix D for more detailed descriptions.]

#### **The Mountain Environment**

##### ***Geographic Zone 1***

This analysis area is located in Lake and Chaffee Counties, Colorado. It encompasses the Sawatch Range of the Continental Divide and lower-positioned landforms along the Upper Arkansas River valley. Its size is approximately 353,376 acres of NFS lands.

The landscape is generally characterized as steep mountainous terrain with glacier-carved valleys that are typically broad at the lower edges and become increasingly steeper as they approach rugged cirque topography. Ridgecrests are narrow and inclined toward the higher mountain

summits. Upper elevations above timberline consist of undulating land surfaces of alpine ecosystems that terminate at the steep rock faces of mountain peaks. Geology includes igneous, metamorphic, and sedimentary rock types as well as transported materials from glacial and fluvial processes. Slope gradients generally range from 0 to 40 percent on depositional landforms which include glacial moraines and alluvial terraces. Residual mountain side slopes of 25 to 60 percent are common throughout the area, and nearly vertical slopes are often associated with rock escarpments.

Climate is characterized by warm summers and cold winters with short growing seasons. A wide range in climatic conditions is largely attributed to variability in physiography and elevation. Lower elevations (8,000 to 10,000 feet) generally have a mean annual precipitation range of 15 to 20 inches, and upper elevations (10,000 to greater than 14,000 feet) have a range of 20 to 30 inches or more in certain locations.

### ***Geographic Zone 2***

This analysis area is located in Las Animas, Huerfano, Custer, Fremont and Chaffee Counties, Colorado. Its size is approximately 225,939 acres of NFS lands. It is geographically divided by watersheds on both sides of the Wet Mountain and Cucharas River valleys that contain some of the most rugged and spectacular mountain scenery in the Rocky Mountain Region. These areas include the southern end of the Wet Mountain Range which is the eastern extent of the Rocky Mountains, the Sangre De Cristo Range, and the prominent Spanish Peaks which are a pair of volcanic plugs which rise sharply from the surrounding plains.

Landscapes are generally characterized as steep mountainous terrain with glacier carved valleys and cirque topography, narrow ridges that are inclined toward mountain summits, undulating to moderately sloping foothills, and dissected upland plateaus with steep canyon escarpments. Upper elevations above timberline consist of undulating land surfaces of alpine ecosystems that terminate at the steep rock faces of mountain peaks. Geology includes igneous, metamorphic, and sedimentary rock types as well as transported materials from glacial and fluvial processes. Slope gradients generally range from 0 to 40 percent on depositional landforms which include glacial moraines and alluvial terraces. Residual mountain side slopes of 25 to 60 percent are common throughout the area, and nearly vertical slopes are often associated with rock escarpments.

Climate is characterized by warm summers and cold winters with wide seasonal variation and short growing seasons. A wide range in climatic conditions is largely attributed to variability in physiography and elevation. Lower elevations (8,000 to 10,000 feet) generally have a mean annual precipitation range of 15 to 20 inches, and upper elevations (10,000 to greater than 14,000 feet) have a range of 20 to 30 inches or more in certain locations.

### ***Geographic Zone 3***

This analysis area is located in Pueblo, Custer, Fremont, Chaffee and Park Counties, Colorado. Its size is approximately 304,200 acres of NFS lands. It is geographically divided by various watersheds in the Upper Arkansas River valley including the Arkansas Hills; as well as watersheds in the Wet Mountain Range north of Greenhorn Mountain, which drain to the northeast.

Landscapes are generally characterized by upland plateaus, rugged foothills, and lower mountainous terrain which have been dissected by numerous drainages with steep canyons and rough topography. Geology within this geographic zone primarily consists of igneous and metamorphic rock types (granite, gneiss, schist), although sedimentary rock layers as well as transported glacial and fluvial materials occur in localized valleys. Slope gradients range from 0 to 40 percent over

most of the upland plateaus and broad ridgetops. Steep slopes of 40 to 70 percent occur around mountain peaks, canyon escarpments, and rugged rockland topography.

Climate is characterized by warm summers and cold winters with wide seasonal variation. Precipitation patterns are probably influenced most by topographic features from other geographic areas. Lower elevations (7,000 to 9,000 feet) have a mean annual precipitation range of 12 to 16 inches, and higher elevations (9,000 to 10,500 feet) have a range of 16 to 25 inches.

#### ***Geographic Zone 4***

This analysis area is located in western El Paso County and Teller County, Colorado. Its size is approximately 140,072 acres of NFS lands. It is comprised of Pikes Peak and surrounding mountains, the southern portion of Rampart Range, and inclusions of depositional fans lying east of Manitou Park.

Landscapes consist of moderately sloping valleys and dissected plateau land to very steep, sharply breaking escarpments and steep mountain slopes. Geology is almost exclusively Pikes Peak granite and depositional materials derived from granitic sources. The granite weathers into large coarse-grained crystals with little binding material. Slope gradients generally range from 20 to 50 percent over most landforms. Steep slopes of 40 to 70 percent occur around mountain peaks and rocky escarpments, and minor areas of 0 to 15 percent slopes are generally confined to valley bottoms and ridges.

Climate is characterized by warm summers and cold winters. Precipitation patterns are influenced by topographic features and elevation. Lower elevations (7,000 to 10,000 feet) have a mean annual precipitation range of 15 to 20 inches, and higher elevations (10,000 to 14,000 feet) have a range of 20 to 25 inches with certain locations receiving up to 30 inches.

#### ***Geographic Zone 5***

This analysis area is located in Teller, Park, Douglas and Jefferson Counties, Colorado. Its size is approximately 346,608 acres of NFS lands. It covers most of the Rampart Range north to the South Platte River Canyon and a portion of land east of Mt. Evans Wilderness, and adjacent lands to the west including the 'eastern foothills' of the Tarryall mountains and Lost Creek Wilderness.

Landscapes consist of moderately sloping valleys and dissected plateau land to rolling hills and steep mountain slopes. Geology is almost exclusively Pikes Peak granite except for areas of gneiss and biotite schist on the western edge, and depositional materials in valley bottoms. Slope gradients range from 20 to 50 percent over most landforms. Steep slopes of 40 to 70 percent occur around mountain peaks and rocky escarpments. Gently sloping landforms with 0 to 15 percent slopes include ridges and alluvial fans.

Climate is characterized by warm summers and cold winters. Precipitation patterns are influenced by topographic features and elevation. Lower elevations (7,000 to 8,500 feet) have a mean annual precipitation range of 12 to 16 inches, and higher elevations (8,500 to 10,000 feet) have a range of 16 to 25 inches.

#### ***Geographic Zone 6***

This analysis area is located in Park County, Colorado. Its size is approximately 44,681 acres of NFS lands. The area lies in the southwest corner of the Pike National Forest, extending northeast from Black Mountain beyond Thirty-nine Mile Mountain to the vicinity of Saddle Mountain.



Landscapes consist of moderately sloping U-shaped valleys and dissected plateau land to rolling hills and steep mountain side slopes. Geology is primarily extrusive igneous (andesite, rhyolite, volcanic conglomerates) and depositional materials in valley bottoms. Slope gradients generally range from 15 to 40 percent over most landforms with shapes that are concave and smooth. Steep slopes of 40 to 60 percent occur around mountain peaks and rocky escarpments. Gently sloping landforms with 0 to 15 percent slopes include ridges and valley bottomland.

Climate is characterized by warm summers and cold winters with wide seasonal variation and short growing seasons. Precipitation patterns are probably influenced most by topographic features from other geographic areas. Lower elevations (8,500 to 10,000 feet) have a mean annual precipitation range of 12 to 16 inches, and upper elevations (10,000 to 12,000 feet) have a range of 16 to 25 inches.

### ***Geographic Zone 7***

This analysis area is located in Park County, Colorado. Its size is approximately 182,235 acres of NFS lands. It lies west of Lost Creek Wilderness and includes portions of the Kenosha Mountains and Tarryall Mountains extending south beyond the Puma Hills to the Elevenmile Canyon area.

Landscapes are generally characterized as undulating broad ridges and dissected plateau land to rolling hills and moderately steep mountain slopes. Geology consists of both igneous and metamorphic rocks (granite, gneiss, biotite schist). An area of Pikes Peak granite occurs west of Lake George in the vicinity of Elevenmile Canyon, and alluvial deposits are found in valley bottoms. Slope gradients range from 10 to 50 percent over most landforms. Steep slopes of 40 to 70 percent occur around mountain summits and rocky escarpments. Nearly level to gently sloping landforms with 0 to 15 percent slopes include ridges, plateaus, and valley bottomland.

Climate is characterized by warm summers and cold winters with wide seasonal variation and short growing seasons. Precipitation patterns are probably influenced most by topographic features and elevation. Lower elevations (7,000 to 9,000 feet) have a mean annual precipitation range of 12 to 16 inches, and upper elevations (9,000 to 11,000 feet) have a range of 16 to 25 inches.

### ***Geographic Zone 8***

This analysis area is located in Park and Summit Counties, Colorado. Its size is approximately 239,532 acres of NFS lands. It lies along a north-south ridge between the Arkansas and South Platte River drainages from the Continental Divide to the northern edge of the Arkansas Hills. The mountainous terrain which comprises most of this area is often referred to as the Mosquito Range.

The landscape is generally characterized as an asymmetrical anticline, gently sloping on the east and steeply faulted on the west. This expansive ridge is highlighted by two highly eroded volcanic mountains (Buffalo Peaks) with steep talus slopes and areas of rock outcrop around their summits. Geology within this geographic zone covers a wide range of igneous, metamorphic, and sedimentary rock types as well as transported materials from glacial and fluvial processes. Slope gradients range from 0 to 40 percent along the broad ridgetops and glacial foothills. Steep slopes of 40 to 70 percent occur around mountain peaks, canyon escarpments, and rugged rockland topography.

Climate is characterized by warm summers and cold winters with wide seasonal variation and short growing seasons. Annual precipitation is influenced by topographic features and elevation. Lower elevations (7,000 to 10,000 feet) generally have a mean annual precipitation range of 15 to 20 inches, and upper zones (10,000 to greater than 13,000 feet) have a mean annual precipitation range of 20 to 30 inches with certain locations receiving up to 40 inches.

## **The Grassland Environment**

### ***Geographic Zone 9***

This analysis area is located in southeastern Colorado in Otero, Las Animas and Baca Counties. Its size is approximately 113,030 acres of NFS lands. It is comprised of Timpas Creek, East Purgatoire River, and Mustang Creek watershed portions of the Comanche National Grasslands (Otero and Las Animas counties).

The landscape is characterized as nearly level to gently undulating upland plains which are dissected by drainageways with moderately steep to steep canyon escarpments and rocky bluffs. Slope gradients generally range from 0 to 15 percent on the plains and 15 to 30 percent on scarp slopes. Steeper slope inclusions up to approximately 60 percent are typically associated with rock outcrop areas.

The area has a semiarid climate with mean annual precipitation ranging from 12 to 15 inches. Native vegetation is dominantly short-grass prairie with scattered juniper woodland associated near scarp slopes and rough topography.

### ***Geographic Zone 10***

This analysis area is located in southeastern Colorado in Las Animas and Baca Counties. Its size is approximately 159,718 acres of NFS lands. It is comprised of Bear Creek and Sand Arroyo watershed portions of the Comanche National Grasslands (Carrizo Unit).

The landscape is characterized as nearly level to gently undulating uplands, and composition is split between loamy "hardlands" and sandy plains. Slope gradients range from 0 to 10 percent, but slightly steeper slopes may occur in narrow drainageways.

The area has a semiarid climate with mean annual precipitation ranging from 13 to 16 inches. Relatively fertile soils support native mid and short grass prairies.

### ***Geographic Zone 11***

This analysis area is located in southeastern Colorado in Baca and Las Animas Counties. Its size is approximately 146,349 acres of NFS lands. It is comprised of the Carrizo Creek watershed portion of the Comanche National Grasslands (Carrizo Unit).

The landscape is characterized as nearly level to gently undulating uplands which are dissected by drainageways with strongly sloping to moderately steep canyon escarpments and rocky bluffs. Composition of the upland plains is split between loamy "hard lands" and sandy plains with slope gradients of 0 to 10 percent. The canyon lands generally comprise the southwestern corner of the Carrizo Unit and slopes commonly range from 10 to 30 percent. Steeper slopes are often associated with sandstone outcroppings.

The area has a semiarid climate with mean annual precipitation ranging from 14 to 16 inches. Native vegetation consists of mid and short grass prairies with scattered juniper woodland areas associated near canyon escarpments and steeper terrain.

### ***Geographic Zone 12***

This analysis area is located in Morton County in the southwestern part of Kansas. Its size is approximately 9,600 acres of NFS lands.

The northern portion of the Cimarron National Grassland is characterized by undulating topography along the North Fork of the Cimarron River, and a relatively flat upland plain which extends to the northern boundary of the grassland. The nearly level to gently sloping upland landscape is comparatively featureless with slope gradients generally under 5 percent. Some dissection exists from drainageways, and gully formations are common.

The area has a semiarid climate with mean annual precipitation ranging from 15 to 17 inches. Native vegetation consists of mid and short grass prairie.

### ***Geographic Zone 13***

This analysis area is located in southwestern Kansas in Morton and Stevens Counties. Its size is approximately 98,108 acres of NFS lands.

The southern portion of the Cimarron National Grassland is characterized by the flood plain and river escarpments on both sides of the Cimarron River channel, comparatively minor areas of loamy "hard lands", and extensive areas of rolling to hilly sandy uplands. Relief is nearly level to undulating with slope gradients ranging from 0 to 15 percent, but hummocky sand hills with dune-like relief can have slope inclusions up to 30 percent. Moisture is readily absorbed so there is not much runoff to develop pronounced drainage patterns.

The area has a semiarid climate with mean annual precipitation ranging from 15 to 17 inches. These sandy lands are considered fertile and support native tall and mid grasses, but moisture is the limiting factor in the growth of most plants.

## ***RFD WELL SITES - AFFECTED ENVIRONMENT (LEVEL 4)***

### **Introduction**

This part of the chapter describes the environment affected by the "reasonable foreseeable post-leasing activity" required in the Oil & Gas Regulations. This reasonably foreseeable development (RFD) includes exploratory and development wells distributed on the unit. In the RFD, wells were specifically located on the mountains. The grasslands wells were distributed based on major soil types (Ecosystem) as described in Appendix C. Those are: Hard lands, Sandy lands, Canyon lands, and Riparian. This information is tiered to the affected environments discussed earlier, as it continues to refine specificity. Additional information can be found in the individual resource Specialist Reports.

The individual well information on the Mountains will be more specific than the environment described on the Grasslands. This is because the variety of environments and effects (road distances, slopes, etc.) is so much greater on the mountains. Statistical analysis of the existing Oil and Gas program on the Grasslands indicated a high level of consistency in the site disturbance related to exploration and development across all soil/ecosystem types. Based on that information, the disclosure of effects in Chapter IV will be at the soil/ecosystem type level

Effects on the Mountains, for both BLM RFD and Concentrated RFD, will be discussed at the "Mountain" (Sub-Unit) level, but developed from the site-specific well analysis. Individual wells may be discussed but they will be in the context of the Forest-wide (Unit) program.

There are two "Concentrated RFD" affected environments because of the four different alternative management scenarios. Alternatives I and III restrict the placement of wells in environmentally

sensitive areas based on stipulations developed by the Interdisciplinary Team (IDT) [see Appendix B]. Alternatives II and IV allow well sites in these areas. Thus, the site-specific affected environments are slightly different between these alternatives.

## The Mountain Environment

### BLM RFD

**Table III-8  
BLM RFD Well Descriptions - All Alternatives**

| Well# | Vegetation Type      | Aspect | % Slope | Suitable (Timber) | % Vegetative Cover | Conflicting Special Uses   |
|-------|----------------------|--------|---------|-------------------|--------------------|----------------------------|
| 1     | Ponderosa            | E      | 16      | No                | 50                 | Electric distribution line |
| 2     | Ponderosa Mtn. grass | ESE    | 20      | No                | 80-100             | None                       |
| 3     | Douglas-fir          | S      | 6       | Yes               | 80-100             | None                       |
| 4     | Ponderosa            | E      | 6       | No                | 50-60              | None                       |

**Well 1** (Wet Mountains, T.20S., R.70W., NW1/4 SW1/4 Sec. 4)

The site has a vegetation cover of primarily Ponderosa Pine. It is on a East aspect, and is not suitable for timber production.

The drill pad and access road occur on moderate slopes surrounded by steep terrain, and moderately deep residual soils in this area have properties with moderate management limitations. A typical undisturbed site on a 16 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.4 tons/acre/year.

There are no critical winter ranges, Big Game production areas, Threatened and Endangered (T&E) species habitat areas or critical Management Indicator Species (MIS) habitat in the area.

It is located in the drainages of an Unnamed Tributary and Oak Creek. No known T&E fish species exist in these drainages at this time. These drainages are below their sediment threshold limits.

The area around the well site is generally used for dispersed recreational activities (i.e., hiking, hunting, sightseeing, etc.). The site is adjacent to the Oak Creek Road, and is visible from the Stultz Creek trail. The site is also adjacent to an electric distribution line.

There are no known cultural, paleontological, or cave resources at this location at the present time.

**Well 2** (Tarryall Mountains, T.9S., R.74W., SW1/4 NE1/4 Sec. 6)

The site is covered with a dense cover on Ponderosa Pine. The access road crosses through sparse vegetation and openings of mountain grass. It has a east by southeast aspect and is not suitable for timber production.

The drill pad and access road occur on gentle to moderate slopes, and the shallow residual soils in this area have properties with moderate management limitations. A typical undisturbed site on a 20 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.1 tons/acre/year.

There are no critical winter ranges, Big Game production areas, Threatened and Endangered (T&E) species habitat areas or critical Management Indicator Species (MIS) habitat in the area.

It is located in the drainages of Hall Gulch and Tarryall Creek. No known T&E fish species exist in these drainages at this time. These drainages are below their sediment threshold limits.

The area around the well site is generally used for dispersed recreational activities (i.e., hiking, hunting, sightseeing, etc.). The site is visible from the Rock Creek Hills road and as middleground from the Lost Creek Wilderness.

There are no known cultural, paleontological, or cave resources at this location at the present time.

**Well 3** (Rampart Range, T.13S., R.67W., NE1/4 SE1/4 Sec. 6)

The site has relatively dense vegetation cover of Douglas-fir. It is on a southern exposure, and is suitable for timber production.

The drill pad and access road occur on gentle to moderately steep slopes with shallow, granitic soils of the Pikes Peak formation. Although soils in this area are considered highly erodible, moderate slopes reduce the risk for significant impacts and increase the effectiveness of erosion-control measures. Surrounding areas have steeper slopes associated with rock outcrop, and soils are considered fragile with severe management implications. A typical undisturbed site on a 6 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.04 tons/acre/year.

The site is located within a Mule Deer Winter Range.

It is located in the drainage of Monument Creek, which drains into Monument Lake. The drainage is within 10% of exceeding its sediment threshold limits at the present time.

The area around the well site is generally used for dispersed recreational activities (i.e., hiking, hunting, sightseeing, etc.). The site is visible from the Rampart Range Road.

There are no known cultural, paleontological, or cave resources at this location at the present time.

**Well 4** (Rampart Range, T.11S., R.67W., SW1/4 NE1/4 Sec. 21)

The site has a vegetative cover of primarily Ponderosa Pine. It has a eastern aspect, and is not suitable for timber production.

The drill pad and access road occur on a deep, non-fragile soil on gentle slopes of an alluvial fan. Soil properties on this landform have slight limitations for management activities even though surrounding areas have steeper slopes associated with rock outcrop, and soils are considered fragile with severe management implications. A typical undisturbed site on a 6 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.04 tons/acre/year.

There are no critical winter ranges, Big Game production areas, Threatened and Endangered (T&E) species habitat areas or critical Management Indicator Species (MIS) habitat in the area.

It is located in the drainages of an Unnamed Tributary and Oak Creek. No known T&E fish species exist in these drainages at this time. These drainages are within 10% of, or exceeding, its sediment threshold limits.

The area around the well site is generally used for dispersed recreational activities (i.e., hiking, hunting, sightseeing, etc.). The site is visible from County Road 105, the Mount Herman Road, and possibly I-25. It is a relatively flat site with natural openings nearby.

The location is in the vicinity of the Monument Nursery, a significant cultural resource containing multiple values, and also potential recreational and interpretive values. There are no known cultural, paleontological, or cave resources at the specific well site at this time.

**Concentrated RFD (for Alternatives I and III)**

**Table III-9  
Concentrated RFD Well Descriptions - Alternatives I & III**

| Well# | Vegetation Type | Aspect | % Slope | Suitable (Timber) | % Vegetative Cover | Conflicting Special Uses |
|-------|-----------------|--------|---------|-------------------|--------------------|--------------------------|
| 1R    | Douglas-fir     | SW     | 35      | No                | 80-100             | None                     |
| 2R    | Ponderosa       | SSW    | 16      | No                | 60-100             | None                     |
| 3R    | Douglas-fir     | NNE    | 25      | No                | 80-100             | None                     |
| 4R    | Lodgepole       | E      | 8       | Yes               | 40-100             | None                     |

**Well 1R (T.9S., R.69W., SW1/4, SE1/4, Sec. 21)**

The site has a dense vegetation cover of Douglas-fir. It is on a southwest aspect, and is not suitable for timber production.

The drill pad and access road occur on moderate slopes, and the shallow residual soils in this area have properties with moderate management limitations. A typical undisturbed site on a 35 percent slope with 80 percent ground cover has a soil loss rate of approximately 1.5 tons/acre/year. Potential soil loss after disturbance would increase to about 17 tons/acre/year which exceeds the soil loss tolerance rate.

The site is located within a Winter Turkey Concentration Area (Meriam Turkeys).

It is located in the drainage of Jackson Creek. There is a self-sustaining population of brook and rainbow trout in Jackson Creek. It has also been identified as exceeding its sediment threshold limit.

The site is located in the proximity of recreation developments that include Jackson Creek Campground, Devils Head Campground, Topaz Point Picnic Ground, Devils Head Lookout, and the Devils Head National Recreation Trail. The area around the well site is generally used for dispersed activities (i.e., hunting, hiking, sightseeing, etc.). The well site is adjacent to a natural opening, and visibility of the site is limited. The access road travels through dense vegetative cover.

There are no known cultural, paleontological, or cave resources at this location at the present time.

**Well 2R** (T.9S., R.69W., NE1/4,SW1/4, Sec. 22)

The site has a relatively dense vegetation cover of Ponderosa Pine. It is on a south by southwest aspect, and is not suitable for timber production.

The drill pad and access road occur on gentle to moderately steep slopes, and the shallow residual soils in this area have properties with moderate management limitations. A typical undisturbed site on a 16 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.5 tons/acre/year.

The site is located within a Winter Turkey Concentration Area (Meriam Turkeys).

It is located in the drainages of Jackson Creek and North Jackson Creek. There is a self-sustaining population of brook and rainbow trout in Jackson Creek. It has also been identified as exceeding its sediment threshold limit. North Jackson creek has been managed as a greenback cutthroat trout fishery for the last several years. The greenback cutthroat trout is a federally listed "Threatened" species and is protected under the Endangered Species Act.

The site is located in the proximity of recreation developments that include Jackson Creek Campground, Devils Head Campground, Topaz Point Picnic Ground, Devils Head Lookout, and the Devils Head National Recreation Trail. The area around the well site is generally used for dispersed activities (i.e., hunting, hiking, sightseeing, etc.). The well site is not visible from the Rampart Range or Jackson Creek Roads. The access road travels through dense vegetative cover.

There are no known cultural, paleontological, or cave resources at this location at the present time.

**Well 3R** (T.9S., R.69W., SW1/4,SE1/4, Sec. 14)

The site is located in relatively dense vegetative cover of Douglas-fir. It is on a north by northwest aspect, and is not suitable for timber production.

The drill pad and access road occur on moderate slopes, and the shallow residual soils in this area have properties with moderate management limitations. A typical undisturbed site on a 25 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.9 tons/acre/year. Potential soil loss after disturbance would increase to about 5 tons/acre/year which exceeds the soil loss tolerance rate.

The site is located within a Winter Turkey Concentration Area (Meriam Turkeys).

It is located in the drainages of Jackson Creek and Watson Park Creek. There is a self-sustaining population of brook and rainbow trout in Jackson Creek. It has also been identified as exceeding its sediment threshold limit.

The site is located in the proximity of recreation developments that include Jackson Creek Campground, Devils Head Campground, Topaz Point Picnic Ground, Devils Head Lookout, and the Devils Head National Recreation Trail. The area around the well site is generally used for dispersed activities (i.e., hunting, hiking, sightseeing, etc.). The well site is not visible from the Devils Head Lookout.

There are no known cultural, paleontological, or cave resources at this location at the present time.

**Well 4R** (T.9S., R.69W., SW1/4,SE1/4, Sec. 26)

The site is located in Lodgepole Pine vegetation which has pockets of dense areas and scattered (less dense) areas. It is on an east aspect, and it is suitable for timber production.

The drill pad and access road occur on gentle slopes, and the shallow residual soils in this area have properties with moderate management limitations. A typical undisturbed site on a 8 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.2 tons/acre/year. Potential soil loss after disturbance would increase to about 3 tons/acre/year which exceeds the soil loss tolerance rate.

The site is located within a Winter Turkey Concentration Area (Meriam Turkeys).

It is located in the drainage of Jackson Creek. There is a self-sustaining population of brook and rainbow trout in Jackson Creek. It has also been identified as exceeding its sediment threshold limit.

The site is located in the proximity of recreation developments that include Jackson Creek Campground, Devils Head Campground, Topaz Point Picnic Ground, Devils Head Lookout, and the Devils Head National Recreation Trail. The area around the well site is generally used for dispersed activities (i.e., hunting, hiking, sightseeing, etc.). The well site is not visible from the Devils Head Lookout.

There are no known cultural, paleontological, or cave resources at this location at the present time.



**Concentrated RFD (for Alternatives II and IV)**

**Table III-10  
Concentrated RFD Well Descriptions - Alternatives II & IV**

| Well# | Vegetation Type     | Aspect | % Slope | Suitable (Timber) | % Vegetative Cover | Conflicting Special Uses              |
|-------|---------------------|--------|---------|-------------------|--------------------|---------------------------------------|
| 1C    | Rock<br>Douglar-fir | S      | 50      | No                | 80-100             | None                                  |
| 2C    | Douglas-fir         | SW     | 50      | No                | 80-100             | None                                  |
| 3C    | Douglas-fir         | W      | 40      | No                | 80-100             | Jackson Creek<br>Summer Home<br>Group |
| 4C    | Douglas-fir         | NW     | 40      | No                | 80-100             | Jackson Creek<br>Summer Home<br>Group |

**Well 1C** (T.9S., R.69W., NW1/4 NW1/4 Sec. 22)

The site has dense areas of Douglas-fir with areas of rock. It is on a southern aspect, and is not suitable for timber production.

The drill pad and access road occur on shallow, granitic soils of the Pikes Peak formation that are associated with steep slopes and rock outcrop. Soil properties are considered fragile and management implications reflect severe limitations. A typical undisturbed site on a 50 percent slope with 80 percent ground cover has a soil loss rate of approximately 2.2 tons/acre/year which indicates natural erosion on steep slopes is already exceeding soil loss tolerance values.

The site is located within a Winter Turkey Concentration Area (Meriam Turkeys).

It is located within the drainages of Jackson Creek and North Jackson Creek. There is a self-sustaining population of brook and rainbow trout in Jackson Creek. It has also been identified as exceeding its sediment threshold limit. North Jackson creek has been managed as a greenback cutthroat trout fishery for the last several years. The greenback cutthroat trout is a federally listed "Threatened" species and is protected under the Endangered Species Act.

The site is located in the proximity of recreation developments that include Jackson Creek Campground, Devils Head Campground, Topaz Point Picnic Ground, Devils Head Lookout, and the Devils Head National Recreation Trail. The area around the well site is generally used for dispersed activities (i.e., hunting, hiking, sightseeing, etc.). The site and access road maybe visible from the Rampart Range and Jackson Creek roads. The access road is near a campground and crosses the National Recreation Trail twice.

The well location and access road is in the vicinity of Devils Head Lookout, a significant cultural resource with multiple significance values. There are no known cultural, paleontological, or cave resources at the specific site location at the present time.

**Well 2C (T.9S., R.69W., SW1/4 NE1/4 Sec. 22)**

The site has a dense vegetation cover of Douglas-fir. It is on a southwest aspect, and is not suitable for timber production.

The drill pad and access road occur on shallow, granitic soils of the Pikes Peak formation that are associated with steep slopes and rock outcrop. Soil properties are considered fragile and management implications reflect severe limitations. A typical undisturbed site on a 50 percent slope with 80 percent ground cover has a soil loss rate of approximately 2.2 tons/acre/year which indicates natural erosion on steep slopes is already exceeding soil loss tolerance values.

The site is located within a Winter Turkey Concentration Area (Meriam Turkeys).

It is located within the drainages of Jackson Creek and North Jackson Creek. There is a self-sustaining population of brook and rainbow trout in Jackson Creek. It has also been identified as exceeding its sediment threshold limit. North Jackson creek has been managed as a greenback cutthroat trout fishery for the last several years. The greenback cutthroat trout is a federally listed "Threatened" species and is protected under the Endangered Species Act.

The site is located in the proximity of recreation developments that include Jackson Creek Campground, Devils Head Campground, Topaz Point Picnic Ground, Devils Head Lookout, and the Devils Head National Recreation Trail. The area around the well site is generally used for dispersed activities (i.e., hunting, hiking, sightseeing, etc.). The site and access road maybe visible from the Rampart Range and Jackson Creek roads. The access road is near a campground and crosses the National Recreation Trail twice.

There are no known cultural, paleontological, or cave resources at this location at the present time.

**Well 3C (T.9S., R.69W., NW1/4 SE1/4 Sec. 23)**

The site has a dense vegetative cover of Douglas-fir. It is on a western aspect, and is not suitable for timber production.

The drill pad and access road occur on shallow, granitic soils of the Pikes Peak formation that are associated with steep slopes and rock outcrop. Soil properties are considered fragile and management implications reflect severe limitations. A typical undisturbed site on a 40 percent slope with 80 percent ground cover has a soil loss rate of approximately 1.6 tons/acre/year which indicates natural erosion on steep slopes is already exceeding soil loss tolerance values.

The site is located within a Winter Turkey Concentration Area (Meriam Turkeys).

It is located in the drainage of Jackson Creek. There is a self-sustaining population of brook and rainbow trout in Jackson Creek. It has also been identified as exceeding its sediment threshold limit.

The site is located in the proximity of recreation developments that include Jackson Creek Campground, Devils Head Campground, Topaz Point Picnic Ground, Devils Head Lookout, and the Devils Head National Recreation Trail. The area around the well site is generally used for dispersed activities (i.e., hunting, hiking, sightseeing, etc.). The first 1/4 mile of the access

road would be visible from Devils Head Lookout and Jackson Creek road (It passes through a solid canopy). The rest of the road and well site would not be seen. The well site is within 1/2 mile of the Jackson Creek Summer Home Group, and the access road goes through the area.

There are no known cultural, paleontological, or cave resources at this location at the present time.

**Well 4C** (T.9S., R.69W., NW1/4 SW1/4 Sec. 26)

The site has a dense vegetative cover of Douglas-fir. It is on a western aspect, and is not suitable for timber production.

The drill pad and access road occur on shallow, granitic soils of the Pikes Peak formation that are associated with steep slopes and rock outcrop. Soil properties are considered fragile and management implications reflect severe limitations. A typical undisturbed site on a 40 percent slope with 80 percent ground cover has a soil loss rate of approximately 1.6 tons/acre/year which indicates natural erosion on steep slopes is already exceeding soil loss tolerance values.

There are no critical Big Game production areas, T&E species habitat, or MIS in this area.

It is located in the drainage of Jackson Creek. There is a self-sustaining population of brook and rainbow trout in Jackson Creek. It has also been identified as exceeding its sediment threshold limit.

The site is located in the proximity of recreation developments that include Jackson Creek Campground, Devils Head Campground, Topaz Point Picnic Ground, Devils Head Lookout, and the Devils Head National Recreation Trail. The area around the well site is generally used for dispersed activities (i.e., hunting, hiking, sightseeing, etc.). The site is not visible from the Jackson Creek road, but possible from the Rampart Range Road. The well site and access road are in solid canopies. The well site is within 1/2 mile of the Jackson Creek Summer Home Group, and the access road goes through the area.

There are no known cultural, paleontological, or cave resources at this location at the present time.

### **The Grassland Environment**

The grasslands were divided up into 5 different geographic zones (discussed earlier in this chapter). Within each zone, there are different major soil/ecosystem types. These types are: Hard lands, Sandy lands, Canyon lands, and Riparian. RFD wells were distributed in these major soil/ecosystem types for analysis.<sup>35</sup> The following briefly describes the affected environment of these major soil/ecosystem types:

#### **Hard Lands**

These areas are characterized as nearly level to gently undulating upland plains comprised of loamy soil types. Soils have typically developed from sedimentary or igneous geology which has been overlain with loess deposits, and soil depth varies from shallow to deep. Loam surface textures and silty clay loam subsoils commonly contain high amounts of lime. These "hard land" soils are well drained and generally have moderate water-holding capacities. Short-grass prairie is the dominant vegetation types on these soils.

### ***Sandy Lands***

These areas are characterized as rolling to hilly uplands comprised of sandy soil types. Deep, excessively drained soils have developed from wind deposited eolian sands. Typical soil textures consist of sandy loam and loamy sand. Mid-grass and tall-grass prairies are the dominant vegetation types on sandy soils.

### ***Canyon Lands***

These areas consist of canyon escarpments and steeper terrain with shallow soils on rocky bluffs and deeper soils on colluvial footslopes. Soils on these landscapes have typically developed from sandstone parent materials, although some are associated with basalt breaks. Soil textures consist of stony sandy loams and limy loams; slightly heavier textures are derived from basalt materials. The dominant vegetation on these soils is short grasses and Pinyon-Juniper.

### ***Riparian***

Riparian areas are limited primarily to depressions in the landscape and narrow stream channels. Riparian soils are typically deep, young and weakly developed from alluvial deposits. The relatively small percentage of riparian areas is primarily the result of the semiarid conditions of the grasslands. Woody riparian vegetation includes primarily cottonwood, willow and salt cedar. Herbaceous plants that inhabit the area include those species that have evolved to withstand periodic droughts and desiccation in the semiarid conditions, as well as those that are restricted to the few permanent aquatic habitats available.

**Exhibit III-1  
Major Vegetation Types  
Forests and Grasslands**

The Forest Plan grouped and classified all Forest and Grassland vegetation into 13 vegetation types (Forest Plan, Chapter II, pages 15 to 25):

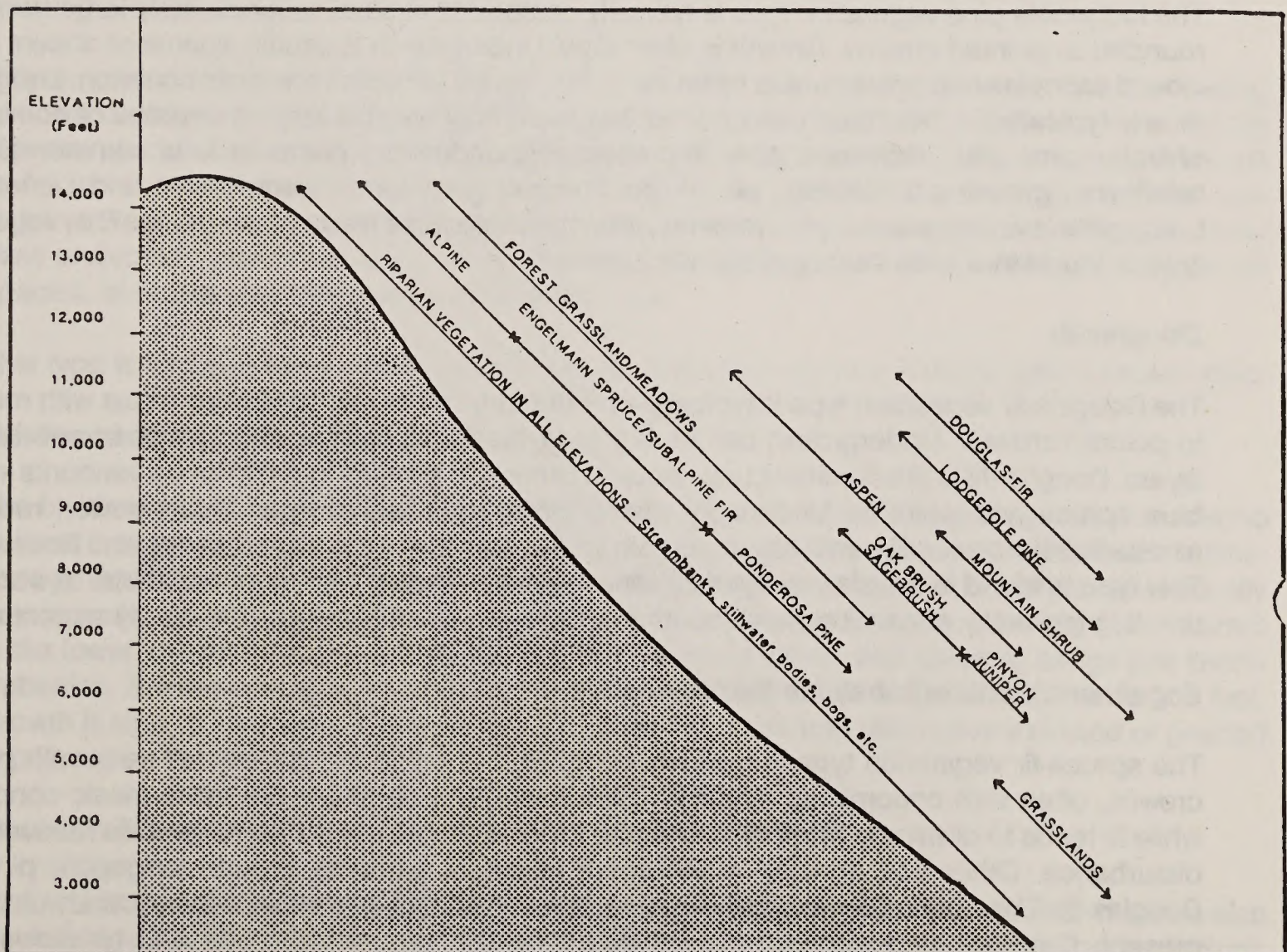
**Forest Types:** aspen, lodgepole pine, Douglas-fir, Engelmann spruce-subalpine fir (spruce-fir), ponderosa pine, pinyon-juniper. Bristlecone pine will be added to the forest types, as it is well-represented on the Forest.

**Non-forest Types:** sagebrush, mountain shrub, Gambel oak, Mountain grasslands and meadows, grasslands (Comanche and Cimarron National Grasslands). Mountain mahogany is usually the dominant mountain shrub on the Forest and provides valuable big game winter range. Therefore, mountain mahogany will be described in this section.

**Special Ecosystems:** Alpine (nonforest: on Forest only), Riparian (forest or nonforest: on Forest and Grasslands). Riparian is a habitat of special concern and will be discussed separately in the Fish Biologist's Specialist Report.

Figure III-3 below from Chapter II of the Forest Plan depicts the general elevational stages of Forest and Grassland vegetation.

**Figure III-3  
Elevational States of Vegetation**



## Exhibit III-2 Mountain Vegetation Types

The 11 vegetation types and 2 special ecosystems were **redescribed for the purpose of this analysis** as follows:

### Vegetation Types

#### ***Aspen***

The aspen vegetation type ranges from moderately tall to tall deciduous forest, often with well developed shrub layers and/or very well-developed tall grasses, short grasses, tall forbs and short forbs. Aspen is the predominant tree species but there may be a component of numerous other species of trees. Most often, the other tree species are replacing aspen through natural plant succession. On warmer sites, representative understory plants may include: beaked hazel, saskatoon serviceberry, thurber fescue, and elk sedge. On cooler sites representative understory plants may include: spreading golden-banner, silvertop sedge, Barbey larkspur, aspen peavine, Kentucky bluegrass, blue wildrye, dwarf blueberry, whortleberry, silvery lupine, honeysuckle, gooseberry currant, and common juniper. Aspen is an early seral species which normally sprouts prolifically after overstory removal, except in localized areas which have experienced soil compaction and/or aspen root damage.<sup>36</sup> This vegetation type is adaptable to a very wide range of climatic conditions and extends from timberline near Leadville to the warm, dry valleys of the Front Range.

#### ***Lodgepole Pine***

The lodgepole pine vegetation type is typically composed of small to moderately large trees with rounded to pointed crowns. Growth is often slow. Undergrowth is usually sparse or absent under closed canopies and grassy under open canopies. Dense canopies are more common. Lodgepole pine is typically the dominant tree species, but there may also be varying degrees of dominance of limber pine and bristlecone pine. Representative understory plants include common juniper, twinflower, grouse whortleberry, elk sedge, Fremont geranium, silvery lupine, and *Lichen spp.* Lodgepole is an aggressive pioneer after disturbance such as fire or clearcutting. This vegetation type is found in a wide variety of climatic regimes.

#### ***Douglas-fir***

The Douglas-fir vegetation type is typically a moderately tall, to tall, coniferous forest with rounded to pointed crowns. Undergrowth can be highly layered and diverse with shrubs in one or more layers. Douglas-fir is the dominant tree species. Other tree species found in lesser amounts include blue spruce and white fir. Understory plants include jamesia, purple virgins-bower, mountain ninebark, bitterbrush, Gambel oak, mountain snowberry, Idaho fescue, elk sedge and Ross sedge. This type is found in a wide variety of climatic regimes, ranging from cool and moist to warm and dry. It is generally absent on harsh southerly aspects or extremely cold northerly aspects.

#### ***Engelmann Spruce/Subalpine Fir (spruce-fir)***

The spruce-fir vegetation type is typically composed of tall to moderately tall trees with pointed crowns, often with codominant species. Spruce tends to dominate the more mesic conditions, while fir tends to dominate the drier and wetter microsites. Growth is often slow as is recovery from disturbance. Other tree species which occur in lesser amounts include lodgepole pine and Douglas-fir. The understory is usually sparse, but sometimes a medium and/or low shrub layer is present. Common understory plants include arrowleaf groundsel, moss and twinflower. This

vegetation type is found at higher elevations and colder conditions than other forested vegetation types on the Forests. The environment is typically wet or moist.

### ***Ponderosa Pine***

The ponderosa pine vegetation type is widely represented throughout the Forest, at lower to mid elevations. At lower elevations and on ridgetops the canopy is generally open. The understory in this environment is typically composed of a sparse shrub layer with a high composition of grasses that are characteristic of high plains. At mid elevations, the canopy tends to be more closed. The understory in this environment is typically more diverse, often with several layers of shrubs, grasses and forbs. Ponderosa pine is the dominant tree species but there may be varying degrees of abundance of Douglas-fir and minor amounts of lodgepole pine, bristlecone pine, and other species. Representative understory plants in the foothills and ridgetop environments include mountain mahogany, Rocky Mountain juniper, bluegrasses, low northern sedge, yucca and sideoats gramma. Understory plants in the montane environments typically include jamesia, purple virgins-bower, mountain ninebark, bitterbrush, Gambel oak, mountain snowberry, Idaho fescue, elk sedge and Ross sedge. This type is found in a wide variety of climatic regimes. In general this type will occur in slightly warmer climates than the lodgepole pine type and slightly drier climates than the Douglas-fir type.

### ***Pinyon-Juniper***

The pinyon-juniper vegetation type is principally represented in the southerly portions of the Pike NF and the southerly and easterly portions of the San Isabel NF, occurring predominantly on the San Carlos, Salida and South Park Ranger Districts. This type appears as an open forest with small rounded trees. Sometimes an open layer of medium to light shrubs is present, otherwise only a sparse herbaceous layer.

Pinyon pine, Utah juniper, Rocky Mountain juniper and one-seed juniper are the dominating species of this vegetation type. On the poorest sites of rocky or shale exposed soils, Rocky Mountain juniper replaces pinyon and the other junipers. On more productive sites pinyon tends to be more prevalent. Common understory plants on the rockiest sites include mountain mahogany, western wheatgrass, littleseed ricegrass, bitterbrush, mosses and lichens. On less rocky sites understory plants are represented by mountain mahogany, Utah serviceberry, sagebrush species, sideoats gramma, prickly pear and yucca.

This type is found in harsh, semi-desert climates that can have very wide temperature extremes.

### ***Bristlecone Pine***

The bristlecone pine vegetation type ranges from small to moderately large trees with rounded to pointed crowns. Canopy cover is often sparse, creating a park-like appearance. However, bristlecone pine tends to occur as a denser forest on sandy soils near timberline. Undergrowth is usually grassy under open canopies. Common understory species range from Arizona fescue and currant in the lower subalpine zone, to common juniper, whiproot clover and silvertop sedge just below timberline. Bristlecone pine generally occurs within an elevational range of 9,500 to 12,000 feet. Growth is slow to very slow. Trees can survive to very old ages and often have a twisted or gnarled appearance.

### ***Mountain Mahogany***

The mountain mahogany vegetation type generally occurs as a mixed species, medium-size shrubland, with mountain mahogany as the dominant species. Associated shrub species include

currant, Gambel oak, rabbitbrush, snowberry and wild rose. Common understory species include Parry oatgrass, mountain muhly, Arizona fescue, blue grama, Carex spp., pussytoes and vetch. Understories tend to be more productive at the upper end of the elevation range, on moister sites.

Mountain mahogany is probably the most important big game winter range browse species for big game animals on the Forest. It also occurs as an understory species in the ponderosa pine type; usually on dry, rocky, hillsides below 8,000 feet. Mountain mahogany normally regenerates by sprouting after disturbance, provided the root stocks are relatively undamaged by the disturbance. Mountain mahogany can be found at elevations ranging from 6,000 feet to 10,000 feet.

### ***Gambel Oak***

Gambel oak is a common tall shrub which often occurs with medium-sized shrubs such as mountain mahogany, currant, snowberry and wild rose. Canopy cover ranges from semiopen to fairly dense. Understory species are similar to those described in the mountain mahogany type. The Gambel oak type tends to have more productive understories, since it usually occupies moister sites than the mountain mahogany type. Gambel oak sprouts prolifically following cutting or wildfire. Sprouts are produced from latent buds located near the root collar and from underground stems called rhizomes. Gambel oak generally occurs at elevations ranging from 6,000 feet to 9,000 feet.

### ***Sagebrush***

The sagebrush type generally occurs as low to medium-sized shrubland with semiopen canopy cover. Big sage often forms a mixed shrubland with rabbitbrush and some snowberry. Dominant grasses include Idaho fescue, mountain muhly, mat muhly, ring muhly and prairie junegrass. Common forbs are Colorado rubberplant, potentilla, eriogonum, antennaria, and aster. The understory is interspersed with patches of bare soil.

Sagebrush occurs at approximately 7,500 to 10,000 feet, primarily on the western portion of the Forests. Sagebrush can be found on flats or slopes, usually on southerly or westerly aspects at higher elevations, but on cooler aspects at lower elevations.

### ***Mountain Grasslands***

Mountain grasslands occur as large parks or openings interspersed within ponderosa pine, Douglas-fir, aspen or spruce-fir forests. Grasslands commonly occur in association with ponderosa pine at elevations of 6,500 to 9,500 feet. Vegetation is dominated by Arizona fescue, mountain muhly and Parry oatgrass. Blue grama, needle and thread, prairie junegrass, Kentucky bluegrass, Carex spp., potentilla, aster, geranium, yarrow, and antennaria are often present in smaller quantities.

Grasslands occur in association with aspen and spruce-fir at elevations from 8500 feet to timberline. Vegetation can be dominated by bunchgrasses with relatively few shrub and forb species. Dominant grasses are Thurber fescue, Arizona fescue, Parry oatgrass, wheatgrasses, and bromes. Yarrow, fleabane, aster, pussytoes and geranium occur in lesser amounts.

## **Special Ecosystems**

Acres occupied by forested or nonforested vegetation fall into one of the 11 previously described vegetation types. These acres overlap with alpine and riparian acres. Due to this acreage overlap, the alpine and riparian acres displayed in the vegetation summary charts in Exhibit D-2 of Appendix



D cannot be added to the forested and nonforested acres. Alpine and riparian acres will therefore be enclosed in parentheses in the vegetation charts.

### **Riparian**

Riparian is a habitat of special concern and will be discussed separately in this document.

### **Alpine**

Alpine vegetation is characterized by short to medium-height grasslike species and a variety of forbs. Trees are seldom found, except those with prostrate form, termed krummolz. On ridges and steep slopes with drier, shallow soils, vegetation communities are dominated by mountain avens. Associated species include curly sedge, spike trisetum, alpine fescue, bistort, moss campion, clover and chickweed. Gentler south and west aspects that are somewhat moister than the ridge sites are dominated by kobresia and golden avens. Other species include agrostis, bluegrass, alpine fescue, timber oatgrass, chickweed, alpine meadowrue, bistort and clover. Tufted hairgrass and golden avens often dominate depressions and draws that have prolonged snow cover. Other species present are spike trisetum, sticky polemonium and clover. Some of these areas can be dominated by forbs such as golden avens and alpine oreoxis.

Willow species (especially *Salix glauca*) also dominate some basin areas and gentle to moderate slopes. Understory species include tufted hairgrass, spike trisetum, sedges, bluebells, clover, pedicularis, bistort and larkspur.

Alpine occurs from timberline to the highest elevations. Climatic conditions are very cold, with significant snowfall. Water is usually present, but is frozen most of the year. Moisture conditions range from wetter alpine meadows and basins to drier tundra and ridges. Soil formation is very slow. Slopes are gentle to steep with rock scree slopes common in some areas. Due to harsh climatic conditions, short growing seasons, and very slow soil formation, alpine areas are fragile ecosystems. Alpine vegetation recovers very slowly after disturbance.<sup>37</sup> Several endangered plant species with very narrow habitat requirements have been found in some alpine areas on the Forest.

**Exhibit III-3**  
**Grassland Vegetation Types**

**Shortgrass Prairie**

The shortgrass prairie type is usually dominated by blue grama, or less frequently, buffalo grass. Other grasses include western wheatgrass, alkali sacaton, sand dropseed, threeawn and bluestem. Sod-forming grasses enhance soil stability and water quality. Forbs also contribute to the vegetation cover, particularly when soil moisture conditions are favorable. Plant growth and vigor ranges from poor to good, depending on available soil moisture provided by winter snow and summer thunderstorms.

**Midgrass Prairie**

The midgrass prairie is usually dominated by sideoats grama, sand lovegrass, bluestem grasses and switchgrass. These grasses tend to be taller and form patches of "bunchgrass" when climatic conditions and grazing favor better range condition. Forbs fill in the open areas between "bunchgrass" clumps when soil moisture conditions are favorable. Sand sage and yucca are common in most of the midgrass areas. Areas with little or no vegetation cover are highly susceptible to wind erosion. Climatic and available soil moisture conditions are similar to those found in the shortgrass prairie type.

**Exhibit III-4**  
**Visual Quality Objectives**  
**and Evaluation Criteria**

**Visual Quality Objectives**

Visual quality objectives are assigned to all NFS lands based on viewing distance, sensitivity level and variety class. The concept of variety class is based on Physiographic Provinces.<sup>38</sup> The analysis area lies within the southern Rocky Mountains and Great Plains provinces. The provinces have been subdivided into landscape character subtypes. Subtypes are divisions of the major character types (provinces) which are significantly different in visual characteristics from each other.

Variety class describes the physical attributes of the land based on landform, vegetation, water-form and climate. The landscape features of each subtype are assigned a variety class rating of A, B or C. The A landscapes are the most scenic and C the least.

Visitor sensitivity (concern for scenic quality) is rated from 1 to 3; level 1 is highest, level 2 is average, and level 3 is lowest.

Primary and secondary travel routes (i.e., Hwy 285, Hwy 9, etc.), use areas, and water bodies are assigned sensitivity levels with each distance zone also indicated. The distance zones are foreground (Fg), middle ground (Mg), and background (Bg).

Visual quality objectives are then based on the combinations of variety class and sensitivity/distance levels. The five visual quality objectives are: preservation (P), retention (R), partial retention (PR), modification (M), and maximum modification (MM). [Refer to Glossary for definitions.]

The following table shows what visual quality objectives result from the various combinations.

**Table III-11**  
**Visual Quality Objectives<sup>39</sup>**

| VARIETY CLASS | SENSITIVITY LEVEL |     |     |     |     |     |      |
|---------------|-------------------|-----|-----|-----|-----|-----|------|
|               | Fg1               | Mg1 | Bg1 | Fg2 | Mg2 | Bg2 | 3    |
| CLASS A       | R                 | R   | R   | PR  | PR  | PR  | PR   |
| CLASS B       | R                 | PR  | PR  | PR  | M   | M   | M,MM |
| CLASS C       | PR                | PR  | M   | M   | M   | MM  | MM   |

Example: Fg 1, Class A, R indicates that the area is located in a foreground zone which has the highest level of visitor sensitivity in a landscape which is very scenic. The visual quality objective for the area is retention of existing quality.

The current Visual Quality Inventory for the Forests is represented in the following table.

**Table III-12  
Inventoried Visual Quality Objectives**

| DISTRICT     | Preservation | Retention | Part. Ret. | Modification | Max. Mod. |
|--------------|--------------|-----------|------------|--------------|-----------|
| Leadville    | 98,129       | 132,986   | 34,213     | 9,876        |           |
| Salida       | 20,138       | 103,516   | 265,720    | 70,317       |           |
| San Carlos   |              | 164,390   | 169,156    | 49,794       |           |
| South Park   | 44,801       | 145,578   | 277,516    | 7,539        |           |
| Pikes Peak   |              | 103,571   | 124,865    | 3,535        |           |
| South Platte | 97,032       | 89,801    | 197,377    | 14,215       |           |
| Comanche GL  |              | 7,880     | 156,248    |              | 255,367   |
| Cimarron GL  |              |           | 12,650     | 95,526       |           |

Figures based on inventory for 1984 Forest LMP.

**Evaluation Criteria**

At the time of an APD, each well site or associated development will be evaluated utilizing the following criteria to determine the level of impacts: distance zone, sensitivity level, variety class, slope, magnitude, user activity, viewer position, existing visual condition, visual absorption capability, duration and climatic conditions.

| Distance Zone | Sensitivity Level | Viewer Position | Existing Visual Condition | Visual Absorption Capability | Duration | Climatic Conditions | Variety Class |
|---------------|-------------------|-----------------|---------------------------|------------------------------|----------|---------------------|---------------|
| Class 1       | Class 1           | Class 1         | Class 1                   | Class 1                      | Class 1  | Class 1             | Class 1       |
| Class 2       | Class 2           | Class 2         | Class 2                   | Class 2                      | Class 2  | Class 2             | Class 2       |
| Class 3       | Class 3           | Class 3         | Class 3                   | Class 3                      | Class 3  | Class 3             | Class 3       |
| Class 4       | Class 4           | Class 4         | Class 4                   | Class 4                      | Class 4  | Class 4             | Class 4       |
| Class 5       | Class 5           | Class 5         | Class 5                   | Class 5                      | Class 5  | Class 5             | Class 5       |

**Exhibit III-5  
Cultural Properties  
Listed on Historic National Registers**

***National Historic Landmarks***

PIKES PEAK, El Paso County, 15 miles west of Colorado Springs in the Pike National Forest; listed October 15, 1966.

***National Register of Historic Places***

ST. ELMO HISTORIC DISTRICT, Chaffee County, vicinity of St. Elmo in San Isabel National Forest; listed September 17, 1979.

NORTH FORK HISTORIC DISTRICT, Jefferson County, vicinity of Deckers; listed September 17, 1979. This property encompasses mostly private holdings with a minimum of Forest lands. It incorporates some individual properties originally listed in 1974 including the BLUE JAY INN, LA HACIENDA, the GREEN MERCHANTILE STORE, and the GREEN MOUNTAIN RANCH.

ESTABROOK HISTORIC DISTRICT, Park County, vicinity of Bailey; listed October 20, 1980. On private lands within boundary of Pike National Forest.

TWIN LAKES HISTORIC DISTRICT, Lake County, vicinity of Twin Lakes in San Isabel National Forest; listed July 30, 1974.

INTERLAKEN RESORT DISTRICT, Lake County, south of Twin Lakes in San Isabel National Forest; listed August 7, 1974.

VICKSBURG MINING CAMP, Chaffee county, 15 miles north of Buena Vista in the San Isabel National Forest; listed March 8, 1977.

LITTLEJOHN MINING COMPLEX, Chaffee County, southwest of Granite in San Isabel National Forest; listed December 27, 1978.

WINFIELD MINING CAMP, Chaffee County, 15 miles northwest of Buena Vista, in San Isabel National Forest; listed March 10, 1980.

MINGUS HOMESTEAD, Custer County, 16 miles northwest of Rye, in San Isabel National Forest; listed December 4, 1990.

***National Historic Trails***

SANTA FE TRAIL, portions in Morton County, Kansas, Cimarron National Grassland, and Otero and Baca Counties, Colorado, Comanche National Grasslands.

**Exhibit III-6**  
**Significant Properties/Resources**  
**Cultural, American Indian Religious Sites, Paleontological, Caves**

**CULTURAL PROPERTIES**

***Cimarron National Grassland***

1. Santa Fe National Historic Trail (several townships and ranges). 300 foot NSO on either side of ruts, swales, or vegetation changes reflecting the Trail; there is also a visual foreground CSU prohibiting drilling sites with 1/2 mile of the Trail (refer to Visual Resources Technical Report).
2. Point of Rocks site on Santa Fe Trail and Beaty Brothers Ranch in same vicinity (T34S, R43W). Discretionary No Lease (DNL), 160 acres.
3. Middle Spring site on Santa Fe Trail, also potential American Indian traditional property (T34S, R43W). DNL, 200 acres
4. 1881 Ranch Headquarters (T33S, R42W). DNL, 80 acres.

***Comanche National Grassland***

1. Mountain Branch of Santa Fe National Historic Trail (several townships and ranges). 300 foot NSO on both sides of Trail for ruts and immediate vicinity; there is also a visual foreground CSU that prohibits drilling sites with 1/2 mile of the Trail.
2. Timpas Stage Station (T25S, R57W). DNL, 40 acres.
3. Barlow and Sanderson Stage Line, also termed the New Stage Road to Trinidad (various townships and ranges). 300 foot NSO on both sides of Road for road bed and immediate vicinity.
4. Vogel Canyon Historic District (proposed), including Vogel Canyon Stage Stop, also potential American Indian religious site (T26S, R54W and 55W). DNL, 680 acres.
5. Rae-Smith Homestead (T27S, R59W). DNL, 40 acres.
6. Granada-Ft. Union Wagon Road (various townships and ranges). 300 foot NSO in vicinity of ruts, on either side; there is also a visual foreground CSU that prohibits drilling sites within 1/2 mile of the Road (refer to Visual Resources Technical Report).
7. Aubrey Cutoff of Santa Fe Trail (various townships and ranges). 300 foot NSO in vicinity of ruts, on either side; there also is a visual foreground CSU that prohibits drilling sites within 1/2 mile of the Cutoff (refer to Visual Resources Technical Report).
8. Carrizo Canyon site, also potential American Indian religious area (T33S, R50W). DNL, 80 acres
9. Archaeological/rock art site (T34S, R48W). DNL, 40 acres.
10. Archaeological/rock art site (T35S, R48W). DNL, 80 acres.
11. Picture Canyon Historic District (proposed), also potential American Indian traditional site (T35S, R47W). DNL, 1840 acres.

***Pike National Forest***

1. Mt. Evans Summit (T5S, R74W). DNL, 280 acres.
2. Guanella Pass (T5S, R74W). DNL, 20 acres.
3. Geneva Smelter (T6S, R74W). DNL, 80 acres.

4. Hallstown site (T6S, R75W). DNL, 160 acres
5. Whale Mine (T6S, R76W). DNL, 40 acres.
6. Missouri Mine (T6S, R76W). DNL, 40 acres
7. DSP&P Railroad Grade and Nighthawk Branch (T7S, R69W and R70W; T8S, R70W). DNL, 260 acres.
8. North Fork Historic District (T7S, R70W). DNL, 80 acres.
9. DSP&P Railroad grade (T7S, R71 and 72W). DNL, 180 acres.
10. Gibbs Homestead (T7S, R73W). DNL, 40 acres.
11. DSP&P Railroad grade (T7S, R75W). DNL, 300 acres.
12. Dake Townsite and Kenosha House site (T7S, R75W). DNL, 40 acres.
13. Kenosha Summit (T7S, R75W). DNL, 40 acres.
14. DSP&P Railroad grade, Boreas Pass, including Boreas Pass Station, and the Peabody's area (T7S, R77W; T8S, R76 and 77W). DNL, 540 acres.
15. Buffalo Creek Work Center (T7S, R70W). DNL, 20 acres.
16. Russia Mine (T8S, R78W). DNL, 80 acres.
17. Magnolia Mill (T8S, R78W). DNL, 80 acres.
18. Moose and Dolly Vardon Mines (T8S, R78W). DNL, 120 acres.
19. Double Boiler Mine (T8S, R78W). DNL, 20 acres.
20. Devil's Head Fire Lookout (T9S, R69W). DNL, 40 acres.
21. Webster Park Scarred Tree Grove, also a potential American Indian religious site (T9S, R71W). DNL, 320 acres.
22. Buckskin Joe townsite (T9S, R78W). DNL, 20 acres.
23. Monument Tree Nursery and Rocky Mountain Region Memorial site (T11S, R67W). DNL, 180 acres.
24. Metbury Sawmill (T11S, R71W). DNL, 20 acres.
25. Lake George Administrative Site (T12S, R71W). DNL, 40 acres.
26. Midland Railroad grade and Elevenmile Canyon Construction Camps (T12S, R71W, and T13S, R72W). DNL, 600 acres.
27. Pikes Peak Auto Road (T13S, R68 and 69W; T14S, R68 and 69W). DNL, 840 acres.
28. Glen Cove site (T13S, R69W). DNL, 20 acres.
29. Pikes Peak National Historic Landmark (T14S, R68W). DNL, 320 acres.
30. Gold Camp Road (T14S, R67W; T15S, R67 and 68W). DNL, 1220 acres.
31. Barr Trail (T14S, R68W). DNL, 340 acres.
32. Pikes Peak Cog Railroad (T14S, R68W). DNL, 280 acres.

### ***San Isabel National Forest***

1. Missouri Hill Charcoal Area (T8S, R80W). DNL, 80 acres.
2. Hagerman Tunnel (T9S, R81W). DNL, 80 acres.
3. Carlton (Busk-Ivanhoe) Tunnel and Busk Camp (T9S, R81W). DNL, 80 acres.
4. Highline Trestle on Midland Railroad (T9S, R81W). DNL, 40 acres.
5. Midland Railroad grade (T9S, R81W). DNL, 360 acres.
6. Mt. Champion Mine and Mill (T10S, R82W). DNL, 80 acres.
7. Twin Lakes Historic District (T11S, R80W). DNL, 80 acres.
8. Interlaken Historic District (T11S, R80W). DNL, 40 acres.
9. Clear Creek Historic District, including the Tasmania Mine, the Swiss Boy Mine, the Fortune Mine, and the BAnker Mine, the Clear Creek Flume and Ditch, and the townsites of Beaver City, Vicksburg, and Winfield (T12S, R80 and 81W). DNL, 4640 acres.

10. Littlejohn's Cabin (National Register of Historic Places T13S, R80W). DNL (in Wilderness).
11. Kaufman Pasture site (T13S, R76W). DNL, 160 acres.
12. Trout Creek Pass (T13S, R77W). DNL, 20 acres.
13. Midland Railroad grade (T14S, R77W). DNL, 240 acres.
14. Trout Creek Jasper Quarry (proposed National Register of Historic Places) (T14, R77W). DNL, 160 acres.
15. Bassam Guard Station (T15S, R76W). DNL, 40 acres.
16. Futurity site (T15S, R77W). DNL, 40 acres.
17. Latchaw Mine (T15S, R79W). DNL, 40 acres.
18. Lucky Mine (T15S, R79W). DNL, 40 acres.
19. Chalk Creek Historic District (proposed) including the Mary Murphy, Iron Chest, Flora Belle, and Allie Bell Mines, the Denver, South Park and Pacific Railroad Grade, the Alpine Tunnel and Atlantic Camp, the Ghost House, the townsites of Hancock, Romley, and St. Elmo, the Iron City Stage Station (T15S, R80W; T51N, R5 and 6E). DNL, 550 acres.
20. Turret townsite (T51N, R9E). DNL, 80 acres.
21. Suckerville Spring site (T51N, R10E). DNL, 80 acres.
22. Lily Mine (T50N, R6E). DNL, 40 acres.
23. Great Monarch Mine (T50N, R6E). DNL, 40 acres.
24. Monarch Game Drive (T49N, R6E). DNL, 320 acres.
25. Marshall Pass (T48N, R6E). DNL, 40 acres.
26. D&RG Railroad grade (T48N, R7 and 8E). DNL, 900 acres.
27. D&RG Railroad grade (T48N, R8E). DNL, 200 acres.
28. Busetti Homestead (T20S, R70W), DNL, 40 acres.
29. Newlin Creek Sawmill (T20S, R70W). DNL, 20 acres.
30. Hayden Pass (T47N, R10E). DNL, 40 acres.
31. Cloverdale Mine (T46N, R11E). DNL, 100 acres.
32. Cloverdale Mill (T46N, R11E). DNL, 40 acres.
33. Mingus Ranch (T22S, R69W). DNL, 80 acres.
34. Squirrel Creek picnic ground (T23S, R68W). DNL, 40 acres.

## PALEONTOLOGICAL RESOURCES

### *Comanche National Grassland*

1. Purgatoire River Dinosaur Trackway (T28S, R55W. Note: this resource is within Picket Wire Canyonlands area and thus outside the scope of this analysis; this resource should be considered for special management designation during the planning process). DNL.

## SIGNIFICANT CAVES

### *Pike National Forest*

1. Cave Creek Caverns (T10S, R78W). NL, 160 acres.
2. Lost Creek Caverns (T9SW, R72W. Within Wilderness, but should be proposed for special management in Forest Plan revision). DNL, 640 acres.

### *San Isabel National Forest*

1. Marble Mountain Caves (T24S, R73W). NL, 480 acres.



**Exhibit III-7**  
**Summary of Total Recreation Use**  
**Pike and San Isabel National Forests**

| Activity Grouping                         | RVD's     | % of Total |
|---|-----------|------------|
| Camping, Picnicking, Swimming             | 1,335,600 | 28%        |
| Mechanized Travel and Viewing Scenery     | 1,806,800 | 38%        |
| Hiking, Horseback Riding and Water Travel | 552,600   | 11%        |
| Winter Sports                             | 181,300   | 4%         |
| Resorts, Cabins and Organization Camps    | 202,700   | 4%         |
| Hunting                                   | 118,400   | 2%         |
| Fishing                                   | 385,600   | 8%         |
| Nonconsumptive Fish and Wildlife Use      | 34,700    | 1%         |
| Recreation Activities                     | 192,300   | 4%         |
| Grand Total                               | 4,810,000 | 100%       |
| Wilderness Total Use (Included Above)     | 225,700   | 5%         |

Source: Recreation Information Management (RIM) source documents (1990).

Exhibit III-8  
ROS Activity Characterization

| Primitive  | Semiprimitive Nonmotorized  | Semiprimitive Motorized  | Roaded Natural   | Rural   | Urban  |
|--|---|--|--|---|--|
| <b>Land Based</b><br>Viewing Scenery<br>Hiking and Walking<br>Tent Camping<br>Hunting<br>Nature Study<br>Mountain Climbing<br>Horseback Riding | <b>Land Based</b><br>Viewing Scenery<br>Hiking and Walking<br>Mountain Biking<br>Tent Camping<br>Hunting<br>Nature Study<br>Mountain Climbing<br>Non-motor Aircraft<br>Horseback Riding | <b>Land Based</b><br>Viewing Scenery<br>Auto (off-road))<br>Motorcycle<br>Special Landcraft<br>Non-motor Aircraft<br>Hiking and Walking<br>Horseback Riding<br>Camping<br>Hunting<br>Nature Study<br>Mountain Biking | <b>Land Based</b><br>Viewing Scenery<br>Auto (off-road)<br>Viewing Activities<br>Special Landcraft<br>View Works of Man<br>Auto Driving<br>Motorcycle<br>Aircraft<br>Aerial Lifts<br>Hiking and Walking<br>Bicycling<br>Mountain Biking<br>Horseback Riding<br>Camping<br>Picnicking<br>Resort Lodging<br>Cabin Use<br>Hunting<br>Nature Study<br>Forest Products<br>Interp Services | <b>Land Based</b><br>Viewing Scenery<br>Auto Driving<br>Viewing Activities<br>View Works of Man<br>Motorcycle<br>Bus Touring<br>Aerial Lifts<br>Hiking and Walking<br>Bicycling<br>Horseback Riding<br>Mountain Biking<br>Camping<br>Picnicking<br>Commercial Service<br>Resort Lodging<br>Cabin Use<br>Hunting<br>Nature Study<br>Forest Products<br>Interp Service<br>Team Sports<br>Games & Play | <b>Land Based</b><br>Viewing Scenery<br>Auto Driving<br>Viewing Activities<br>View Works of Man<br>Motorcycle<br>Bus Touring<br>Aerial Lifts<br>Hiking and Walking<br>Bicycling<br>Horseback Riding<br>Mountain Biking<br>Camping<br>Picnicking<br>Commercial Service<br>Resort Lodging<br>Cabin Use<br>Hunting<br>Nature Study<br>Forest Product<br>Interp Service<br>Team Sports<br>Games & Play |
| <b>Water Based</b><br>Canoeing<br>Other Watercraft<br>Fishing  | <b>Water Based</b><br>Canoeing<br>Other Watercraft<br>Fishing   | <b>Water Based</b><br>Boating<br>Other Watercraft<br>Diving<br>Fishing   | <b>Water Based</b><br>Boating<br>Other Watercraft<br>Diving<br>Fishing<br>Waterplay  | <b>Water Based</b><br>Boating<br>Other Watercraft<br>Diving<br>Fishing<br>Waterplay   | <b>Water Based</b><br>Boating<br>Other Watercraft<br>Diving<br>Fishing<br>Waterplay  |
| <b>Snow/Ice Based</b><br>Snowplay<br>X-Country Skiing<br>Snowshoeing   | <b>Snow/Ice Based</b><br>Snowplay<br>X-Country Skiing<br>Snowshoeing  | <b>Snow/Ice Based</b><br>Ice and Snowcraft<br>Downhill Skiing<br>Snowplay<br>X-Country Skiing<br>Snowshoeing<br>Ice Skating  | <b>Snow/Ice Based</b><br>Ice and Snowcraft<br>Downhill Skiing<br>Snowplay<br>X-Country Skiing<br>Snowshoeing<br>Ice Skating  | <b>Snow/Ice Based</b><br>Ice and Snowcraft<br>Snowplay<br>Downhill Skiing<br>Snowshoeing<br>Ice Skating   | <b>Snow/Ice Based</b><br>Ice and Snowcraft<br>Snowplay<br>Downhill Skiing<br>Snowshoeing<br>Ice Skating  |

Source: Recreation Opportunity Spectrum (ROS) book (1986)

Exhibit III-9

Recreation Opportunity Spectrum Class  
Composition and Use

| ROS Class                        | % of Forest | % Use on Forest |
|----------------------------------|-------------|-----------------|
| Urban (U)                        | 1%          | 1%              |
| Rural (R)                        | 1%          | 8%              |
| Roaded Natural (RN)              | 53%         | 75%             |
| Semiprimitive Motorized (SPM)    | 20%         | 6%              |
| Semiprimitive Nonmotorized (SPN) | 22%         | 9%              |
| Primitive                        | 3%          | 1%              |

Source: Table II-2, Forest Plan, 1984

Percent Use  
By ROS Class and Type of Use

| Type of Use                      | ROS Class |     |     |     |    |    | Total |
|----------------------------------|-----------|-----|-----|-----|----|----|-------|
|                                  | P         | SPN | SPM | RN  | R  | U  |       |
| Developed                        | -         | -   | 1%  | 23% | 6% | -  | 30%   |
| Dispersed (excluding Wilderness) | -         | 5%  | 5%  | 52% | 2% | 1% | 65%   |
| Wilderness                       | 1%        | 4%  | -   | -   | -  | -  | 5%    |

Source: Table II-3, Forest Plan, 1984

**Exhibit III-10**  
**Long-Term Special Use Authorizations**  
**Mountain Environment**

**Recreation Special Uses** - Boat docks, organization camps, trail shelters, recreation cabins, resorts, parks, playgrounds, target ranges and ski areas are the types of recreation special use permits. There are a total of 252 permits totaling 3,253 acres. The four ski areas have a capacity of 12,150 skiers-at-one-time (SAOT) and occupy an area totaling 2,065 acres. The other 248 developments have a capacity of 1,714 people-at-one-time (PAOT) and occupy a total area of 1,188 acres.

**Agricultural Special Uses** - Sheds, barns, corrals, fences and livestock pastures are included in these types of uses. There are 35 permits totaling 3,847 acres. The majority of these uses are livestock pasture permits.

**Community or Public Information Special Uses** - Waste disposal sites, signs, cemeteries and service areas are included in this category of uses. There are 21 permits covering 23 acres.

**Research and Historical Special Uses** - There are four special use permits in this category for a total of five acres. One permit is for historic buildings in Vicksburg and Winfield on the Leadville District. The others are for weather stations.

**Industrial Special Uses** - Storage sites, processing plants, (oil and gas related), and mineral materials (common variety) are the types of special uses in this category. Currently there are 15 permits occupying 118 acres. This includes one mile of access roads.

**Energy Generation and Transmission Special Uses** - The type of uses in this category include hydroelectric generation plants, oil and gas pipelines, and electrical transmission and distribution lines. One hydroelectric generation plant is authorized by special use permit and is located in an area that has been formally withdrawn from oil and gas leasing (Air Force Academy Withdrawal). There are several others that are authorized by Federal Energy Regulatory Commission (FERC) licenses. There are 19 miles of natural gas distribution lines located on the Pike and San Isabel National Forests. There are 397 miles of electrical transmission and distribution lines.

**Transportation Special Uses** - There are 204 permits authorizing 368 miles (3,539 acres) of railroad and road rights of way. This includes 32 miles of railroad right of way, 185 miles of State/County roads, and 150 miles of private access.

**Communication Special Uses** - There are 100 permits authorizing use of 21 sites for communication (microwave, two-way radio, radio broadcast, TV translators, etc.) uses. Total area involved is 65 acres. Most of the the sites are located at high elevations and involve small acreages. Sixteen permits authorize 292 miles (330 acres) of telephone lines.

**Water Related Special Uses** - There are 99 permits authorizing 160 miles (608 acres) for water transmission (pipelines, ditches, tunnels). There are 31 permits that authorize 7,571 acres for dams and reservoirs. An additional 36 permits authorized 26 acres for springs, windmills, wells, water storage tanks, etc.

**EXHIBIT III-11**  
**LONG TERM SPECIAL USE AUTHORIZATIONS**  
**GRASSLAND ENVIRONMENT**

**Recreation Special Uses** - Playgrounds and target ranges are the types of recreation special use permits. There are a total of 2 permits totaling 21 acres.

**Agricultural Special Uses** - Fences and livestock pastures are included in these types of uses. There are 3 permits totaling 3 acres.

**Community or Public Information Special Uses** - Solid and liquid waste disposal sites are included in this category of uses. There are 2 permits covering 12 acres.

**Research and Historical Special Uses** - The SE Colorado Research Station is authorized under this category of use.

**Industrial Special Uses** - Storage sites, processing plants, (oil and gas related), and mineral materials (common variety) are the type of special uses in this category. Currently there are 16 permits occupying 171 acres. This includes one mile of access road.

**Energy Generation and Transmission Special Uses** - The types of uses in this category include oil and gas pipelines, and electrical transmission and distribution lines.

There are 226 authorizations which occupy 1,715 acres on the Comanche and Cimarron National Grasslands.

**Transportation Special Uses** - There are 12 permits authorizing 28 miles (256 acres) of road rights of way. These are State and County roads.

**Communication Special Uses** - There are five permits authorizing use of two sites for communication (microwave, two-way radio, radio broadcast, TV translators, etc.) uses. Total area involved is 10 acres.

Five permits authorize 51 miles (102 acres) of telephone lines.

**Water Related Special Uses** - There are 6 permits authorizing 32 miles (42 acres) for water transmission pipelines.

## FOOTNOTES

<sup>1</sup> Greystone Development Consultants, Inc.; Socioeconomic and Cost Efficiency Analysis to Support the Oil and Gas Leasing EIS for the Pike/San Isabel National Forests and the Cimarron/Comanche National Grasslands; Englewood, CO.; November 1989 (A.R. Vol. VIII, Part 2, pp. 556-596).

<sup>2</sup> Clean Air Act Amendments of 1977; Act of August 7, 1977 (P.L. 95-95, 91 Stat. 685, as amended; 42 U.S.C. 7401, 7418, 7470, 7472, 7474, 7475, 7491, 7506, 7602)(A.R. Vol. II, Part 4, pp. 1710-1713).

<sup>3</sup> Leopold, Luna B., Wolman, Gordan M. and Miller, John P. (1964). Fluvial Processes in Geomorphology, W. H. Freeman and Co., pp 198-329.

<sup>4</sup> Classifications and Numeric Standards-Arkansas River Basin, Colorado Department of Health, Water Quality Control Commission, adopted March 11, 1982, amended June 5, 1990; Classifications and Numeric Standards, South Platte River Basin, Colorado Department of Health, Water Quality Control Commission, adopted April 6, 1981, amended February 5, 1990.

<sup>5</sup> Colorado Oil and Gas Leasing and Development, Final Environmental Impact Statement, January 1991, U.S. Department of the Interior, Bureau of Land Management, Colorado State Office.

<sup>6</sup> R.G. Walsh. 1988. A Comparison of Long Run Forecasts of Demand for Fishing, Hunting, and Nonconsumptive Wildlife Recreation Based on the 1980 and 1985 National Surveys. Department of Agriculture and Resource Economics, Colorado State University, Fort Collins, Colorado.

<sup>7</sup> J. Woodling. 1985. Colorado's Little Fish. A guide to the minnows and other lesser known fishes in the State of Colorado. Colorado Division of Wildlife, Denver, Colorado. pp. 17-72

<sup>8</sup> P.L. Hansen, S.W. Chaddle, and R.D. Pfister. 1988. Riparian Dominance Types of Montana. Miscellaneous Publication No. 49. Montana Forest and Conservation Experiment Station. School of Forestry, University of Montana, Missoula, Montana.

<sup>9</sup> P.L. Hansen, S.W. Chaddle and R.D. Pfister. 1988. Riparian Dominance Types of Montana. Miscellaneous Publication No. 49. Montana Forest and Conservation Experiment Station. School of Forestry, University of Montana, Missoula, Montana.

<sup>10</sup> L.M. Cowardin, V. Carter, F.C. Golet and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FSW/OBS-79/31. Office of Biological Sciences. U.S. Fish and Wildlife Service, Washington, DC.

<sup>11</sup> L.M. Cowardin, V. Carter, F.C. Golet and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FSW/OBS-70/31. Office of Biological Sciences, U.S. Fish and Wildlife Service, Washington, DC.

<sup>12</sup> P.L. Hansen, S.W. Chaddle and R.D. Pfister. 1988. Riparian Dominance Types of Montana. Miscellaneous Publication No. 49. Montana Forest and Conservation Experiment Station. School of Forestry, University of Montana, Missoula, Montana.

<sup>13</sup> B.L. Melton, R.L. Hoover, R.L. Moore and D.J. Pfankuch. 1987. Aquatic and Riparian Wildlife, pp. 263 and 267, pp. 267-304 in R.L. Hoover and E. Wills, eds. Managing Forested Lands for Wildlife. Colorado Division of Wildlife in Cooperation with USDA Forest Service, Rocky Mountain Region, Denver, Colorado.

<sup>14</sup> U.S. Fish and Wildlife Service. 1983. Revised Greenback Cutthroat Trout Recovery Plan. Prepared by the Greenback Cutthroat Trout Recovery Team. USFWS, Denver, Colorado.

<sup>15</sup> USDA, FS, letter of 10/26/88.

<sup>16</sup> USDA FS. Jon E. Verner. Specialist Report, Resource Areas: Wildlife, Threatened and Endangered Species, Range, Experimental Forests, Research Natural Areas, Special Interest Areas. March 19, 1991.

<sup>17</sup> USDA, FS. Jon E. Verner. Specialist Report. Resource Areas: Wildlife, Threatened and Endangered Species, Range, Experimental Forests, REsearch Natural Areas, Special Interest Areas. March 19, 1991.

<sup>18</sup> U.S. Mining Laws (Public Domain Lands): Act of May 10, 1872 (Ch. 152, 17 Stat. 91; 30 U.S.C. 22, 28, 28b) (A.R. Vol. II, Part 4, pp. 1482-1484).

<sup>19</sup> Mineral Leasing Act: Act of February 25, 1920 (Ch. 85, 41 Stat. 437, as amended; 30 U.S.C. 181) (A.R. Vol. II, Part 4, pp, 1489-1490).

<sup>20</sup> Mineral Leasing for Acquired Lands: Act of August 7, 1947 (Ch. 513, 61 Stat. 913; 30 U.S.C. 351-359) (A.R. Vol. II, Part 4, pp. 1491-1493).

<sup>21</sup> USDA Forest Service, Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands Land and Resource Management Plan FEIS, Chap. III, Pages III-109-110 (A.R. Vol. VIII, Part 1, pp. 244-245).

<sup>22</sup> Extracted from Transportation Information System (TIS) 12/90 (system C, Fort Collins Computer Center (FCCC)).

<sup>23</sup> Forest Plan, Chapter II, page 67.

<sup>24</sup> University of Colorado, Colorado Division of Commerce and Development; Region 6, Colorado Regional Profile, Lower Arkansas Valley; Boulder, CO 10/75.

<sup>25</sup> SCS, Soil Survey, 1963.

<sup>26</sup> SCS, Soil Survey, 1963.

<sup>27</sup> I.E. Lindauer. 1983. A comparison of the plant communities of the South Platte and Arkansas River drainages in eastern Colorado. *The Southwestern Naturalist* 28: 249-259.

<sup>28</sup> USDA Forest Service, Forest LMP, Final Environmental Impact Statement, Human Resource Unit #9, pp. III-38-40.

<sup>29</sup> Mineral Leasing Act, Act of February 25, 1920 (Ch. 85, 41 Stat. 437, as amended; 30 U.S.C. 181) (A.R. Vol. II, Part 4, pp. 1489-1490).

<sup>30</sup> Reorganization Plan No. 3 of 1946, Part IV, Section 402; U.S. Department of The Interior (A.R. Vol. II, Part 4, p. 1616).

<sup>31</sup> Mineral Leasing Act for Acquired Lands, Act of August 7, 1947 (Ch. 513, 61 Stat. 913; 30 U.S.C. 351-359)(A.R. Vol. II, Part 4, pp. 1491-1493).

<sup>32</sup> Onshore Oil and Gas Order No. 1, Approval of Operations on Onshore Federal and Indian Oil and Gas Leases, 43 CFR 3164, Circular 2538, U.S.D.I., BLM Effective Nov. 21, 1983 (Published in 48 F.R. 48916, October 21, 1983 - Effective November 21, 1983, and Corrections Published in 48 F.R. 56226, December 20, 1983)(A.R. Vol. II, Part 4, pp. 1516-1527).

<sup>33</sup> USDA, Forest Service; Dersch, John S., Mineral Potential Report for Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands; Lakewood, Co. April 6, 1981.

<sup>34</sup> Bill Zimmer, Special Uses and Withdrawals, Specialist Report, April 1991.

<sup>35</sup> Rodney K. Jorgensen, Soils Specialist Report, April 1991.

<sup>36</sup> Personal communication with Wayne Shepperd, Silviculturist, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. February, 1991.

<sup>37</sup> Johnston, B.C. (Draft) Alpine Ecosystems and Their Management in the Southern and Central Rocky Mountains, p. 6. February, 1991.

<sup>38</sup> N.M. Fenneman, *Physiography of the Western United States*. (New York: McGraw-Hill, 1931).

<sup>39</sup> USDA Forest Service, 1974, Visual Resource Management System, Handbook #462, Vol. 2, Chp. 1, p. 43.



## CHAPTER IV

### ENVIRONMENTAL CONSEQUENCES

#### INTRODUCTION

In this chapter we will discuss the forest-wide effects of the various alternatives for a Forest leasing program. The disclosure is required by the Forest Service Oil and Gas Regulations that implement the Leasing Reform Act and the National Environmental Policy Act (NEPA). It will provide the information the Forest Supervisor needs in order to: decide how to manage a Forest-wide Leasing program; identify lands that will be available for leasing; and, identify the conditions that will be applied in order to protect resources on a forest-wide basis.

As specified in Forest Service Final Rule (36 CFR Part 228), this chapter provides the anticipated environmental consequences of alternative oil and gas leasing decisions. Environmental consequences are the effects (or impacts) on the physical, biological, social and economic environment that result from implementing an alternative. Identification of these expected consequences provides the scientific and analytical basis for comparing alternatives. The analysis shall be based on the effects of the reasonably foreseeable post-leasing activities (RFD) developed in cooperation with the Bureau of Land Management and a "Concentrated" RFD developed by the Interdisciplinary Team (IDT).

This chapter also provides the disclosure of a proposed action (preferred alternative) and a comparison of alternatives with the baseline, or no action, alternative.

In Chapter III, several different and tiered levels of environments were discussed. Among them were the "Forest-wide" environment, the Mountain environment, Grassland environment, the geographic zone, the major soil or ecosystem type, and the individual RFD wells. All of these environments were described to allow the reader to understand the complexity of the analysis that is being undertaken and the various requirements of disclosure under the regulations and NEPA. In this chapter we will be disclosing the anticipated effects of the Forest-wide proposals.

The availability decision being made is a programmatic, planning level decision for which NEPA does not require site-specific disclosure of effects. In order to generate the effects analysis required under the oil and gas regulations the Forest Service had to develop the "reasonable foreseeable post-leasing activity" or RFD. This automatically led to a more site-specific analysis than required under NEPA. In this Chapter we shall use the specific analysis to assist in the description of the effects of the programmatic decision.

It must be clearly understood that the RFD used in the site-specific analysis is a "projected" activity with "projected" effects based on information developed for the reasonable foreseeable post-leasing activity. Based on that information the Forest Service anticipates that approximately 214 wells will be drilled across the Unit; the majority on the Cimarron, approximately forty-five on the Comanche, and only a minimal number in the Mountains. These wells are very unlikely to be drilled on the specific sites that were located for this analysis. The hypothetical projections were used to identify the possible effects of the planning level decisions that will be made in the record of decision.

## **THE ANALYSIS**

As described in earlier chapters, the analysis process used across the Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands, or Unit, varied. Two analysis methods were used, one for the Mountain districts and another for the Grasslands.

### **On the Mountain Districts**

On the Mountain districts there has been very little oil and gas activity. One seismic well was drilled for exploratory purposes in the 1960's. The anticipated activity identified by the BLM of four wells over fifteen years is so minimal that its effects could easily be "lost" in the vast acreage currently available for leasing (over 1.5 million acres). To identify effects for the four exploratory wells anticipated in the RFD the Forest Service and BLM identified general areas of land that were most "likely" to be drilled upon. General exploratory practices were recognized and four potential well sites were identified. Those four wells are used to project effects of the management alternatives. They are referred to as BLM RFD wells throughout this document.

Since the four RFD well locations identified are very unlikely to end up being the sites proposed by industry, the IDT was concerned that the limited effects determined by using those locations would not adequately reflect the broad array of effects that might occur with different locations for the four wells. The IDT developed a "Concentrated" RFD that placed wells on areas, and in a manner considered to have the potential to be highly impactful to resources. The IDT then analyzed the effects of the management alternatives based on impacts in these sensitive areas.

By analyzing both the BLM RFD and the Concentrated RFD the IDT could identify a possible range of effects for each alternative that would be likely to include all possible arrays of the projected level of development of four exploratory wells over the 15-year planning period.

### **On the Grasslands**

There has been considerable oil and gas activity on both of the Grasslands during the last 50 years. Statistical analysis identified that all wells on the Cimarron were very similar in the number of acres which were directly affected through ground disturbance. The analysis further indicated that the future development could be anticipated within acceptable statistical standards.<sup>1</sup>

The same analysis was completed for the Comanche with the same results. The analysis did, however, identify that the average acres disturbed was different for each Grassland. Average pad size on the Comanche is approximately .5 acre smaller than on the Cimarron. Newer, smaller sites were better represented in the Comanche sample than the Cimarron sample.

The IDT used the ninety-fifth percentile figure for each Grasslands' projected acres of disturbance by well, i.e., statistical analysis based on 95 percent of the wells already existing on the Grasslands. Additional information on the statistical analysis for disturbed acres is found in Appendix C of this document. These figures will be used to analyze the effects of implementation and should lead to a slightly exaggerated total effect.

## **DISPLAY OF EFFECTS**

This Chapter will display the anticipated effect of each management alternative on the various resources. To determine the forest-wide effects the team aggregated the effects on the Cimarron, Comanche, and Mountain districts.

The effects generated by the forest-wide BLM RFD is the total of the effects of the RFD on the Grasslands combined with the effects of the BLM RFD on the Mountains.

The effects generated by the Forest-wide "Concentrated RFD" is the total of the effects of the RFD on the Grasslands combined with the effects of the Concentrated RFD on the Mountains.

We will discuss the forest-wide effects of the Concentrated RFD by alternative. In all cases the Concentrated RFD was more impactful to resources than the BLM RFD wells. It will, therefore, represent the high end of the expected impacts for all alternatives. At the end of the chapter the BLM RFD will be compared to provide a range of anticipated effects for each alternative.

In order to describe the effects, discussions will include pertinent segments of the site-specific analysis that was done for the BLM and Concentrated RFD wells documented in the Specialists' Reports. Reference may also be made to the analysis disclosed in Appendix D, "Validation of Supplemental Stipulations".

## **ANALYSIS VERSUS IMPLEMENTATION**

### **Analysis**

It is important to remember that the analysis, to the extent possible, assumes that we are at the time of Application for Permit to Drill (APD). In other words, a lease has been issued and we are now identifying the conditions that will apply when the ground-disturbing activities begin. This provides the basis for the effects disclosure.

For the purposes of the analysis the original proposed well locations are common to all action alternatives. Mitigation, by alternative, might require that a well site be moved based on an applied stipulation. The anticipated level of post-leasing activity does not change by alternative because the available land base is sufficient to provide for the level of development identified in the RFD. As forest-wide effects are discussed the term "potential well site" will be used to identify sites that were not represented in the RFD locations.

### **Implementation**

In actual implementation there would never be the "commitment" of a site, as indicated here, without the full disclosure of the stipulations, or conditions that will be applied to the site. The purpose of this document is to provide the information that will be discussed in this chapter prior to leasing. Industry and the public will know what type of activities will be allowed on what lands, and in what manner, so that the protection of other resources, public land uses and users is ensured. Additional NEPA analysis will be done at the time an APD is received. The analysis will be completed and a decision document signed prior to any ground-disturbing activity.

## **DEFINITIONS**

This chapter discusses the short-term, long-term, direct, indirect, and cumulative effects (or impacts) of each alternative considered in this Draft EIS. Effects and impacts as used in this Draft EIS are synonymous.

For the purpose of this analysis, short-term effects include those effects that do not last for the entire planning period. Long-term effects are those effects that are as long or longer in duration than the planning period.

Direct effects as defined in 40 CFR 1508.8 are "caused by the action and occur at the same time and place". Indirect effects as defined in 40 CFR 1508.8 are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable".

40 CFR 1508.7 defines cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time".

## **DESCRIPTION OF ALTERNATIVES**

The following is a brief summary of the alternatives. Chapter II presents each alternative in detail. In the comparison of alternatives it is important to note the difference between the alternatives.

**Alternative I** - Current management (no action). The land identified in the Forest Plan would be available for leasing with no changes in the current management direction. This alternative would allow the use of supplemental lease stipulations in addition to the standard lease terms based on a case-by-case analysis and amendment to the Forest Plan.

**Alternative II** - All currently available lands would remain available for lease under the standard lease terms. There would be no additional stipulations attached to any lease agreements.

**Alternative III** - Currently available lands would be analyzed and a new availability determination would be made. Available lands would be subject to supplemental stipulations in the lease agreements. Approximately 91 percent of the currently available lands would still be available for leasing. Supplemental stipulation would apply to approximately 65 percent of those available lands.

**Alternative IV** - No NFS lands would be available for future oil and gas leases. This alternative would remove all Forest lands from future leasing. Expiring leases would not be resold but development could occur on already leased lands. Existing leases considered to be "producing" would still be in place at the end of the planning period. That is expected to include approximately 60 percent of the Grasslands. There would be no leases at the end of the planning period on the Mountain districts.

## **ENVIRONMENTAL CONSEQUENCES**

This section discusses the environmental consequences associated with oil and gas exploration and production activities, including construction of roads, drill pads, pipelines and production facilities as required in 36 CFR 228.102(c). Mitigation for oil and gas activities is described in the Conditions of Approval, Standard Lease Terms, Supplemental Lease Stipulations and management direction established in Chapter III of the Forest and Land Management Plan.

The following subsections discuss the effects of the oil and gas activity and, where necessary, the mitigation for those activities by resource.

### **Comparing Alternatives**

As the comparison between alternatives begins it is important to understand, up front, that there are similarities between them. The alternatives, because of the use of RFD, are often similar in their effects based on the individual well analysis. The same, or very similar, well locations were used for the analysis because the alternatives did not generate a change to the RFD. Some RFD well locations were adjusted to meet objectives of various alternatives but the actual RFD numbers and general locations remained consistent. The level of anticipated oil and gas activity is so low, when compared to the available acres, that it is difficult to generate a broad array of effects. The effects that were generated in the individual well analysis will be used to help determine the Forest-wide effects of alternatives.

The individual analysis generated quantitative results that will be displayed throughout this chapter. That quantitative display generally demonstrates that the alternatives and mitigation applied in Alternatives I and III, and their effects, are almost exactly the same. The effects of Alternatives II and IV are also quantitatively the same. This is the result of the analysis using the specific RFD well locations. The variations to these alternatives that we expect due to actual industry interest, management emphasis, and scheduling, will also be discussed here. The specific effects of individual wells actually drilled is not expected to be outside of the range of effects identified by the Concentrated RFD, however, those individual wells could be distributed in a manner much different than was analyzed.

This chapter will discuss the impacts of the identified level of development on the Unit. It will include discussion of these effects on land areas other than those identified in the development of RFD.

### ***Disturbed Acres***

The immediate direct effects of proposed activities are a result of site clearance for road, pad and pipeline construction. These shall be discussed throughout the analysis as "disturbed acres". The disturbed acres are consistent for all resources and are constant throughout an alternative. Disturbed acres will include total acres disturbed during the 15-year planning period.

The actual placement of wells for the RFD analysis resulted in the site-specific distribution of BLM RFD, and Concentrated RFD wells on the Mountain districts. It resulted in the general placement of wells on the Grasslands in soil, or ecosystem, types. These types are hard lands, sandy lands, riparian and canyon lands. These wells are described in Chapter II. The locations of the RFD wells, as well as direct disturbance, are displayed in Tables IV-1 through IV-3.

**Table IV-1  
Site-Specific Well Locations by Alternatives**

| Well | Legal       | Geographic  | Acres     | Alternative |    |     |    |
|------|-------------|-------------|-----------|-------------|----|-----|----|
|      | Description | Description | Disturbed | I           | II | III | IV |

| BLM RFD (Mountains)                           |                      |               |    |    |    |    |    |
|---|----------------------|---------------|----|----|----|----|----|
| 1   | T20s,R70W,Sec4,NWSW  | Wet Mountains | 4  | X  | X  | X  | X  |
| 2   | T8S, R75W,Sec13,SWSE | Tarryall Mtns | 5  | X  | X  | X  | X  |
| 3   | T13S,R67W,Sec20,NENE | Rampart Range | 5  | X  | X  | X  | X  |
| 4   | T11S,R67W,Sec21,NWNE | Rampart Range | 4  | X  | X  | X  | X  |
| TOTAL Disturbed Mountain Acres by Alternative |                      |               | 18 | 18 | 18 | 18 | 18 |

| Concentrated RFD (Mountains)                  |                     |               |     |   |    |   |    |
|---|---------------------|---------------|-----|---|----|---|----|
| 1C  | T9S,R69W,Sec22,NWNW | Rampart Range | 13  |   | X  |   | X  |
| 2C  | T9S,R69W,Sec22,SWNW | Jackson Creek | 11  |   | X  |   | X  |
| 3C  | T9S,R69W,Sec23,NWSE | Jackson Creek | 11  |   | X  |   | X  |
| 4C  | T9S,R69W,Sec26,NWSW | Jackson Creek | 9   |   | X  |   | X  |
| TOTAL Disturbed Mountain Acres by Alternative |                     |               | 144 | 0 | 44 | 0 | 44 |

| "Adjusted" Concentrated RFD (Mountains)       |                     |               |                 |    |   |    |   |
|---|---------------------|---------------|-----------------|----|---|----|---|
| 1R  | T9S,R69W,Sec21,SWSE | Jackson Creek | 8               | X  |   | X  |   |
| 2R  | T9S,R69W,Sec22,NESW | N. Jackson Cr | 9               | X  |   | X  |   |
| 3R  | T9S,R69W,Sec14,SWSE | Watson Prk Cr | 8               | X  |   | X  |   |
| 4R  | T9S,R69W,Sec26,SWSE | Jackson Creek | 4               | X  |   | X  |   |
| TOTAL Disturbed Mountain Acres by Alternative |                     |               | <sup>2</sup> 29 | 29 | 0 | 29 | 0 |

<sup>1,2</sup> Adjustment of Concentrated RFD in 1 versus 2 is a result of relocation of wells drilled due to application of stipulations in 1 which caused some lands to be unavailable for surface occupancy.

**Table IV-2  
Grassland Well Distribution By Alternative**

| Soil/Ecotype  | Number of wells by Alternative |            |            |            |
|---------------|--------------------------------|------------|------------|------------|
|               | I                              | II         | III        | IV         |
| Hard lands    | 73                             | 70         | 73         | 70         |
| Sandy lands   | 137                            | 131        | 137        | 131        |
| Riparian      | 0                              | 8          | 0          | 8          |
| Canyon lands  | 0                              | 1          | 0          | 1          |
| <b>TOTALS</b> | <b>210</b>                     | <b>210</b> | <b>210</b> | <b>210</b> |

**Table IV-3  
Grassland Disturbed Acres by Alternative**

| Soil/Vegetation Type                                  | Disturbed Acres by Alternative |            |            |            |
|---|--------------------------------|------------|------------|------------|
|   | I                              | II         | III        | IV         |
| Shortgrass prairie<br>Hard lands                      | 165                            | 159        | 165        | 159        |
| Midgrass prairie<br>Sandy lands                       | 310                            | 295        | 310        | 295        |
| Riparian  | 0                              | 19         | 0          | 19         |
| Shortgrass prairie/<br>Pinyon-juniper<br>Canyon lands | 0                              | 2          | 0          | 2          |
| <b>Total Disturbed Acres</b>                          | <b>475</b>                     | <b>475</b> | <b>475</b> | <b>475</b> |

***Impacted Acres***

The disturbed areas are consistent but vary in location by alternative. They are then analyzed by each resource specialist who has identified the effects of these disturbed acres, as well as other development activities, on their resource. The total area affected by the activity shall be called "impacted acres" throughout this chapter. The impacted acres are specific to each resource and shall be discussed separately, where appropriate. Not all resources can be quantified, many effects discussed in this chapter are to the perceived value of an experience. That value, and the effects to it of the alternatives, shall be discussed.

***Abandonment and Reclamation***

The IDT worked with managers of oil and gas programs on the Unit to identify trends in well abandonment and reclamation. The development of those trend estimates can be found in

Appendix C. The reclamation acres remain constant for each alternative. In general, reclamation shall be ongoing for up to 5 years after the abandonment of a well. Total reclaimed acres are identified for the end of the 15-year planning period.

The number of acres reclaimed and unreclaimed by vegetation and soil type for each alternative are displayed for the forest-wide Concentrated RFD in Table IV-4.

**Table IV-4  
Concentrated RFD (Unit)  
Reclaimed/Unreclaimed Acres for Each Alternative**

| Soil/Vegetation                                | Alternatives I & III |             | Alternatives II & IV |             |
|--|----------------------|-------------|----------------------|-------------|
| Type   | Reclaimed            | Unreclaimed | Reclaimed            | Unreclaimed |
| Douglas-fir/<br>Granitic Residuals             | 16                   | 0           | 0                    | 44          |
| Ponderosa Pine/<br>Granitic Residuals          | 9                    | 0           | 0                    | 0           |
| Lodgepole Pine/<br>Granitic Residuals          | 0                    | 4           | 0                    | 0           |
| Midgrass Prairie/<br>Hard lands                | 114                  | 196         | 108                  | 187         |
| Shortgrass Prairie/<br>Sandy lands             | 61                   | 104         | 59                   | 100         |
| Shortgrass pinyon-<br>juniper/<br>Canyon lands | 0                    | 0           | 1                    | 1           |
| Riparian                                       | 0                    | 0           | 7                    | 12          |
| <b>TOTALS BY ALTERNATIVE</b>                   | <b>200</b>           | <b>304</b>  | <b>175</b>           | <b>344</b>  |

***Effects Common to All Alternatives***

With the level of anticipated activity being relatively equal in all alternatives there are many effects that are common to them. The broad effects that would be similar shall be discussed early so that the differences between alternatives can be clearly displayed.

All alternatives result in the development of 214 wells and access roads across the Unit. The size and distribution of well sites would vary by alternative. Clearing of vegetation for these improvements would generally cause a short-term effect on ground cover vegetation and forested vegetation on acres suitable for timber production. Clearing of vegetation would generally cause a long-term effect on forested vegetation on acres unsuitable for timber production, where tree planting would not necessarily be required mitigation. Soil loss on cleared acres due to wind and water erosion would generally be a short-term effect. The well site and access clearings would



undergo rehabilitation and reclamation as soon as the wells have been abandoned. Abandonment and reclamation initiation for exploratory wells would occur in the year that the well is drilled.

The effects to air resources would be localized based on the possible discharge of hydrogen sulfide and exhaust and dust created by exploration and development traffic. These activities would also provide short-term effects to the visual quality along and adjacent to the roads being used for oil and gas activities.

All activities would generate some level of impacts to visual quality. The effects would vary greatly based on well location and the actual oil and gas activity involved. The highest visual impact would come at the time of exploration, when the well is actually being drilled, and during periods of heavy maintenance. This is because the drill rig that would be used for this work has a mast that is over 60 feet in height. There is little vegetation on the Unit that would provide full screening of these activities. New road construction would have a visual impact until rehabilitation has been completed. Various types of mitigation are available and effectiveness would be identified when the alternative effects are discussed.

The effects to non-recreation special uses is the same for all alternatives. Their investments can be protected by condition six of the standard lease terms.

Special areas, threatened and endangered species, including their habitat, and cultural resources sites can be protected in all alternatives with the application of standard lease terms. These lease terms incorporate all laws and executive orders applicable to National Forest lands. The legally required protection level would be provided.

Current Forest Plan direction prohibits most surface occupancy and ground-disturbing activities within Research Natural Areas.

All alternatives would result in detrimental impacts to soils and vegetation from saltwater and oil leaks related to production activities. Since production is not expected on any of the Mountain districts these impacts would be found in all alternatives on the Grasslands.

Some level of sediment input to stream and lake fishery resources would occur. This would be through wind or water erosion on clearings. The total input would vary by alternative but all would impact the resource to some degree.

All possible effects of the release of subsurface toxic materials shall be mitigated equally by venting and burning of hydrogen sulfide and storage of liquids in secure reserve pits until disposal, meeting EPA standards, is completed.

There would be minor effects to grazing and range activities. These would occur because of the construction of roads and well pads in allotments. The total loss of animal unit months (AUM) over the planning period for all alternatives is 77. By the end of the planning period 32 AUM would have been recovered through mitigation. 45 AUM, which represents .04 percent of the total permitted use on the Unit, would be unavailable at the end of the planning period. All of the loss in AUM would occur on the Grasslands.

All alternatives would affect wildlife habitat. There would be a reduction in habitat for non-critical species. Critical species are those identified as sensitive, threatened or endangered, management indicator species, or big game species. The mitigation provided by alternatives would affect these critical species.

All alternatives would provide income to the federal treasury and local communities. The amounts and distribution of that income would shift based on alternative.

In all alternatives there would be a subsurface effect from the actual drilling itself. That effect would be the depletion of mineral resources. All alternatives are expected to produce approximately the same amounts of oil and gas resources for public consumption.

On the Mountain districts, all four alternatives would have minimal direct effects on cultural resources, paleontological resources and cave resources. On the Grasslands, there would be no foreseeable effects on paleontological resources or cave resources. Conclusions regarding impacts have been based on what is presently known about each resource.

### **Vegetation**

Disturbed acres and reclaimed acres for the projected RFD are depicted in tables found in earlier sections of this chapter.

Clearings for oil and gas wells, roads, and pipelines directly affect the vegetation resource. Soil compaction caused by associated ground-disturbing activities could cause potentially long-term direct or indirect effects on vegetation reclamation potential or vegetation growth on affected areas. The potential for soil compaction would be greater on fine-textured clay loams, such as the "hard lands" on the Grasslands. Standard lease terms allow for ground-disturbing operation shut-down during periods of inclement weather to minimize the potential for soil compaction. Mechanical site preparation such as ripping would be required on areas of compacted soils before reclamation efforts.

The Forest Plan identifies approximately 580,000 acres of land suitable for timber production on the Mountain districts. Exploratory post-leasing activities would cause a minor, short-term loss of timber production. Tree planting would be required on sites suitable for timber production to facilitate minimum stocking within 5 years of well abandonment.

The BLM RFD well locations would not cause a significant effect on the 13 basic vegetation types described in Chapter III. Alpine ecosystems and riparian ecosystems are not considered basic vegetation types. Disturbed acres are minor compared to total acres occupied by basic vegetation on the Mountains and Grasslands. Many acres would be revegetated during or shortly after the planning period with the application of appropriate, site-specific reclamation mitigation.

Standard lease terms usually offer adequate protection of the basic vegetation resource. Concentrated RFD Wells 1C through 4C are an exception. Timely revegetation is uncertain on these well sites, even if artificially induced, due to a combination of the following site factors: slopes greater than 40 percent, shallow, highly erosive soils, dry aspects, and relatively low precipitation during the growing season. The Concentrated RFD is situated along the Rampart Range. Extensive areas of fragile, granitic soils of the Pikes Peak formation have been identified along the Rampart Range. Other potential wells on sites with a similar combination of factors would negatively impact vegetation in other portions of the Rampart Range, the canyon lands on the Comanche National Grassland, or localized areas on the Unit.

Alpine areas occur from timberline to the highest elevations on the Mountain districts. Vegetation plays a major role in alpine surface stability and succession. Due to harsh climatic conditions and very slow soil formation, plant succession and growth, alpine areas are fragile ecosystems which are very sensitive to disturbances that alter vegetative cover and expose bare soil.<sup>2</sup>

None of the BLM RFD or Concentrated RFD wells and roads would impact alpine areas. However, other potential well sites could impact alpine ecosystems in such areas as the Spanish Peaks, Lost Creek Further Planning Area and Sangre de Cristos under most alternatives. The magnitude of potential effects on alpine would vary by alternative, as discussed below.

### ***Alternative I***

Current Forest Plan direction provides for relocation of oil and gas activities from areas with high erosion hazard rating to areas with more stable soils. The Controlled Surface Use stipulation for soil resource protection would be applied to relocate Concentrated RFD Wells 1C through 4C to gentler slopes with better potential for timely revegetation. Therefore, Alternative I would not cause significant effects on the basic vegetation resource on the Unit.

Current Forest Plan oil and gas management direction does not specify alpine ecosystems as a consideration for consent denials. However, one or more of the consent denial criteria or conditions specified on page III-57 of the Forest Plan could be found in all or portions of some alpine ecosystems: slopes steeper than 60 percent, high erosion hazard rating, high geologic hazard rating, low visual absorption capacity or threatened or endangered species habitat. Supplemental stipulations to protect soils and visual resources may or may not adequately protect fragile alpine ecosystems, depending on site-specific conditions in alpine areas where leasing proposals and post-leasing activity might occur.

### ***Alternative II***

This alternative could cause long-term and potentially significant effects on the vegetation resource in the vicinity of Concentrated RFD Wells 1C through 4C on the Mountains. Although disturbed acres would be minor, effects on vegetation would be irreversible if site-specific erosion control and rehabilitation measures proved ineffective. Alternative II would not cause significant effects on Grassland vegetation.

Standard lease terms would not adequately protect fragile alpine ecosystems. As noted earlier, alpine areas are very sensitive to disturbance. Post-leasing activities may require relocation farther than 200 meters to find acceptable microsites for development.<sup>3</sup> Standard development could cause potentially long-term and significant impacts to alpine areas if suitable microsites for development and subsequent reclamation could not be found within 200 meters of the proposed location.

### ***Alternative III***

Similar to Alternative I, the Controlled Surface Use stipulation would be applied to relocate Concentrated RFD wells to gentler slopes with better reclamation potential. Alternative III would not cause a significant impact on the basic vegetation resource on the Unit.

Alternative III is the only alternative which would allow application of a supplemental stipulation specifically designed to protect alpine ecosystems. The Controlled Surface Use stipulation would allow relocation of potential wells greater than 200 meters, either outside alpine areas or to alpine microsites more favorable for disturbance and subsequent reclamation. Special operating constraints are designed to minimize alpine surface disturbance and therefore the potential for long-term, significant impacts to alpine vegetation.<sup>4</sup>

Alpine within Discretionary No Lease (DNL) areas listed in Table II-11 would not be impacted for the duration of the DNL protection.

### **Alternative IV**

Effects on basic vegetation would be similar to Alternative II. However, vegetation disturbance could only occur on lands currently under lease. On the Mountain districts, exploratory well disturbance would occur early in the planning period, before termination of existing leases. This condensed time frame for such low RFD disturbance levels would not cause unacceptable effects on vegetation.

There is one existing lease in alpine in the Spanish Peaks area. Standard development could cause potentially long-term and significant effects to alpine vegetation on disturbed acres on this lease. No other alpine areas would be impacted by this alternative.

### **SOILS<sup>5</sup>**

Managing soils for sustained productivity and protection of water quality is a major concern of National Forest management. Post-leasing activities can generate detrimental impacts to the soil resource that could cause significant reduction in potential productivity. Oil and gas activities, like other forms of land use activities, can cause varying degrees of soil disturbance. The type of disturbance and duration of activities primarily determine whether or not site productivity is significantly affected by changes in soil properties.

Construction of access roads and drill pads for mineral operations would remove or destroy protective vegetative cover and expose soils to accelerated erosion. The potential for soil loss during the construction period is an impact of major concern because the transport of soil particles takes place more rapidly than natural erosion, and there is a greater probability of indirect or off-site impacts to water quality and aquatic life.

The severity of soil erosion depends on many factors such as soil type, slope, climatic conditions, and both the season and duration of ground-disturbing activities. In general, water is the erosive force that has been the most damaging to soils in the Mountain environment, and wind erosion is more damaging in the Grasslands. Surface disturbances in areas of steep terrain typically result in greater soil loss amounts than landforms with gentle to moderate slope gradients.

Soil management objectives for controlling wind erosion on the loose sandy soils of the Grasslands focus on maintaining vegetative ground cover protection at all times. Wind erosion damage is evident in several ways.<sup>6</sup>

- (1) the removal of surface soils along with plant materials,
- (2) loss of organic matter and finer soil particles bringing about a change in surface soil texture,
- (3) deposition that forms drifts that bury vegetation, and
- (4) wind-blown sand particles that cut off young plants at the soil surface.

Soil loss estimates were derived for disturbed acres of both access roads and drill pads to evaluate differences in the alternatives for resource protection. The most appropriate erosion model, surface erosion by water or wind, was used for the different environments and land types.<sup>7</sup> Predicted erosion amounts are displayed for potential soil loss before mitigation and after a 75 percent reduction of impacts through reclamation within the first year. Certain soil types require stabilization practices (e.g., mulching) in addition to revegetation within the first year, to reduce erosion to within acceptable limits. Forest Plan direction is that reclamation maintenance would be required until on-site erosion is reduced by 95 percent within 5 years. Soil erosion estimates are relative values and should only be used as a comparison or indicator of soil loss amounts. These soil loss

amounts are most likely underestimated for potential soil loss increase because they only reflect impacts that could occur from the removal of vegetation and litter on natural slopes. Research has shown that surface erosion resulting from cut and fill slopes is greater on soils physically disturbed, erosion rates are highest during the first year after construction, and erosion decreases rapidly after detached particles have moved off-site.<sup>8</sup> These facts were considered in using an Erosion Hazard Rating Guide<sup>9</sup> to evaluate potential impacts and assign adjective interpretation ratings. Predicted soil loss for the Concentrated RFD (Mountains) and BLM RFD (Grasslands) are presented in Table IV-5. It is important to note that the totals given are for a Unit-wide basis, and the information reflects a disproportionate amount of impacts for disturbed acres on the Grasslands as compared to the Mountain environment. The magnitude of effects is dependent upon slope steepness and the kind, amount, and location of surface and vegetation disturbance.<sup>10</sup> The longevity of direct impacts and reclamation potential are also determined by similar variables, and different combinations of soil/landform characteristics influence response to soil disturbance.

**Table IV-5  
Predicted Soil Loss  
Concentrated RFD Wells (Mountains) and BLM RFD Wells (Grasslands)**

| Soil/Vegetation Type                      | Predicted Soil Loss in Tons Per Year |              |                      |              |
|---|--------------------------------------|--------------|----------------------|--------------|
|   | Alternatives I & III                 |              | Alternatives II & IV |              |
|   | Year 1                               | Outyears     | Year 1               | Outyears     |
| <b>MOUNTAIN ENVIRONMENT</b>               |                                      |              |                      |              |
| Douglas Fir/<br>Granitic Soils            | 216                                  | 41           | 920                  | 920          |
| Ponderosa Pine/<br>Granitic Soils         | 107                                  | 20           | 0                    | 0            |
| Lodgepole Pine/<br>Granitic Soils         | 12                                   | 2            | 0                    | 0            |
| Totals                                    | 335                                  | 63           | 920                  | 920          |
| <b>GRASSLAND ENVIRONMENT</b>              |                                      |              |                      |              |
| Midgrass Prairie/<br>Hard lands           | 148                                  | 19           | 137                  | 19           |
| Shortgrass Prairie/<br>Sandy lands        | 40,416                               | 2,756        | 39,610               | 2,702        |
| Shortgrass pinyon-juniper<br>Canyon lands | 0                                    | 0            | 13                   | 13           |
| Riparian                                  | 0                                    | 0            | 2,490                | 2,490        |
| Total                                     | 40,564                               | 2,756        | 42,250               | 5,224        |
| <b>GRAND TOTALS - UNIT</b>                | <b>40,899</b>                        | <b>2,819</b> | <b>4,3170</b>        | <b>6,144</b> |

### **Alternative I**

Under Alternative I, the current Forest Plan provides direction and guidelines for surface disturbance of erosive soils and unstable slopes. Individual analysis at the time of lease request would likely result in an analysis and decision notice that will recognize other sensitive soil conditions that are not in the Forest Plan. The fragile granitic soils of the Rampart Range, sensitive alpine ecosystems along the Continental Divide, and riparian areas would be identified for additional protection above the standard lease terms.

Direct impacts from the BLM Mountain RFD can be mitigated with standard lease terms due to moderate slopes and non-fragile soils. This alternative would protect erosive soils and unstable slopes by relocating activities of the Concentrated RFD to suitable sites with better reclamation potential.

In the Grassland environment, direct effects to soils on the hard lands and sandy lands can be effectively mitigated under standard lease terms. The figures displayed in Table IV-5 indicate that potential soil loss of 40,564 tons per year would occur if all wells were drilled on the Grasslands in one year. Effective reclamation of disturbed acres (outyear mitigation) would reduce soil erosion by 93 percent within the first year, and erosion rates would be restored to natural levels within 5 years. Fragile soils on canyon escarpments and sensitive alluvial soils in riparian or floodplain areas can be avoided under this alternative. It is important to note that successful reclamation on the Grasslands can generally be accomplished with less complications than usually exist in the Mountain environment.

### **Alternative II**

Standard lease terms allow adequate protection to the soil resource from short-term impacts of the BLM Mountain RFD. Significant reductions in soil productivity would occur on steep slopes and fragile soils associated with the Concentrated RFD Wells 1C through 4C. Extensive areas of highly-erodible, shallow soils occur throughout the Rampart Range, and well movement within 200 meters may not always be sufficient for soil resource protection. Accelerated erosion [Table IV-5] in areas with low reclamation potential would result in significant long-term effects and risk of irreversible damage. On the Grasslands, short-term unavoidable effects can be effectively mitigated with exception of canyon escarpments and riparian areas. Accelerated erosion on shallow soils of canyon escarpments would conceivably cause irreversible damage by removing all soil material until bedrock is exposed. Detrimental impacts to sensitive alluvial soils would reduce soil productivity and potentially cause long-term damage to riparian areas or floodplain areas.

### **Alternative III**

Effects on the soil resource would be similar to Alternative I. The current Forest Plan provides direction and guidelines for surface disturbance of erosive soils and unstable slopes. This alternative discloses supplemental stipulations across the entire unit and identifies discretionary no lease areas where lands would not be available for leasing. This additional form of protection would be implemented in specific areas of fragile soils and sensitive ecosystems such as alpine and riparian areas [see Appendix B, Lease Stipulations section]. No Surface Occupancy prevents slope failures and mass movements of earth on slopes greater than 60 percent with soils that have high (Severe) geologic hazard. The Controlled Surface Use stipulation protects other areas with steep slopes, highly erodible soils, and sensitive ecosystems by relocating activities to suitable sites with better reclamation potential. Standard stipulations allow adequate protection on moderate slopes and non-fragile soils of the BLM Mountain RFD. The Controlled Surface Use stipulation applies to the Concentrated RFD Wells 1C through 4C, and potentially irreversible damage to the soil resource can be prevented by relocating activities to suitable sites.

On the Grasslands, standard stipulations effectively mitigate impacts to most soils, and reclamation on hard lands and sandy lands can be accomplished in the short term. The Controlled Surface Use stipulation provides additional protection for fragile soils on canyon escarpments and sensitive alluvial soils in riparian or floodplain areas. These areas are avoided by relocating activities to suitable land types.

#### ***Alternative IV***

Under this alternative, direct effects to the soil resource would be similar to Alternative II. However, surface disturbance could only occur on lands currently under lease. The soil resource would be fully protected when leases expire. Short-term effects of the BLM Mountain RFD wells can be mitigated in the same manner as the other alternatives. Significant reductions in soil productivity would occur on steep slopes and fragile soils associated with the Concentrated RFD wells. Accelerated erosion would conceivably cause long-term, irreversible damage. Short-term, unavoidable impacts in the Grassland environment can be effectively mitigated on hard land and sandy land soils. The Conditions of Approval would not be sufficient to protect shallow soils of canyon escarpments, and these areas have high risk for long-term irreversible damage. Detrimental impacts to sensitive alluvial soils would potentially cause long-term damage to riparian areas.

#### ***Water***

Oil and gas activity can adversely affect the water resource. Road construction and pad development associated with the exploratory drilling phase and full development phase will cause an increase in sediment yield. Drilling fluids contain toxic substances that could pollute the surface water and ground water if not properly contained. Salt water is also found in association with oil and gas in the underground formations. This salt water can cause serious degradation to water quality and aquatic life if not handled properly. Oil and gas products themselves are also a threat to water quality. The major water issues identified as part of this EIS includes maintaining the surface and ground water quality as well as protecting the stream systems themselves.

The primary issue associated with the produced water is the potential for contamination of surface and ground water, soil, vegetation, and animals. Oil and gas wastes from exploration, development and production activities include sediment, brine, drilling fluids, well bore cuttings and chemical additives related to the drilling and well completion process, hydrocarbons and sanitary wastes. The largest volume of waste associated with oil and gas exploration activities is the produced water. Most produced water is strongly saline. The total dissolved solids (TDS) in produced water ranges from several hundred parts per million to over 150,000 parts per million. Seawater, by comparison, is typically about 35,000 parts per million TDS. Produced water also contains trace quantities of petroleum hydrocarbons, metals, and additives used in the production process.

Another potential effect on water quality is increased sediment from the oil and gas activity. Streams transport sediment as part of their natural process. The amount of sediment moved is related to the stream flow, in that the sediment, especially the portion moving near the bed, increases and decreases with streamflow. All streams can transport a maximum amount of sediment termed the sediment threshold. Sediment in excess of the threshold is stored in the channel and not easily displaced. Streams will usually adjust laterally around deposits rather than moving the deposit. Excessive lateral migration by a stream channel will disrupt its pattern and cause the stream to be in disequilibrium. Excessive sediment can disrupt this balance and cause the channel to degrade (cut down) or aggrade (build up) in a short time frame.

One standard listed in the Forest Plan states that increased sediment will be prevented from exceeding sediment limits. A sediment threshold is that point where the amount of sediment

exceeds the stream's ability to transport it. Sediment thresholds can be determined by measurement or by use of predictive models. Sediment threshold limits were determined for the major planning watersheds in the forests during the Forest Land Management Plan analysis. Nine out of 146 planning watersheds on the Pike and San Isabel National Forests exceed sediment thresholds. These watersheds are listed in the Affected Environment, Chapter III.

**Table IV-6  
Total Delivered Sediment (Tons/year) Mountains**

|                 | BLM RFD | Concentrated RFD |
|-----------------|---------|------------------|
| Alternative I   | 0.87    | 0                |
| Alternative II  | 1.65    | 29.19            |
| Alternative III | 0.87    | 0                |
| Alternative IV  | 1.65    | 29.19            |

***Alternative I***

The Forest Plan specifies that sediment thresholds will not be exceeded. Activities have been allowed in watersheds that exceed sediment thresholds but only after an equal or greater amount of existing disturbed acres in the watershed are rehabilitated. This type of management strategy still allows for activities but only after the existing problem areas in the watershed are taken care of.

Two of the BLM RFD wells (3 & 4) are in drainages within 10 percent of exceeding or are exceeding sediment threshold levels. Two wells (1 & 2) are in drainages that are within acceptable threshold limits. Exploration on well sites 3 & 4 will not be allowed until an equal or greater amount of existing disturbed area is rehabilitated. No increase in sediment over the existing levels is expected from the development of BLM RFD Wells 3 & 4. Exploration on Wells 1 & 2 would be allowed under standard lease terms and a slight increase in sediment to the drainages is expected as shown in Table IV-6. The increased sediment would remain within acceptable levels.

Quantitative impacts of oil and gas activity on the watershed resource of the Grasslands are difficult to determine, due to the hypothetical nature of the RFD wells on the Grasslands. In general, on-site erosion is of more concern than delivered sediment because there are so few perennial drainages present for the delivered sediment to impact. Sediment delivery would be insignificant if the wells are located 500 feet or greater from drainages. Due to the relatively flat terrain, sediment delivery will be only about 1 percent of the calculated soil loss for wells within 500 feet of a drainage. Impacts to water quality will primarily be from waste products such as oil, brine, and drilling fluids. Percolation of these products into the soils could be a problem on sandy soils, or in areas with a high water table. Protecting the ground water resource from any leaks or spills is especially important in the Cimarron River Corridor where ground water is within a few feet of the surface. Mitigation requirements such as lining reserve pits and removing produced water to preapproved disposal sites are designed to minimize effects to the ground water resource.

All of the Concentrated RFD wells are located in the Jackson Creek watershed. The watershed is already exceeding sediment threshold limits. No new ground-disturbing activities can occur until an equal or greater amount of existing disturbed area is rehabilitated. No increase in sediment over the existing levels is expected from the development of the four Concentrated RFD wells.



The Forest Plan currently gives direction for all watersheds on the Unit. Specific direction includes maintaining instream flows for stream channel maintenance, reducing erosion to naturally occurring rates. Within the National Forests, nine watersheds whose sediment production exceeds the threshold level and an additional seven watersheds have production levels that are very near the threshold level. Many, but not all of these watersheds are associated with highly erosive soils derived from granitic bedrock.

### ***Alternative II***

Under standard lease terms, well locations can only be moved a maximum of 200 meters to protect the watershed resource. There is no provision in standard lease terms to curtail development in watersheds exceeding sediment thresholds until a specified amount of existing disturbed acres are rehabilitated. Wells that are developed, even with mitigation, would produce sediment that could impair water quality and aquatic life in the drainages affected. Sediment quantities delivered to affected streams in the Mountains are shown in Table IV-6.

Even with the mitigation of moving well locations 200 meters, there would be significant impacts to the drainages where the BLM RFD and Concentrated Wells are located. Development of BLM RFD Well 3, BLM RFD Well 4, and all Concentrated RFD Wells (1C-4C) would increase sediment in the Rampart, Beaver Creek, and Jackson Creek watersheds. These watersheds either exceed sediment thresholds or are within 10 percent of exceeding sediment thresholds. Sediment increases could cause the streams to adjust laterally, cutting into the stream banks and disrupting the stream's equilibrium. Sediment fills the pools, reduces reproduction, and destroys habitat for all aquatic life.

The South Platte River corridor between Elevenmile Reservoir Dam and the North Fork of the South Platte River is another area in the Mountain environment that could be used as an example. Although this section of river has been identified as an area with excessive sedimentation problems, there is little guidance in standard stipulations that would provide protection of this degraded stretch of river. As previously discussed in Alternative I there are several other watersheds that could be similarly classified.

### ***Alternative III***

Effects of oil and gas development on the watershed resource under this alternative would be similar to Alternative I. The only differences between Alternative I and Alternative III are: (1) Alternative III discloses supplemental stipulations across the entire Unit, while Alternative I follows direction from the Forest Plan, requiring each application to be examined individually, and (2) Alternative III identifies discretionary no lease areas where lands would not be available for leasing.

In summary, the controlled surface use (CSU) stipulation applied by this alternative would not allow oil and gas development in drainages within 10 percent of sediment thresholds, or exceeding sediment thresholds, until a specified amount of existing disturbed acres are rehabilitated. Sections of the South Platte River, Badger Creek and other sensitive and degraded watersheds in the Forests would be protected under this stipulation.

### ***Alternative IV***

Effects to the watershed resource would be similar to effects in Alternative II except that effects would be limited to existing lease parcels. Effects of this alternative from development of BLM RFD Wells and Concentrated RFD Wells are the same as discussed in Alternative II. Watersheds which have been identified throughout the Forest environment which are exceeding their sediment

threshold levels, including sections of the South Platte River, Jackson Creek and several other watersheds, would not be protected from further degradation under this alternative.

### ***Wildlife, and Threatened and Endangered Plant and Animal Species***

Effects of oil and gas activities on wildlife are dependent on such factors as time of year, duration, and sensitivity of the species involved. In the case of the Pike and San Isabel National Forests and the Comanche and Cimarron National Grasslands, the following habitats or groups of animal species would be affected by oil and gas operations. These are:

- (1) Critical big game winter range.
- (2) Production areas.
- (3) Management Indicator Species (MIS).
- (4) Threatened and Endangered plant and animal species.

Temporary disturbance, such as seismic operations, during non-critical periods seldom cause major impacts to big game because of minimal habitat disturbance and short duration of the activity. There would be a temporary movement away from the affected area with no permanent adverse consequences.

The greatest impacts from oil and gas operations would occur during critical periods and within critical habitats, such as winter ranges. During severe winters, excessive snow depth forces big game animals into smaller, more critical winter range habitats. These areas are essential for their survival and wintering big game animals may become highly susceptible to mortality if unduly disturbed over a long period of time. However, if only a single well is involved, there would not be a significant effect on the availability of critical habitat. Activity would be restricted by timing stipulations to non-critical periods, therefore, disturbance would not be a factor.

A production area is where big game animals traditionally go to give birth. These areas are preferred because of the optimal conditions that exist for the maximum survival of newborn animals. If displaced by oil and gas activities, the animals may still give birth, but reproductive success would probably be reduced. Protecting these areas can be managed through the use of Timing Stipulations.

Activities during oil and gas operations can exceed the tolerance levels for some species resulting in increased stress, altered behavior patterns and abandonment of preferred habitat. Some examples of the effects of oil and gas activities on some MIS are:

- Lesser Prairie Chicken-The breeding season is from mid-March to early June. Dancing grounds (leks) and an area within a one mile radius of the display grounds are essential to the maintenance of prairie chicken populations. Any activity during this period could have a significant impact on prairie chickens.
- Raptors (hawks, eagles, owls)-These birds normally cannot tolerate disturbance or harassment during the nesting period. Along with harassment, nest destruction and abandonment could occur during this period.

The effects of oil and gas activities on other MIS can be described. However, habitat for all MIS can be protected from disturbance under the Standard Lease Conditions of Approval and the Special and Timing Stipulations.

The Endangered Species Act stipulates that no action would be taken that would jeopardize any Federally listed and/or proposed candidate species for listing. Impacts to Colorado and Kansas

designated T&E and sensitive species would also be evaluated and applicable mitigation developed prior to the initiation of any action on public lands. No adverse environmental impact would be permitted that cannot be properly mitigated.

Where site-specific locations are known and T&E plant and animal species may be adversely affected, mitigation measures would be in the form of a Lease Notice with site-specific location(s). By using the various Notices and Stipulations there would be no significant impact on T&E species and their habitats that could not be mitigated.

Alternatives identified in this EIS have varying effects on these four habitats or groups of animals.

#### ***Alternative I***

The "no action" or current management alternative requires a site-specific analysis of lease areas on a case-by-case basis, as outlined by the Endangered Species Act.

Oil and gas effects on the wildlife resource can be mitigated in most cases through the use of site-specific timing restrictions. Timing stipulations prohibit activity during critical periods for wildlife during the year. The supplemental timing restrictions allow for more wildlife solitude than is afforded by the standard lease terms that only allow activities to be prohibited for a 60 day period. Supplemental restrictions apply to both the Mountains and Grasslands.

The BLM RFD Wells and the Concentrated RFD Wells serve as an example of how timing restrictions may be used to protect the wildlife resource. BLM RFD Well 1 is located in critical deer winter range. A timing restriction would require that no activity occur from December 1 to April 15 annually to protect deer during this stressful period. All Concentrated RFD Wells (1R-4R) are located in critical turkey winter range. The timing restriction would prohibit activity from November 15 to April 15 to protect turkeys on their winter habitat.

Effects on T&E species across the unit can be mitigated through guidance provided by the Endangered Species Act.

Guidance from the Forest Plan includes timing direction for critical lambing areas for bighorn sheep, and calving and fawning areas for elk and deer. An example would be in several lambing areas in the Sangre de Cristo Mountains, where activities would not be allowed between the dates of April 1 and June 15 annually. There are a number of areas throughout the Forests that would require inactivity between May 15 and June 30 for elk and deer calving and fawning respectively.

#### ***Alternative II***

Standard lease terms allow for the prohibition of oil and gas activity for a maximum of 60 days. This time period is not sufficient to protect wildlife populations during critical periods such as winter or during breeding and birthing periods. Effects of this alternative on the wildlife resource would include animal displacement to marginal habitat, resulting in poor animal condition, deaths, and reduced birth rates.

Effects on T&E species across the unit can be mitigated by issuance of a lease notice, at the time of lease, describing the mitigation measures necessary to protect T&E species within a lease.

Under Alternative II, RFD Well (Both BLM and Concentrated) construction would negatively affect both critical deer winter range and critical turkey winter range.

There is no documentation in the standard stipulations that would require the protection of lambing, calving or fawning areas. Although these areas are found throughout the Unit, they would not necessarily be protected under this alternative.

### ***Alternative III***

Effects of this alternative on the wildlife resource are similar to effects in Alternative I. The only difference in effects from Alternative I are: (1) supplemental stipulations have been identified for the entire unit. (2) discretionary no lease areas have been removed from leasing availability.

Supplemental stipulations are identified for critical winter range protection for mule deer, pronghorn, big horn sheep, and elk. These areas are found throughout the Unit and are critical in harboring these animals through this stressful period. In addition, calving and nesting areas for specific wildlife species has been identified. Bald eagle wintering habitat, such as in sections of the South Platte River system would be an example of an area that would require inactivity from oil and gas related activities from November 15 through April 15.

### ***Alternative IV***

Wildlife would not be adequately protected during critical periods under this alternative, since standard lease terms only allow prohibition of activity for a maximum of 60 days.

Requirements for the protection of T&E species would occur at the time of APD in the surface use plan of operations.

Under this alternative, critical rearing and wintering habitat could be impacted for several species. An example might be wintering bald eagles in the South Platte River corridor. As a result of activity during critical winter periods, eagles could be displaced to less desirable areas. A result could be an increase in winter mortality.

### ***Aquatic and Riparian***

Sediment input to streams would be the most important, direct impact of oil and gas exploration and development on fishery and aquatic resources. Soil erosion from newly constructed facilities could result in significant amounts of sediment entering streams and standing water environments within the impacted watershed. Stream crossings also could result in excessive amounts of sediment entering stream systems.

The effects of introduced sediment on aquatic systems have been extensively studied, although are difficult to quantify. In a direct sense, sediment can result in reduced growth rates and size at maturity, altered feeding behavior, clogged gills, and reduced reproduction success. Habitat alterations also can result from increased sediment in streams. Areas that were once low-velocity refuges for fish become shallow high-velocity areas of unsuitable habitat. Indirectly, sediment may alter the food community by smothering bottom-dwelling invertebrates used by both lake and stream fish.

The other potential main impact from oil and gas activities is from chemicals used in the drilling process and the effluent that comes to the surface. Both substances may contain a variety of chemical constituents that could be toxic to aquatic life.

The impact on riparian areas from oil and gas activities can be related to direct manipulation of the land as well as indirect effects from soil movement and/or chemical releases. Road and pad construction can directly impact riparian areas, through direct disturbance of the soil, vegetation, and hydrologic conditions. Compaction and alterations of riparian soils may be difficult if not impossible to mitigate.

The forest-wide effects of the four alternatives are summarized below.

### ***Alternative 1***

Under this alternative, site-specific analysis would have to be conducted for individual lease applications to determine adequate protection of riparian and aquatic resources.

The Forest Plan provides protection to these resources. Guidance prohibits activities in drainages that exceed sediment threshold values. It states that adequate mitigation would have to be implemented to reduce sedimentation to acceptable levels prior to any development.

When roads have to be located in the riparian, streams would be crossed at right angles. Streams would not be paralleled by roads within riparian, reducing the amount of possible sediment entering the fisheries and/or aquatic habitat. Impacts to threatened and endangered species of fish would be addressed following the guidance from the Endangered Species Act.

Using the Concentrated RFD wells as an example, the sediment input into the nearby stream would be 13.96 tons/yr under this alternative. However, because this watershed exceeds its sediment threshold level, adequate mitigation would have to occur before any further impacts would be allowed. There would be no direct impact to riparian areas due to pad construction with this alternative, although there would be one crossing of the riparian. Impacts to threatened and endangered species of fish would be addressed following the guidance from the Endangered Species Act.

Two of the BLM RFD Wells (3 & 4) are in drainages where the Forest Plan restrictions would apply and two wells (1 & 2) are in drainages where standard lease terms would apply. Exploration on Well sites 3 & 4 would not be allowed until an equal or greater amount of existing disturbed land is rehabilitated. No increase in sediment in the drainages is expected from development of BLM RFD Wells 3 & 4 with this mitigation. Exploration on wells 1 & 2 would be allowed under standard lease terms and a slight increase in sediment in the drainages is expected as shown in Table IV-6.

The amount of sediment transport on the Grasslands is difficult to quantify, due to the hypothetical nature of the Grasslands analysis. Wells would not be placed in riparian areas and strict guidelines on crossings would be administered. As a result, cumulative impacts to riparian areas would be considered insignificant on the Grasslands.

There is little guidance in the Forest Plan relating directly to fishery resources. Although fishery and aquatic habitat is found throughout the Unit, most of the direction comes from other resources. The aquatic habitat is generally a "receiving" area for activities outside of the aquatic ecosystem. Guidance for sedimentation and riparian areas directly influence aquatic habitats. The South Platte River corridor would also be an example of an area in the Forest environment where other resource concerns would influence fishery resources. General direction for Wild and Scenic river management would provide some protection to this area. The standards and guidelines for protecting riparian areas would also apply. As a result, there would be no significant impact to fisheries resources.

### ***Alternative II***

Under this alternative, well sites (or roads) could be moved up to 200 meters to mitigate the effects on riparian. However, in a large riparian area, like the Cimarron River, it may not be enough protection to move the well out of the riparian area. Roads would be allowed to parallel streams, and to cross them at less than right angles. Executive orders 11990 and 11988 protect wetlands and floodplains to some extent, but don't allow for the protection of the much broader areas defined as riparian areas. In addition, when a drainage is exceeding, or within 10 percent, of its sediment threshold limit, no specific provisions in the Standard Lease Terms protect the drainage from further damage. Under this alternative, oil and gas activities could be allowed in these sensitive watersheds [see Appendix B]. Using the Concentrated RFD Well sites as an example, the sediment input into the drainage would be 20.99 tons/year. A total of 8 wells would be projected under this alternative in the riparian, comprising 19 acres.

Threatened and endangered fish would be protected under the guidance of the Endangered Species Act.

On a Unit level, there would be little protection for aquatic and riparian resources under this alternative. Habitats in the Grasslands and Mountain areas would receive little protection under this alternative. Fishery resources in the Cimarron ponds could be impacted from mining wastes and sulphur dioxide intrusions while sedimentation from roads and pads could impact stream fisheries in the Mountain areas. There could be significant adverse impacts in select drainages if wells were accessed or constructed in areas where they directly impacted water quality and the fishery resource. These effects would only occur at locations where excessive sediment and/or contaminants could enter the stream system.

### ***Alternative III***

This alternative is similar to Alternative I. The difference under this alternative is that the Unit is covered under one EIS, rather than a case-by-case basis (Alternative I) and specific stipulations providing additional protection in riparian areas would also apply. The Controlled Surface Use stipulations would apply in watersheds within 10 percent of their sediment threshold level. Sediment input from this alternative, using the Concentrated RFD's, would be 13.96 tons/year. Adequate mitigation would have to occur within this drainage to ensure that at least this amount of sediment is reduced before exploration began. Two of the BLM RFD Wells (3 & 4) are in drainages where the Forest Plan restrictions would apply and two wells (1 & 2) are in drainages where standard lease terms would apply. Exploration on Well sites 3 and 4 would not be allowed until an equal or greater amount of existing disturbed land is rehabilitated. No increase in sediment in the drainages is expected from development of BLM RFD Wells 3 & 4. Exploration on Wells 1 & 2 would be allowed under standard lease terms and a slight increase in sediment in the drainages is expected as shown in Table IV-6.

Special stipulations would be adequate in protecting riparian and aquatic resources throughout the Unit. By protecting riparian areas in the Mountain areas, sedimentation and resulting loss in aquatic habitats would be mitigated for the most part. Potential chemical spills in the Mountain areas and additional sediment in watersheds that are exceeding sediment threshold levels would be minimized. The same reasoning would follow for the Grasslands.

### ***Alternative IV***

This alternative is similar to Alternative II. The difference is that this would only look at existing leases. Sediment input from this alternative, using the Concentrated RFD's, would be 20.99 tons/year. Because this watershed currently exceeds its sediment threshold, this amount of

sediment would have to be mitigated prior to development. Two of the BLM RFD Wells (3 & 4) are in drainages where sediment threshold levels are exceeded and two wells (1 & 2) are in drainages where these conditions do not apply. No increase in sediment in the drainages is expected from development of BLM RFD Wells 3 & 4. Exploration on Wells 1-2 would be allowed under standard lease terms and a slight increase in sediment in the drainages is expected. Riparian areas on the Grasslands would also be impacted from well and pad development.

On a Unit level, there would be little protection for aquatic and riparian resources under this alternative. Habitats in the Grasslands and Mountain areas would receive little protection under this alternative. Fishery resources in the Cimarron ponds could be impacted from mining wastes and sulphur dioxide intrusions, while sedimentation from roads and pads could impact stream fisheries in the Mountain areas.

### **Range**

There are approximately 305,400 acres of suitable range on the Mountain districts. This acreage figure is based on current data contained in the Forest Service Range Management Information System (FSRAMIS). Suitable range is also defined as land accessible and capable of producing forage on a sustained yield basis.

There are approximately 522,005 acres of suitable range on the National Grasslands. The scoping process identified the following issues and concerns on the Range resource:

- Impacts of oil and gas leasing causing a reduction of range forage
- Impacts of oil and gas leasing on range improvements

The effects of oil and gas activities on the range resource are determined by the amount of suitable range land that can be disturbed and/or removed from use. Roads, drill pads, pipelines and other activities can remove the forage used by livestock for a period of time. Some activities, such as seismic exploration, are insignificant as virtually no surface disturbance takes place.

Exploratory post-leasing activities would cause short-term removal of forage and impacts on the range resource. A minor amount of grazing capacity would be lost until sites can be restored to their former production. In some areas this may occur within three years after the activity is completed. In other areas, such as the alpine, it may take more than 20 years.

Full production would cause minor long-term effects on the range resource. Seeding of road cuts, fills and barrow pits with suitable forage plants would result in an insignificant forage reduction. In some vegetation types disturbance and partial reclamation might increase forage.

### **Alternatives**

Effects on the range resource are essentially the same throughout all alternatives during the 15-year planning period and were identified earlier in this chapter. However, under Alternative IV, all projected level of development would occur on lands currently under lease creating the potential for slightly greater impacts on a more limited number of range allotments. Well pad construction and road construction would cause a short-term or minor long-term loss of forage production. Most exploratory well sites would be completely revegetated during the planning period. Producing wells would only occupy about 1 acre each. There would be a potential loss of 38 AUM's on the Cimarron and 7 AUM's on the Comanche in all alternatives. This loss would be insignificant when compared to the total annual permitted grazing use of over 115,000 AUM's.

## **Visuals**

Oil and gas activities would impact visual quality as development occurs. Impacts would result when contrast is created between the natural landscape and the oil and gas developments. The natural landscape is described in terms of line, form, color, and texture. Oil and gas developments may introduce new elements into the landscape such as: roads, site developments, soil disturbance, structures, and vegetation removal. Impacts on visual quality are not limited to the site or road development. Developments may affect entire viewsheds and several viewpoints.

Visual absorption capability is an important consideration in the analysis of potential impacts to the visuals resource. Visual absorption capability is an estimate of the relative ability of a tract of land to withstand management manipulations without significantly affecting its visual character. High visual absorption capability areas can withstand the most visual change, while low visual absorption capability areas can withstand little or no change.

The summit of Kenosha Pass is an example of an area with low visual absorption capability. Open meadows provide little screening of middleground and background areas. Highway 285 near Bailey would have high visual absorption capability. This area has more landform variety and vegetation is dominated by fairly dense wooded areas.

### ***Alternative I***

Current Forest Plan direction allows the use of supplemental stipulations to ensure oil and gas activities do not occur in areas with low visual absorption capability which cannot be reclaimed to the established visual quality objective. Since operations could be moved more than 200 meters to meet Forest Plan direction, this alternative would reduce potential impacts to visual quality more than Alternatives II or IV.

### ***Alternative II***

Development under Alternative II has the potential to disrupt the scenic quality in various areas on the Unit. Well locations can be moved only 200 meters to protect visual resources. As a result, relocated wells could still be within low visual absorption capacity areas, possibly within view of roads, recreation facilities or other important attractions.

The Concentrated RFD (Wells 1C-4C) presents a clear example of visual quality disruption that could occur with this alternative. Locations of these wells would have negative visual effects on the area around Devil's Head Trail and Campground, Rampart Range Road, Jackson Creek Road, and Jackson Creek itself. Mitigation would be difficult since this area has a low visual absorption capability. The projected long-term vegetation recovery period would prolong the negative impact to the visual character of this area.

Under this alternative, other potential well sites could negatively impact visual quality in such areas as the Highway 285 corridor, roadless areas or the Spanish Peaks National Natural Landmark.

### ***Alternative III***

Alternative III provides the most effective protection of visual quality. Supplemental stipulations would be used to locate well sites in areas with high visual absorption capabilities. Discretionary No Lease would offer additional protection of visual quality within roadless areas and segments of the South Platte River being considered for designation as Wilderness or classification as Wild and Scenic river.



### ***Alternative IV***

On existing leases subject to standard lease terms, the effects of Alternative IV on visual quality would be similar to the effects of Alternative II. However, negative impacts to the visuals resource under Alternative IV would be limited to lands currently under lease.

#### ***Cultural, Paleontological and Cave Resources***

Most of the historic, architectural and archeological values of cultural sites can be protected effectively through application of the National Historic Preservation Act (NHPA) of 1966 as amended and the Archeological Resources Protection Act (ARPA) of 1979 as amended in the event of oil and gas development. However, according to the General Counsel,<sup>11</sup> the NHPA may not protect all historic values associated with a cultural property, especially if the property has more than scientific worth. Cultural sites may contain educational and recreational values that are not protected by NHPA or ARPA; these values are the ones most endangered by oil and gas development as they are not protected by law or the current Forest Plan. Specifically, oil and gas development may cause degradation of the sensory environment associated with educational and recreational cultural sites and create conflicts with recreational and traditional place users of the sites and areas. These values should be protected through supplemental stipulation or through more comprehensive management plans protecting the resources from all types of potential disturbances.

Paleontological and cave resources usually are not protected by the NHPA and ARPA laws unless they have characteristics that qualify them as cultural sites. Very important paleontological sites may be protected by the Antiquities Act of 1906, although this law is vague in its specific application. The Federal Cave Resources Act of 1988 requires the protection and maintenance, to the extent practical, of significant caves on Federal lands. Implementing regulations are not currently available. Thus, paleontological and cave resources may be more vulnerable to direct effects caused by oil and gas activities. Mitigation measures consistent with standard lease terms would be developed on a case-by-case basis. Paleontological and cave resources may contain educational and recreational values in addition to their scientific attributes; these values are not protected by law and potentially are threatened by oil and gas development.

Oil and gas activities could cause indirect effects on cultural, paleontological and cave resources. Increased public access may increase illegal artifact collecting at archaeological and paleontological sites. There appear to be no measurable indirect effects on cave resources.

### ***Alternative I***

Current Forest Plan direction stipulates interpretation and protection of cultural resources that are eligible to or listed in the National Register of Historic Places. However, no specific areas for cultural resources protection or interpretation are listed in the text or depicted on the management prescription maps. Provision in the Forest Plan is made for protection of special interest historical, paleontological, and geological areas through implementation of management prescription 10C; however, no areas on the Forests or Grasslands are afforded this prescription in the current Forest Plan.

Alternative I would not allow Discretionary No Lease to protect known significant caves and the recreational and interpretive values of cultural resources until those areas needing special management designation are identified during Forest Plan revision. Examples of areas with interpretable cultural resources which could be impacted include Cloverdale Basin in the Sangre de Cristo range, Elevenmile Canyon of the South Platte River in South Park, and Picture Canyon.

Wells could be drilled adjacent to known cultural, paleontological and cave resources. The actual resources would be protected from physical disturbance, but oil and gas activity could impact recreational or interpretive values.

### ***Alternative II***

Potential effects on the recreational and interpretive values of cultural and paleontological resources would be similar to Alternative I.

### ***Alternative III***

Alternative III is the only alternative which would allow application of supplemental stipulations and Discretionary No Lease to provide added protection to significant cultural, paleontological and cave resources and their environment. The No Surface Occupancy stipulation for the Santa Fe National Historic Trail would prohibit surface occupancy on the trail itself and within a buffer of specified distance. This stipulation would adequately protect the recreational and interpretive values of this significant cultural resource. The Controlled Surface Use stipulation would avoid disturbance to important geologic features within the Spanish Peaks National Natural Landmark.

Discretionary No Lease would prohibit leasing in several other areas with significant, interpretable cultural resources until those areas needing special management designation are identified during Forest Plan revision. Discretionary No Lease would also prohibit leasing in the vicinity of the Cave Creek Caverns in the Mosquito Range. Areas not identified for special management would then be subject to standard lease protection.

### ***Alternative IV***

Standard lease development would cause impacts similar to Alternative II. However, impacts to cultural resources would be limited to lands currently under lease. Post-leasing activity on current leases could negatively impact significant cultural resources such as the Santa Fe Trail on the Cimarron, the Aubrey Cut-off area of the Santa Fe Trail on the Comanche, Picture Canyon on the Comanche and Devil's Head Lookout and Trail on the South Platte District.

### ***Recreation***

The two main types of recreational experiences managed by the Forest Service are dispersed and developed recreation. Oil and gas activities could impact both types.

### ***Alternative I***

Current Forest Plan direction does not allow the use of supplemental stipulations to protect developed and dispersed recreation experiences. Standard lease terms as supplemented by standard conditions of approval prohibit surface occupancy within developed recreation sites and within a limited buffer of unspecified distance around the sites. Wells could be drilled close to developed recreation sites. Nearby oil and gas activity could cause indirect negative impacts to the recreation experience, such as dust, noise, lights, increased vehicle traffic, and potential loss of the environment that made the site desirable for development.

Certain dispersed recreation areas considered for special designation are currently under multiple use management. These areas include Roadless Areas inventoried under the RARE II inventory, areas in Wilderness Study Areas identified by Congress as not suitable for Wilderness, roadless areas adjacent to BLM Wilderness Study Areas, and Wild and Scenic River segments not found to be eligible for classification under the inventory guidelines and process. Table II-11 lists these

areas. All these areas would be available for leasing subject to standard lease terms. Standard lease terms would not provide the extensive site protection necessary in Roadless Areas and other unclassified areas to protect the character of these areas for further evaluation for special designation.

#### ***Alternative II***

Under Alternative II, standard lease terms would offer the same level of protection of developed and dispersed recreation areas as Alternative I.

#### ***Alternative III***

Supplemental stipulations would prohibit surface occupancy within 1/4 mile around developed recreation sites. In most cases this distance would reduce indirect negative impacts that users might experience, such as dust, noise, lights, increased vehicle traffic, loss of recreation activities in close proximity to the developed site, and loss of the environment that made the site desirable for development. Exhibit B-1 of Appendix B lists developed recreation facilities where supplemental stipulations would apply.

Discretionary No Lease would be applied on tracts of land that are undergoing analysis for designation as Wilderness or classification as Wild and Scenic River. Discretionary No Lease would protect the character of lands for specific purposes until final decisions are made on special designations.

#### ***Alternative IV***

Under Alternative IV, standard lease terms would offer the same level of protection of developed and dispersed recreation areas as Alternative I or Alternative II. However, potential direct and indirect negative impacts to developed and dispersed recreation experiences would be limited to lands currently under lease.

#### ***Special Uses***

This discussion would focus on potential effects of oil and gas development on the recreation experience in recreational special use permit areas. None of the alternatives would impact current, valid permittee rights authorized by permit.

#### ***Alternative I***

Current Forest Plan direction prohibits surface occupancy only on recreational special use sites. Wells could be drilled adjacent to these sites. Nearby oil and gas activity could cause indirect negative impacts on the recreation experience of permittees, such as dust, noise, lights and increased traffic.

#### ***Alternative II***

Standard lease terms would prohibit occupancy within recreational special use sites to protect improvements but would not provide a buffer around these sites. Potential indirect effects on the recreation experience of permittees would be similar to Alternative I.

### **Alternative III**

Alternative III would prohibit surface occupancy within 1/4 mile of recreational special use sites. In most cases this buffer would reduce indirect negative impacts that recreational permittees might experience in the form of dust, noise and increased vehicle traffic.

### **Alternative IV**

Existing lease terms offer similar protection to Alternative II. However, negative impacts to the recreation experience of permittees would be limited to lands currently under lease.

## **Cumulative Impacts**

Cumulative effects are the impacts on an environment that result from an individual action when added to other past, present and reasonably foreseeable future activities regardless of who undertakes such other actions. Cumulative impacts occur from individual actions that might be collectively significant.

For the purposes of this EIS the cumulative effects are primarily the result of drilling activities. These drilling activities are not being approved in the Record of Decision that will accompany the final EIS. They will not be approved until an Application for Permit to Drill, or APD, is reviewed, analyzed, and approved for each specific lease parcel. This EIS deals with the impacts of a Forest-wide leasing program where some lands are already leased; some are identified in pending lease requests; and, many acres which have future leasing opportunities. Possible development is unknown on all lands, including those currently leased, until the APD is reviewed by the management agencies. The oil and gas regulations direct us to use the reasonably foreseeable development to project effects. This provides the opportunity to comply with the overlapping requirements of the oil and gas regulations and NEPA. No ground-disturbing activities, however, will take place until after an environmental analysis and a decision document relating to the APD are completed.

Appendix C, Reasonable Foreseeable Activity, pages C-16 through C-20, identifies the activities that are included in the cumulative effects analysis. Descriptions of current and future timber sale activity can be found in Appendix B, Exhibits B-3 and B-4. Developed recreation facilities that result in recreation use and impacts are identified in Appendix B, Exhibit B-2.

Information disclosed in the discussion of individual well impacts in Appendix D were used to help identify the possible cumulative effects.

Because the well locations used in the analysis are not the actual locations where wells are likely to be drilled, it is difficult to assess the "real" cumulative effects of the leasing program. Cumulative effects are based on known and anticipated future activities.

Oil and gas planning efforts are based on Reasonable Foreseeable Post-Leasing Activity projections. These projections are developed by subject matter specialists using historical and market trends and mineral potential. We do not, until the time of the APD, have a specific proposal for ground-disturbing activities. The speculative nature of both the reasonable foreseeable development and projection of other activities included in cumulative effect analyses lead to a high level of uncertainty until APD.

The following discussions relating to cumulative effects are arranged in the same manner as the information relating to the comparison of alternatives that you just read.

## **Vegetation**

Ground-disturbing activities or events such as timber harvest, minerals extraction, prescribed fire, wildfire, grazing, and road, trail and facility development can result in cumulative impacts to vegetation. Grazing impacts to vegetation are generally negative in localized areas where vegetation cover is basically removed. The potential for cumulative impacts is normally greater when more than one activity occurs within the same watershed or subwatershed. Cumulative impacts to vegetation are compounded when multiple activities or events alter vegetation cover within a relatively short time frame, especially when disturbed acres have not received revegetation treatments or experienced natural vegetation recovery.

Past, present and foreseeable future non oil and gas activities would not vary by leasing alternative. Basic vegetation is distinguished from alpine ecosystems and riparian ecosystems. Cumulative impacts to riparian are discussed separately in this chapter.

Under any alternative, significant impacts to basic vegetation could occur if wells occur in watersheds with substantial levels of vegetation disturbance that have not been reclaimed. An example would be a watershed which experienced a large wildfire that resulted in the removal of vegetation over an extensive area.

None of the RFD wells were situated within fragile alpine ecosystems. Cumulatively significant impacts to alpine vegetation could occur if any of the wells actually occurred in alpine ecosystems which had already experienced ground-disturbing activity such as utility development, mining activity or road or trail construction. The potential for cumulatively significant effects to alpine would likely be greatest under Alternative II, followed by Alternatives I, III and IV. Only Alternative III would allow application of the Controlled Surface Use stipulation specifically designed to minimize disturbance in alpine.

### ***Alternative I***

On the Mountains, there are no past, present or foreseeable future timber sales or prescribed fires in the same watersheds as the BLM RFD wells. One BLM RFD well would occur in the same watershed which experienced a wildfire in 1989. The wildfire caused damage or mortality to approximately 600 acres of noncommercial ponderosa pine and 100 acres of Gambel oak. Rehabilitation and natural vegetation recovery are expected to be complete early in the 15-year planning period and the impact from these activities would be acceptable.

All 4 Concentrated RFD wells would occur in a watershed which has an active timber sale and a planned timber sale. Most timber sale units are partial cuts in Douglas-fir stands. All RFD wells would occur on slopes less than 40 percent with good reclamation potential. Most acres disturbed by oil and gas development and timber sales would be reclaimed during the planning period.

On the Grasslands, oil and gas activity is more likely to occur in the same general vicinity as other activities such grazing, prescribed fires or wildfires on midgrass prairie. However, vegetation disturbance would be relatively low compared to the total land base or total acres occupied by midgrass prairie or shortgrass prairie. Over half of the acres disturbed by oil and gas development, prescribed fires and wildfires would be reclaimed by the end of the planning period.

The BLM RFD or the Concentrated RFD would result in no significant, irreversible or irretrievable cumulative impacts to basic vegetation on the Unit.

### *Alternative II*

For BLM RFD wells, Alternative II effects on vegetation would be similar to Alternative I effects. Under Alternative II, the Concentrated RFD wells would be located on slopes greater than 40 percent on shallow, highly erosive soils. Most wells would be on dry aspects. Timely revegetation would be uncertain. This alternative could cause a cumulatively significant and irreversible impact on vegetation in the vicinity of the wells in Jackson Creek. Over half the acres disturbed by oil and gas development on the Grasslands and most timber sales would be reclaimed during the planning period.

### *Alternative III*

For BLM and Concentrated RFD wells, Alternative III cumulative effects on basic vegetation would be similar to Alternative I effects.

### *Alternative IV*

Alternative IV cumulative effects on basic vegetation would be similar to Alternative II, since all RFD wells could occur on existing leases. Alternative IV would not cause additional impacts to vegetation after expiration of current leases.

### *Soils*

A variety of land use activities and events can generate cumulative impacts that could cause significant changes in soil properties that affect potential site productivity. Examples include timber harvesting, mineral development, recreation development, roads, trails, fire, and grazing. Ground-disturbing activities can expose soils to accelerated erosion by removing or destroying vegetation and protective ground cover. Soil compaction and rutting caused by equipment are impacts which involve physical changes of in-place soil properties. The magnitude of cumulative impacts is dependent upon the types of disturbance and the duration of multiple activities in a given area. There is greater probability that soil erosion will create indirect or off-site cumulative effects to other resources when more than one activity occurs within the same watershed.

Past, present, and future non-oil and gas activities would not vary by leasing alternative.

Existing roads and trails occur throughout the Unit and are considered long-term commitments of the soil resource until their function has been served. Surface erosion will continue to produce indirect effects to water quality and aquatic life until natural conditions are restored through reclamation.

Grazing impacts to soils are generally confined to random areas where vegetation is actually removed or concentration areas where soil compaction reduces potential productivity. Light utilization of forage is generally recommended to maintain forage yields and ground cover protection for erosion control. Compaction problems can usually be avoided through timing of activities and proper management planning. Therefore, no attempt was made to quantify grazing impacts to soils on random areas of different land types across the Unit.

Prescribed fire is a management tool with objectives for vegetation and watershed improvement, and effects generally do not require rehabilitation. Prescribed fires are not expected to produce negative effects to soil productivity.

### ***Alternative I***

Under this alternative, the soil resource is protected from activities which cause detrimental disturbance on highly erosive soils and unstable slopes. Unavoidable impacts such as erosion and/or compaction would occur, but losses should be short-term in nature.

Other past, present, and future non-oil and gas activities in the respective watersheds of the BLM Mountain RFD include a wildfire (1989) in the vicinity of one well. Most accelerated erosion from this fire occurred within the first two years, and erosion rates have stabilized on most slopes. Rehabilitation efforts and natural vegetation recovery reflect encouraging results, and complete reestablishment of ground cover vegetation is expected early in the planning period. There are no other foreseeable future activities planned which would affect soil productivity, and cumulative impacts are considered non-significant for these locations.

The Concentrated RFD wells all occur in the same watershed where other activities include an active timber sale and future timber sale. Surface disturbance from all timber harvesting is expected to remove vegetative protection on moderate slopes, and impacts can be mitigated to acceptable soil loss limits. Under this alternative, oil and gas activities would also occur on stable soil/slope conditions, and most disturbed acreage would be reclaimed during the planning period. There would be no significant, irreversible or irretrievable cumulative impacts to the soil resource [see Table IV-7].

Other past, present, and future non-oil and gas activities on the Grasslands include prescribed fires, wildfires, grazing, and recreation development. Wildfires on the Cimarron National Grassland have typically affected about 100 acres each year on sandy soils that require rehabilitation to control wind erosion. Past wildfires on the Comanche National Grassland have not been associated with specific land types, and no attempt was made to predict future wildfires. As previously explained, grazing impacts and prescribed fires were not quantified in the analysis. Under this alternative, oil and gas activities would not affect fragile soils and sensitive ecosystems. Unavoidable impacts to the soil resource in other areas would be short-term until ground cover protection is restored through mitigation. Cumulative impacts on the Grasslands are displayed in Tables IV-8 and IV-9 respectively.

### ***Alternative II***

Under this alternative, there were no significant cumulative impacts on the BLM Mountain RFD. Effects are essentially the same as Alternative I due to moderate slopes and non-fragile soil types. The Concentrated RFD wells would create significant adverse impacts to fragile soils, and there is high probability for long-term irreversible and irretrievable damage in the Jackson Creek watershed. Impacts from timber harvesting can be effectively mitigated on moderate slopes, but low reclamation potential exists on steep slopes and fragile soils associated with well development.

On the Grasslands, this alternative could cause cumulatively significant impacts to fragile soils on canyon escarpments and sensitive alluvial soils in riparian or floodplain areas. The effects of all other activities would be essentially the same as Alternative I. Cumulative impacts on the Grasslands are displayed in Tables IV-8 and IV-9 respectively.

**Table IV-7  
Cumulative Effects for Concentrated RFD  
and Non-Oil & Gas Activities - Mountains**

| Disturbance                     | Alt. I | Alt. II | Alt. III | Alt. IV |
|---------------------------------|--------|---------|----------|---------|
| Total Acres Disturbed           | 124    | 139     | 124      | 139     |
| Potential Soil Loss (Tons/Year) | 846    | 1431    | 846      | 1431    |

Cumulative impacts on the Grasslands include oil and gas activities, grazing, wildfires, and recreation development. Under this alternative, detrimental impacts would occur to fragile alluvial soils and shallow soils on canyon escarpments. Significant adverse impacts from ground-disturbing activities would cause long-term damage and reductions to potential soil productivity in these areas. The effects of other activities were discussed under Alternative I, and surface disturbances on non-fragile soils can be effectively mitigated to soil loss tolerance levels commensurate with natural ecological conditions. Cumulative impacts for BLM RFD and other activities that affect soil productivity on the Grasslands are displayed in Tables IV-8 and IV-9 respectively.

**Table IV-8  
Cumulative Effects for BLM RFD  
and Non-Oil & Gas Activities - Cimarron**

| Wells       | Impacts               | Alt. I  | Alt. II | Alt. III | Alt. IV |
|-------------|-----------------------|---------|---------|----------|---------|
| Hard lands  | Disturbed Acres       | 275     | 273     | 275      | 273     |
|             | Pot. Soil Loss (T/Yr) | 220     | 218     | 220      | 218     |
| Sandy lands | Disturbed Acres       | 2,011   | 1,996   | 2,011    | 1,996   |
|             | Pot. Soil Loss (T/Yr) | 269,474 | 267,464 | 269,474  | 267,464 |
| Riparian    | Disturbed Acres       | 0       | 17      | 0        | 17      |
|             | Pot. Soil Loss (T.Yr) | 0       | 2,283   | 0        | 2,283   |



**Table IV-9  
Cumulative Effects for BLM RFD  
and Non-Oil & Gas Activities - Comanche**

| Wells        | Impacts               | Alt. I | Alt. II | Alt. III | Alt. IV |
|--------------|-----------------------|--------|---------|----------|---------|
| Hard lands   | Disturbed Acres       | 36     | 32      | 36       | 32      |
|              | Pot. Soil Loss (T/Yr) | 43     | 38      | 43       | 38      |
| Sandy lands  | Disturbed Acres       | 73     | 73      | 73       | 73      |
|              | Pot. Soil Loss (T/Yr) | 9,782  | 9,782   | 9,782    | 9,782   |
| Riparian     | Disturbed Acres       | 0      | 2       | 0        | 2       |
|              | Pot. Soil Loss (T/Yr) | 0      | 269     | 0        | 269     |
| Canyon lands | Disturbed Acres       | 0      | 2       | 0        | 2       |
|              | Pot. Soil Loss (T/Yr) | 0      | 14      | 0        | 14      |

**Alternative III**

Under this alternative, implementation of supplemental stipulations would result in non-significant cumulative effects to the soil resource [see Appendix B for specific stipulations]. Fragile soils, unstable slopes, and sensitive alpine and riparian ecosystems would be fully protected from surface-disturbing activities. Unavoidable impacts such as erosion and/or compaction would occur, but soil losses should be short-term in nature until protective ground cover is restored through mitigation. The effects of all RFD scenarios and other activities discussed under previous alternatives can be effectively mitigated to soil loss tolerance levels commensurate with natural ecological conditions. Cumulative impacts are displayed in Tables IV-7, IV-8, and IV-9.

**Alternative IV**

Under this alternative, current leases are under standard terms, and cumulative impacts to the soil resource would be essentially the same as Alternative II. Significant adverse impacts would occur in areas with fragile soils, unstable slopes, and sensitive ecosystems, but surface-disturbances can be effectively mitigated on non-fragile sites. Direct effects of all other activities have been discussed under previous alternatives, and cumulative impacts for the various RFD scenarios are displayed in Tables IV-7, IV-8, and IV-9.

On the Grasslands, detrimental impacts would occur to fragile alluvial (riparian) soils and shallow soils on canyon escarpments. Ground-disturbing activities would cause significant adverse impacts and long-term damage on unreclaimed acres of these land types. Surface disturbances on on-fragile soils of other land types can be effectively mitigated to soil loss tolerance levels. Cumulative impacts for the BLM RFD and other activities that affect soil productivity on the Grasslands are displayed in Tables IV-8 and IV-9 respectively.

**Water**

Cumulative impacts to water resources can be basically classified as quantity and quality related. Ground-disturbing activities, including road and facility related construction, recreation activities, grazing, timber harvest, prescribed and wild fires plus other less significant activities result in cumulative inputs of sediment into streams. Past and current mining activities have also resulted

in a cumulative decrease in water quality in several stream drainages, primarily in the Mountain areas. Other less significant water quality impacts can be related to contaminant spills, and domestic sewage releases. Water quantity, as discussed in Chapter III is critical in maintaining stream channels and supporting aquatic life. Cumulative impacts to water quantity are related to domestic and agricultural activities.

#### ***Alternative I***

Current Forest Plan direction is to mitigate sedimentation from activities in watersheds exceeding sediment threshold values [see Appendix B for listing of watersheds in supplemental stipulation]. Additional mitigative measures are outlined that require oil and gas related activities to reduce possible impacts. Under this alternative, cumulative impacts to water resources would not be significant in the Concentrated RFD analysis. Adequate mitigative measures would be needed to ensure that no net gain of sediment to the stream would occur. Additional activity in this drainage, primarily from roads and recreational activities has contributed to the cumulative impacts to this drainage. There could be significant cumulative impacts in watersheds that are close to exceeding sediment threshold values, but are not listed in the Forest Plan. The South Platte River between Elevenmile Reservoir and its confluence with the North Fork of the South Platte River was not identified in the Forest Plan as exceeding sediment thresholds, however, it was identified in the State's nonpoint assessment report as having sediment problems.

An example of a scenario where existing disturbance in a watershed would have to be mitigated before new development is allowed, is the Concentrated Mountain wells. Additional development in this watershed would not be allowed to occur until an equal or greater amount of existing disturbed acres are rehabilitated. There is some guidance for riparian areas which would protect water quality in the Grassland environments. Protection of riparian areas in these environments are important in maintaining the ground and surface water quality.

#### ***Alternative II***

Standard stipulations alone would result in significant cumulative impacts to watersheds within 10 percent of exceeding, or are exceeding, sediment threshold levels, if development were to occur. In addition, pollution of ground water is greatly increased if the activity is within a riparian area or within the floodplain area. Pollution of the ground water resource would be a significant impact, which would be considered irreversible and irretrievable.

Ground water and surface water impacts to drainages in the Grasslands could also occur. Drilling and road construction in the Cimarron River corridor could result in significant, irretrievable and irreversible impacts to water quality,

#### ***Alternative III***

Alternative III would result in no significant irretrievable or irreversible cumulative impacts. In addition to the Forest Plan direction for watersheds exceeding sediment threshold the Controlled Surface use stipulation for watersheds within 10 percent of the sediment threshold value would reduce the risk of creating significant impacts to those watersheds. In addition to those watersheds which have been exceeding sediment thresholds, mitigation would be required on all watersheds where excessive sediment could be a problem. There could be positive impacts to watersheds that are mitigated under this alternative. The NSO in wetlands, riparian areas and floodplains also minimizes the potential for significant cumulative impacts from ground water contamination.

In the South Platte River between the Elevenmile Reservoir and the confluence with the North Fork of the South Platte River, additional sedimentation could significantly impact this system. As a

result of the additional stipulations, there would be no further cumulative impacts from oil and gas development until adequate measures are taken to mitigate existing sedimentation. The No Surface Occupancy stipulation for wetlands, riparian areas and floodplains would protect Grassland and Mountain drainages from ground and surface water degradation as well as excessive sedimentation.

#### ***Alternative IV***

There would be no new leasing under this alternative. However, there could be significant, irretrievable and irreversible impacts to the water resource from well development on lands having existing leases. Using standard stipulations, there could be significant cumulative impacts to watersheds exceeding sediment threshold levels. In addition, pollution of ground water is greatly increased if the activity is within a riparian area or within the floodplain area. Pollution of the ground water resource would be a significant impact, which would be considered irreversible and irretrievable.

In the Concentrated Mountain RFD example, all of the wells fall within current leases. As a result, development in this watershed could not occur until adequate mitigation resulted in no net gain in sediment delivery to Jackson Creek. In the Cimarron River corridor, where a considerable amount of the public land is leased, ground water degradation as a result of drilling in the floodplain and riparian area and sedimentation could result in significant impacts.

#### ***Aquatic and Riparian***

Cumulative impacts to fishery and riparian resources can be grouped into direct and indirect influences. Ground-disturbing activities, including road and facility related construction, recreation activities, grazing, timber harvest, prescribed and wild fires plus other less significant activities result in cumulative inputs of sediment into streams. As outlined in the beginning of this chapter, sedimentation can have devastating effects on fishery reproduction, food sources and habitat of aquatic organisms. Stream channel changes, as a result of excessive sedimentation could also result in riparian and fishery resources. Past and current mining activities have also resulted in a cumulative decrease in water quality in several stream drainages, primarily in the Mountain areas. Other less significant water quality impacts can be related to contaminant spills, and domestic sewage releases. Direct manipulation to riparian areas has occurred as a result of ground-disturbing activities as well. Road construction along stream corridors has probably been the most detrimental impact to riparian areas. Cumulative impacts to water quantity are related to domestic and agricultural activities have also influenced riparian and fishery resources. Historically, the Cimarron River has been dewatered significantly, resulting in drastic alteration of the river corridor in the Cimarron Grassland. This alteration of habitat conditions in the Cimarron River has altered drastically the composition and distribution of fish in the river. Although pre-diversion information is not available, the riparian community in the Cimarron corridor has also no doubt been altered as a result of dewatering.

#### ***Alternative I***

Current direction in the Forest Plan regarding fishery resources is that fishery habitat will be maintained at 40 percent of potential. Direction from riparian and water resources generally protects this resource and the habitat associated with it. Current Forest Plan direction is to mitigate sedimentation from activities in watersheds exceeding sediment threshold values [see Appendix B for listing of watersheds in supplemental stipulation]. Additional mitigative measures are outlined that require oil and gas related activities to reduce possible impacts. Under this alternative, cumulative impacts to fishery resources would not be significant in drainages exceeding sediment threshold values. However, drainages not yet exceeding these levels, or even within 10 percent of exceeding could have significant, irretrievable and irreversible impacts. Adequate mitigative

measures would be needed to ensure that no net gain of sediment to the stream would occur. Additional activity in this drainage, primarily from roads and recreational activities has contributed to the cumulative impacts to this drainage. There could be significant cumulative impacts in watersheds that are close to exceeding sediment threshold values, but are not listed in the Forest Plan. The South Platte River between Elevenmile Reservoir Dam and the confluence with the North Fork of the South Platte River would be an example of a river system that is within 10 percent of exceeding its sediment threshold limits, but is not listed in the Forest Plan as an area that has to undergo additional mitigation measures. Additional sedimentation could have significant, irreversible and irreversibly impacts to fishery resources in this river system.

There is some guidance for riparian areas which would protect water quality in the Grassland environments. Protection of riparian areas in these areas would be important in maintaining ground water quality in the Cimarron River corridor.

### ***Alternative II***

Using standard stipulations, there would be significant cumulative impacts to watersheds within 10 percent or exceeding sediment threshold levels if development were to occur. In addition, pollution of ground water is greatly increased if the activity is within a riparian area or within the floodplain area. Pollution of the ground water resource would be a significant impact, which would be considered irreversible and irretrievable.

In the South Platte River downstream of Elevenmile Reservoir Dam, there would be significant, irretrievable and irreversible impacts to channel stability due to increased sediment loads if wells were developed. Movement of the wells within this drainage would not significantly alter this finding due to the highly erosive nature of the soils within this drainage. Ground water and surface water impacts to drainages in the Grasslands could also occur. Drilling and road construction in the Cimarron River corridor could result in significant, irretrievable and irreversible impacts to water quality,

### ***Alternative III***

Alternative III would result in no significant irretrievable or irreversible cumulative impacts. In addition to the Forest Plan direction for watersheds exceeding sediment threshold the Controlled Surface use stipulation for watersheds within 10 percent of the sediment threshold value would reduce the risk of creating significant impacts to those watersheds. In addition to those watersheds which exceed sediment threshold values, mitigation would be required on additional drainages that meet these requirements. There could be positive impacts to watersheds that are mitigated under this alternative. The NSO in wetlands, riparian areas and floodplains also minimizes the potential for significant cumulative impacts from ground water contamination.

In the South Platte River between the Elevenmile Reservoir and the confluence with the North Fork of the South Platte River, additional sedimentation could significantly impact this system. As a result of the additional stipulations, there would be no further cumulative impacts from oil and gas development until adequate measures are taken to mitigate existing sedimentation. The No Surface Occupancy stipulation for wetlands, riparian areas and floodplains would protect Grassland and Mountain drainages from ground and surface water degradation as well as excessive sedimentation.

### ***Alternative IV***

There would be no new leasing under this alternative. However, there could be significant, irretrievable and irreversible impacts to the water resource from well development on lands having existing

leases. Using standard stipulations, there could be significant cumulative impacts to watersheds exceeding sediment threshold levels. In addition, pollution of ground water is greatly increased if the activity is within a riparian area or within the floodplain area. Pollution of the ground water resource would be a significant impact, which would be considered irreversible and irretrievable.

In the Concentrated Mountain RFD example, all of the wells fall within current leases. As a result, development in this watershed could not occur until adequate mitigation resulted in no net gain in sediment delivery to Jackson Creek. In the Cimarron River corridor, where a considerable amount of the public land is leased, ground water degradation as a result of drilling in the floodplain and riparian area and sedimentation could result in significant impacts.

### **Visuals**

Cumulative impacts to the visuals resource can result when management activities that alter the visual setting occur in the same viewshed. Such activities include oil and gas development, road, trail and facility construction, timber sales, prescribed fire and utility developments. Management activities are designed to comply with visual resource management direction in the Forest Plan. Emphasis or priority is given to protecting the scenic quality of lands within foreground viewing distances, which are 0 to 1/4 or 1/2 mile from viewing areas, depending on topography.

Under any alternative, conditions of approval would be used to ensure new oil and gas developments meet the visual quality objectives in affected areas.

#### ***Alternative I***

Current Forest Plan direction allows for relocation of wells outside areas with low visual absorption capabilities which cannot be reclaimed to the established visual quality objective. The Controlled Surface Use stipulation would be applied to meet Forest Plan direction for protection of visual quality. Alternative I would result in no significant, irreversible or irretrievable cumulative impacts to the visuals resource.

Under this alternative, other potential sites on the Mountains would probably not cause significant cumulative impacts on the visuals resource. The four exploratory wells on Mountain districts would be separated by time and space on a large land base. On the Grasslands, projected oil and gas development would result in an insignificant increase in cumulative visual impacts.

#### ***Alternative II***

Alternative II could cause cumulatively significant impacts on visual quality, particularly in areas with low visual absorption capability. In the Concentrated RFD example, existing visual condition inventories indicate there is little evidence of past and current management activities in the affected viewshed. Concentrated RFD well locations would have negative visual effects from several important viewing areas. Impacts would be irretrievable if affected areas could not be reclaimed to the established visual quality objective.

Although the Concentrated RFD could cause significant visual impacts in the same viewshed, it is unlikely that any of the four exploratory wells on the Mountain districts would actually occur in the same viewshed. Other potential well sites would likely cause short-term, insignificant cumulative impacts to scenic quality. On the Grasslands, oil and gas development would cause an insignificant increase in cumulative visual impacts.

### ***Alternative III***

Under Alternative III, the Concentrated and BLM RFD developments would result in no significant or irreversible cumulative impacts on visual resources. Supplemental stipulations would be used to locate wells in areas with high visual absorption capability.

Discretionary No Lease stipulations would prohibit leasing in specified dispersed recreation and interpretable cultural resource areas. This would indirectly protect the scenic quality of such areas as Cloverdale Basin in the Sangre de Cristos, RARE II roadless areas and Picture Canyon.

### ***Alternative IV***

Standard development of Concentrated RFD wells on existing leases could cause cumulatively significant impacts to visual quality. Other potential well sites on existing leases would likely result in insignificant cumulative impacts to scenic quality on the Unit.

### ***Cultural, Paleontological and Cave Resources***

Ground-disturbing activities such as timber harvest, prescribed fire, grazing, road, trail and facility development and minerals extraction can result in cumulative negative impacts to recreational and interpretive values of cultural, paleontological and cave resources. Actual cultural and cave resources are protected by law.

Current and projected increased visitor levels have led to more emphasis on recreation access and facilities development. This activity has led to concerns over the security of cultural resources. On the Grasslands, range management and oil and gas developments occur in the vicinity of the Santa Fe National Historic Trail, resulting in cumulative impacts to the sensory environment of this significant cultural resource.

### ***Alternative I***

Based on the RFD analysis, and the forecast level and characteristics of other future activities in the same watersheds, there should not be any significant, irreversible or irretrievable cumulative effects of oil and gas exploratory development on cultural, paleontological or cave resources on the Mountain districts. Other potential well sites could cause significant and irreversible cumulative impacts to interpretable cultural resources in areas such as Kenosha Pass. Exploratory well development could occur simultaneously with one active timber sale or one planned timber sale in the vicinity of Kenosha Pass.

There could be significant, potentially irreversible cumulative effects on cultural resources resulting from the RFD level of oil and gas development and other reasonably foreseeable activities on the Grasslands. Negligible cumulative effects would result for paleontological and cave resources.

### ***Alternative II***

Under Alternative II, the potential for cumulative impacts to interpretable cultural resources, paleontological and cave resources would be similar to Alternative I.

### ***Alternative III***

Alternative III would not result in significant, irreversible or irretrievable cumulative impacts to interpretable cultural resources, paleontological or cave resources. The most significant inter-

pretable resources would be protected with the No Surface Occupancy or Discretionary No Lease stipulations described in Appendix B.

#### ***Alternative IV***

Standard development could cause significant cumulative impacts on recreational and interpretive values of cultural resources on the Grasslands during the planning period. However, potential cumulative impacts would occur only on existing leases, until lease termination.

#### ***Recreation***

Cumulative impacts to dispersed or developed recreation experiences can occur when management activities which alter the visual and auditory environment occur in the same viewshed or vicinity. Such activities include oil and gas development, timber sales, access and facility construction and utility developments. Activities which improve access into dispersed recreation areas or near developed sites can result in positive or negative impacts to recreation experiences, depending on the Recreation Opportunity Spectrum class of the given area, user expectations for solitude, and the proximity of access to developed sites or important attractions within dispersed recreation areas.

Under Alternatives I, II, and IV, other potential well sites could cause cumulatively significant impacts to developed recreation experiences in areas such as Jefferson Creek, north of Highway 285. This area is a popular, high use area near the Colorado Trail which has already been impacted by utility developments. The impacts would most likely be limited to the viewshed that is affected by the activity and would have to be a high use area.

Under Alternatives I, II and IV, other potential well sites could cause cumulatively significant impacts to dispersed recreation experiences in areas such as the Spanish Peaks. Oil and gas development could coincide with grazing activity. Discretionary No Lease would prohibit new leasing in the Spanish Peaks under Alternative III.

#### ***Alternative I***

Alternative I would not cause significant cumulative impacts to the developed recreation experience near Concentrated RFD wells. This area is already fairly congested. Wells would cause an insignificant degradation of the recreation experience. BLM RFD wells would not occur near developed recreation sites.

Alternative I would not cause significant cumulative impacts to the quality of the dispersed recreation experience near Concentrated or BLM RFD wells. Areas that are protected in Alternative III could be negatively impacted by this alternative if wells were to be located on them.

#### ***Alternative II***

Alternative II could cause significant cumulative impacts to the developed recreation experience at Jackson Creek Campground. Concentrated RFD wells are closer to this campground than under Alternatives I and III. Alternative II could also cause significant cumulative impacts to the developed recreation experience at current and pending sites located along the main fork of the Cimarron River. Oil and gas development could coincide with grazing activity near developed sites.

Alternative II would not cause significant, irreversible or irretrievable impacts to the quality of the dispersed recreation experience near Concentrated or BLM RFD wells.

### ***Alternative III***

Alternative III would not result in significant, irreversible or irretrievable cumulative impacts to the developed or dispersed recreation experiences. The No Surface Occupancy stipulation would prohibit surface occupancy within a 1/4 mile buffer around developed recreation sites. Discretionary No Lease would prohibit new leasing in dispersed recreation areas considered for special designation but currently under multiple use management.

### ***Alternative IV***

Alternative IV could cause significant cumulative impacts to the developed recreation experience at Jackson Creek Campground. All Concentrated RFD wells are on existing leases and subject to standard lease terms. Alternative IV could cause significant cumulative impacts to the developed recreation experience at current and planned sites along the main fork of the Cimarron River.

### ***Special Uses***

Under all alternatives, all special use permit improvements and current, valid permittee rights would be protected by standard lease terms. Cumulative impacts to the recreation experience of recreational special use permittees can occur when management activities which alter the visual and auditory environment occur near the sites. Alternative III would prohibit surface occupancy within 1/4 mile of recreational special use permit sites. Alternative III would therefore reduce the likelihood of cumulative impacts to the recreation experience of permittees more than the other alternatives.

### ***Experimental Forests, National Natural Landmarks, Research Natural Areas, and Special Interest Areas***

The effects of oil and gas activities on the surface use of Experimental Forests, National Natural Landmarks, Research Natural Areas, and Special Interest Areas are a special concern.<sup>2</sup> Approval of oil and gas leasing on Experimental Forests has been retained by the Chief of the Forest Service. The Manitou Experimental Forest was removed by the Chief, USFS, from oil and gas leasing and will be excluded from analysis in the EIS.

There are three Research Natural Areas, nine Special Interest Areas and one National Natural Landmark designated or proposed on the Pike and San Isabel National Forests. These areas will be protected by a lease notice or stipulation.

### ***Wilderness and Wild and Scenic Rivers***

The Wilderness Act of 1964 (PL 88-577) withdrew Wilderness acres from mineral leasing.<sup>2</sup> There are five classified wilderness areas on the Forest that would not be available for leasing and therefore not impacted by any alternative. The area on the South Platte River from Elevenmile Canyon Reservoir to Cheesman Reservoir has been determined eligible for further planning as an inclusion in the National Wild and Scenic River System and is removed from leasing under Alternative III. From Cheesman Dam to Waterton (Forest boundary) will be withdrawn from leasing until an eligibility study can be completed. Badger Creek was administratively removed from oil and gas leasing until an eligibility determination study can be completed.

The Colorado Wilderness Act of 1980 (P.L. 96-560) designated four Wilderness Study Areas (Buffalo Peaks, Greenhorn Mountain, Sangre de Cristo, Spanish Peaks) in the Pike and San Isabel National Forests. NFS lands in three study areas (Greenhorn Mountain, Sangre de Cristo, and Buffalo Peaks) consisting of 120,017 acres were recommended for Wilderness designation in the



Forest Plan. The lands that are not currently recommended as Wilderness Study Areas could be available for lease under Alternative I, II and IV.

### ***Minerals***

Effect to oil and gas resources, and the other minerals, are tied to specific geologic areas where host formations are found.<sup>12</sup> Locations of favorable host formations for oil and gas resources are generally limited to five geographic areas on the Forests: Rampart Range, Spanish Peaks, South-eastern flank of the Sangre de Cristo Mountains, northern Wet Mountains, and an area immediately east of the South Park area. There are known reservoirs on both the Comanche and Cimarron National Grasslands.

Oil and gas resources were measured from the aspect of the mineral potential that was found in the affected environment. Existing U.S. Geological Data and other reference material was used to generate mineral potential levels that could be found on the Forests and the Grasslands.

The Mountain RFD will have minimal direct, indirect, short-term and long-term social and economic effects under Alternatives I and III. Impacts to the mineral resource itself will be virtually non-existent since it is unlikely that production of oil and gas resources will occur on the National Forests during the planning horizon covered by the EIS. If a wildcat well becomes a valid discovery with subsequent development and production, the extraction of the mineral resources will deplete the existing reservoirs. This is an unavoidable impact that is an irretrievable and irreversible commitment of such resources.

Under Alternative II, the least impacts to the mineral resource would occur. This is due to the amount of latitude that is available to the lessee and/or operator during surface use. The consequences of discovery would be similar to those under Alternatives I and III.

Under Alternative IV, the impacts to the resource would be similar to Alternative II where there are existing leases.

Under Alternative IV, the loss of lands for leasing could deplete opportunities for drilling. The existing leases will still be available under this alternative and would be a positive social and economic benefit.

### ***Human and Community Development***

Exploration and development of oil and gas involve the building and use of roads, drill pads, pipelines, and associated facilities needed for development, production and transportation. Development of all these functions changes the nature of the area and the way in which land is being used.

The counties in the nine Human Resource Units will all see some social changes in the future. Changes will occur in these areas, as in other portions of Colorado, whether or not there is a change in the level of activity in oil and gas exploration, development, and production.

The changes and social effects from each alternative will not be major. No significant changes will be made to the lifestyle, the social values, or the attitudes of the local population.

Oil and gas production has long been an important activity in both the Comanche and Cimarron Human Resource Units. Currently, there are 2 producing gas fields on the Comanche National Grassland and 23 producing oil and gas fields within the Cimarron National Grassland.

In the rural areas, in both the mountains and the plains, the more intensive development under Alternative II may result in an increase in the amount of employment and economic activity in small communities. This would enhance the community stability. However, this is not expected to result in drastic changes to the social character and setting of most of the rural communities. There would be even less effect under the other alternatives.

### **Transportation**

No significant direct, indirect, long-term or cumulative effects are foreseen from oil and gas activities. There could be some minor upgrading and some new road construction.<sup>13</sup> These are not expected to affect the transportation network to any extent. The transportation developments may affect other resources or populations and those affects are addressed in discussions of those resources or populations.

There may be a small short-term impact to the traffic on a given highway from oil and gas drilling operations. There is not likely to be any long-term impact from well operations. The same conclusions can be expected to apply to County and Forest Development Roads.<sup>14</sup>

## **IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES**

### **Vegetation**

Alternatives II and IV of the Concentrated RFD could cause irreversible and irretrievable commitment of vegetation resource on fragile soils where revegetation success is uncertain.

### **Soils**

Alternatives II and IV could cause irreversible and irretrievable impacts on steep slopes and shallow (fragile) soils associated with Pikes Peak granite and other localized areas in mountainous terrain. Shallow soils on scarp slopes of the Canyon lands could also be subjected to irreversible and irretrievable losses in soil productivity. Soils with unfavorable substrata (e.g., rock) cannot be renewed by economical means.

### **Water Quality**

There is always the potential of a spill of wastes such as oil, salt water, drilling fluids, etc. associated with oil and gas development. Mitigation measures are designed to make this potential as small as possible. However, any spill in a riparian area would have direct and immediate impacts on the water resource. Impacts to the ground water resource would be considered long-term, irreversible and irretrievable impacts.

### **Aquatic and Riparian**

There are possible irreversible and irretrievable impacts to fishery and riparian resources under Alternatives II and IV. This is due to the sensitive nature of riparian areas that if not fully protected may not recover. Sediment and chemical impacts may cause similar impacts to the fishery resources.

### Range

All alternatives cause a relatively minor irretrievable loss of forage production on the Grasslands.

### Mineral

The production of oil and gas under any of the alternatives would be an irreversible and irretrievable impact to the mineral resource.

### SUMMARY BY ALTERNATIVE

The significant effects for each alternative are displayed in Table IV-10. Alternatives that have the potential for significant effects depending on well location are listed with a +, non-significant with a 0.

**Table IV-10  
Summary of Significant Effects by Resource/Alternative**

| Resource           | Alt. I |      | Alt. II |      | Alt. III |      | Alt. IV |      |
|--------------------|--------|------|---------|------|----------|------|---------|------|
|                    | BLM    | Conc | BLM     | Conc | BLM      | Conc | BLM     | Conc |
| Vegetation         | 0      | 0    | 0       | +    | 0        | 0    | 0       | +    |
| Soils              | 0      | 0    | 0       | +    | 0        | 0    | 0       | +    |
| Water Quality      | 0      | 0    | +       | +    | 0        | 0    | +       | +    |
| Wildlife           | 0      | 0    | +       | +    | 0        | 0    | +       | +    |
| Aquatic & Riparian | 0      | 0    | +       | +    | 0        | 0    | +       | +    |
| T & E Species      | 0      | 0    | 0       | 0    | 0        | 0    | 0       | 0    |
| Range              | 0      | 0    | 0       | 0    | 0        | 0    | 0       | 0    |
| Visual             | 0      | 0    | 0       | +    | 0        | 0    | 0       | +    |
| Cultural           | 0      | 0    | 0       | +    | 0        | 0    | 0       | +    |
| Sacred Sites       | 0      | 0    | 0       | +    | 0        | 0    | 0       | +    |
| Paleontological    | 0      | 0    | 0       | 0    | 0        | 0    | 0       | 0    |
| Caves              | 0      | 0    | 0       | 0    | 0        | 0    | 0       | 0    |
| Recreation         | 0      | 0    | +       | 0    | 0        | 0    | 0       | 0    |
| Special Areas      | 0      | 0    | 0       | 0    | 0        | 0    | 0       | 0    |
| Mineral            | 0      | 0    | 0       | 0    | 0        | 0    | +       | +    |
| Human & Community  | 0      | 0    | 0       | 0    | 0        | 0    | 0       | 0    |
| Transportation     | 0      | 0    | 0       | 0    | 0        | 0    | 0       | 0    |
| Air and Noise      |        |      |         |      |          |      |         |      |
| Pollution          | 0      | 0    | 0       | 0    | 0        | 0    | 0       | 0    |

Key - BLM = Mountain RFD; Conc = Concentrated RFD

#### Alternative I

This alternative implements the current Forest Plan direction. Existing mitigation tools would be used including consent denial on slopes over 60 percent and on highly erosive soils. There would be an NSO in place on the eligible section of the So. Platte River. Impacts under this alternative would be insignificant unless activities occurred on a few sensitive areas where supplemental stipulations cannot be applied.

#### Alternative II

This alternative uses standard stipulations as the means to mitigate oil and gas activities. Under this alternative the impacts would be insignificant forest-wide but significant impacts could occur on sensitive locations. Specific resources that could be significantly impacted based on well location and negotiated mitigation include vegetation, water quality, soils, aquatic, riparian, visual and recreation.

Due to the higher rate of activity, the Grasslands also could be impacted for both the entire Grassland and on a site-specific basis. Resources impacted would include those listed above plus cultural and American Indian sacred sites.

### **Alternative III**

This alternative allows the use of special stipulations as well and addressing cumulative effects. The impacts under this alternative for both the Forests and Grasslands would be insignificant to most resources. The additional stipulations maximize resource protection but increase the cost of exploration and development. Some loss of drilling opportunities would occur.

### **Alternative IV**

This alternative would not permit future oil and gas leasing. In areas without current leases there would be no significant impact to the surface resources. However, the lost drilling opportunities may have a significant social and economic effect on some local areas. Impacts to the areas already leased under this alternative would be similar to those shown for Alternative II.

## ***THE PROPOSED ACTION***

The proposed action is Alternative III. This alternative provides the greatest resource protection while leaving the majority of the National Forest System lands available for leasing.

## ***IMPLEMENTATION OF SITE-SPECIFIC DECISIONS***

The decisions the Forest Supervisor will make are based on the best information available to date. Analysis for oil and gas leasing in the past has dealt with leasing decisions for specific known and proposed lease parcels on a case-by-case basis with the same level of knowledge about future development that is disclosed here.

The analysis presented in this document, appendices and supportive reports identifies well impacts on projected sites with known conditions. The procedure outlined in Chapter I page 35 will be used to make site-specific determinations for future leases.

## FOOTNOTES

<sup>1</sup> USDA, Forest Service; Smith, Eugene L., Oil and Gas Leasing Transportation System Report, Pike and San Isabel Forests, Comanche and Cimarron National Grasslands; Pueblo, CO, April 10, 1991.

<sup>2</sup> Johnston, B.C. (Draft) Alpine Ecosystems and Their Management in the Southern and Central Rocky Mountains, Page 6; February, 1991.

<sup>3</sup> USDA, Forest Service; Gordon, C., Vegetation resource report for the oil and gas leasing environmental impact statement, Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands, pages 16-18 and 28-29; May, 1991.

<sup>4</sup> USDA, Forest Service; Gordon, C., Vegetation resource report for the oil and gas leasing environmental impact statement, Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands, pages 28-29; May, 1991.

<sup>5</sup> USDA, Forest Service; Jorgensen, Rodney, Oil and Gas Leasing Environmental Impact Statement, Soil Resource Report, Pueblo, CO, May 1991.

<sup>6</sup> USDA, Forest Service; Soil Management Report for Cimarron National Grasslands, 1968, Part III, p. 19.

<sup>7</sup> USDA, Soil Conservation Service, Denver, Colorado, Erosion Handbook-Water and Wind, 1988, pp. GEN-1 to GEN-5, pp. WEQ-1 to WEQ-4.

<sup>8</sup> Megahan, W.F. and Kidd, W.J.; Effect of Logging Roads on Sediment Production Rates in the Idaho Batholith; USDA, Forest Service Research Paper, INT-123, p. 8; 1972.

<sup>9</sup> USDA, Forest Service, Southwestern Region; Terrestrial Ecosystem Survey Handbook, 1986, Chapter V, pp. 26-27.

<sup>10</sup> Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands, Land and Resource Management Plan, October 18, 1984, Chapter III, p. 73.

<sup>11</sup> Bacon, Glenn H.; Tribal Participation in Federal Historic Preservation Efforts; article published in ASCA Report, Vol. 17, No. 1; 1990.

<sup>12</sup> USDA, Forest Service; Martinez, M.C.; Minerals Specialist Report for Oil and Gas EIS, Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands; Pueblo, CO, May, 1991.

<sup>13</sup> USDA, Forest Service; Smith, Eugene L., Oil and Gas Leasing Transportation System Report, Pike and San Isabel Forests, Comanche and Cimarron National Grasslands; Pueblo, CO, April 10, 1991.

<sup>14</sup> USDA, Forest Service; Smith, Eugene L., Oil and Gas Leasing Transportation System Report, Pike and San Isabel Forests, Comanche and Cimarron National Grasslands; Pueblo, CO, April 10, 1991.

## CHAPTER V

### LIST OF PREPARERS AND REVIEWERS

This EIS was prepared by an Interdisciplinary Team composed of individuals of varied specialties and backgrounds. Throughout the planning process, an interdisciplinary approach was used to conduct the analysis and to develop the alternatives. The following are those who helped in the analysis and in the preparation of this EIS.

***Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands, Pueblo, Colorado***

**Dick Bennin** - Minerals/Lands Specialist. Cimarron National Grassland, Elkhart, Kansas. B.S. Degree Forest Management. Fifteen years Forest Service experience at Ranger District level in minerals management.

**Robert D. Bishop** - Primary Staff Officer, Engineering and Resources Staff. B.S. Degree Civil Engineering. Twenty-four years Forest Service experience at District and Forest Supervisor's Office levels in engineering.

**Lela Chavez** - Forest Hydrologist. B.S. Degree Watershed Science. Nineteen years experience at District and Supervisor's Offices.

**Linda Davis** - Resource Specialist. Thirteen years Forest Service experience at Supervisor's Office level, five years in land management planning. Assisted in document preparation.

**Emmett Foster** - Recreation Staff. B.S. Degree Landscape Design. Twenty-six years Forest Service experience at Ranger District, Supervisor's Office, and Regional Office levels in recreation planning, administration, and landscape architecture. Provided input for developed recreation, wilderness, wilderness study areas, and roadless area evaluation.

**Christl Gordon** - Silviculture and Timber Sales Forester. B.S. Degree Forest Management. Nine years Forest Service experience at Ranger District and Supervisor's Office levels in the fields of timber sale preparation, administration, silviculture and lands.

**Joe Hartman** - District Ranger, Cimarron National Grassland, Elkhart, Kansas. B.S. Degree Forest Management, Oklahoma State University. Twenty-six years of resource management experience with the Forest Service in timber, fire, range, wildlife, minerals, soils and water.

**Gene C. Hennen** - Interdisciplinary Forester/Range Conservationist. B.S. Degree Wildlife Management and M.S. Degree Forest Pathology and Entomology. Thirty-four years of Forest Service experience at Ranger District and Supervisor's Office level in the fields of range, wildlife, recreation, minerals, special uses, silviculture, and fire. Assignments included two years with Rocky Mountain Experimental Station; 12 years as District Resource Staff Officer (4 Ranger Districts); 10 years as District Ranger; and 10 years at Forest Supervisor's Office in silviculture, fire, range and forest biologist positions. Member of interdisciplinary teams for EA and EIS input at District, Forest Supervisor's, and Regional Office levels during last 18 years.

**Steven Holdsambeck** - Interdisciplinary Forester. B.S. Degree Forest Recreation. Eleven years Forest Service experience in the fields of reforestation, silviculture, fire, human resources, special uses, civil rights, wildlife, watershed, recreation and wilderness. Certified Silviculturist in Regions 2 and 8.

**Rodney K. Jorgensen** - Soil Scientist. B.S. Degree Soil Science. Thirteen years of Forest Service experience at the Supervisor's Office and Regional Office inventory team levels. Provided soil resource information.

**Allen E. Kane** - Archaeologist. B.A. and M.A. Degrees Archaeology. Four years Forest Service experience in cultural resources management at Supervisor's Office level. Provided technical direction for cultural resources, paleontological resources and cave resources.

**Charles A. Knight** - Primary Staff Officer, Land Management Planning. Responsible for National Environmental Policy Act and National Forest Management Act Coordination, Appeals, Geographic Information System Coordination, Forest and Rangeland Renewable Resources Planning Act Coordination, Public Affairs, and Forest Safety Officer. B.S. Degree Soil Science and Conservation Education. Twenty-two years Forest Service experience at District, Supervisor's and Regional Office levels. Two years military service.

**Clinton D. Kyhl** - Forester. B.S. Degree Forest Management, Iowa State University. Eight years of experience on three different Ranger Districts.

**Logan Lee** - Deputy Forest Supervisor. B.S. Degree Forest Biology, Colorado State University, 1978. USFS for 13 years; 2 years State & Private Forestry, 11 years at District and Forest level programs.

**Marti C. Martinez** - Forest Geologist. B.A. Degree Environmental Studies with emphasis on geology; plus three years in geology. Five years on the Forest IDT for the Forest Plan, and five years in minerals management on the Forest, Pueblo, CO.

**Susan Mease** - Computer Specialist, CEO & DBA/Oracle Manager. B.S. Degree Computer Information Systems with emphasis on Business Administration, A.S. Computer Programming. Four and a half years Forest Service experience.

**Randy Moore** - Soil Scientist. B.S. Degree Agronomy with emphasis in Soil Science. Nine years Forest Service experience and five years Soil Conservation Service experience.

**Darryl Murphy** - Cartographic Technician. Four years Forest resource support management working with soil surveys, mineral reversions and field work. Prepared cartographic displays for this EIS.

**Marl Nakada** - Hydrologist trainee. B.A. Degree Biology, University of California at Santa Cruz. Currently enrolled in Master's Degree Program at Colorado State University in Watershed/Hydrology. Approximately two years of Forest Service experience: one summer as volunteer at the Arapahoe-Roosevelt, two summers at the Umatilla National Forest, Oregon, one summer at the Routt, nine months working on the Water Division I adjudication case and approximately one year at the Pike and San Isabel National Forests.

**Harry Nickless** - Primary Staff Officer, Timber/Fire/Pest Management, Forest Supervisor's Office, Pueblo, Colorado. B.S. Degree Forest Management. Twenty-nine years Forest Service experience at District and Supervisor's office levels.



**Heldl L. Pfosch** - Assistant Forest Land Surveyor. B.S. Land Surveying, Michigan Technological University, 1984. Forest Service 1988 to present.

**Charles Richmond** - District Ranger, Comanche National Grasslands, Springfield, Colorado. B.S. Degree Range/Forest Management from Colorado State University. Thirteen years of resource management experience with the Forest Service at the District level in range, wildlife, soils, water, and minerals.

**Richard R. Roth** - Primary Staff Officer, Wildlife, Fisheries and Range. B.S. Degree Forestry, M.S. Degree Wildlife Biology. Fifteen years Forest Service experience at District, Supervisor's Office and Area Office levels. Three years with the USFWS in water resource project evaluation.

**Theron E. Schenck II** - Forest Biologist. B.S. Degree Wildlife Biology and M.S. Degree Wildlife Management. College instructor for two years. Twelve years wildlife management experience with South Dakota Department of Game, Fish and Parks (SDGFP). SDGFP/Forest Service biologist for nearly three years at the Supervisor's Office level. Forest biologist for two years.

**Eugene L. Smith** - Professional Engineer. B.S. Degree Civil Engineering, Municipal University of Omaha, 1968; Forest Engineering Institute, Oregon State University, 1978. Fifteen years Forest Service experience, Operations Engineer.

**Lidia M. Swope** - Writer/Editor Trainee. B.S. Degree Psychology with English Minor, University of Southern Colorado, 1982. Six years with Forest Service at Supervisor's Office. Editorial assistance for EIS.

**Marvin P. VanderKolk** - Primary Staff Officer, Recreation and Lands. B.S. Degree Forestry. Twenty-seven years Forest Service experience at District, Supervisor's Office, Regional Office, and Washington Office levels in recreation, lands and timber. Four years as District Ranger.

**Jon Verner** - Forest Wildlife Biologist. B.S. Degree Range/Wildlife Management. Twenty-eight years Forest Service experience at Ranger District and Forest Supervisors Office levels in the fields of range, wildlife, recreation, special uses, threatened and endangered species and minerals. Provided input for wildlife, threatened and endangered plant and animal species, range, experimental forests, research natural areas and special interest areas for this EIS.

**Stan Versaw** - Professional Engineer. Degree Geological Engineering, Colorado School of Mines 1960; M.S. Degree Natural Resources Administration, Colorado State University, 1988. Twenty-four years Forest Service experience. Two years military service, U.S. Army Corps of Engineers.

**Neal P. Weierbach** - Forest Landscape Architect. Bachelor of Landscape Architecture Degree, Virginia Tech, 1985. Six years Forest Service experience.

**David S. Winters** - Fishery Biologist. Associate of Applied Science Degree Fishery and Wildlife Technology, State University of New York, 1977; B.S. Degree Fishery Biology, Colorado State University, 1979; M.S. Degree Aquatic Ecology, Colorado State University, 1987. Seven years experience as an aquatic ecologist/biologist for private and federal organizations.

**Bill Zimmer** - Lands Staff Forester. B.S. Degree Forest/Range Management. Twenty-nine years Forest Service experience at District and Supervisor's Office levels with responsibilities in timber, lands, minerals, range, and wildlife. District Ranger for eight years. Provided expertise in areas of special land uses and minerals.

***Shoshone National Forest, Cody, Wyoming***

**Robert Rossman** - Hydrologist. B.S. Degree Watershed/Hydrology, Colorado State University. Employed by the Shoshone National Forest since 1980. Previous assignments include District Hydrologist on the Klamath National Forest and Hydrologist with the U.S. Geologic Survey in Atlanta, Georgia. Member of the core interdisciplinary team for Shoshone Forest Plan. Areas of responsibility include soil, water, air, and Wild and Scenic Rivers. Currently assigned to Lander Ranger District, Shoshone National Forest as Recreation/Wilderness/Special Uses/Hydrology Staff.

***Region 2 Regional Office, USDA Forest Service, Lakewood, Colorado***

**Rosemary Bailey** - Leasable Technician. USFS, Lakewood, Colorado. Responsible for technical aspects of reviewing, processing, reporting and record keeping for the Region-2 mineral leasing program. Twenty-three years Federal service, the last 15 years (3 years engineering; 8 years Water Rights Technician; 4 years minerals) with the Forest Service in the Regional Office, Lakewood, Colorado.

**Pam Case** - Regional NEPA Coordinator, Planning and Program Budget, Rocky Mountain Region, Lakewood, Colorado. B.S. Degree International Relations, Ph.D. Political Science. Seven years as Professor of Forest Management, Statistics, and Political Science; twelve years Forest Service experience at Forest Supervisor's and Regional Office levels. Advisor to the IDT and editor of this EIS.

**John S. Dersch** - Regional Geologist, Watershed, Soils & Minerals Area Management, Region 2 Regional Office. B.S. Degree Geology, Colorado State University. Responsible for Mining Law Administration and Geological Services, including the determination of mineral potential for locatable, leasable, and salable minerals. Fifteen years Forest Service minerals experience at District, Supervisor's, and Regional Office levels. Member of American Association of Petroleum Geologists and Society of Mining Engineers. Provided locatable, leasable, and salable mineral potential information to the Planning Staff for the Pike and San Isabel Land and Resource Management Plan.

**Bud Phillips** - Minerals Staff, Pawnee National Grassland, Arapaho-Roosevelt National Forest. Five years experience in oil and gas management.

**William Robinson** - Energy and Leasable Minerals Specialist, Region 2 Regional Office. Responsible for Regional minerals programs, including oil and gas leasing and operations. B.S. Degree Forest Management, Louisiana State University, 1959; M.S. Degree Forest Watershed Management, North Carolina State University, 1972. Thirty-one years Forest Service experience with eight years on Ranger Districts in Oregon and Mississippi; six years State and Private watershed programs, Southeast U.S.; three years watershed and land use planning, Region-2; nine years Deputy Director, Watershed, Soils and Minerals Area management, Region-2; and six years Leasable and Energy Minerals Specialist, Region-2.

***Bureau of Land Management, U.S. Department of the Interior, Colorado***

**Kevin Anderson** - Petroleum Geologist, Canon City, Colorado. B.S. Degree Geology, Colorado State University. Two years experience U.S. Geological Survey Coal Geologist, one year experience Mine Supervisor, Ideal Basic Industries, six years experience Geologist, Royal Gorge Resource Area and five years experience current position.

**Ernie Gillingham** - Surface Reclamation Specialist, Oil and Gas Inspection and Enforcement Coordinator, Canon City, Colorado. B.S. Degree Biology, University of Texas. Two years experience Fire Command Officer, Pindale Ranger District, three years experience Range Technician, Bridger-Teton National Forests, two years experience Range Technician, Royal Gorge Resource Area, two years experience Surface Reclamation Specialist, Royal Gorge Resource Area, six years experience current position.

**David Hallock** - Realty Specialist. Environmental Coordinator, Royal Gorge Resource Area, Canon City, Colorado. B.S. Degree Forestry, University of Florida. One year experience Forester, USDA Forest Service, California; three years experience Forester, Florida State Division of Forestry; three years experience BLM Forester, Idaho; five years experience Planning and Environmental Coordinator, Canon City; four years experience current position.

**Jim Rhett** - Geologist, Fluid Minerals Operations, BLM Colorado State Office, Lakewood, Colorado. B.S. Degree Geology, University of South Carolina. Two years experience as Hydrologic Technician, U.S. Geologic Survey, six years experience as Environmental Scientist, U.S. Geologic Survey, Minerals Management Service and BLM, two years experience as Geologist, Craig District and two years experience, current position.

**Ken Smith** - Planning and Environmental Coordinator, Canon City, Colorado. B.S. Degree, Pennsylvania State University, M.S. Degree, West Virginia University, both in Park and Outdoor Recreation. Two years experience Park Technician, U.S. Army Corps of Engineers; two years experience Wilderness Specialist, Royal Gorge Resource Area; two years experience Outdoor Recreation Planner, Canon City District; four years experience Outdoor Recreation Planner, Royal Gorge Resource Area; and three years experience current position.

**David Telafaro** - RMP Project Manager, Canon City, Colorado. B.A. Degree Recreation Park Administration; M.S. Degree Recreation Resource Planning, University of Missouri. Six and a half years experience, Park Departments of Idaho and Missouri; two years experience, Bureau of Outdoor Recreation; sixteen years experience with BLM in planning and environmental projects.

**Roger Underwood** - Assistant District Manager, Mineral Resources, Canon City, Colorado. B.S. Degree Geology, Oklahoma State University; Graduate work in Economic Geology, Missouri School of Mines. One year in oil and gas industry; three years experience Project Geologist, BLM; ten years experience District Geologist (two BLM Districts); four years experience in current position.

**Kermit Witherbee** - Supervisory Geologist, BLM Colorado State Office, Lakewood, Colorado. B.S. Degree Geology, M.A. Degree Geology, State University of New York, Oneonta, New York. Two years experience as consultant, one year experience as Geologist, Wyoming BLM State Office, six years experience in private industry (Powers Resources and Total Minatome), three years experience as BLM Area and District Geologist, four years experience current position.

***Bureau of Land Management, U.S. Department of the Interior, Oklahoma***

**Brian Mills** - Planning Coordinator, Oklahoma City, Oklahoma. B.S. Degree Wildlife Management, Oklahoma State University. Fifteen years experience BLM Wildlife Biologist, Coal Team Leader and RMP Team Leader. Experience with Amoco Production Research Division prior to government service.

**Paul Tanner** - Area Manager, Oklahoma City, Oklahoma. B.S. Degree Forestry, Stephen F. Austin University. Seventeen years experience as Natural Resource Specialist, Area Manager. Experience

with USDA Forest Service as a Forester. Forestry experience with the Battelle Institute prior to government service.

## CHAPTER VI

### PERSONS OR AGENCIES CONSULTED AND/OR RECEIVING COPIES OF THIS ENVIRONMENTAL IMPACT STATEMENT

#### INTRODUCTION

This Chapter summarizes public involvement activities and consultation with others during preparation of this EIS.

Appendix Q contains a comprehensive record of public notice, other agency and public participation and Forest Service response to issues identified for this EIS. The first section of the appendix summarizes public involvement activities undertaken during this EIS process, the second section summarizes all the issues and describes the Forest Service recommended response to each issue, and the third section identifies, Federal, State and County agencies and private citizens and interest groups who provided comments and identified issues pertaining to the scope of the analysis for this EIS.

#### CONSULTATION WITH OTHERS

Public involvement concentrated on identification of issues. The Forest Supervisor requested comments on issues pertaining to this action in a Notice of Intent To Prepare an EIS, published in the Federal Register, Volume 53, No. 249, Wednesday, December 28, 1988. Public notice (paid advertisements) announcing this action and requesting comments regarding the scope of issues to be addressed was provided in eleven local newspapers of general circulation within or near the analysis area. Letters, inviting comment regarding the scope of the environmental analysis were mailed by the Forest Supervisor to fifteen elected officials and other Federal and State agencies. A similar letter from the Forest Supervisor, inviting comments and suggestions, was mailed to 226 names on the Forest Plan mailing list.

The Forest Supervisor submitted a NOI to prepare a new EIS on April 15, 1991. A letter of information about the intent to prepare a new EIS for oil and gas leasing was mailed on March 22, 1991, to 495 names on the oil and gas leasing mailing list.

Written or verbal responses were received from Federal and State agencies and from individuals or organizations are in the Planning Records for this EIS. All public comments are available for review at the Supervisor's Office, 1920 Valley Drive, Pueblo, Colorado.

The BLM (Canon City, Colorado; Tulsa, Oklahoma) is a cooperating agency and has assisted the Forest Service in preparing this EIS.

As a result of public participation activities a mailing list has been established for this EIS. All mailing lists are available for review, during normal working hours, at the Forest Supervisor's Office, 1920 Valley Drive, Pueblo, Colorado.

Availability of this Draft EIS for review and comment will be published in the Federal Register and in local newspapers of general circulation within and near the planning area.

**LIST OF ELECTED OFFICIALS, AGENCIES, ORGANIZATIONS, AND INDIVIDUALS  
TO WHOM COPIES OF THE STATEMENT ARE SENT**

The following list of elected officials received the first Draft EIS and/or a letter of notification about the intent of the Forest Service to prepare a new Draft EIS:

Honorable William L. Armstrong  
Honorable Tim Wirth  
Honorable Hank Brown  
Honorable Ben Nighthorse Campbell  
Honorable Joel Hefley  
Honorable Dan Schaeffer  
Honorable Pat Schroeder  
Honorable Roy Romer, Governor, State of Colorado  
Honorable Michael Hayden, Governor, State of Kansas (former)  
Honorable Joan Finney, Governor, State of Kansas (current)  
Honorable Robert J. Dole  
Honorable Nancy L. Kassebaum  
Honorable Pat Roberts  
Honorable Dan R. Glickman  
Honorable Robert Whittaker  
Honorable Leroy Hayden, Kansas Senator

A complete oil and gas mailing list of elected officials, federal, state, county and city agencies, and other interested organizations and individuals may be viewed at the Supervisor's Office, 1920 Valley Drive, Pueblo, Colorado.

**MEMBERS OF THE PUBLIC WHO PROVIDED COMMENT**

| <b>ID<br/>#</b> | <b>COMMENTOR NAME</b>                                  |
|-----------------|--|
| EA-1            | Bill Hughes, Colorado Assoc. of Four Wheel Drive Clubs |
| EA-2            | Frances C. Carter                                      |
| EA-3            | David Johnson  |
| EA-4            | Susan Wenger   |
| EA-5            | Dale Greene/Richard Greene                             |
| EA-6            | Andrew McConkey  |
| EA-7            | Eldred A. Lee, Jr.                                     |
| EA-8            | Lorraine Lane  |
| EA-9            | Mrs. John W. Stewart                                   |
| EA-10           | Theo Page Waller                                       |
| EA-11           | Craig Schnorf  |
| EA-12           | George M. Miller                                       |

|       |  |
|-------|--|
| EA-13 | Thomas L. Holderfield  |
| EA-14 | Karl Gehring   |
| EA-15 | Debbie Carstensen  |
| EA-16 | Sandy Esque, Associate Program Director, COLORADO OUTWARD BOUND SCHOOL   |
| EA-17 | Andrew Loizeaup  |
| EA-18 | Michelle Holcomb   |
| EA-19 | Chris MacWaters  |
| EA-20 | Mike Terry   |
| EA-21 | Wendell Funk   |
| EA-22 | Dorothy V. Gumaer  |
| EA-23 | Mark and Marty Copelin   |
| EA-24 | Barbara E. Brayton   |
| EA-25 | S. & B. Smith and Family   |
| EA-26 | Dale Gardner   |
| EA-27 | Elbert Schmeitzer  |
| EA-28 | Stephen Higgins/Laurel Higgins   |
| EA-29 | Tim Baker/Zoe Faff   |
| EA-30 | William R. Allen, DDS  |
| EA-31 | John Spezia  |
| EA-32 | Dick & Jan Scar  |
| EA-33 | Kirk Koepsel, Public Lands Coordinator, COLORADO ENVIRONMENTAL COALITION |
| EA-34 | Sharon Russon  |
| EA-35 | Helena Hawks   |
| EA-36 | H. H. Goldberg   |
| EA-37 | Gary A. & Marilyn J. Robinson  |
| EA-38 | Nancy O. Foote   |
| EA-39 | John G. Hartung  |
| EA-40 | David Tidd   |
| EA-41 | Lisa Johnson Waugh   |
| EA-42 | David G. Eisenstein  |
| EA-43 | Robert W. Schutte  |
| EA-44 | G. K. Harkness   |
| EA-45 | Carol A. Case  |
| EA-46 | Charlotte M. Hier  |
| EA-47 | Janet Woodman  |
| EA-48 | Gerridina Stowe  |
| EA-49 | Herbert J. Hinze   |
| EA-50 | Jean Bartheld  |
| EA-51 | Dan and Sharon Brainard  |
| EA-52 | Gay O'Connor   |
| EA-53 | James Mark Simmerman   |
| EA-54 | William A. Coates  |
| EA-55 | Anne Vickery   |
| EA-56 | Mark & Charla Palmer   |
| EA-57 | Edward A. Binkley  |
| EA-58 | George & Marilyn Nelson  |
| EA-59 | Adelle Vickers   |
| EA-60 | Bruce Batting  |
| EA-61 | Barbara & Les Foiles   |
| EA-62 | Liz Washburn   |
| EA-63 | Kat Feher  |

|        |  |
|--------|--|
| EA-64  | Gary Gabrel  |
| EA-65  | Michael E. Cockrell  |
| EA-66  | Paul Berteau   |
| EA-67  | Hume Davenport   |
| EA-68  | Renee Reed   |
| EA-69  | Jim Logeterman   |
| EA-70  | Glen Ayers   |
| EA-71  | Joanne Carter, Regional Associate, THE WILDERNESS SOCIETY    |
| EA-72  | Gary E. Oakley   |
| EA-73  | Julie Orr  |
| EA-74  | Charles V. Swan  |
| EA-75  | Susan E. Lee   |
| EA-76  | Donna Corrigan   |
| EA-77  | David Lucas  |
| EA-78  | Henry Gibb   |
| EA-79  | Bradley Edwards  |
| EA-80  | Stacy McClurg  |
| EA-81  | William Foltyn III   |
| EA-82  | Ray Miller   |
| EA-83  | Merrin Slocombe  |
| EA-84  | Dean Yashan  |
| EA-85  | Kurt Menning, Director, CU Wilderness Study Group            |
| EA-86  | Janet Hardin   |
| EA-87  | Bryan Ayer   |
| EA-88  | David Upthegrove   |
| EA-89  | Guy Garcia   |
| EA-90  | Debbie Kunkel  |
| EA-91  | Gary M. Wooler   |
| EA-92  | Brad Bartels   |
| EA-93  | Hilary Harris  |
| EA-94  | John Dehellow  |
| EA-95  | Eric J. Kessler, University of Colorado Environmental Center |
| EA-96  | Chris Kreider  |
| EA-97  | David Rahbany  |
| EA-98  | Katherine L. Kunz  |
| EA-99  | Craig Dunne  |
| EA-100 | Laura Green  |
| EA-101 | Nancie Rudy  |
| EA-102 | Larry Stuhl, President, High Country River Rafters           |
| EA-103 | David Anderson   |
| EA-104 | Matthew W. Steiman   |
| EA-105 | Melissa Fine   |
| EA-106 | Mark D. Hutchinson   |
| EA-107 | Dan Bejesky  |
| EA-108 | John Fielder, WESTCLIFFE PUBLISHERS                          |
| EA-109 | Maura Rieman   |
| EA-110 | Barbara Blunt  |
| EA-111 | Mr. & Mrs. Duane B. Eaton, Sierra Club-Rachel Carson Group   |
| EA-112 | Alison J. Thomson  |
| EA-113 | Lara Meyer   |
| EA-114 | Mary Kate Willett  |
| EA-115 | Scott Leakas   |
| EA-116 | Woodworth Coleman  |



EA-117 Greg Smith  
 EA-118 Alex Pearlman  
 EA-119 Katherine Meeder  
 EA-120 Ethan Laufer  
 EA-121 Norman Meyer  
 EA-122 Jane Adams  
 EA-123 Thomas J. Cassidy, Jr., Public Lands Counsel, American Rivers, Inc.  
 EA-124 Thomas & Lillian McCracken  
 EA-125 Jim Cursley  
 EA-126 Kevin and Linda Cox  
 EA-127 Sharon Russom  
 EA-128 Walt & Lucie Wilson  
 EA-129 Bryan Kyle  
 EA-130 Barbara Zwigg  
 EA-131 Bill Jones  
 EA-132 Marvin L. Ottosen  
 EA-133 John Wade  
 EA-134 Eric David Miller  
 EA-135 C. E. & M. J. Williamson  
 EA-136 Annette Puttammer  
 EA-137 Kelley Harpstrite  
 EA-138 Jane Anderson  
 EA-139 Leon Bright  
 EA-140 Leon Bright, Conservation Chair, Arkansas Valley Audubon Society  
 EA-141 Claire M. Moseley, Public Lands Consultant, Rocky Mountain Oil & Gas Assoc.  
 EA-142 Charles H. Wagner  
 EA-143 Anne Vickery, Conservation Director, The Colorado Mountain Club  
 EA-144 Randy L. Pitre, Region Environmental Advisor, OXY USA, Inc.  
 EA-145 Paul Zogg, Editor/Attorney, Colorado Wildlife Federation  
 EA-146 Todd Robertson, Public Lands Coordinator, Colorado Environmental Coalition  
 EA-147 Nancy Strong  
 EA-148 Paul E. Feldman, Div. Landman, Anadarko Petroleum Corporation  
 EA-149 Alice Frell Benitez, Public Lands Director, Rocky Mountain Oil & Assoc.  
 EA-150 Harry E. Wilson  
 EA-151 David R. Brown  
 EA-152 Karin P. Sheldon, Senior Counsel, The Wilderness Society  
 EA-153 Mrs. Kit Carlsen, President, Kansas Associated Garden Clubs  
 EA-154 Randal S. Marks  
 EA-155 David Naslund, Coordinator, Timber Resources Information Program and Lauren Naslund

#### COMMENTS OF GOVERNMENT AGENCIES

EFA-1 Robert D. Wood, Wildlife Ecologist  
 Environmental Services Section  
 Kansas Wildlife & Parks

EFA-2 Robert Schroeder, State Supervisor  
 USDI Fish and Wildlife Service  
 Kansas State Office

EFA-3 Jim Sims, District Manager  
 U.S. Department of the Interior

Bureau of Land Management

- EFA-4 Kenneth W. Holt, M.S.E.H.  
Department of Health and Human Services  
Public Health Service  
Centers for Disease Control
- EFA-5 James N. Habiger, State Conservationist  
Soil Conservation Service
- EFA-6 Donnie Sparks, District Manager  
USDI Bureau of Land Management
- EFA-7 Jim Sims, District Manager  
USDI Bureau of Land Management
- EFA-8 Scotty Baugh, Region 3 Fisheries & Wildlife Supervisor  
Kansas Department of Wildlife and Parks
- EFA-9 Robert F. Stewart  
Regional Environmental Officer  
USDI Office of Environmental Affairs
- EFA-10 Robert R. DeSpain, Chief  
Environmental Assessment Branch  
Water Management Division  
US EPA - Region VIII
- EFA-11 Bruce Goforth, Senior Wildlife Biologist  
Department of Natural Resources  
Southeast Regional Office
- EFA-12 Steve Norris  
Department of Natural Resources

## APPENDIX A

### PROPOSED FOREST PLAN AMENDMENT

#### INTRODUCTION

This Appendix details the contents of a proposed Forest Plan amendment which will be necessary to implement the proposed action detailed in the DEIS for Oil and Gas Leasing on the Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands. Alternative Forest Plan amendments consisting primarily of alternative leasing stipulations were considered and the effects disclosed for each of the alternatives analyzed in the DEIS.

Appendix B of this DEIS contains a detailed discussion of how the leasing stipulations in this proposed Forest Plan Amendment will be applied once a lease application is received. Appendices E, F and G of this DEIS discuss various maps that are necessary for understanding how the stipulations that constitute the Forest Plan amendment will be applied once the Plan is actually amended.

The proposed amendment is a non-significant amendment based on the definition in 36 CFR 219.10(f) and will be approved by the Forest Supervisor as part of the decision associated with this Oil and Gas Leasing EIS.

The proposed Forest Plan amendment consists of three parts:

1. Forest-wide Management Requirements
2. Oil and Gas Leasing Stipulations, Lease Notices and Standard Lease Terms
3. Stipulation Base Map

#### FOREST-WIDE MANAGEMENT REQUIREMENTS

The Forest-wide management requirements under Management Activity "Minerals Management-Oil, Gas and Geothermal (GO2 and 4)" on pages III-54 through III-61 in the Forest Plan will be replaced with the following General Direction statements.

1. Withdrawal of lands from operations of the mineral leasing acts will be requested only in exceptional situations because Federal decisions on mineral disposals under these acts are discretionary on a case-by-case basis.
2. Forest Service authorization of geophysical prospecting will include terms and conditions controlling operating methods and times to prevent or control adverse impacts on surface resources and uses.
3. Standard lease terms listed on USDI, BLM Form 3100-11 apply to all leases. They require that the "Lessee shall conduct operations in a manner that minimizes adverse impacts to

the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users.

4. No Surface Occupancy (NSO) is the most restrictive stipulation available and is intended for use only when standard lease terms and other, less restrictive, stipulations are determined insufficient to adequately protect the public interest. The analysis record must show that a no-lease alternative was considered when applying the NSO stipulation.

The No Surface Occupancy Stipulation will be applied for the following purposes:

- a. Protecting the physical manifestations and immediate environment of the Santa Fe National Historic Trail, including inherent interpretive, educational, and recreational values for the segment potentially impacted.
  - b. Protecting the investment of facilities within the all developed recreation sites, to protect the recreation experience and safety of visitors, and to protect the natural environment that initially made the site desirable for development.
  - c. Protecting wetlands, riparian areas, and floodplains of any defined drainage or location containing these specific ecosystem types. Wetlands and floodplains are protected pursuant to Executive Orders 11990 and 11988, respectively, and all policy or direction proceeding from those orders.
  - d. Preventing mass movements of earth such as landslides.
  - e. Maintaining or improving water quality to meet Federal or State standards.
  - f. Preventing significant or permanent impairment to soil productivity.
  - g. Protecting the investment and facilities on all developed special use recreation sites as identified in FLUR including a 1/4 mile buffer around each site and ensuring continuation of the recreation experience and safety of the users, and the natural environment that initially made the site desirable for the existing use.
  - h. Protecting the natural, cultural, historical and scenic qualities of foreground visual zones of the Forests and Grasslands that have an inventoried visual quality objective of Fg1A.
5. The Timing Limitation (often called seasonal) Stipulation prohibits fluid mineral exploration and development activities for time periods less than yearlong. A timing stipulation is not necessary if the time limitation involves the prohibition of new surface disturbing operations for periods of less than 60 days (43 CFR 3101.1-2). The Timing Limitation Stipulation will be applied for the following purposes:
    - a. Protecting mule deer, pronghorn antelope, bighorn sheep, and elk during critical use periods of their winter ranges.
    - b. Minimizing disturbances during the reproductive seasons as noted below:
      - (1) Elk calving, bighorn sheep lambing, pronghorn and deer fawning and goat kidding areas.

- (2) Prairie chicken dancing grounds and nesting areas.
- (3) Critical raptor nesting areas.
- (4) Bald eagle and turkey winter habitat.
- (5) Curlew, and mountain plover nesting, resting, staging areas.

6. The Controlled Surface Use (CSU) Stipulation is intended to be used when oil and gas activities are allowed on all, or portions, of the lease area year-round but, because of special values or resource concerns, lease activities must be strictly controlled. The CSU Stipulation is used to identify constraints on surface use or operations which may otherwise exceed the mitigation provided by Section 6 of the standard lease terms and the regulations and operating orders. The CSU Stipulation is less restrictive than the NSO or Timing Limitation stipulations, which prohibit all activity on all, or portions, of a lease for all, or portions, of a year. The CSU Stipulation should not be used in lieu of an NSO or Timing Limitation stipulation but should be limited to areas where restrictions or controls are necessary for specific, rather than all, activity.

The stipulation should explicitly describe what activity is to be restricted or controlled, or what operation constraints are required, and must identify the applicable area and the reason for the requirement. The legal subdivision, distance, location, or geographic feature, and resource value of concern must be identified in the stipulation and be tied to a land use plan and/or NEPA document.

The Controlled Surface Use Stipulation will be applied for the following purposes:

- a. Preventing significant or permanent impairment of soil productivity.
- b. Protecting off-site areas by preventing impacts from accelerated soil erosion.
- c. Maintaining or improving water quality to meet Federal or State standards.
- d. Preventing detrimental impacts such as gully erosion, streambank failure, soil compaction, and severe rutting which could cause long-term damage or permanent impairment to soil productivity.
- e. Protecting the significant and contributing geological features of the Spanish Peaks National Natural Landmark, and its scenic and recreational values.
- f. Minimizing the potential for cumulatively significant impacts in fragile alpine ecosystems.
- g. Protecting the natural, cultural and historical scenic values on lands with the visual resource classification of Fg1B, Fg1C, Fg2A, Fg2B, Mg1A, and/or Mg1B.
- h. Preventing the siting of collection facilities, well sites or exploration activities within the foreground and middleground zones on lands with the visual resource classification of Fg1B, Fg1C, Fg2A, Fg2B, Mg1A, and/or Mg1B.
- i. Meeting the objective of the Clean Water Act (CWA 1977) and Federal Water Pollution Control Act (FWPCA 1972) to restore and maintain the physical, chemical, and

biological integrity of the nation's water on watersheds that have been identified as being over sediment threshold or within 10% of exceeding sediment threshold.

7. Lease Notices are attached to leases to transmit information at the time of lease issuance to assist the lessee in submitting acceptable plans of operation, or to assist in administration of leases. Lease Notices are attached to leases in the same manner as stipulations, however, there is an important distinction between Lease Notices and Stipulations. Lease Notices do not involve new restrictions or requirements. Any requirements contained in a Lease Notice must be fully supported in either a law, regulation, standard lease term, or onshore oil and gas order.

Lease notices may be applied to leases for the following purposes:

- a. Protecting unique ecosystems, threatened and endangered plant and animal species, and the integrity of research activities within existing and proposed research natural areas and other special interest areas.
  - b. Protecting the operational capabilities of existing special use communication sites.
  - c. Meeting legal requirements for the protection of threatened and endangered species.
  - d. Minimizing potential conflicts with timber sales planned under 2400-3(T) or 2400-6(T) contracts.
8. Conditions of Approval (COA) may be generated at the time of site specific analysis when a Surface Use Plan of Operations has been received for exploratory drilling, or production activities resulting in ground disturbance. COA's may not unduly hinder or preclude the lessee's opportunity to exercise valid existing lease rights and may only be applied if they are consistent with the lease terms or are the result of information that was unknown at the time of leasing.
  9. Federal minerals which underlie private lands are known as "split-estate" minerals and are subject to the same mineral leasing laws and requirements as federal minerals which are beneath federally owned surface. The Forest Service will inform the Bureau of Land Management if there is no objection to offering a lease of these split-estate lands that are located within the external boundaries of the Pike and San Isabel National Forest and Cimarron and Comanche National Grasslands. The Forest Service will also be responsible for determining the stipulations and conditions of approval that are needed to ensure adequate surface protection, where the federal decision to offer a lease has the potential to affect the surface of adjacent or intermingled NFS lands.

#### **OIL AND GAS LEASING STIPULATIONS, LEASE NOTICES AND STANDARD LEASE TERMS**

Appendix F in the Forest Plan (Stipulations for Lands Under the Jurisdiction of Department of Agriculture) will be replaced by the stipulations, lease notices and standard lease terms contained in Appendix B of this DEIS.

## STIPULATION BASE MAP

A 1/2 inch per mile map displaying the general application of the stipulations will be appended to the Forest Plan. The map is and is included in this document as Appendix F and is intended to represent the site-specific information disclosed on the working maps that will be used in implementation. The working maps, or quads, will be maintained at the Forest Supervisor, Ranger District, and State BLM offices.

To understand the application of the mapping process please see Chapter I, pages 35-36, and the summary, pages 5 and 7.





## **APPENDIX B**

### **MITIGATION**

#### **INTRODUCTION**

Federal agencies are required to include and discuss appropriate measures to mitigate adverse environmental impacts (40 CFR Parts 1502.14 (f), 1502.16 (h), 1508.20). Mitigation includes the following possibilities for dealing with adverse environmental impacts:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing resources or providing substitute resources or environments.

Mitigation, in the federal oil and gas leasing program, is provided in various intensities at different levels of planning. Mitigation, at the level of the leasing analysis, must be relatively general to encompass all of the possible conditions that may exist at the time of ground disturbance. The opportunities to provide adequate protection at the time of disturbance must be identified and generated at this level of planning. Mitigation that exceeds what is available through the standard lease terms and which is identified now becomes a condition of the lease and restricts the rights that are granted to the purchaser of a lease. These restrictions may affect the lease purchase price as well as the lessee's future ability to develop facilities on various, or all, segments of the lease. The restrictions, however, are a known condition at the time of advertisement and purchase.

Mitigation can be refined at two later stages of planning, after the Forest Supervisor makes a decision relating to this analysis. The first of those opportunities is when an actual lease parcel is identified. At that time any knowledge about the parcel, or resources it affects, that is not now available can be used to refine or change the lease restrictions. Those changes will have to be disclosed through an environmental analysis and decision document. The changes recognized at this stage will be identified prior to lease advertisement so they, too, will become known conditions of the lease purchase.

The last formal opportunity where refinement can, and will, occur is at the time that an Application for Permit to Drill (APD) and Surface Use Plan of Operations is provided to the government by the lessee or their representative. At that time a specific plan is provided that displays proposed road and drill locations, and all of the desired facilities. This information allows the Forest Service to analyze and document site specific effects of the proposed development prior to making a decision.

Many types of mitigation can be identified and required at the time of APD. The only restriction is that the mitigation cannot "unduly hinder or preclude the lessees opportunity to exercise valid existing rights". This makes it important that the government correctly identify the rights that it wishes to confer prior to sale of a lease. Those rights, and mitigation that may limit them, are identified through the application of standard lease terms and necessary additional stipulations prior to advertisement. Once a lease has been sold the government can apply any mitigation requirements that still allow the lessee to exercise the rights they were granted in the lease.

Mitigation measures may be waived or modified by the authorized officer if they are proven unnecessary at the time a site specific analysis is completed for the APD. This could occur because the resource to be protected is absent or more effective mitigation has been identified and will be used. All waivers will be displayed in a decision document at the time the Surface Use Plan analysis is completed.

In this document we will discuss the mitigation provided under the standard lease terms and with supplemental stipulations. We will also briefly discuss some of the standard types of mitigation, termed conditions of approval, that are used at the time of APD. It is important to remember that the lease terms and stipulations build the framework for the application of conditions at the time of APD.

Standard lease terms, stipulations, and conditions of approval will be applied to all ground disturbing activities occurring within a lease parcel. These activities include, but are not limited to, prospecting, exploration drilling, and production.

### **STANDARD LEASE TERMS**

Standard lease terms apply to all leases. They are attached as Exhibit B-1. They require that the "Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users. Standard lease terms are commonly considered to be adequate to mitigate most adverse environmental impacts (40 CFR Part 1505.2 (c) and Part 1508.20). They are common to all leases, and therefore, to all management alternatives being analyzed.

The standard terms also apply all non-discretionary statutes, and reasonable measures required by the Authorizing Officer to minimize adverse impacts to other resources and users.

Under standard lease terms mitigation may include moving the site of developments up to 200 meters, timing restrictions of up to 60 days, facility design changes, and interim and final reclamation efforts. Many other protection measures can be applied and negotiated under standard terms. It must be demonstrated that standard lease terms are insufficient in order to apply supplemental stipulations.

### **SUPPLEMENTAL STIPULATIONS**

When there are resource values, uses, or user conflicts identified that cannot be managed or accommodated by the standard lease terms or on other lands, a lease stipulation may be necessary. The leasing analysis must show that less restrictive stipulations were considered and determined to be insufficient. Stipulations may be applied to all, or part, of a lease parcel as required for resource protection. It will display the need for lease stipulations and establish guidelines for

granting waivers, exceptions, or modifications. Substantial modification or waiver after lease issuance is subject to public review for at least a 30-day period in accordance with Section 5120.f of the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA).

Stipulations may be necessary if the authority to control the activity on the lease does not already exist under laws, regulations, or orders. It is important to recognize that the Authorized Forest Officer has the authority to modify the siting and design of facilities, control the rate of development and timing of activities, as well as require other mitigation under Sections 2 and 6 of the standard lease terms (BLM Form 3100-11) and 43 CFR 3101.1-2.

The following guidance is provided in order to assist in the determination of needed stipulations. They are displayed from the most to the least restrictive.

### **No Surface Occupancy Stipulation Guidance**

No Surface Occupancy (NSO) is the most restrictive stipulation available and is intended for use only when standard lease terms and other, less restrictive, stipulations are determined insufficient to adequately protect the public interest. The analysis record must show that a no-lease alternative was considered when applying the NSO stipulation.

### **Timing Limitation Stipulation Guidance**

The Timing Limitation (often called seasonal) Stipulation prohibits fluid mineral exploration and development activities for time periods less than yearlong. When using this stipulation, assure that date(s) and location(s) are as specific as possible. A timing stipulation is not necessary if the time limitation involves the prohibition of new surface disturbing operations for periods of less than 60 days (43 CFR 3101.1-2).

### **Controlled Surface Use Stipulation Guidance**

The Controlled Surface Use (CSU) Stipulation is intended to be used when oil and gas activities are allowed on all, or portions, of the lease area year-round but, because of special values or resource concerns, lease activities must be strictly controlled. The CSU Stipulation is used to identify constraints on surface use or operations which may otherwise exceed the mitigation provided by Section 6 of the standard lease terms and the regulations and operating orders. The CSU Stipulation is less restrictive than the NSO or Timing Limitation stipulations, which prohibit all activity on all, or portions, of a lease for all, or portions, of a year. The CSU Stipulation should not be used in lieu of an NSO or Timing Limitation stipulation but should be limited to areas where restrictions or controls are necessary for specific, rather than all, activity.

The stipulation should explicitly describe what activity is to be restricted or controlled, or what operation constraints are required, and must identify the applicable area and the reason for the requirement. The legal subdivision, distance, location, or geographic feature, and resource value of concern must be identified in the stipulation and be tied to a land use plan and/or NEPA document.

## Stipulations for use on the Unit

Table B-1 displays the stipulations that follow it which are described in detail. These stipulations may be applied on both federal surface and split-estate lands where necessary.

**Table B-1**  
**Limitations or Prohibition of Surface Activity**  
**In Areas with Resource Sensitivity**

| Limitation/Prohibition | Area/Resource to be protected   |
|------------------------|---|
| NSO Stipulation        | Cultural Resources<br>Recreation<br>Riparian, Wetlands, Floodplains<br>Soils<br>Special Uses - Recreation<br>Visual Resources |
| Timing Stipulation     | Wildlife (Big Game Winter Range)<br>Wildlife (Management Indicator Species)   |
| CSU Stipulation        | Soils<br>Special Areas (NNL)<br>Vegetation, Alpine<br>Visual Resources<br>Water   |
| Lease Notices          | Research and Special Areas<br>Special Uses<br>Threatened and Endangered Species<br>Vegetation                                 |
| Standard Lease Terms   | Air<br>Cultural Resources<br>Range<br>Recreation<br>Soils<br>Special Uses<br>Visual Resources<br>Water<br>Wildlife            |

**THE FOLLOWING SECTION LISTS  
THE STIPULATIONS THAT MAY BE APPLIED  
AND A SHORT EXPLANATION  
OF THE REASONS FOR THE STIPULATION  
ON THE FACING PAGE.**

Serial No. \_\_\_\_\_

**NO SURFACE OCCUPANCY STIPULATION**

**No surface occupancy or use is allowed on the lands described below** (legal subdivision or other description).

The Santa Fe National Historic Trail, to include ruts or rut zones or swales or vegetation changes designated as the major routes of the Trail and a 300 foot buffer area on both sides of the Trail. The Trail (single or multiple ruts or swales) varies in width from approximately 50 feet to over 300 feet. Thus the total NSO zone may be 450 feet or more in width for some portions of the Trail.

**On the lands described below:**

The locations of the major routes of the Santa Fe National Historic Trail are available through the Cultural Resources Management records section maintained at Forest Headquarters, Pueblo. They include the major routes and branches of the Cimarron Cutoff on the Cimarron National Grassland, the major routes and branch of the Mountain Branch, the Aubrey Cutoff, the Granada-Ft. Union Military Road and the Las Animas-Trinidad New State Road, all on the Comanche National Grassland.

**For the purpose of:**

Protecting the physical manifestations and immediate environment of the Trail, including inherent interpretive, educational, and recreational values for the segment potentially impacted.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2920, FS Oil & Gas Regulations, 36 CFR, Sec. 228.104.)

Form #/Date

---

## Cultural

No Surface Occupancy is being used to protect the Santa Fe National Historic Trail and its features. The Trail consists of 1200 miles of ruts and other remnants of the original 1821-1880 route from Old Franklin, Missouri, to Santa Fe, New Mexico. The Trail was added to the National Trails System in 1987 through amendment to the National Trails System Act (P.L. 100-35). National Historic Trails are managed by the USDI Park Service for identification and protection of historic routes and remnants for public use and enjoyment. The Park Service has prepared a Management and Use Plan for the Santa Fe Trail which includes identification of major routes, side branches, and sites. Those specific areas on the Cimarron and Comanche National Grasslands are the Cimarron Cutoff, the Mountain Branch, the Aubrey Cutoff, and the Granada-Ft. Union Wagon Road. Currently, the Forest Service with the cooperation of the Park Service, is developing the Trail for public recreation use within the guidelines provided in the Management and Use Plan.

The following guidelines would be implemented:

For ruts or rut zones, or vegetation changes, or shallow swales designated as the main route of the Trail, a No Surface Occupancy Zone has been established for the Trail and a 300 foot buffer areas on either side. Oil and gas wells, roads, collection points or other surface disturbances will not be permitted within the Zone. It may be feasible to tunnel under visible remnants of the Trail to construct pipelines, utility lines etc.

Serial No. \_\_\_\_\_

**NO SURFACE OCCUPANCY STIPULATION**

**No surface occupancy or use is allowed on the lands described below (legal subdivision or other description).**

All developed recreation sites as identified in RIM including a 1/4 mile buffer around each site. Locate roads outside developed recreation site buffer zones unless alternative routes have been reviewed and rejected as being more environmentally damaging.

**For the purpose of:**

Protecting the investment of facilities within the site, to protect the recreation experience and safety of the visitors, and to protect the natural environment that initially made the site desirable for development.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2920, FS Oil & Gas Regulations, 36 CFR, Sec. 228.104.)

Form #/Date

---



## Recreation

The Forest Service will maintain the recreational quality of public lands by ensuring that opportunities for fishing, hunting, sightseeing, hiking, snow sports and other outdoor activities are not adversely impacted as a result of oil and gas leasing activities. The quality of the scenic (visual) values on public lands throughout the Forest will be maintained.

The NSO stipulation will be applied to leases for tracts in and around identified developed recreation sites. [See Exhibit B-2 for a listing of these sites.] NSO will be used to meet the goals of the Forest Plan for developed recreation opportunities and experiences.

Serial No. \_\_\_\_\_

**NO SURFACE OCCUPANCY STIPULATION**

**No surface occupancy or use is allowed on the lands described below (legal subdivision or other description).**

Wetlands, Riparian Areas, and Floodplains of any defined drainage or location containing these specific ecosystem types. Access roads may be allowed in these areas only if alternative roads have been reviewed by the appropriate personnel, and have been rejected as being more environmentally damaging. When road locations must occur in these areas, streams will be crossed at right angles and access across other areas will be held to a minimum. Streams will not be paralleled by roads through these areas.

**On the lands described below:**

Information on the location of these areas can be found on 1:24,000 scale maps located at the Forest Supervisor's Office. Additional site-specific information may be required due to lack of data.

**For the purpose of:**

Wetlands and floodplains are protected pursuant to Executive Orders 11990 and 11988, respectively, and all policy or direction proceeding from those orders. Also it is recognized that there is a direct relationship between impacts on such areas and effects on water quality and aquatic ecosystems. There is a high risk of irreversible and irretrievable impacts on the latter with operation and development in wetlands, riparian areas, and floodplains.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820, and 2526, and FS Oil & Gas Regulations, 36 CFR, Sec. 228.104)

Form #/Date

---

## Riparian, Water, Fisheries

Eligibility character in terms of water quality and the aquatic ecosystem (including wetlands and floodplains) can be preserved only through application of the NSO stipulation. A less restrictive stipulation would not be adequate.

Executive orders, policy (Forest Service Manuals 2526, 2527) and the goals of the Forest Plan require the NSO stipulation for mineral leasing activities on wetlands and floodplains. Most such areas are not mapped at the planning scale, but must be considered a part of all lease units. When specific APD's are being evaluated, wetlands and floodplains must be covered by the requisite stipulation. No Surface Occupancy must correspond to an area along the edges of all streams, lakes and other bodies of water. The actual distance for riparian areas shall correspond to at least the recognizable area dominated by riparian vegetation and soil conditions. The area of the floodplain is the 100-year floodplain. The stipulation will ensure that new development is not permitted without a detailed analysis of the activities to be exempted from executive order requirements.

Ephemeral streams on the Grasslands meet the executive order criteria for defining wetlands and floodplains and are subject to the mitigation measures described herein.

All waterfowl and fisheries resources will be evaluated to determine the need for permanent or temporary fencing to promote riparian vegetation establishment. Other areas may need fencing to restore the riparian community. Protection of riparian areas is required due to the high risk of irreversible and irretrievable impacts to the water quality and associated ecosystems from oil and gas operations and developments in wetlands, riparian areas and floodplains.

Wetlands and floodplains must be mapped for a lease report in accordance with FSM 2526 and 2527 direction. The areas subject to an NSO stipulation include the width of a riparian area and include the area calculated for conveyance of a 100 year recurrence interval flood. The specific description must be reflected or referenced on the face of the stipulation form.

Serial No. \_\_\_\_\_

**NO SURFACE OCCUPANCY STIPULATION**

**No surface occupancy or use is allowed on the lands described below (legal subdivision or other description)**

Areas identified with **both** of the following characteristics:

1. Slopes steeper than 60 percent.
2. High (severe) geologic hazard.

**For the purpose of:**

1. Preventing mass movements of earth such as landslides.
2. Maintaining or improving water quality to meet Federal or State standards.
3. Preventing significant or permanent impairment to soil productivity.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820, FS Oil & Gas Regulations, 36 CFR, Sec. 228.104)

Form #/Date

---

## Soils

### NSO Stipulation

The NSO stipulation is applied to leases in areas of high geologic hazard (mass movement) on slopes steeper than 60 percent for the purpose of:

- (1) Preventing mass movement of earth materials.
- (2) Maintaining or improving water quality to meet federal and state standards.
- (3) Preventing significant or permanent impairment of soil productivity.

Soil criteria used for no surface occupancy include *both* of these characteristics: 1) slopes steeper than 60 percent and, 2) high geologic hazard. Areas inferred to be high geologic hazards include landslides, avalanches, debris flows or slides, rockslides, rockfalling, slumping or talus accumulation. Some till is mapped with landslide deposits, because distinguishing these two deposits from one another is difficult. Areas mapped as susceptible to landslides and related activity should be carefully studied before any development begins.

The map showing suitability for NSO as it relate to soils should be viewed as displaying areas of generality. The delineated areas of NSO means that the vast majority of that area has severe limitations such as slopes steeper than 60 percent, and high geologic hazards. However, there are small benches or parcels of land within these delineated areas that do not have the limitations mentioned above but are surrounded by them. These areas would be open to surface occupancy if industry plans show, to the satisfaction of the Forest Service, that all concerns can be mitigated.

NSO - Special Uses (Recreation Sites)

---

Serial No. \_\_\_\_\_

**NO SURFACE OCCUPANCY STIPULATION**

**No surface occupancy or use is allowed on the lands described below: (legal subdivision or other description)**

All developed special use recreation sites as identified in FLUR including a 1/4 mile buffer around each site. Locate roads outside of developed site buffer zone unless alternative routes have been reviewed and rejected as being more environmentally damaging.

**For the purpose of:**

Protecting the investment of facilities within the site, the recreation experience and safety of the users, and the natural environment that initially made the site desirable for the existing use.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2920, FS Oil & Gas Regulations, 36 CFR, Sec. 228.104.)

Form #/Date

---

Table B-3  
FLUR Report Identifying Protected Recreation Special Uses

| KIND OF USE                             | NO. | ACRES | MILES | KIND OF USE                              | NO.   | ACRES  | MILES |
|---|-----|-------|-------|--|-------|--------|-------|
| BOAT DOCK                               | 1   | 1     | 1     | HYDROELECTRIC PROJECT, FERC LICENSED     | 1     | 15     | 15    |
| CLUB                                    | 1   | 3     | 3     | OIL AND GAS PIPELINES/RELATED FACILITIES | 211   | 1,582  | 507   |
| ORGANIZATION CAMP                       | 6   | 106   | 106   | POWERLINES                               | 76    | 2,325  | 543   |
| TRAIL SHELTER                           | 4   | 4     | 4     | OTHER UTILITY IMPROVEMENT                | 4     | 3      | 2     |
| CABINS                                  | 8   | 10    | 10    | TOTAL POWER GENERATION/TRANSMISSION USES | 292   | 3,932  | 1,052 |
| RECREATION RESIDENCE                    | 221 | 822   | 822   | RAILROAD RIGHT-OF-WAY                    | 6     | 648    | 32    |
| RESORT                                  | 1   | 16    | 16    | ROADS, STATE AND COUNTY                  | 30    | 1,712  | 208   |
| PARK, PLAYGROUND                        | 3   | 252   | 252   | ROADS, PRIVATE                           | 185   | 1,433  | 155   |
| TARGET RANGE                            | 3   | 21    | 21    | TRAMWAY OR CONVEYOR                      | 1     | 2      | 1     |
| TRAMWAY (RECREATIONAL)                  | 1   | 4     | 4     | TOTAL TRANSPORTATION USES                | 222   | 3,795  | 396   |
| RESTAURANT                              | 1   | 2     | 2     | COMMUNICATION SITES                      | 105   | 75     | 1     |
| SKI AREAS                               | 4   | 2,032 | 2,032 | TELEPHONE LINES                          | 22    | 445    | 343   |
| TOTAL RECREATION USES                   | 254 | 3,274 | 3,274 | OTHER COMMUNICATION IMPROVEMENTS         | 3     | 3      | 1     |
| CULTIVATION                             | 1   | 31    | 31    | TOTAL COMMUNICATION USES                 | 130   | 523    | 345   |
| LIVESTOCK PASTURES                      | 31  | 3,809 | 2     | IRRIGATION WATER DITCH                   | 28    | 128    | 35    |
| BARN, SHED                              | 1   | 1     | 1     | IRRIG. WATER TRANS. PIPE., 12" DIA. OR + | 1     | 1      | 1     |
| FENCE                                   | 2   | 2     | 2     | IRR. WATER TRANS. PIPE., LESS 12" DIA.   | 3     | 3      | 3     |
| RESIDENCE                               | 1   | 5     | 5     | WATER TRANS. PIPE., 12" DIAMETER OR MORE | 28    | 449    | 70    |
| CORRAL                                  | 2   | 2     | 2     | WATER TRANS. PIPE., LESS THAN 12" DIAM.  | 40    | 65     | 46    |
| TOTAL AGRICULTURE USES                  | 38  | 3,850 | 4     | DAM, RESERVOIR                           | 28    | 7,564  | 37    |
| CEMETERY                                | 1   | 1     | 1     | WATER DIVERSION, WEIR                    | 3     | 7      | 4     |
| MARKER/MONUMENT/SIGN                    | 10  | 5     | 5     | RESERVOIR                                | 2     | 4      | 1     |
| SOLID WASTE TRANSFER SITE               | 2   | 8     | 8     | WELL, SPRING, WINDMILL                   | 21    | 10     | 3     |
| LIQUID WASTE DISPOSAL SITE              | 1   | 6     | 1     | STOCK WATER                              | 3     | 4      | 2     |
| SEWAGE TRANSMISSION LINE                | 1   | 6     | 6     | WILDLIFE WATER SUPPLY                    | 2     | 1      | 1     |
| SERVICE BUILDING                        | 2   | 2     | 2     | WATER STORAGE TANK                       | 4     | 3      | 3     |
| PARKING LOT                             | 3   | 4     | 4     | STREAM GAUGING STATION                   | 2     | 2      | 2     |
| RESIDENCES                              | 1   | 1     | 1     | TOTAL WATER USES                         | 165   | 8,241  | 202   |
| TOTAL COMMUNITY/PUBLIC INFORMATION USES | 23  | 35    | 4     | RECREATION                               | 254   | 3,274  | 1     |
| EXPERIMENTAL AND DEMONSTRATION          | 2   | 3,909 | 3,909 | AGRICULTURE                              | 38    | 3,850  | 4     |
| WEATHER STATION                         | 2   | 2     | 2     | COMMUNITY AND PUBLIC INFORMATION         | 23    | 35     | 4     |
| HISTORIC BUILDINGS AND IMPROVEMENTS     | 1   | 2     | 2     | RESEARCH, HISTORIC, CULTURAL             | 5     | 3,913  | 1     |
| TOTAL RESEARCH/HISTORIC USES            | 5   | 3,913 | 3,913 | INDUSTRY                                 | 31    | 289    | 1     |
| CONSTRUCTION CAMPS                      | 2   | 1     | 1     | POWER GENERATION AND TRANSMISSION        | 292   | 3,932  | 1,052 |
| WAREHOUSE AND STORAGE YARD              | 4   | 25    | 25    | TRANSPORTATION                           | 222   | 3,795  | 396   |
| STOCKPILE SITE                          | 1   | 1     | 1     | COMMUNICATION                            | 130   | 523    | 345   |
| PROCESSING PLANT                        | 10  | 58    | 58    | WATER                                    | 165   | 8,241  | 202   |
| MINERAL MATERIALS                       | 14  | 204   | 204   | TOTAL OF ALL USES                        | 1,160 | 27,852 | 2,005 |
| TOTAL INDUSTRY USES                     | 31  | 289   | 1     |  |       |        |       |

Source: Forest Land Use Report (FLUR) dated March 8, 1991

Serial No. \_\_\_\_\_

**NO SURFACE OCCUPANCY STIPULATION**

**No surface occupancy or use is allowed on the lands described below (legal subdivision or other description).**

Foreground visual zones of the Forests and Grasslands that have an inventoried visual quality objective of Fg1A. (May include Turquoise Lake, Twin Lakes, Rampart Range Road, Pikes Peak, Elevenmile Canyon, South Platte River, Jefferson Lake, Guanella Pass and Highway of Legends Scenic Byways, area surrounding the Point of Rocks and Cimarron River overlooks.)

**For the purpose of:**

1. Protecting the natural, cultural and historical scenic qualities of these areas.
2. Preventing the siting of collection facilities, well sites or exploration activity within the foreground zones of these areas.
3. Providing Forest and Grassland visitors with quality experiences.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Form #/Date

---



## Visual Resources

The NSO stipulation is used to prevent disturbance from drilling, and treatment or storage facilities in areas of high sensitivity due to scenic quality or high recreation use. This stipulation when used, will be limited to the foreground viewing distance, based on topographic features. Along roads it will not exceed one-quarter of a mile on either side. Along trails, or scenic rivers it may vary from zero to one half of a mile, again based on topography and visibility. The one-quarter and one-half mile distances are used to differentiate between viewer types, duration of viewing experience, intent of viewer, and relationship of scenery to other activities.

Criteria used to establish NSO areas include foreground viewing distance, scenic quality, level of recreation development, impacts of current uses, characteristic landscape, and visual absorption capability.

Serial No. \_\_\_\_\_

**TIMING LIMITATION STIPULATION  
(FOR BIG GAME CRITICAL WINTER RANGE)**

No surface use is allowed during the following time period(s); this stipulation does not apply to operation and maintenance of production facilities.

1. Exploration, drilling, and development activity will not be allowed during the period from December 1 to April 15.
2. New oil and gas roads on public lands will be closed to the public from December 1 to April 15.

**On the lands described below:**

Big Game Critical Winter Ranges

**For the purpose of:**

These areas are critical mule deer, pronghorn antelope, big horn sheep, and elk winter ranges. These key concentration areas support and sustain a large percentage of the total winter populations. They are extremely important for animal survival during winters of harsh weather conditions. Disturbances and habitat losses may place unnecessary stress on the wintering big game herds and cause an increase in mortality. (Forest Plan, Prescription 5B).

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Conditions under which this stipulation would be waived.

1. Winter conditions which would not concentrate wildlife on the critical winter ranges, (and):
2. The duration of the operation would not exceed two weeks.

Form #/Date

---

**Wildlife**  
**Big Game Critical Winter Range**

The Forest Plan indicates that habitat will be maintained for viable population levels of all existing wildlife species within the Forest. The emphasis for habitat maintenance and development will be on present and potential habitat for sensitive, threatened and/or endangered species, MIS, and critical big-game winter ranges/big-game production areas.

Timing stipulations were identified to mitigate potential significant effects which could occur as a result of oil and gas leasing exploration and development activities on the big game critical winter range, habitat for management indicator species. The following table shows when activities will be allowed or prohibited.

**TABLE B-4**  
**SEASONAL OPERATING RESTRICTIONS**  
**TO RESOURCE DEVELOPMENT ACTIVITIES**

| SEASONAL OPERATING DATES |     |     |     |     |     |     |     |     |     |     |     |     |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| SPECIES                  | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| WINTER RANGE             |     |     |     |     |     |     |     |     |     |     |     |     |
| DEER/ELK                 | ==  | === | === | === |     |     |     |     |     |     |     | ==  |
| BIGHORN SHEEP            | ==  | === | === | === |     |     |     |     |     |     |     | ==  |
| MOUNTAIN GOAT            | ==  | === | === | === |     |     |     |     |     |     |     | ==  |
| PRONGHORN                | ==  | === | === | === |     |     |     |     |     |     |     | ==  |
| TURKEY                   | ==  | === | === | === |     |     |     |     |     |     |     | ==  |

TIMING - Wildlife (MIS)

---

Serial No. \_\_\_\_\_

**TIMING STIPULATION**  
(Management Indicator Species)

**No surface use is allowed during the following time period(s):** this stipulation does not apply to operation and maintenance of producing wells:

**Seasonal Wildlife Stipulation for Management Indicator Species**

No surface use is allowed during the periods listed under purpose below.

Elk calving, Bighorn Sheep lambing, Pronghorn and Deer fawning areas:

Goat kidding areas:

Prairie Chicken Dancing grounds and nesting areas:

Critical Raptor nesting areas:

Bald Eagle and Turkey Winter Habitat:

Curlew, and Mountain Plover Nesting, Resting, Staging areas:

Abert's squirrel winter habitat:

(Forest Plan Gen. Direction and Management area prescriptions).

**For the purpose of:**

These areas have been identified by the CDOW and KDGP. Disturbance during the reproductive season may reduce herd productivity. For nesting species, surface disturbance and associated human activity could disrupt breeding and/or cause nest abandonment. Winter habitat for the Bald Eagles and turkey are important for roosting, perching or feeding. Human disturbance would produce increased stress, leading to poor physical condition, winter mortality and/or reduced reproduction. Areas and dates of Timing Stipulations are:

Elk calving, Bighorn Sheep lambing, Pronghorn and Deer fawning areas:

Activities could not occur from April 15 to July 1.

Prairie Chicken Dancing grounds and nesting areas: Activities could not occur from March 1 to June 1.

Critical Raptor nesting areas (area includes buffer zones): Activities could not occur from March 1 to July 31.

Bald Eagle and turkey Winter Habitat: Activities could not occur from November 15 to April 15.

Curlew, and Mountain Plover Nesting, Resting, Staging areas: Activities could not occur from March 1 to July 1.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Form #/Date

---

**Wildlife  
Management Indicator Species**

The Forest Plan indicates that habitat will be maintained for viable population levels of all existing wildlife species within the Forest. The emphasis for habitat maintenance and development will be on present and potential habitat for sensitive, threatened and/or endangered species, MIS, and critical big-game winter ranges/big-game production areas.

Timing stipulations were identified to mitigate potential significant effects which could occur as a result of oil and gas leasing exploration and development activities on the big game critical winter range, habitat for management indicator species. The following table shows when activities will be allowed or prohibited.

**TABLE B-5  
SEASONAL OPERATING RESTRICTIONS  
TO RESOURCE DEVELOPMENT ACTIVITIES**

| SEASONAL OPERATING DATES |     |     |     |     |     |     |     |     |     |     |     |      |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| SPECIES                  | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC  |
| PRAIRIE CHICKEN LEKS     |     |     | ==  | === | === | =   |     |     |     |     |     |      |
| BALD EAGLE (WINTER)      | ==  | === | === | === |     |     |     |     |     |     |     | ==== |
| MULEDEER/ELK MIGRATION   | ==  | === | === | =   |     |     |     |     |     |     | =   | ==== |
| BIRTHING AREAS           |     |     |     |     |     |     |     |     |     |     |     |      |
| ELK                      |     |     |     |     | === | === |     |     |     |     |     |      |
| MULE DEER                |     |     |     | ==  | === | === |     |     |     |     |     |      |
| BIGHORN SHEEP            |     |     |     | ==  | === | === |     |     |     |     |     |      |
| MOUNTAIN GOAT            |     |     |     | ==  | === | === |     |     |     |     |     |      |
| PRONGHORN                |     |     |     | ==  | === | === |     |     |     |     |     |      |
| NESTING AREAS            |     |     |     |     |     |     |     |     |     |     |     |      |
| PRAIRIE CHICKEN          |     |     | ==  | === | === | =   |     |     |     |     |     |      |
| RAPTOR                   |     |     | ==  | === | === | === | === | =   |     |     |     |      |
| CURLEW                   |     |     | ==  | === | === | === | ==  |     |     |     |     |      |
| MTN. PLOVER              |     |     | ==  | === | === | === | ==  |     |     |     |     |      |

===== BARS indicate dates activity restricted

---

Serial No. \_\_\_\_\_

**CONTROLLED SURFACE USE STIPULATION**

**Surface occupancy or use is subject to the following special operating constraints.**

On land areas identified with **any** of the following characteristics, the activity will be relocated to suitable soil types and /or stable slope conditions.

1. Slopes steeper than 60 percent.
2. Fragile soils with High (severe) erosion potential on slopes of 40 percent or greater.
3. Fragile soils with High (severe) erosion potential, soil depth to bedrock is less than 20 inches, and slopes of 35 percent or greater.
4. Lands identified as riparian areas, wetlands and floodplains.

**For the purpose of:**

1. Preventing significant or permanent impairment of soil productivity.
2. Protecting off-site areas by preventing impacts from accelerated soil erosion.
3. Maintaining or improving water quality to meet Federal or State standards.
4. Preventing detrimental impacts such as gully erosion, streambank failure, soil compaction, and severe rutting which could cause long-term damage or permanent impairment to soil productivity.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101, FS Oil & Gas Regulations, 36 CRF, Sec. 228.104.)

Form #/Date

---

## Soils

Soil criteria used for justification of the CSU stipulation include any of the following characteristics: 1) slopes steeper than 60 percent; 2) High (severe) erosion potential on slopes of 40 percent or greater; and 3) High (severe) erosion potential on shallow (less than 20 inches) soils and slopes of 35 percent or greater. Associated with these areas are a low reclamation potential and high probability for loss of soil productivity.

Soils in riparian areas, wetlands, and floodplains typically form in alluvial deposits; weakly-developed soils in these landscape positions are highly susceptible to detrimental impacts and loss of productivity.

The CSU stipulation is applied where relocation to suitable soil types and/or stable slope conditions is necessary for the purpose of:

- (1) Maintaining or improving water quality to meet federal and state standards.
- (2) Protecting off-site areas by preventing impacts from accelerated soil erosion.
- (3) Preventing significant or permanent impairment of soil productivity.

Remaining areas are governed by standard lease terms. Standard lease terms apply to existing leases in all areas of the analysis unit.

Serial No. \_\_\_\_\_

**CONTROLLED SURFACE USE STIPULATION**

**Surface occupancy or use is subject to the following special operating constraints.**

Production activity will be limited to the minimum necessary for normal service and maintenance. Companies will be required to submit for approval by the area manager, a plan that outlines the minimum activity required for normal operation. New roads no longer needed for oil and gas operations will be closed and reclaimed.

**On the lands described below:**

Within the boundaries of the Spanish Peaks National Natural Landmark, including all Forest Service System lands within T30S, R67W; T30S, R68W; T31S, R67W; T31S, R68W; T31S, R69W, Sections 1, 2, 11, 12, 13, and 14. Within the boundaries of the Landmark oil and gas development will avoid all geological features that contribute to the landmark including the above timberline portion of the East and West Spanish Peaks and volcanic dikes. The dike formations also are protected by a 500 foot avoidance buffer on both sides to protect their visual integrity and to prevent erosion.

**For the purpose of:**

1. Protecting the significant and contributing geological features of the Spanish Peaks Natural Landmark, and its scenic and recreational values.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820, FS Oil & Gas Regulations, 36 CFR, Sec. 228.104.)

Form #/Date

---



**Special Area  
National Natural Landmarks**

The Spanish Peaks National Natural Landmark should be afforded protection according to the Forest Plan with the implementation of any of the four alternatives. Protection includes avoidance of contributing geologic features, including dikes, and preservation of scenic values. Protection under Alternative II would have to be according to standard lease terms for new leases, and through the same provisions for already-leased land for all alternatives.

Serial No. \_\_\_\_\_

**CONTROLLED SURFACE USE STIPULATION**  
(for Alpine Ecosystems)

**Surface occupancy or use is subject to the following special operating constraints.**

**Access** will be limited to existing roads or point access (helispots, etc.) Point access must be on flat, stable landforms, of minimal size, and as close to the well pad as safety will allow. **Well configuration** - There will be no reserve pit excavation in alpine areas. Waste materials must be temporarily stored in tanks and disposed of in pre-approved areas outside the alpine zone. There will be no on-site camp facilities for crews. On-site equipment and supply storage will be kept to a minimum. Surface levelling will also be kept to a minimum by storing as much equipment as possible on racks with minimal surface contact. Surface disturbance will be limited to 1 acre per lease-hold, or 1 acre per 500 acres, whichever is more restrictive. The well pad and storage facilities will be located on alpine surfaces which are naturally flat (generally less than 5% slope).

**On the lands described below:**

Land areas identified as alpine ecosystems above timberline on the 1:24000 scale resource maps on file at the Supervisor's Office in Pueblo, Colorado.

**For the purpose of:**

1. Preventing significant or permanent impairment of soil productivity.
2. Maintaining or improving water quality to meet Federal or State standards.
3. Minimizing the potential for cumulative significant impacts in fragile alpine ecosystems, per 40 CFR 1508.27(b)(7).

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820, FS Oil & Gas Regulations, 36 CFR, Sec. 228.104.)

Form #/Date

---

## Vegetation

The Controlled Surface Use (CSU) stipulation will be applied to all leases within mapped alpine areas. The CSU stipulation is specified to minimize disturbance to fragile alpine ecosystems, to prevent accelerated soil erosion by water or wind and to maintain soil productivity and facilitate revegetation.

Surface disturbance will be successfully revegetated to approximate the pre-disturbance condition. Re-vegetation will be artificially induced as soon as possible after disturbance or non-use. re-vegetation species will be determined during the site specific environmental analysis phase.

---

Serial No. \_\_\_\_\_

**CONTROLLED SURFACE USE STIPULATION**

**Surface occupancy or use is subject to the following special operating constraints.**

Site clearings, collection facilities, site developments, utilities, roads and pipelines may require relocation further than 200 meters to meet adopted visual quality objectives. At the time of APD a visual site analysis will be completed to determine if vegetation, topography and distance are sufficient to mitigate visual impacts. If not, site will be relocated.

**On the lands described below:**

Lands with the following visual resource classification, Fg1B, Fg1C, Fg2A, Fg2B, Mg1A, Mg1B. This includes land seen along Federal and State Highways, nationally designated trails, major water features, recreation complexes, and High use Forest Service Roads. Visual Quality Maps are on file in the Supervisor's Office, Pueblo, Colorado.

**For the purpose of:**

1. Protecting the natural, cultural and historical scenic values of these areas.
2. Preventing the placement of collection facilities, well sites or exploration activity within the foreground and middleground zones of these areas, to meet Visual Resource Management guidelines.
3. Providing Forest and Grassland visitors with quality experiences.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Form #/Date

---

## Visuals

The CSU stipulation is used to prevent visual disturbances from drilling operations, treatment, storage and collection facilities and exploration on areas of high scenic and recreation value. Use of the CSU stipulation when applied will be limited to foreground and middleground viewing distance zones of primary and secondary viewpoints.

CSU stipulation allows the Forest Service the flexibility to relocate activity farther than the allowable 200 meters. This is particularly important on the National Grasslands to take advantage of the limited topography and vegetation available for screening and siting facilities to prevent intrusions on focal points, scenic features or "skylighting" of facilities.

When development is visible from more than one viewpoint, primary consideration will be given to the viewpoint closest to the development.

Serial No. \_\_\_\_\_

---

**CONTROLLED SURFACE USE STIPULATION**

**Surface use or occupancy is subject to the following special operating constraints.** All ground disturbing activities will be avoided in watersheds that have been identified as being over sediment thresholds or within 10 percent of exceeding sediment thresholds. At the time of the APD, an site-specific analysis must be done for the streams in these areas to determine the existing biological and physical conditions.

If these conditions are found to be impaired, ground-disturbing activities may have to be curtailed until the conditions can be improved.

Activities may be allowed to proceed if they are heavily mitigated and an equal or greater amount of disturbed area in the watershed is rehabilitated. The area to be rehabilitated will be determined by the forest hydrologist, soils scientist and fisheries biologist.

**On the lands described below:**

On watersheds that have been identified as being over sediment threshold or within 10% of exceeding sediment threshold. They include:

|   |                               |
|---|-------------------------------|
| Badger Creek  | West Creek 6-1                |
| S. Platte R. from Elevenmile to<br>confluence W/N. Fk. S. Platte R. | Spinney Mtn. 8-1              |
| Trail Creek 6-3   | Elevenmile 8-3                |
| Thirtynine Mile Mtn. 8-2  | Bailey 9-2                    |
| Twin Creek 8-4  | Elk Creek 11-2                |
| Jackson Creek 15-3  | Bear Creek 15-2               |
| Stark/Gove Creek 15-4   | Rampart 17-3                  |
| Beaver Creek 17-2   | East Beaver Creek 21-3        |
| Fourmile Creek 21-1   | Spruce Grove 23-2             |
| Link Creek 25-1   | Pulver Gulch 25-2             |
| Kaufman Ridge 98-5  | Hackett Gulch 25-3            |
|   | Newlin Creek 87-2             |
|   | North Fork Purgatoire R. 97-1 |

**For the purpose of:**

Meeting the objective of the Clean Water Act (CWA 1977) & Federal Water Pollution Control Act (FWPCA 1972) to restore and maintain the physical, chemical, and biological integrity of the nation's water.

Form #/Date

---

## Water

At the time of the APD, an analysis must be done to determine if the watershed is still exceeding sediment thresholds and if the oil and gas exploration activities will cause the watershed to exceed its sediment threshold. If the watershed is exceeding thresholds or additional activities will cause the thresholds to be exceeded, no ground disturbing activities can occur until existing sediment levels are reduced to levels below threshold. Leasing on lands in watersheds that have been identified as being over sediment threshold or within 10 percent of exceeding sediment threshold are subject to CSU stipulation.

This stipulation is applied to watersheds in areas which potentially would produce effects as identified and described in the Affected Environment Chapter of this EIS. Stipulations are applied to meet the objective of the Clean Water Act (CWA 1977) & Federal Water Pollution Control Act (FWPCA 1972) to restore and maintain the physical, chemical, and biological integrity of the nation's water. They are also necessary to meet Forest Plan goals for maintaining or improving water quality, to conserve water resources and to protect environmental quality. Less restrictive stipulations could result in impacts that would further exceed threshold sediment yield values.

All of these impact areas are made relatively more important by the possible cumulative effects of oil and gas development. In many areas, notably those which have been identified as not meeting water quality standards, surface use must be controlled by application of the CSU stipulation. All areas of concern should be monitored for project-specific impacts on water quality.

---

## LEASE NOTICES

Lease Notices are attached to leases to transmit information at the time of lease issuance to assist the lessee in submitting acceptable plans of operation, or to assist in administration of leases. Lease Notices are attached to leases in the same manner as stipulations, however, there is an important distinction between Lease Notices and Stipulations. Lease Notices do not involve new restrictions or requirements. Any requirements contained in a Lease Notice must be fully supported in either a law, regulation, standard lease term, or onshore oil and gas order. A Lease Notice is not signed by the lessee. Guidance in the use of Lease Notices is found in BLM Manual 3101 and 43 CFR 3101.1-3.

A Lease Notice should contain the following elements: (1) the resource/use/value and the lands affected, if applicable; (2) the reason(s); (3) the effect on lease operations or what may be required; and (4) a reference to the lease term, regulation, law or order from which enforcement authority is derived.

If a situation or condition is known to exist that could constrain lease operations, there should be full disclosure at the time of lease issuance via a Lease Notice. If a lessee may be prevented from extracting oil and gas through a prohibition mandated by a specific non-discretionary statute, such as the Endangered Species Act, then a stipulation may be used even though a Lease Notice would be sufficient. It is at the discretion of the Authorized Forest Officer whether a situation is sufficiently sensitive to warrant the use of a lease stipulation.

LEASE NOTICE - Research/Special Interest Areas

---

Serial No. \_\_\_\_\_

**LEASE NOTICE**

Activities on Research and Special Interest Areas

**Oil and gas operations will be limited based on the goals and management requirements for RNA's and other special interest areas. If there is no plan in place an NSO will be applied until the plan is complete and identifies the compatibility of special management needs with oil and gas exploration and development.**

|  |                 |            |
|--|-----------------|------------|
| Hurricane Canyon RNA                         | Pikes Peak R.D. | 520 acres  |
| Saddle Mountain RNA                          | South Park R.D. | 480 acres  |
| Hoosier Ridge RNA                            | South Park R.D. | 695 acres  |
| Campo RNA                                    | Comanche NG     | 35 acres   |
| Cimarron RNA                                 | Cimarron NG     | 310 acres  |
| Windy Ridge Bristlecone Pine Scenic Area     |                 | 150 acres  |
| Queen's Canyon Geologic Area                 |                 | 1130 acres |
| Mt. Bross Botanical Area (Proposed)          |                 | 105 acres  |
| West Hoosier Ridge Botanical Area (Proposed) |                 | 54 acres   |
| Iron Mountain Botanical Area (Proposed)      |                 | 100 acres  |
| Lost Lake Botanical Area (Proposed)          |                 | 160 acres  |
| Lost Park Botanical Area (Proposed)          |                 | 160 acres  |
| Spout Lake Botanical Area (Proposed)         |                 | 120 acres  |
| Droney Gulch Botanical Area (Proposed)       |                 | 20 acres   |
| Carrizo Frasera Botanical Area (Proposed)    |                 | 400 acres  |
| Lesser Prairie Chicken Zoological Area       |                 |            |
| Southeastern Colorado Research Center        |                 |            |

**For the purpose of:**

Protecting unique ecosystems, threatened and endangered plant and animal species, and the integrity of research activities within the above listed Areas.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820, FS Oil & Gas Regulations, 36 CFR, Sec. 228.104.)

Form #/Date

---



## **Research Natural and Special Interest Areas**

Research Natural and Special Interest Areas are established to provide emphasis for research, study, observations, monitoring and educational activities that are nondestructive and nonmanipulative, that maintain unmodified conditions, or ensure the protection of species of interest.

The Lesser Prairie Chicken Zoological Area has presently existing gas and oil leases and also has divided minerals ownership patterns. Recommended lease stipulations for new leases within this area are NSO where lesser prairie chicken leks are established and CSU stipulations where seasonal nesting restrictions are required. All other areas will have an NSO stipulation applied.

The designated documents and plans for the Campo Research Natural Area stipulate that the areas will be managed with NSO stipulations for gas and oil activities.

Leasing will likely be allowed with NSO. This would permit directional drilling or other techniques which would not disturb surface resource values for exploration, development, and production of operations from adjacent lands that are recommended for leasing with surface occupancy. Current technology and reasonable accessibility considerations limit these operations to lands within a one-half mile perimeter of areas leasable with surface occupancy (Forest Plan and FEIS, Chapter IV, page 72).

LEASE NOTICE - Special Uses (Communication Sites)

---

Serial No. \_\_\_\_\_

**LEASE NOTICE**  
(Leases Containing an Electronic Communication Site)

The \_\_\_\_\_ Communication Site is located within a portion of the lease area.

In accordance with Section 6 of the standard lease terms, the lessee shall coordinate with the Forest Service and the permit holder(s) to minimize potential user conflicts. The following Lease Notice measures will apply.

1. Drilling operations will be located so as not to cause structural damage, either directly or indirectly, to the structures authorized by special use permit.
2. Drilling rigs will be located out of microwave paths or at a location agreed to by the permit holder(s), Lessee and the Forest Service, that will not interfere with electronic transmission or reception.

Form #/Date

---

## SPECIAL USES AND COMMUNICATION SITES

Previous rights for use have been granted for the purposes of construction of communication facilities.

These costly investments must be maintained and operated without interference. A Lease Notice identifies this potentially conflicting authorized use.

**LEASE NOTICE - Threatened & Endangered Species**

---

Serial No. \_\_\_\_\_

**LEASE NOTICE**  
Threatened and Endangered Species

**Oil and gas operations will be restricted by an NSO stipulation on all known locations of T&E species. These species will be inventoried and mapped and a mitigation plan prepared and approved prior to approval of ground disturbing activities.**

**For the purpose of:**

Meet legal requirements for the protection of threatened and endangered species.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820, FS Oil & Gas Regulations, 36 CFR, Sec. 228.104.)

Form #/Date

---

## Threatened and Endangered Species

The legal requirements for the protection of threatened and endangered species requires adequate mitigation which may include avoidance, substitution of habitat, or other costly mitigation action.

Known and potential locations and associated habitats of federal and state T&E wildlife and fish species are described in Chapter III of this EIS. Known habitat locations of federal and state T&E plants, sensitive plant associations, and plants of special concern are also identified in Chapter III. Resource maps are on file in the Forest Supervisor's Office of the Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands.

A Lease Notice will be attached to new leases where site-specific surveys show the presence of these T&E wildlife and fish species in other areas within the Grasslands. This Lease Notice will stipulate that proposals for gas and oil operations within identified T&E species habitat areas will require consultation with the USFWS and the CNAP. NSO stipulations will be required for those areas where T&E species have permanent habitats (peregrine falcon nesting sites, lesser prairie chicken leks, and Mexican spotted owl territories), or in the case of plants, are known to occur.

LEASE NOTICE - Vegetation (Timber)

---

Serial No. \_\_\_\_\_

**LEASE NOTICE**

Leases Within Active or Planned Timber Sale Areas)

*Active Timber Sales Under 2400-3(T) or 2400-6(T) Contract:*

In accordance with Section 6 of the standard lease terms, the Lessee shall coordinate with the Forest Service and Timber Sale Purchaser to minimize potential user conflicts. The following Lease Notice measures will apply, unless waived in writing by the Authorized Forest Officer in the site specific NEPA decision document at the APD phase.

1. Standing timber to be affected by lessees operations, and slash created by lessees operations, shall be disposed of as agreed to by Forest Service and Lessee (FSM 2464; Standard Provisions of 2400-3(T) or 2400-6(T), Timber Sale Contract).
2. Lessee shall submit an operating plan which will mitigate potential conflict with Purchaser's operations to the satisfaction of the Forest Service. lessees operating plan shall address public safety and Forest Service Officer's safety during performance of administrative duties.
3. Lessee shall perform or pay for road maintenance work, commensurate with lessees use, on roads controlled by Forest Service and used by Lessee in connection with lease. Road maintenance specifications and required deposits shall be those stated in the timber sale contract provisions, unless Forest Service specifies otherwise. (FSM 7732.22; Standard Provision 8 of 2400-3(T) Timber Sale Contract; Standard Provision BT5.4 of 2400-6(T) Timber Sale Contract).

*Planned Timber Sales:*

In accordance with Section 6 of the standard lease terms, the Lessee and Forest Service shall perform on-the-ground coordination to minimize potential conflicts with timber sales planned under 2400-3(T) or 2400-6(T) contracts.

Form #/ Date

---

## Vegetation (Timber)

In order to protect timber purchaser and lessee rights and minimize potential conflicts, lessee shall coordinate with the Forest Service and timber sale purchaser for all activities. The following lists are multi-year schedules for timber activity on the Unit. These schedules may be changed. If changes occur, lessee will be notified.

This program is displayed by Exhibits B-3 and B-4.

## CONDITIONS OF APPROVAL

A Condition of Approval (COA) is generated at the time of site specific analysis when a Surface Use Plan of Operations has been received. Plans are received for geophysical exploration resulting in ground disturbance, exploratory drilling, and production. These plans may be submitted separately or as a comprehensive package. COA's may not unduly hinder or preclude the lessees opportunity to exercise valid existing lease rights. COA's may only be applied if they are consistent with the lease terms or are the result of information that was unknown at the time of leasing.

The review of the Proposed Surface Use Plans of Operations will be disclosed in an environmental analysis and decision document. The mitigation measures in this appendix provide examples of post-lease environmental protection the Forest Service may require at the time of APD. Any COA listed here may, and will, be adjusted to meet the needs of the site-specific analysis.

COA's may be applied to all oil and gas activities including associated rights of way. The Authorized Forest Officer may select from or adjust these, and as yet unidentified, measures to mitigate or avoid environmental impacts. New COA's may be developed at the time of APD if currently unforeseen impacts are identified and the new COA's conform with the rights of the lessee and are consistent with this plan and subsequent amendments.

COA's are not added to permits for drilling if they are unnecessary or duplicate efforts already incorporated in the operators submittal. The following are examples of COA's that may be applied to activities on the Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands. The list is not intended to be all inclusive and any of the listed COA's may be adjusted to the specific situation for which it is being applied.

### Standard COA's for Use on the Unit

#### *Pre-activity Inventories*

When ground disturbing activities are proposed in the following areas inventories may be required to determine appropriate mitigation. The inventories shall be completed prior to approval of operating plans.

Aquatic biota and riparian areas.

Known or realistically potential habitat for threatened or endangered species.

Sensitive species' habitat such as bighorn sheep lambing areas, elk calving areas, raptors, etc.

Areas of identified unstable slopes may require a geotechnical survey.

Cultural resource surveys. Guidance is provided in: "Handbook for Cultural Resources Inventory/Mitigation" (Colorado State Office Release 8-13), dated 1990. A notice to lessees for Cultural Resource Surveys, NTL-85-1-CO, will be attached to all leases issued by Colorado State BLM.

Mapped alpine areas. A qualified botanist/ecologist will conduct the vegetation survey and provide site-specific re-vegetation recommendations for the reclamation plan.



## **Mitigation Plans**

The following mitigation plans will be required at prior to ground disturbing activities.

A Soil and Water Mitigation Plan shall be prepared for all ground disturbing projects. It is described as follows:

- (1) *Prior* to construction activities, a detailed Erosion Control and Water Quality Monitoring Plan, hereafter called Erosion Control Plan, will be developed by the proponent which includes site-specific location of all mitigation measures. The Plan will be approved by the Forest Service before implementation begins. The Erosion Control Plan will be jointly administered by the Forest Service and the proponent.
- (2) The erosion control plan will contain specific measures or BMP's for minimizing or eliminating the nature and degree of specific impacts which may occur from oil and gas leasing activities. The mitigation measures are designed to be practical for on-the-ground implementation. They are not tied to site-specific locations at this time, due to the current broad scope of this project. There are numerous temporary and permanent erosion-control measures available, but mitigation that works well in certain locations may not be acceptable in other areas. BMP's include such measures as soil stabilization practice, re-vegetation, slope stabilization, velocity controls, sediment barriers, retention ponds etc.

Soil stabilization and re-vegetation practices include seeding, mulching, timing of construction activity and fertilization. Slope stabilization practices include netting, surface roughing, mulching, retaining walls, rip rapping. Velocity control practices include slope drains, spreaders, energy dissipaters, check dams, drop structures, diversion berms. Sediment barriers include straw bales, filter fence, inlet protection, siltation berms and siltation traps.

These specific mitigation measures that are identified as part of the erosion control plan will be included in a contract. Monitoring will be required to ensure that the specific mitigation measures are in place and are effective.

- (3) The erosion control plan is developed to address adverse impacts to the soil resource incurred through implementation of oil land gas development, and to protect water quality and aquatic life as identified in Chapter III of this EIS.
- (4) Mitigation is required by the Forest Service, for impacts on National Forest System lands. The erosion control plan will outline the Forest Service's authority and responsibility and the proponents authority and responsibility for implementing the mitigation plan, and for monitoring construction activities and mitigation measures.

Cultural resources discovered during the survey will have to be evaluated for significance according to the criteria for National Register eligibility. If determined eligible, the cultural resource should be avoided. A mitigation program will be designed and implemented for all significant cultural properties that cannot be avoided.

All companies will have a spill prevention control and countermeasure plan (SPCC plan), Federal Register, Volume 38, No. 237 - Part II, Oil Pollution Prevention. Monitoring techniques, frequency and methodologies will be developed and included in activity plans. The monitoring level will be determined after an evaluation of the resource and potential impacts.

### **General Conditions for all Site-Disturbing Activities**

Well pads, roads, and facilities will be located to minimize visual impacts.

All operations will be conducted in a manner that avoids jeopardizing protected fisheries, invertebrates, wildlife, plants, and their habitats in compliance with the Endangered Species Act of 1973, and its implementing regulations.

If historic or archaeological materials, cave systems, or paleontological resources are uncovered during construction, the operator shall immediately stop any work that might further disturb such materials and contact the Forest Service. The operator shall immediately bring to the attention of the Authorized Forest Officer any and all antiquities or other objects of historical, paleontological, or scientific interest, including, but not limited to, prehistoric or historic ruins or artifacts discovered as a result of operations. The operator and the Authorized Forest Officer shall consult and determine the best option for avoiding or mitigating site damage.

All merchantable timber shall be purchased by the operator at the appraised price, as determined by the Forest Service.

Fire precautions required of timber sale purchasers will be required of lessees. Refer to timber sale contract provisions FS-2400-6 (T), section BT 7.0 and special provision R2-CT 7.2.

Linear-type facilities such as roads, power lines, and pipelines shall use the same route unless otherwise approved by the Authorized Forest Officer. Surface disturbance will be minimized.

Activities may be curtailed during periods when the soil is saturated.

Trash and garbage from all leasing operations must be contained in a closed receptacle or earthen pit and hauled to an approved county landfill. EPA listed nonexempt waste must be contained in a closed receptacle and recycled or disposed of at approved sites.

Operators shall remind all personnel in the area associated with the project that the removal, injury, defacement, or alteration of any object of scenic, archaeological, historical, or scientific interest is a federal crime and may be punishable by fine and/or jail terms.

Raptor nests will be protected from all development activities.

All known populations of sensitive fish, wildlife and plants, and identified high priority remnant vegetation associations will be protected from surface disturbing activities. The area of protection will include the actual location of the populations or occurrences of important associated vegetation and shall be determined in consultation and coordination with the Colorado Natural Areas Program (CNAP).

Those populations/occurrences, which analysis determines needs protection shall be protected by: (1) requiring relocation or rerouting of proposed well sites, pipelines, roads, other surface facilities, etc., or (2) applying other protective mitigation (i.e., fencing). Forest Service will require operator to effectively mitigate potential impacts to important populations/occurrences.

Actions in all riparian types will be managed to maintain: (1) vegetation and soil conditions that sustain over 80% of capable ground cover of plants and litter; and (2) stable stream channels and favorable water quality and aquatic habitat.

Land vehicles in stream channels prohibited except at designated crossings.

An area specific waste management plan will be required at the time of the APD.

Use filter strips along lakes, wetlands and streams to trap sediment before it reaches water bodies and impairs channel stability or aquatic habitat. Maintain over 80% of capable ground cover of plants and litter in filter strips. Design filter strip width, considering types of actions, vegetation, soils, and topography, to have over an 80% chance of trapping all sand size sediment.

Ensure that all activities maintain instream flows needed to protect channel stability, aquatic habitat, and riparian vegetation.

### ***Road Construction and Operations***

Existing roads will be used to the extent possible. Additional roads, if needed, shall be minimized and approved by the Forest Service prior to construction. Roads will be located outside of riparian areas unless alternative routes have been reviewed and rejected as being more environmentally damaging. Upon determination of an impending field development, a transportation plan will be prepared by the proponent to reduce unnecessary access roads. Roads will be constructed and maintained to Forest Service road standards unless otherwise approved.

Locate and design roads and drainage structures to prevent road or slope failure. Install subsurface drainage, binwalls, and other structures as needed to avoid slope saturation and failure.

Locate service and refueling areas on ridges or benches upslope from floodplains and terraces, and berm them to trap spills onsite.

Do not incorporate slash or other organic material into fills.

Seed cuts and fills and armor drain outlets promptly at final shaping. Use mulch or matting of steep, highly erodible fills as needed to achieve over 80% of potential ground cover of plants and litter before onset of seasonal runoff. Use cobbles or larger rocks at drain outlets as needed to prevent rill or gully erosion of fills and downslope areas.

Install sediment traps below fills in filter strips, tying them into stream crossings. Compact all slash windrows and key and stake all straw bales and filter fences into ground to enhance trapping efficiency. Clean out traps before they are 80% full, and place and revegetate cleaned material on a gentle slope outside the floodplain.

Cross streams perpendicular to channels on as gentle grades and slopes as possible. Install all crossings using fluvial and fisheries design concepts to maintain stable channels and favorable water quality and aquatic habitat. Use bridges and fords instead of culverts where practical.

Where feasible, locate new facilities outside of the 100 year floodplain.

New oil and gas roads on public lands within crucial big game winter range will be closed to the public from December 15 to April 30.

All new roads on the mountains shall be closed with a lockable gate to prevent general use of the road. Use of closed road segments will be restricted authorized agents of: 1) the operator and/or the subcontractor(s), 2) the Forest Service, 3) other agencies with a legitimate need (CDOW, other law enforcement agencies, etc.). Unauthorized use or failure to lock gates during specified time

frames by the operator or its subcontractors will be considered a violation of the terms of the APD or associated grants. This will apply to all roads on public lands.

Improvement or upgrading of existing roads and trails shall conform to the same requirements as the approval APD.

The operator shall regularly maintain all roads used for access to the lease operation. This shall include installation of additional surfacing and surface drainage control structures not foreseen during construction.

Air pollution sources such as dust from unpaved roads and cleared areas will be minimized by controlling use or by applying surface treatments to hold down fine particles.

Cattle guards heavy enough to handle proposed road traffic will be installed, maintained, and kept cleaned out when access roads pass through pasture gates or fences.

Improvement to existing access will be as necessary and limited to a 12-foot running surface with turnouts as needed and minimum disturbance of surrounding soil and vegetation (abrupt back sloped borrow ditch). Cut and fill will be 1 1/2:1 up to 50% side slope. Over 50% side slope cut will be 3/4:1 with a full bench section. New construction will be limited to the same specifications as above. Cleared trees and brush along the road right of way will be windrowed to the side in convenient clearings. Surfacing material will not be placed on the access road or location without prior Forest Service approval.

The operator may be required to construct waterbars on abandoned roads and pipeline routes. General guidelines for installation of waterbars are: less than two percent grade, 200-foot spacing; four to five percent grade, 75-foot spacing; greater than five percent grade, 50-foot spacing. Unstable soils may require closer spacing, whereas stable soils and rock outcroppings may have greater spacing. The waterbars shall be constructed to drain freely to the natural ground level and to prevent siltation and clogging. No waterbars will drain directly into a stream without first flowing through a sediment trap.

Traffic will be limited to roads and drill pads.

Slash will be windrowed at the toe of fill slopes for at least 100 yards on either side of a stream crossing or in areas where an adequate buffer width cannot be maintained between the road and stream. Other sediment barriers may be used in lieu of slash.

Roads on Grasslands will not be closed during operations.

Roads shall:

- be aligned in a manner that prevents tangents longer than one quarter of a mile and views directly into the well site.
- be 12 ft. wide and follow the contours where possible.
- be cleared from the top of cut to toe of fill.
- not have drainage outlets empty directly into existing channels.

- have velocity-reducing structures on outlets that empty out onto steep slopes.
- have sediment traps below all relief culverts within 200 feet of live water.

### ***Drill Pad Development***

In planning for well sites, tank batteries, sump, reserve and mud pits, and pumping stations, the operator shall select locations that involve the least disruption to scenic values and other surface resources. This may include:

- Construction techniques and design practices, including selection of material, camouflage techniques, and rehabilitation practices that will preserve scenic aesthetic qualities.
- Shape and grade drill sites to maintain the natural integrity of the area. Tier the site rather than one large level clearing.
- Concentrations of development clearings should reflect the the character of natural openings in the area.
- Slope the site away from any viewpoints if bright or contrasting soils exist.
- Minimize vegetation removal. Lop and scatter slash to a depth no more than 18 inches or windrow.
- Scallop horizontal and vertical edges of vegetation surrounding sites.
- Use fencing with a non-reflective finish.
- Silt barriers for pads within 200 feet of live water.
- Avoid development in the foreground zone.
- Paint equipment being used to minimize contrast. The color selected shall have a flat, non-reflective finish. The Munsell soil color chart provides good examples. The following guidelines should be used:

HUE 10R - 10YR  
 VALUE 2.5 - 5  
 CHROMA 0 - 6

- Avoid areas that will allow the drill rig to be silhouetted above the surrounding or background landscape to prevent "skynighting".
- Maintain a minimum distance of 1/4 mile from natural features, such as rock outcrops, peaks, cliffs, waterfalls, etc.

Pads will not be constructed in riparian areas or floodplains. Pads will be constructed in a manner that minimizes impacts to the areas.

Pads will be constructed with runoff controls.

Steep slopes shall be avoided where possible; the site shall be located on the most level location obtainable that will accommodate the intended use.

## **Pits**

Excavations used for the permanent impoundment of usable water should be sloped at a 3:1 grade to establish safe access for humans, livestock, and wildlife. Pits should not be constructed in either riparian or aquatic ecosystems.

Pits shall not be constructed in alpine, riparian or floodplain areas. In addition, pits shall not be constructed in a manner that results in materials seeping or being transported overground to these areas.

A minimum of two feet of free board will be maintained between the maximum fluid level and the top of the berm. These pits will be designed to exclude all surface runoff. The pits will have the maximum volume in cut portion of well pad site.

Final written certification is required that there are no hazardous chemicals on the RCRA list left in the drilling fluids within the mud pit. If the operator cannot provide certification, the drilling fluids and pit liner must be disposed of at a federally approved hazardous materials site.

Mud, separation pits, and other containments used during the exploration or operation of the lease for the storage of oil and other hazardous materials shall be adequately fenced, posted, and covered. Additional protective measures may be needed to minimize hazards and prevent access to humans, livestock, waterfowl, and other wildlife. The need and type of protective requirement will be determined on a case-by-case basis. The pits should be allowed to dry before backfilling and rehabilitating. Reserve pits should be closed as soon as practical or within 12 months after cessation of drilling operations. Pit liquids should have free oil removed and be sampled for total dissolved solids (TDS) prior to pit closure. Pits liquids with TDS content greater than 3000 ppm should be removed from the reserve pits as soon as possible or within 1 to 2 months after discontinuing the drilling operations.

All pits, cellars, rat holes, and other bore holes unnecessary for further lease operations, excluding the reserve pit, will be backfilled immediately after the drilling rig is released to conform with surrounding terrain. Pits, cellars and/or bore holes that remain on location must be fenced as specified for the reserve pit.

Semi-closed or closed mud systems may be required if conditions warrant. Produced water will be injected, contained in a lined pit, or hauled to a federally approved disposal facility.

All reserve pits will be lined so that they are made impervious.

Synthetic pit liners will be used in areas located within 40 feet of ground water (or greater if soils are extremely permeable).

Pit liners must be approved by the Forest Service, be impermeable and resistant to weather, sunlight, hydrocarbons, aqueous acids, alkalies, salt, fungi, or other substances likely to be contained in the drilling fluids or produced water.

The liner will be underlain by a suitable bedding material, and other measures will be taken as needed to protect the integrity of the liner.

A leak detection system will be installed to monitor lined reserve pits. This system must be installed in order to detect liner leakage. The leak detection plan must be submitted to and approved by the Authorized Forest Officer during APD approval. This plan must include the system design

including line installation, monitoring plan, and the individual responsible for the required monitoring.

If air or gas drilling, the operator shall control the blowout line discharge dust by use of water injection or any other acceptable method. The blowout line discharge shall be a minimum of 100 feet from the blowout preventer and be directed into the blowout pit so that the cuttings and waste are contained in the pit.

### **Pipelines**

Where possible utilize existing corridors.

Linear openings should have a turn or angle every 1/4 mile.

Scallop horizontal vertical edges of corridors.

Pipeline and transmission corridors should parallel contours on slopes greater than 20%.

Alignment, siting, and reclamation of pipelines and flow-lines should be designed to conform to adjacent terrain and to prevent or minimize vehicular travel. If maintenance is necessary in problem areas, consider use of an all terrain vehicle (ATV) or snowcat etc., in lieu of regular truck. Relocation of portions of the line may be necessary to reduce the impact to surface resources.

Pipelines shall be constructed outside of riparian areas except when crossing perpendicular to stream riparian areas. Construction in riparian areas will be conducted in a manner that minimizes impacts to riparian areas at the discretion of the Authorized Forest Officer.

For associated pipeline rights of way, except rights of way expressly authorizing a road after construction of the facility is complete, the right of way holder shall not use the right of way as a road for any purpose other than routine maintenance. Necessary routine maintenance will be determined through consultation with the Authorized Forest Officer.

Existing telephone, telegraph, power lines, pipelines, roads, trails, fences, ditches, and like improvements shall be protected during construction, operation, maintenance, and termination of an oil and gas facility. Damage caused by such activities shall be properly repaired to condition which is satisfactory to the Authorized Forest Officer or the facility owner/operator.

Pipeline routes will be graded to conform to the adjacent terrain, waterbarred, and reseeded in accordance with the Reclamation Plan.

When clearing is necessary, disturbance will be kept to a minimum. Bladed materials shall be placed back into the cleared route upon completion of construction.

Pipeline construction shall not block, dam, or change the natural course of any drainage. Suspended pipelines will provide adequate clearance for runoff.

Pipeline trenches shall be compacted during backfilling. These trenches will be maintained in order to correct settlement and prevent erosion. Waterbars and other erosion control devices will be repaired as necessary.

Pumping stations shall be kept in a neat and well-maintained condition.

Crossing of pipelines owned by other companies shall be in accordance with an agreement secured with that company.

### ***Production***

Where electrical power lines are constructed in association with oil and gas development the operator will apply "Suggested Practices for Raptor Protection on Power Lines" and ensure power lines are properly grounded to prevent electrocution of raptors.

The BLM manages the venting or flaring of hydrocarbon gases associated with hydrogen sulfide (H<sub>2</sub>S, sour gas) from Federal leases. Waste disposal and the appropriate equipment and action for hazardous geologic conditions, such as H<sub>2</sub>S gas and high pressures, are considerations dealt with in the APD approval process prior to drilling.

Compaction and construction of the berms surrounding tank batteries will be done prior to storage of fluids and designed to prevent lateral movement of fluids through the construction materials. The berms must be constructed to hold at minimum 120 percent of the storage capacity of the largest tank within the berm. All loading lines will be placed inside the berm.

All improvements, including fences, gates, cattle guards, roads, trails, pipelines, bridges, water developments, and control structures will be maintained in a serviceable and safe condition.

Any release of production water on or across the land requires prior approval by the Forest Service. A NPDES permit will be required from the state for point discharge.

Small amounts of oil field produced water which do not meet water quality standards will be disposed of in accordance with Notice To Lessee-2B and/or Environmental Protection Agency (EPA) guidelines.

If the well or production facility is located within one half mile of residences, appropriate noise mitigation (i.e., hospital muffler, vegetation screening, electric motors, etc.) will be employed to ensure that federal, state, and local noise standards are adhered to during production.

Livestock, sewage systems, and petroleum facilities will be located a minimum of 100 feet from all wells. Design all well casings and collars for the lowest practical contamination risk.

Within 60 days of completion of construction, the holder shall provide the Authorized Forest Officer an as-built survey of facilities as constructed.

### ***Reclamation***

Well drilling sites and service roads will be rehabilitated as soon after completion of project as possible. Seasonal weather should be considered for optimum results.

All equipment and debris will be removed from the site.

Lessee must establish a diverse, effective and permanent vegetation cover of the same seasonal variety native to the area of disturbed land and capable of self-regeneration and plant succession at least equal in extent of cover to the natural vegetation of the area; except that introduced species may be used where desirable and necessary to achieve goals of the approved reclamation plan. Undesirable weedy species such as kuchia, cheatgrass, and other noxious weeds will not be



included unless otherwise directed by the Authorized Forest Officer. The operator will continue re-vegetation efforts using any and all cultural methods available until this standard is met.

Tree planting will be required on disturbed acres which are suitable for timber production. The standard will be to achieve minimum stocking per Chapter 70 of FSH 2409.26b, within 5 years after non-use. Aspen transplanting and portable irrigation or ripping may be required on localized areas to promote aspen regeneration. If aspen regeneration fails, conifer seedlings adapted to the sites will be planted.

After reshaping the site, soil material should be distributed to a uniform depth to allow the establishment of desirable vegetation. The disturbed areas shall be scarified prior to replacement of surface soil material.

Mulching of the seedbed following seeding may be required under certain conditions (i.e., expected severe erosion), as determined by the surface owner/manager.

Reclamation of riparian areas will be conducted in a manner that restores the impacted area to its original condition, in terms of soils, vegetation and hydrologic conditions. Stream and lake fishery habitat will also be restored to pre-project conditions, based on monitoring of the system. Stream habitat reclamation may include instream habitat improvement, erosion control and species replenishment if deemed appropriate by the Authorized Forest Officer.

Noxious weeds which may be introduced due to soil disturbance and reclamation will be treated by biological, mechanical or chemical methods to be approved by the Authorized Forest Officer. Should chemical methods be approved, the lessee must submit a Pesticide Use Proposal to the Authorized Forest Officer 60 days prior to the planned application date.

Reserve pits will be closed as soon as practical or within 12 months after cessation of drilling operations. Pit liquids should have free oil removed and be sampled for total dissolved solids prior to pit closure. Pit liquids with a TDS content greater than 3000 ppm should be removed from the reserve pits as soon as possible or within 1-2 months after discontinuing the drilling operations.

Reserve pit fluids will be allowed to evaporate through the entire summer season (June-August) after drilling is completed, unless an alternate method of disposal is approved. After the fluids disappear, the reserve pit muds will be allowed to dry sufficiently to allow backfilling. The backfilling of the reserve pit will be done so that the muds and associated solids will be confined to the pit and not squeezed out and incorporated in the surface materials. There will be a minimum of three feet of cover (overburden) on the pit. Lined pits will be effectively folded over and effectively capped. When the work is complete, the pit area will support the weight of heavy equipment without sinking.

If a producing well is developed, the reserve pit and that portion of the location and access road not needed for production or production facilities will be recontoured to appropriate conformation (one which allows lease operations and avoids steep cut and fill slopes) as soon as possible. All of the topsoil stockpiled will be evenly disturbed over these recontoured areas. Brush cleared prior to construction of the well site shall be scattered back over the recontoured area.

Immediately after seeding, the stockpiled trees and slash will be lopped and scattered evenly over the disturbed areas. The access will be blocked to prevent vehicular access. Logging slash will also be used to construct filter windrows below all fill slopes.

Seed certification tags from seed used in reclamation will be submitted to the Authorized Forest Officer .

Prior to abandonment of the facilities authorized by APD or Special Use Authorization, the holder shall contact the Authorized Forest Officer to arrange a joint inspection of the area. The inspection will be held to agree on an acceptable abandonment and rehabilitation plan. The Authorized Forest Officer must approve the plan in writing prior to the holder beginning any abandonment and/or rehabilitation activities. The plan may include removal of surfacing material from the road, recontouring, replacement of topsoil, seeding, mulching, and planting.

Cut and fill slopes shall be reduced and graded to conform the site to the adjacent terrain. The disturbed sites will be prepared to provide a seedbed for reestablishment of desirable vegetation and reshaped to blend with the natural contour. Such practices may include contouring, terracing, gouging, scarifying, mulching, fertilizing, seeding, and planting.

Reclamation and abandonment of pipelines and flow-lines may involve: replacing fill in the original cuts, reducing and grading cut and fill slopes to conform to the adjacent terrain, replacing surface soil material, waterbarring, and revegetating in accordance with rehabilitation practices specified by the Forest Service.

Surface buildings, supporting facilities, and other structures, which are not required for present or future operations, shall be removed upon termination of use.

### ***SPLIT-ESTATE MINERAL RESOURCES***

The Bureau of Land Management identified stipulations for those split-estate lands under their jurisdiction which are included in this analysis. These lands are not within the jurisdiction of the Forest Supervisor. The stipulations Applied on the specifically identified lands are as follows:

#### **Bureau of Land Management Stipulations**

Stipulations utilized within the Oklahoma Resource Area (ORA) include both mandatory and optional stipulations. A mandatory stipulation is one which addresses protection of a resource which the BLM is required by law, regulation, or policy to protect, and which the BLM feels Standard Lease Terms would not offer sufficient protection. Mandatory stipulations include:

##### ***ORA-1, Floodplain Protection Stipulation***

"All or portions of the lands under this lease lie in and or adjacent to a major watercourse and are subject to periodic flooding. Surface occupancy of these areas will not be allowed without the specific approval, in writing, of the Bureau of Land Management."

This stipulation is a result of Executive Order (E.O.) 11988 Floodplain Management of May 24, 1977.

##### ***ORA-2, Wetland/Riparian Stipulation***

"All or portions of the lands under this lease contain wetland and/or riparian areas. Surface occupancy of these areas will not be allowed without the specific approval, in writing, of the Bureau of Land Management. Impacts or disturbance to wetlands and riparian habitats which occur on this lease, must be avoided, minimized or compensated. The mitigation goal will be no net loss of in-kind wetlands. Such mitigation will be developed during the application for permit to drill process in cooperation with appropriate state and federal agencies."

The wetland/riparian stipulation is mandated by E.O. 11990 "Protection of Wetlands" of May 24, 1977.

Optional stipulations protect a resource value or other land use which would be potentially impacted by normal oil and gas lease operations. These stipulations are optional in the sense that they are not mandated by law or regulation. They will be used only when the value of the resource warrants protection. These optional stipulations include:

***ORA-3, Season of Use Stipulation***

"Surface occupancy of this lease will not be allowed from date , through date , without the specific approval in writing, from the Authorized Officer of the Bureau of Land Management."

This stipulation restricts the time that the lessee can be on the lease for a period of more than 60 days. Most season of use restrictions involve wildlife seasonal use requirements or recreation use conflicts with drilling activities.

***ORA-4, No Surface Occupancy***

"Surface occupancy of this lease will not be allowed."

This stipulation prohibits surface use to protect a resource or use that is not compatible with oil and gas development. The tract could be leased for inclusion in a drilling unit and may be drilled directionally from an off-site location where occupancy is allowed.

***Lease Notices***

A Lease Notice provides more detailed information concerning limitations that already exist in law, lease terms, regulations, or operational orders.

A Lease Notice also addresses special items the lessee should consider when planning operations, but does not impose new or additional restrictions. A lease notice is not binding or enforceable, it provides the potential lessee with additional information. Lease Notices attached to leases should not be confused with NTL's, Notices to Lessees.

Lease Notices (LN) would be applied under the proposed RMP, and include:

***LN-1, Special Status Species***

According to preliminary information all or portions of the lease area could contain Federal and/or state-listed threatened or endangered species and/or other special status species and/or habitats utilized by these groups of species. Any proposed surface disturbing activity may require an inventory and consultation with the U.S. Fish and Wildlife Service, the state wildlife agency and/or the BLM. The consultation could take up to 180 days to complete. Surface occupancy could be restricted or not allowed as a result of the consultation. Appropriate modifications to the imposed restrictions will be made for the maintenance and operations of producing oil and gas wells.

***LN-2, Black-footed Ferret in Kansas***

"If black-footed ferrets occur anywhere in the wild in Kansas, they are presumed to be associated with prairie dogs. All or portions of this lease area lie within a county of Kansas where prairie dog town have occurred in the past. Therefore, if a prairie dog town of eighty acres or more is found

to occur on or near this lease, a black-footed ferret survey may be required before permitting surface disturbing activity which may impact the prairie dog town."

LN-2 will be applied to leases issued in the counties which last reported the presence of prairie dog towns. These counties are:

Barber, Barton, Cheyenne, Clark, Clay, Comanche, Decatur, Edwards, Ellis, Ellsworth, Finney, Ford, Gove, Graham, Grant, Gray, Greeley, Hamilton, Harper, Harvey, Haskell, Hodgeman, Jewell, Kearny, Kingman, Kiowa, Lane, Lincoln, Logan, McPherson, Meade, Mitchell, Morton, Ness, Norton, Osborne, Ottawa, Pawnee, Phillips, Pratt, Rawlins, Reno, Rice, Rooks, Rush, Russell, Saline, Scott, Seward, Sheridan, Sherman, Smith, Stafford, Stanton, Stevens, Sumner, Thomas, Trego, Wallace, and Wichita.

### **Conditions of Approval**

Additional BLM requirements to protect a resource or value that does not affect the lessees rights or restrict location on the lease can be imposed as a condition of approval of the APD.

One such condition utilized to protect migratory birds is as follows:

"All open pits and tanks being used in conjunction with the development of this lease will be netted or otherwise covered no later than four days after final drilling depth is achieved and until such time as they are removed and/or filled and reclaimed. The recommended coverings include hard covers or a screen material of small enough mesh size so as to prevent the entry and the death of migratory birds. The U.S. Fish and Wildlife Service, Division of Law Enforcement, has prepared materials which provide more detailed guidelines for covering oil field pits and tanks."

Note: The granting of four working days for completion of covering or netting pits and/or tanks in no way limits your responsibility should migratory birds be discovered dead in tanks or pits with the four day period or during the actual drilling phase.

### **Morton & Stevens Counties, Kansas Analysis of Split-Estate Tracts for USFS (Including Reverted Tracts)**

The split-estate tracts within Morton and Stevens counties where no surface resource values or special conditions exist to warrant additional protective measures would be leased with standard lease terms and conditions. The majority of these tracts occur in croplands, improved pasture lands and native grasslands. Typically, these are uplands with no surface water, riparian vegetation or other unique or special habitat features. In all cases LN-2 applies to split-estate in these counties.

The split-estate tracts described below are those tracts which would require other than standard lease terms and conditions should oil and gas leasing occur.

Specific protective measures, stipulations, are identified for each tract and are required under existing BLM policy as well as identified by the proposed Kansas RMP.

## **Morton County**

### **Tract 1**

*T32S, R39W, Sec. 28, N1/2N1/2, S1/2NE1/4, SW1/4NW1/4 & NW1/4SW1/4*  
Approximately 320 acres

This tract is located 8 miles north and 3 miles east of Rolla, Kansas. The Cimarron River courses through this tract creating wetland and floodplain concerns. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner.

Should this tract (or portions) become available for lease BLM stipulations ORA-1 and ORA-2 and BLM lease notice LN-1 would apply.

### **Tract 2**

*T32S, R39W, Sec. 29, NE1/4, E1/2W1/2*  
Approximately 320 acres

This tract is located 8 miles north and 2.5 miles east of Rolla, Kansas. The Cimarron River courses through this tract creating wetland and floodplain concerns. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner.

Should this tract (or portions) become available for lease BLM stipulations ORA-1 and ORA-2 and BLM lease notice LN-1 would apply.

### **Tract 3**

*T32S, R40W, Sec. 25, S1/2 & SE1/4NE1/4*  
Approximately 360 acres

This tract is located 7 miles north of Rolla, Kansas. The Cimarron River courses through this tract creating wetland and floodplain concerns. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner.

Should this tract (or portions) become available for lease BLM stipulations ORA-1 and ORA-2 and BLM lease notice LN-1 would apply.

### **Tract 4**

*T32S, R40W, Sec. 35, N1/2NE1/4, SW1/4NE1/4, SE1/4NW1/4, NE1/4SW1/4 & part of the S1/2SW1/4*  
Approximately 250 acres

This tract is located 7 miles north and 1 mile west of Rolla, Kansas. The Cimarron River courses through this tract creating wetland and floodplain concerns. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner.

Should this tract (or portions) become available for lease BLM stipulations ORA-1 and ORA-2 and BLM lease notice LN-1 would apply.

## Stevens County

### Tract 1

*T31S, R38W, Sec. 10, SE1/4SE1/4*  
Approximately 40 acres

This tract is located 12 miles north and 5 miles west of Hugoton, Kansas. The Cimarron River crosses the southeast corner of this tract creating wetland and floodplain concerns. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner. The KDWP has requested that no surface disturbing activities be allowed on this tract based on the tract's size and public values as wildlife habitat. The surface estate of this tract was deeded to the KDWP by the BLM for wildlife habitat purposes.

Should this tract (or portions) become available for lease BLM stipulations ORA-1 and ORA-2 and BLM lease notice LN-1 would apply.

### Tract 2

*T31S, R38W, Sec. 15, W1/2NE1/4*  
Approximately 80 acres

This tract is located 12 miles north and 5 miles west of Hugoton, Kansas. The Cimarron River crosses this tract creating wetland and floodplain concerns. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state listed endangered Arkansas River Shiner. The KDWP has requested that no surface disturbing activities be allowed on this tract based on the tract's size and public values as wildlife habitat. The surface estate of this tract was deeded to the KDWP by the BLM for wildlife habitat purposes.

Should this tract (or portions) become available for lease BLM stipulations ORA-1, ORA-2 and ORA-4 and BLM lease notice LN-1 would apply.

### Tract 3

*T31S, R38W, Sec. 21, SW1/4NE1/4 and NW1/4SE1/4*  
Approximately 80 acres

This tract is located 10 miles north and 6 miles west of Hugoton, Kansas. The KDWP has requested that no surface disturbing activities be allowed on this tract based on the tract's size and public values as wildlife habitat. The surface estate of this tract was deeded to the KDWP by the BLM for wildlife habitat purposes.

Should this tract (or portions) become available for lease BLM stipulation ORA-4 would apply.

### Tract 4

*T31S, R38W, Sec. 21, SE1/4SW1/4*  
Approximately 40 acres

This tract is located 10 miles north and 6 miles west of Hugoton, Kansas. The Cimarron River is adjacent to this tract. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner.

Should this tract (or portions) become available for lease BLM lease notice LN-1 would apply.

**Tract 5**

*T31S, R38W, Sec 29, SE1/4SW1/4*  
Approximately 40 acres

This tract is located 9 miles north and 8 miles west of Hugoton, Kansas. The Cimarron River crosses this tract creating wetland and floodplain concerns. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner.

Should this tract (or portions) become available for lease BLM stipulations ORA-1, ORA-2 and BLM lease notice LN-1 would apply.

**Tract 6**

*T31S, R38W, Sec. 30, SW1/4SE1/4*  
Approximately 40 acres

This tract is located 9 miles north and 8.5 miles west of Hugoton, Kansas. The Cimarron River is adjacent to this tract. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner.

Should this tract (or portions) become available for lease BLM lease notice LN-1 would apply.

**Tract 7**

*T31S, R38W, Sec. 31, SE1/4NE1/4*  
Approximately 40 acres

This tract is located 9 miles north and 8 miles west of Hugoton, Kansas. The Cimarron River is adjacent to this tract creating wetland and floodplain concerns. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner.

Should this tract (or portions) become available for lease BLM stipulations ORA-1, ORA-2 and BLM lease notice LN-1 would apply.

**Tract 8**

*T32S, R38W, Sec. 6, Lot 1 and SE1/4NE1/4*  
Approximately 81.49 acres

This tract is located 8 miles north and 8 miles west of Hugoton, Kansas. The KDWP has requested that no surface disturbing activities be allowed on this tract based on the tract's size and public values as wildlife habitat. The surface estate of this tract was deeded to the KDWP by the BLM for wildlife habitat purposes.

Should this tract (or portions) become available for lease BLM stipulation ORA-4 would apply.

**Tract 9**

**T32S, R39W, Sec. 13, NW1/4SE1/4**  
Approximately 40 acres

This tract is located 5 miles north and 9 miles west of Hugoton, Kansas. The Cimarron River is adjacent to this tract creating wetland and floodplain concerns. The KDWP has designated the main stem of the Cimarron River as critical habitat for the state-listed endangered Arkansas River Shiner. The KDWP has requested that no surface disturbing activities be allowed on this tract based on the tract's size and public values as wildlife habitat. The surface estate of this tract was deeded to the KDWP by the BLM for wildlife habitat purposes.

Should this tract (or portions) become available for lease BLM stipulations ORA-1, ORA-2 and ORA-4 and BLM lease notice LN-1 would apply.



# STANDARD LEASE TERMS AND CONDITIONS

The standard terms and conditions for oil and gas leasing are part of all federal leases regardless of other considerations. These terms and conditions will automatically apply to all alternatives.

"Sec. 6. Conduct of Operations- Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee."

"Prior to disturbing the surface of the lands, lessee shall contact lessor to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent to impacts to other resources. Lessee may be required to complete minor inventories or short term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historical or scientific interest, or substantial unanticipated environmental effects

are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects."

The "lease rights granted," as used in this section have also been partially defined in the Code of Federal Regulations, part 3101.1-2, shown below.

A lessee shall have the right to use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and dispose of all the leased resource in a leasehold subject to: Stipulations attached to the lease; restrictions deriving from specific, nondiscretionary statutes; and such reasonable measures as may be required by the Authorized Officer to minimize adverse impacts to other resource values, land uses or users not addressed in the lease stipulations at the time operations are proposed. To the extent consistent with lease rights granted, such reasonable measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. At a minimum, measures shall be deemed consistent with lease rights granted provided that they do not: require relocation of proposed operations by more than 200 meters; require that operations be sited off the leasehold; or prohibit new surface-disturbing operations for a period in excess of 60 days in any lease year.

The lease form is shown as Figure B-1.

# STANDARD LEASE TERMS AND CONDITIONS

These terms and conditions shall govern the lease of the premises described in the schedule hereunder, and shall be deemed to form part of the lease agreement.

1. The lessor hereby leases to the lessee the premises described in the schedule hereunder, together with the fixtures and fittings therein, for the term of years therein expressed.

2. The lessee shall pay to the lessor the rent thereon as ascertained in accordance with the provisions of clause 3 hereof, and shall also pay to the lessor the rates, taxes, and other charges which may be levied on the premises, and shall also be bound to indemnify the lessor in respect of the same.

3. The rent shall be payable by the lessee to the lessor in arrears, and shall be paid in equal instalments on the days specified in the schedule hereunder.

Figure B-1  
UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
**OFFER TO LEASE AND LEASE FOR OIL AND GAS**

Serial No. \_\_\_\_\_

The undersigned (*reverse*) offers to lease all or any of the lands in Item 2 that are available for lease pursuant to the Mineral Leasing Act of 1920, as amended and supplemented (30 U.S.C. 181 et seq.), the Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351-359), the Attorney General's Opinion of April 2, 1941 (40 Op. Atty. Gen. 41), or the

**READ INSTRUCTIONS BEFORE COMPLETING**

1. Name \_\_\_\_\_  
Street \_\_\_\_\_  
City, State, Zip Code \_\_\_\_\_

2. This application/offer/lease is for: (Check only One)  PUBLIC DOMAIN LANDS  ACQUIRED LANDS (percent U.S. interest \_\_\_\_\_)  
Surface managing agency if other than BLM: \_\_\_\_\_ Unit/Project \_\_\_\_\_  
Legal description of land requested: \_\_\_\_\_ \*Parcel No.: \_\_\_\_\_ \*Sale Date (m/d/y): \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
**\*SEE ITEM 2 IN INSTRUCTIONS BELOW PRIOR TO COMPLETING PARCEL NUMBER AND SALE DATE.**

T. \_\_\_\_\_ R. \_\_\_\_\_ Meridian \_\_\_\_\_ State \_\_\_\_\_ County \_\_\_\_\_

Amount remitted: Filing fee \$ \_\_\_\_\_ Rental fee \$ \_\_\_\_\_ Total acres applied for \_\_\_\_\_  
Total \$ \_\_\_\_\_

**DO NOT WRITE BELOW THIS LINE**

3. Land included in lease:

T. \_\_\_\_\_ R. \_\_\_\_\_ Meridian \_\_\_\_\_ State \_\_\_\_\_ County \_\_\_\_\_

Total acres in lease \_\_\_\_\_  
Rental retained \$ \_\_\_\_\_

This lease is issued granting the exclusive right to drill for, mine, extract, remove and dispose of all the oil and gas (*except helium*) in the lands described in Item 3 together with the right to build and maintain necessary improvements thereupon for the term indicated below, subject to renewal or extension in accordance with the appropriate leasing authority. Rights granted are subject to applicable laws, the terms, conditions, and attached stipulations of this lease, the Secretary of the Interior's regulations and formal orders in effect as of lease issuance, and to regulations and formal orders hereafter promulgated when not inconsistent with lease rights granted or specific provisions of this lease.

**NOTE:** This lease is issued to the high bidder pursuant to his/her duly executed bid or nomination form submitted under 43 CFR 3120 and is subject to the provisions of that bid or nomination and those specified on this form.

Type and primary term of lease:

- Noncompetitive lease (ten years)
- Competitive lease (five years)
- Other \_\_\_\_\_

THE UNITED STATES OF AMERICA

by \_\_\_\_\_  
(Signing Officer)

\_\_\_\_\_  
(Title) (Date)

EFFECTIVE DATE OF LEASE \_\_\_\_\_

4. (a) Undersigned certifies that (1) offeror is a citizen of the United States; an association of such citizens; a municipality; or a corporation organized under the laws of the United States or of any State or Territory thereof; (2) all parties holding an interest in the offer are in compliance with 43 CFR 3100 and the leasing authorities; (3) offeror's chargeable interests, direct and indirect in either public domain or acquired lands do not exceed 246,080 acres in Federal oil and gas leases in the same State, of which not more than 200,000 acres are held under option, or 300,000 acres in leases and 200,000 acres in options in either leasing District in Alaska; (4) offeror is not considered a minor under the laws of the State in which the lands covered by this offer are located; (5) offeror is in compliance with qualifications concerning Federal coal lease holdings provided in sec. 2(a)(2)(A) of the Mineral Leasing Act; (6) offeror is in compliance with reclamation requirements for all Federal oil and gas lease holdings as required by sec. 17(g) of the Mineral Leasing Act; and (7) offeror is not in violation of sec. 41 of the Act.

(b) Undersigned agrees that signature to this offer constitutes acceptance of this lease, including all terms, conditions, and stipulations of which offeror has been given notice, and any amendment or separate lease that may include any land described in this offer open to leasing at the time this offer was filed but omitted for any reason from this lease. The offeror further agrees that this offer cannot be withdrawn, either in whole or in part, unless the withdrawal is received by the proper BLM State Office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has been signed on behalf of the United States.

This offer will be rejected and will afford offeror no priority if it is not properly completed and executed in accordance with the regulations, or if it is not accompanied by the required payments. 18 U.S.C. Sec. 1001 makes it a crime for any person knowingly and willfully to make to any Department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

Duly executed this \_\_\_\_\_ day of \_\_\_\_\_, 19 \_\_\_\_\_.

(Signature of Lessee or Attorney-in-fact)

## LEASE TERMS

Sec. 1. Rentals—Rentals shall be paid to proper office of lessor in advance of each lease year. Annual rental rates per acre or fraction thereof are:

(a) Noncompetitive lease, \$1.50 for the first 5 years; thereafter \$2.00;

(b) Competitive lease, \$1.50; for primary term; thereafter \$2.00;

(c) Other, see attachment, or as specified in regulations at the time this lease is issued.

If this lease or a portion thereof is committed to an approved cooperative or unit plan which includes a well capable of producing leased resources, and the plan contains a provision for allocation of production, royalties shall be paid on the production allocated to this lease. However, annual rentals shall continue to be due at the rate specified in (a), (b), or (c) for those lands not within a participating area.

Failure to pay annual rental, if due, on or before the anniversary date of this lease (or next official working day if office is closed) shall automatically terminate this lease by operation of law. Rentals may be waived, reduced, or suspended by the Secretary upon a sufficient showing by lessee.

Sec. 2. Royalties—Royalties shall be paid to proper office of lessor. Royalties shall be computed in accordance with regulations on production removed or sold. Royalty rates are:

(a) Noncompetitive lease, 12½%;

(b) Competitive lease, 12½%;

(c) Other, see attachment; or as specified in regulations at the time this lease is issued.

Lessor reserves the right to specify whether royalty is to be paid in value or in kind, and the right to establish reasonable minimum values on products after giving lessee notice and an opportunity to be heard. When paid in value, royalties shall be due and payable on the last day of the month following the month in which production occurred. When paid in kind, production shall be delivered, unless otherwise agreed to by lessor, in merchantable condition on the premises where produced without cost to lessor. Lessee shall not be required to hold such production in storage beyond the last day of the month following the month in which production occurred, nor shall lessee be held liable for loss or destruction of royalty oil or other products in storage from causes beyond the reasonable control of lessee.

Minimum royalty in lieu of rental of not less than the rental which otherwise would be required for that lease year shall be payable at the end of each lease year beginning on or after a discovery in paying quantities. This minimum royalty may be waived, suspended, or reduced, and the above royalty rates may be reduced, for all or portions of this lease if the Secretary determines that such action is necessary to encourage the greatest ultimate recovery of the leased resources, or is otherwise justified.

An interest charge shall be assessed on late royalty payments or underpayments in accordance with the Federal Oil and Gas Royalty Management Act of 1982 (FOGRMA) (30 U.S.C. 1701). Lessee shall be liable for royalty payments on oil and gas lost or wasted from a lease site when such loss or waste is due to negligence on the part of the operator, or due to the failure to comply with any rule, regulation, order, or citation issued under FOGRMA or the leasing authority.

Sec. 3. Bonds—A bond shall be filed and maintained for lease operations as required under regulations.

Sec. 4. Diligence, rate of development, utilization, and drainage—Lessee shall exercise reasonable diligence in developing and producing, and shall prevent unnecessary damage to, loss of, or waste of leased resources. Lessor reserves right to specify rates of development and production in the public interest and to require lessee to subscribe to a cooperative or unit plan, within 30 days of notice, if deemed necessary for proper development and operation of area, field, or pool embracing these leased lands. Lessee shall drill and produce wells necessary to protect leased lands from drainage or pay compensatory royalty for drainage in amount determined by lessor.

Sec. 5. Documents, evidence, and inspection—Lessee shall file with proper office of lessor, not later than 30 days after effective date thereof, any contract or evidence of other arrangement for sale or disposal of production. At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing amounts and quality of all products removed and sold, proceeds therefrom, and amount used for production purposes or unavoidably lost. Lessee may be required to provide plats and schematic diagrams showing development work and improvements, and reports with respect to parties in interest, expenditures, and depreciation costs. In the form prescribed by lessor, lessee shall keep a daily drilling record, a log, information on well surveys and tests, and a record of subsurface investigations and furnish copies to lessor when required. Lessee shall keep open at all reasonable times for inspection by any authorized officer of lessor, the leased premises and all wells, improvements, machinery, and fixtures thereon, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or in the leased lands. Lessee shall maintain copies of all contracts, sales agreements, accounting records, and documentation such as billings, invoices, or similar documentation that supports

costs claimed as manufacturing, preparation, and/or transportation costs. All such records shall be maintained in lessee's accounting offices for future audit by lessor. Lessee shall maintain required records for 6 years after they are generated or, if an audit or investigation is underway, until released of the obligation to maintain such records by lessor.

During existence of this lease, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 6. Conduct of operations—Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee shall contact lessor to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects.

Sec. 7. Mining operations—To the extent that impacts from mining operations would be substantially different or greater than those associated with normal drilling operations, lessor reserves the right to deny approval of such operations.

Sec. 8. Extraction of helium—Lessor reserves the option of extracting or having extracted helium from gas production in a manner specified and by means provided by lessor at no expense or loss to lessee or owner of the gas. Lessee shall include in any contract of sale of gas the provisions of this section.

Sec. 9. Damages to property—Lessee shall pay lessor for damage to lessor's improvements, and shall save and hold lessor harmless from all claims for damage or harm to persons or property as a result of lease operations.

Sec. 10. Protection of diverse interests and equal opportunity—Lessee shall: pay when due all taxes legally assessed and levied under laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; and take measures necessary to protect the health and safety of the public.

Lessor reserves the right to ensure that production is sold at reasonable prices and to prevent monopoly. If lessee operates a pipeline, or owns controlling interest in a pipeline or a company operating a pipeline, which may be operated accessible to oil derived from these leased lands, lessee shall comply with section 28 of the Mineral Leasing Act of 1920.

Lessee shall comply with Executive Order No. 11246 of September 24, 1965, as amended, and regulations and relevant orders of the Secretary of Labor issued pursuant thereto. Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 11. Transfer of lease interests and relinquishment of lease—As required by regulations, lessee shall file with lessor any assignment or other transfer of an interest in this lease. Lessee may relinquish this lease or any legal subdivision by filing in the proper office a written relinquishment, which shall be effective as of the date of filing, subject to the continued obligation of the lessee and surety to pay all accrued rentals and royalties.

Sec. 12. Delivery of premises—At such time as all or portions of this lease are returned to lessor, lessee shall place affected wells in condition for suspension or abandonment, reclaim the land as specified by lessor and, within a reasonable period of time, remove equipment and improvements not deemed necessary by lessor for preservation of producible wells.

Sec. 13. Proceedings in case of default—If lessee fails to comply with any provisions of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation unless or until the leasehold contains a well capable of production of oil or gas in paying quantities, or the lease is committed to an approved cooperative or unit plan or communitization agreement which contains a well capable of production of unitized substances in paying quantities. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time. Lessee shall be subject to applicable provisions and penalties of FOGRMA (30 U.S.C. 1701).

Sec. 14. Heirs and successors-in-interest—Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to the heirs, executors, administrators, successors, beneficiaries, or assignees of the respective parties hereto.

**Exhibit B-2  
Developed Recreation Sites on the Unit**

| RANGER DISTRICT | SITE NAME            | SITE KIND   | MINERAL POTENTIAL | CAP (PAOT) | DEV ACRES | NSO ACRES | TOWNSHIP & RANGE | ROSC CLASS |
|-----------------|----------------------|-------------|-------------------|------------|-----------|-----------|------------------|------------|
| Comanche        | Carrizo              | Picnic      | MOD               | 35         | 5         | 160       | 33S/50W          |            |
|                 | Picture Canyon       | Documentary | MOD               | 15         | 1         | 160       | 35S/47W          |            |
|                 | Vogel Canyon         | Documentary | MOD               | 15         | 1         | 160       | 26S/54W          |            |
| Cimarron        | Cimarron Rec Area    |             | HIGH              |            |           | 160       | 33S/41W          |            |
|                 | Cimarron             | Camp        |                   | 70         |           |           |                  |            |
|                 | Cimarron             | Picnic      |                   | 30         |           |           |                  |            |
|                 | Cimarron             | Picnic Gp   |                   | 70         |           |           |                  |            |
|                 | Atwood Ponds         | Fish Site   |                   | 50         |           |           |                  |            |
|                 | Mallard Ponds        | Fish Site   |                   | 30         | 5         | 160       | 33S/41W          |            |
|                 | Point of Rocks Ponds | Fish Site   |                   | 50         | 10        | 160       | 34S/42W          |            |
|                 | Wilburton Ponds      | Fish Site   |                   | 25         | 5         | 160       | 33S/41W          |            |
|                 | Cimarron River       | Fish Site   |                   | 20         | 2         | 160       | 33S/42W          |            |
|                 | Middle Springs       | Obser       |                   | 35         | 5         | 160       | 34S/42W          |            |
|                 | Point of Rocks       | Obser       |                   | 25         | 2         | 160       | 34S/42W          |            |
|                 | Cimarron River       | Picnic      |                   | 30         | 3         | 160       | 34S/42W          |            |
|                 | Conastoga            | Trailhead   |                   | 25         | 2         | 160       | 33S/40W          |            |
|                 | Murphy               | Trailhead   |                   | 25         | 2         | 160       | 34S/43W          |            |
| Leadville       | Twin Lakes Complex   |             | LOW               |            |           | 2200      |                  |            |
|                 | Dexter Point         | Boat        |                   | 60         | 3         |           | 11S/80W          |            |
|                 | Dexter               | Camp        |                   | 130        | 2         |           |                  |            |
|                 | Lakeview             | Camp        |                   | 295        | 13        |           |                  |            |
|                 | White Star           | Camp        |                   | 320        | 9         |           |                  |            |
|                 | Cabin Cove           | Camp        |                   | 100        | 2         |           |                  |            |
|                 | Interlaken           | Camp Gp     |                   | 0          | 11        |           |                  |            |
|                 | Twin Lakes Hist Dist | Doc         |                   | 0          | 17        |           |                  |            |
|                 | Big Mac              | Doc         |                   | 40         | 3         |           |                  |            |
|                 | Deception Point      | Fish Site   |                   | 75         | 3         |           |                  |            |
|                 | Moache               | Fish Site   |                   | 35         | 1         |           |                  |            |
|                 | Mountain View        | Fish Site   |                   | 35         | 3         |           |                  |            |
|                 | Praying Angel        | Fish Site   |                   | 35         | 1         |           |                  |            |
|                 | Red Rooster          | Fish Site   |                   | 75         | 3         |           |                  |            |
|                 | Sunnyside            | Fish Site   |                   | 100        | 3         |           |                  |            |
|                 | Whistlers Point      | Fish Site   |                   | 40         | 3         |           |                  |            |

| RANGER DISTRICT | SITE NAME              | SITE KIND | MINERAL POTENTIAL | CAP (PAOT) | DEV ACRES | NSO ACRES | TOWNSHIP & RANGE | ROS CLASS |
|-----------------|------------------------|-----------|-------------------|------------|-----------|-----------|------------------|-----------|
| Leadville       | Twin Lakes             |           |                   |            |           |           |                  |           |
|                 | Sure Pretty            | Obser     |                   | 75         | 1         |           |                  |           |
|                 | Mount Elbert           | Picnic    |                   | 45         | 3         | 1830      | 09S/80W          |           |
|                 | Turquoise Lake Complex |           | LOW               |            |           |           |                  |           |
|                 | Matchless              | Boat      |                   | 300        | 6         |           |                  |           |
|                 | Tabor                  | Boat      |                   | 100        | 4         |           |                  |           |
|                 | Baby Doe               | Camp      |                   | 250        | 13        |           |                  |           |
|                 | Belle of Colorado      | Camp      |                   | 95         | 6         |           |                  |           |
|                 | Father Dyer            | Camp      |                   | 140        | 5         |           |                  |           |
|                 | May Queen              | Camp      |                   | 170        | 6         |           |                  |           |
|                 | Molly Brown            | Camp      |                   | 245        | 28        |           |                  |           |
|                 | Silver Dollar          | Camp      |                   | 225        | 14        |           |                  |           |
|                 | Tabor Self Contained   | Camp      |                   | 100        | 5         |           |                  |           |
|                 | Printerboy             | Camp Gp   |                   | 125        | 10        |           |                  |           |
|                 | Abe Lee                | Fish Site |                   | 60         | 2         |           |                  |           |
|                 | Boustead Tunnel        | Obser     |                   | 50         | 1         |           |                  |           |
|                 | Lady of the Lake       | Picnic    |                   | 25         | 1         |           |                  |           |
|                 | Maid of Erin           | Picnic    |                   | 45         | 4         |           |                  |           |
|                 | Elbert Creek           | Camp      | LOW               | 85         | 12        |           | 10S/81W          |           |
|                 | Halfmoon               | Camp      | LOW               | 120        | 14        |           | 10S/81W          |           |
|                 | Parry Peak             | Camp      | LOW               | 130        | 10        |           | 11S/81W          |           |
|                 | Twin Peaks             | Camp      | LOW               | 185        | 9         |           | 11S/81W          |           |
|                 | Crystal Lake           | Fish Site | LOW               | 50         | 5         |           | 10S/80W          |           |
|                 | Vicksburg Mining Camp  | Doc       | LOW               | 20         | 3         |           | 12S/80W          |           |
|                 | Winfield Mining Camp   | Doc       | LOW               | 30         | 3         |           | 12S/81W          |           |
|                 | Independence Pass      | Inter Mi  | LOW               | 112        | 7         |           | 11S/82W          |           |
|                 | Lake Creek Avalanche   | Obser     | LOW               | 20         | 1         |           | 11S/82W          |           |
|                 | Emerald Lake           | Picnic    | LOW               | 50         | 8         |           | 10S/81W          |           |
|                 | Black Cloud            | Trailhd   | LOW               | 30         | 1         |           | 11S/81W          |           |
|                 | Colo Trail-Bear Lake   | Trailhd   | LOW               | 50         | 1         |           | 09S/81W          |           |
|                 | Colo Trail-Mt. Elbert  | Trailhd   | LOW               | 100        | 1         |           | 11S/81W          |           |
|                 | Colo Trail-Timberline  | Trailhd   | LOW               | 30         | 1         |           | 09S/81W          |           |
|                 | High Lakes             | Trailhd   | LOW               | 50         | 1         |           | 09S/81W          |           |
|                 | Lake Fork              | Trailhd   | LOW               | 100        | 1         |           | 09S/81W          |           |
|                 | Missouri Gulch         | Trailhd   | LOW               | 125        | 1         |           | 13S/81W          |           |
|                 | Mt. Elbert-Mt. Massive | Trailhd   | LOW               | 100        | 1         |           | 12S/81W          |           |
|                 |                        |           |                   |            |           |           | 10S/81W          |           |

| RANGER DISTRICT | SITE NAME               | SITE KIND | MINERAL POTENTIAL | CAP (PAOT) | DEV ACRES | NSO ACRES | TOWNSHIP & RANGE | ROS CLASS |
|-----------------|-------------------------|-----------|-------------------|------------|-----------|-----------|------------------|-----------|
| Leadville       | Pine Creek              | Trailhd   | LOW               | 50         | 1         | 160       | 12S/79W          |           |
|                 | Tennessee Pass          | Trailhd   | LOW               | 150        | 1         | 160       | 08S/80W          |           |
| Salida          | Cottonwood Lake Complex |           | LOW               |            |           | 430       | 14S/80W          |           |
|                 | Cottonwood Lake         | Boat      |                   | 50         | 1         |           |                  |           |
|                 | Cottonwood Lake         | Camp      |                   | 140        | 14        |           |                  |           |
|                 | Cottonwood Lake         | Fish Site |                   | 100        | 1         |           |                  |           |
|                 | Cottonwood Lake         | Picnic    |                   | 95         | 5         |           |                  |           |
|                 | Chalk Creek Complex     |           | LOW               |            |           | 590       | 15S/79W          |           |
|                 | Boot Leg                | Camp      | LOW               | 30         | 5         |           |                  |           |
|                 | Cascade                 | Camp      |                   | 115        | 8         |           |                  |           |
|                 | Chalk Lake              | Camp      |                   | 105        | 4         |           |                  |           |
|                 | Mt. Princeton           | Camp      |                   | 85         | 5         |           |                  |           |
|                 | Chalk Lake              | Camp      |                   | 125        | 2         |           |                  |           |
|                 | Agnes Vail Falls        | Fish Site |                   | 25         | 1         |           |                  |           |
|                 | Chalk Creek             | Trailhd   |                   | 30         | 1         |           |                  | 15S/79W   |
|                 | Angel of Shavano        | Trailhd   |                   | 30         | 1         |           |                  | 15S/79W   |
|                 | Coaldale                | Camp      |                   | 85         | 10        |           |                  | 50N/07E   |
|                 | Collegiate Peaks        | Camp      |                   | 55         | 4         |           |                  | 47N/10E   |
|                 | Garfield                | Camp      |                   | 225        | 11        |           |                  | 14S/80W   |
|                 | Hayden Creek            | Camp      |                   | 55         | 5         |           |                  | 50N/06E   |
|                 | Iron City               | Camp      |                   | 55         | 4         |           |                  | 47N/10E   |
|                 | Monarch Park            | Camp      |                   | 85         | 21        |           |                  | 15S/80W   |
|                 | North Fork Reservoir    | Camp      |                   | 190        | 17        |           |                  | 49N/06E   |
|                 | O'Haver Lake            | Camp      |                   | 40         | 3         |           |                  | 50N/06E   |
|                 | Angel of Shavano        | Camp      |                   | 145        | 11        |           |                  | 48N/07E   |
|                 | North Fork Reservoir    | Camp Gp   |                   | 100        | 5         |           |                  | 50N/07E   |
|                 | O'Haver Lake            | Fish Site |                   | 30         | 1         |           |                  | 50N/06E   |
|                 | Monarch Pass            | Fish Site |                   | 120        | 2         |           |                  | 48N/07E   |
|                 | Monarch Aerial Tramway  | Info      |                   | 20         | 1         |           |                  | 49N/06E   |
|                 | Angel of Shavano        | Obser     |                   | 24         | 1         |           |                  | 49N/06E   |
|                 | Avalanche               | Trailhd   |                   | 30         | 1         |           |                  | 50N/07E   |
|                 | Bear Creek              | Trailhd   |                   | 100        | 2         |           |                  | 14S/80W   |
|                 | Big Cottonwood          | Trailhd   |                   | 35         | 1         |           |                  | 49N/09E   |
| Browns Creek    | Trailhd                 |           | 25                | 1          |           |           | 47N/11E          |           |
|                 | Trailhd                 |           | 30                | 1          |           |           | 51N/07E          |           |

| RANGER DISTRICT        | SITE NAME        | SITE KIND           | MINERAL POTENTIAL | CAP (PAOT) | DEV ACRES | NSO ACRES | TOWNSHIP & RANGE | ROS CLASS |  |
|------------------------|------------------|---------------------|-------------------|------------|-----------|-----------|------------------|-----------|--|
| Salida                 | Denny Creek      | Trailhd             | LOW               | 75         | 1         | 160       | 14S/80W          |           |  |
|                        | Fooses Creek     | Trailhd             | LOW               | 40         | 1         | 160       | 50N/07E          |           |  |
|                        | North Cottonwood | Trailhd             | LOW               | 60         | 2         | 160       | 13S/79W          |           |  |
|                        | Poplar Gulch     | Trailhd             | LOW               | 30         | 1         | 160       | 15S/80W          |           |  |
|                        | Ptarmigan Lake   | Trailhd             | LOW               | 30         | 1         | 160       | 14S/80W          |           |  |
|                        | Shirley Site     | Trailhd             | LOW               | 35         | 1         | 160       | 48N/08E          |           |  |
|                        | San Carlos       | Lake Isabel Complex |                   | LOW        |           |           | 470              | 24S/69W   |  |
|                        |                  | Lake Isabel         | Boat              |            | 30        | 1         |                  |           |  |
|                        |                  | Lake Isabel         | Camp              |            | 75        | 10        |                  |           |  |
|                        |                  | Lake Isabel         | Camp              |            | 40        | 1         |                  |           |  |
| Lake Isabel            |                  | Camp                |                   | 75         | 10        |           |                  |           |  |
| Lake Isabel            |                  | Camp                |                   | 60         | 2         |           |                  |           |  |
| Lake Isabel - East     |                  | Fish Site           |                   | 300        | 10        |           |                  |           |  |
| Lake Isabel - North    |                  | Fish Site           |                   | 225        | 40        |           |                  |           |  |
| Lake Isabel            |                  | Picnic              |                   | 50         | 2         |           |                  |           |  |
| Cisneros               |                  | Trailhd             |                   | 235        | 20        |           |                  |           |  |
| Alvarado               |                  | Camp                | MOD               |            |           | 120       | 44N/73W          |           |  |
| Bear Lake              |                  | Camp                | MOD               | 70         | 5         | 160       | 31S/69W          |           |  |
| Blue Lake              |                  | Camp                | MOD               | 75         | 8         | 120       | 31S/69W          |           |  |
| Cuchara                |                  | Camp                | MOD               | 75         | 13        | 450       | 31S/69W          |           |  |
| Davenport              |                  | Camp                | MOD               | 60         | 6         | 160       | 23S/69W          |           |  |
| Lake Creek             |                  | Camp                | MOD               | 55         | 4         | 160       | 46N/12E          |           |  |
| Oak Creek              |                  | Camp                | MOD               | 30         | 5         | 40        | 20S/70W          |           |  |
| Ophir                  |                  | Camp                | LOW               | 155        | 14        | 160       | 23S/69W          |           |  |
| Purgatoire             |                  | Camp                | MOD               | 115        | 9         | 160       | 32S/69W          |           |  |
| Oak Creek              |                  | Camp                | MOD               | 100        | 9         | 120       | 20S/70W          |           |  |
| Balman Reservoir       |                  | Camp Gp             | MOD               | 100        | 2         | 160       | 46N/11E          |           |  |
| Blue Lake              |                  | Fish Site           | MOD               | 30         | 1         | 40        | 31S/69W          |           |  |
| Farley Flower Overlook |                  | Fish Site           | MOD               | 30         | 1         | 160       | 31S/69W          |           |  |
| Spring Creek           |                  | Obser               | MOD               | 45         | 6         | 160       | 31S/69W          |           |  |
| Alvarado               |                  | Picnic              | MOD               | 75         | 2         | 40        | 44N/73W          |           |  |
| Bartlett               |                  | Trailhd             | MOD               | 40         | 2         | 160       | 25S/68W          |           |  |
| Brush Creek            |                  | Trailhd             | LOW               | 50         | 2         | 160       | 46N/12E          |           |  |
| Cordova Pass           | Trailhd          | MOD                 | 30                | 2          | 160       | 31S/68W   |                  |           |  |
| Florence               | Trailhd          | MOD                 | 20                | 1          | 160       | T22/69W   |                  |           |  |



| RANGER DISTRICT | SITE NAME                 | SITE KIND | MINERAL POTENTIAL | CAP (PAOT) | DEV ACRES | NSO ACRES | TOWNSHIP & RANGE | ROS CLASS |
|-----------------|---------------------------|-----------|-------------------|------------|-----------|-----------|------------------|-----------|
| San Carlos      | Gibson Creek              | Trailhd   | MOD               | 50         | 2         | 160       | 45N/12E          |           |
|                 | Grape Creek               | Trailhd   | MOD               | 100        | 4         | 160       | 24S/72W          |           |
|                 | Greenhorn Mtn             | Trailhd   | LOW               | 50         | 1         | 160       | 24S/69W          |           |
|                 | Horn Creek                | Trailhd   | MOD               | 50         | 2         | 160       | 23S/73W          |           |
|                 | Music Pass                | Trailhd   | MOD               | 75         | 2         | 160       | 43N/72S          |           |
|                 | North Fork                | Trailhd   | MOD               | 50         | 1         | 160       | 32S/69W          |           |
|                 |                           |           |                   |            |           |           |                  |           |
|                 |                           |           |                   |            |           |           |                  |           |
|                 |                           |           |                   |            |           |           |                  |           |
|                 |                           |           |                   |            |           |           |                  |           |
| Pikes Peak      | Rampart Reservoir Complex |           | HIGH              |            |           | 1100      | 12S/68W          | RN        |
|                 | Dikeside                  | Boat      |                   | 300        | 10        |           |                  |           |
|                 | Meadow Ridge              | Camp      |                   | 95         | 8         |           |                  |           |
|                 | Thunder Ridge             | Camp      |                   | 105        | 11        |           |                  |           |
|                 | Wildcat Wayside           | Info      |                   | 45         | 2         |           |                  |           |
|                 | BPW Nature Trail          | Inter Mi  |                   | 50         | 5         |           |                  |           |
|                 | Peak View                 | Obser     |                   | 40         | 1         |           |                  |           |
|                 | Boatmans                  | Picnic    |                   | 60         | 3         |           |                  |           |
|                 | Promontory                | Picnic    |                   | 170        | 15        |           |                  |           |
|                 | Manitou Park Complex      |           | LOW               |            |           | 820       | 11S/69W          | R         |
|                 | Colorado                  | Camp      |                   | 405        | 25        |           |                  |           |
|                 | Painted Rocks             | Camp      |                   | 95         | 4         |           |                  |           |
|                 | South Meadows             | Camp      |                   | 320        | 23        |           |                  |           |
|                 | Pike Community            | Camp Gp   |                   | 350        | 5         |           |                  |           |
|                 | Redrocks                  | Camp Gp   |                   | 90         | 9         |           |                  |           |
|                 | Manitou Lake              | Picnic    |                   | 210        | 21        |           |                  |           |
|                 | Pikes Peak Complex        |           | LOW               |            |           | 950       | 14S/68W          | RN        |
|                 | Pikes Peak                | Doc       |                   | 50         | 8         |           |                  |           |
|                 | Bottomless Pit            | Obser     |                   | 25         | 1         |           |                  |           |
|                 | Elk Park                  | Obser     |                   | 50         | 1         |           |                  |           |
|                 | Pikes Peak                | Obser     |                   | 24         | 1         |           |                  |           |
|                 | Ridge Crest               | Obser     |                   | 40         | 1         |           |                  |           |
|                 | Glen Cove                 | Picnic    |                   | 35         | 3         |           |                  |           |
|                 | Halfway                   | Picnic    |                   | 110        | 10        |           |                  |           |
|                 | The Craggs                | Camp      | LOW               | 85         | 7         |           |                  |           |
|                 | Trail Creek               | Camp      | LOW               | 35         | 1         |           |                  |           |
|                 | Wildhorn                  | Camp      | LOW               | 45         | 4         |           |                  |           |
| Wye             | Camp                      | LOW       | 105               | 8          |           |           |                  |           |
| Cascade         | Obser                     | HIGH      | 12                | 1          |           |           |                  |           |
|                 |                           |           |                   |            |           | 160       | 13S/69W          | RN        |
|                 |                           |           |                   |            |           | 160       | 11S/70W          | RN        |
|                 |                           |           |                   |            |           | 160       | 11S/70W          | RN        |
|                 |                           |           |                   |            |           | 160       | 15S/68W          | RN        |
|                 |                           |           |                   |            |           | 160       | 13S/68W          | RN        |

| RANGER DISTRICT           | SITE NAME           | SITE KIND               | MINERAL POTENTIAL | CAP (PAOT) | DEV ACRES | NSO ACRES | TOWNSHIP & RANGE | ROS CLASS |    |
|---------------------------|---------------------|-------------------------|-------------------|------------|-----------|-----------|------------------|-----------|----|
| Pikes Peak                | Springdale          | Camp Gp                 | HIGH              | 50         | 5         | 160       | 12S/68W          | RN        |    |
|                           | Eagles Nest         | Picnic                  | LOW               | 25         | 1         | 160       | 14S/68W          | RN        |    |
|                           | Barr                | Trailhd                 | LOW               | 125        | 4         | 160       | 14S/68W          | RN        |    |
|                           | Crags               | Trailhd                 | LOW               | 50         | 1         | 160       | 13S/69W          | RN        |    |
|                           | Horsethief Park     | Trailhd                 | LOW               | 12         | 1         | 160       | 14S/69W          | RN        |    |
|                           | No. Cheyenne Canyon | Trailhd                 | LOW               | 12         | 1         | 160       | 14S/67W          | RN        |    |
|                           | Rainbow Gulch       | Trailhd                 | HIGH              | 50         | 1         | 160       | 12S/68W          | RN        |    |
|                           | Rosemont Reservoir  | Trailhd                 | LOW               | 150        | 1         | 160       | 15S/68W          | RN        |    |
|                           | St. Mary's Falls    | Trailhd                 | LOW               | 50         | 1         | 160       | 15S/67W          | RN        |    |
|                           | St. Peter's Dome    | Trailhd                 | LOW               | 35         | 1         | 160       | 15S/67W          | RN        |    |
|                           | Waldo Canyon        | Trailhd                 | HIGH              | 120        | 1         | 160       | 13S/68W          | RN        |    |
|                           | Rampart Range       | Play/Sport              | LOW               | 50         | 3         | 160       | 13S/67W          | RN        |    |
|                           | St. Peter's Dome    | Play/Sport              | LOW               | 75         | 3         | 160       | 15S/67W          | RN        |    |
|                           | South Par           | Jefferson Creek Complex | Boat              | MOD        | 120       | 2         | 850              | 07S/76W   | RN |
|                           |                     | Jefferson Lake          | Camp              |            | 60        | 5         |                  |           |    |
|                           |                     | Aspen                   | Camp              |            | 85        | 28        |                  |           |    |
|                           |                     | Jefferson Creek         | Camp              |            | 175       | 15        |                  |           |    |
|                           |                     | Lodgepole               | Camp              |            | 200       | 2         |                  |           |    |
|                           |                     | Jefferson Lake          | Fish              |            | 20        | 1         |                  |           |    |
|                           |                     | Beaver Ponds            | Picnic            |            | 20        | 1         |                  |           |    |
| Jefferson Boundary        |                     | Picnic                  |                   | 20         | 1         |           |                  |           |    |
| Jefferson Lake            |                     | Picnic                  |                   | 175        | 18        |           |                  |           |    |
| Elevenmile Canyon Complex |                     | Picnic                  | LOW               | 105        | 8         | 1540      | 13S/72W          | RN        |    |
| Blue Mountain             |                     | Camp                    |                   | 25         | 2         |           |                  |           |    |
| Cove                      |                     | Camp                    |                   | 95         | 6         |           |                  |           |    |
| Riverside                 |                     | Camp                    |                   | 120        | 12        |           |                  |           |    |
| Spillway                  |                     | Camp                    |                   | 75         | 6         |           |                  |           |    |
| Springer Gulch            |                     | Camp                    |                   | 35         | 3         |           |                  |           |    |
| Wagon Tongue              |                     | Camp                    |                   | 75         | 4         |           |                  |           |    |
| Elevenmile                |                     | Picnic                  |                   | 25         | 2         |           |                  |           |    |
| Idlewilde                 |                     | Picnic                  |                   | 10         | 1         |           |                  |           |    |
| Messenger Gulch           |                     | Picnic                  |                   | 10         | 1         |           |                  |           |    |
| O'Brien Gulch             |                     | Picnic                  |                   | 15         | 1         | 160       | 09S/77W          | RN        |    |
| Beaver Creek              | Camp                | MOD                     | 85                | 9          | 160       | 12S/77W   | RN               |           |    |
| Buffalo Springs           | Camp                | MOD                     |                   |            |           |           |                  |           |    |

| RANGER DISTRICT | SITE NAME         | SITE KIND             | MINERAL POTENTIAL | CAP (PAOT) | DEV ACRES | NSO ACRES | TOWNSHIP & RANGE | ROS CLASS |    |
|-----------------|-------------------|-----------------------|-------------------|------------|-----------|-----------|------------------|-----------|----|
| South Park      | Fourmile          | Camp                  | MOD               | 70         | 6         | 160       | 10S/78W          | RN        |    |
|                 | Happy Meadows     | Camp                  | LOW               | 30         | 2         | 160       | 12S/71W          | RN        |    |
|                 | Horseshoe         | Camp                  | MOD               | 95         | 14        | 160       | 10S/78W          | RN        |    |
|                 | Kite Lake         | Camp                  | LOW               | 35         | 3         | 160       | 08S/78W          | RN        |    |
|                 | Lost Park         | Camp                  | LOW               | 50         | 4         | 120       | 09S/73W          | RN        |    |
|                 | Michigan Creek    | Camp                  | MOD               | 65         | 6         | 160       | 07S/76W          | RN        |    |
|                 | Round Mountain    | Camp                  | LOW               | 80         | 12        | 160       | 12S/72W          | RN        |    |
|                 | Selkirk           | Camp                  | MOD               | 75         | 2         | 160       | 08S/77W          | RN        |    |
|                 | Spruce Grove      | Camp                  | LOW               | 140        | 12        | 160       | 10S/72W          | RN        |    |
|                 | Weston Pass       | Camp                  | MOD               | 70         | 6         | 160       | 11S/78W          | RN        |    |
|                 | South Park Office | Inter Ad              | LOW               | 20         | 1         | 40        | 09S/77W          | R         |    |
|                 | Wilkerson Pass    | Inter Ad              | LOW               | 250        | 3         | 160       | 12S/73W          | RN        |    |
|                 | Hoosier Pass      | Obser                 | MOD               | 70         | 1         | 160       | 08S/78W          | RN        |    |
|                 | Windy Ridge       | Obser                 | LOW               | 30         | 1         | 160       | 08S/78W          | RN        |    |
|                 | Limber Grove      | Trailhd               | LOW               | 35         | 1         | 160       | 10S/78W          | RN        |    |
|                 | Lost Park         | Trailhd               | LOW               | 40         | 1         | 40        | 09S/73W          | RN        |    |
|                 | Platte River      | Trailhd               | LOW               | 35         | 1         | 160       | 12S/81W          | RN        |    |
|                 | Rich Creek        | Trailhd               | MOD               | 50         | 1         | 160       | 11S/78W          | RN        |    |
|                 | Salt Creek        | Trailhd               | MOD               | 30         | 1         | 160       | 12S/78W          | RN        |    |
|                 | Twin Eagles       | Trailhd               | LOW               | 50         | 2         | 160       | 10S/72W          | RN        |    |
|                 | Ute Creek         | Trailhd               | LOW               | 50         | 1         | 160       | 10S/73W          | RN        |    |
|                 | South Platte      | Buffalo Creek Complex |                   |            |           |           | 1410             | 08S/71W   | RN |
|                 |                   | Baldy                 | Camp              | LOW        | 40        | 4         |                  |           |    |
| Buffalo         |                   | Camp                  |                   | 205        | 18        |           |                  |           |    |
| Green Mountain  |                   | Camp                  |                   | 30         | 4         |           |                  |           |    |
| Tramway         |                   | Camp                  |                   | 30         | 3         |           |                  |           |    |
| Wigwam          |                   | Camp                  |                   | 50         | 4         |           |                  |           |    |
| Meadows         |                   | Camp Grp              |                   | 300        | 50        |           |                  |           |    |
| Buffalo Creek   |                   | Picnic                |                   | 20         | 2         |           |                  |           |    |
| Big Turkey      |                   | Camp                  | LOW               | 50         | 4         | 160       | 11S/70W          | RN        |    |
| Burning Bear    |                   | Camp                  | LOW               | 65         | 6         | 160       | 06S/74W          | RN        |    |
| Burning Bear    |                   | Trailhd               |                   | 50         | 2         |           |                  |           |    |
| Deer Creek      |                   | Camp                  | LOW               | 65         | 5         | 420       | 06S/73W          | R         |    |
| Meridian        |                   | Camp                  |                   | 90         | 16        |           |                  |           |    |
| Deer Creek      |                   | Trailhd               |                   | 100        | 2         |           |                  |           |    |

| RANGER DISTRICT | SITE NAME        | SITE KIND | MINERAL POTENTIAL | CAP (PAOT) | DEV ACRES | NSO ACRES | TOWNSHIP & RANGE | ROS CLASS |
|-----------------|------------------|-----------|-------------------|------------|-----------|-----------|------------------|-----------|
| South Platte    | Devils Head      | Camp      | LOW               | 110        | 10        | 260       | 09S/69W          | RN        |
|                 | Cabin Ridge      | Picnic    | LOW               | 25         | 4         |           |                  |           |
|                 | Devils Head      | Picnic    |                   | 50         | 4         |           |                  |           |
|                 | Cabin Ridge      | Trailhd   | LOW               | 85         | 1         | 160       | 09S/69W          |           |
|                 | Devils Head      | Trailhd   | LOW               | 25         | 1         |           |                  |           |
|                 | Flat Rocks       | Camp      | HIGH              | 100        | 8         | 160       | 08S/69W          | RN        |
|                 | Flat Rocks       | Trailhd   | HIGH              | 60         | 1         |           |                  |           |
|                 | Geneva Park      | Camp      | LOW               | 130        | 4         | 260       | 06S/75W          | RN        |
|                 | Duck Creek       | Picnic    |                   | 25         | 2         |           |                  |           |
|                 | Goose Creek      | Camp      | LOW               | 50         | 4         | 280       | 10S/71W          | RN        |
|                 | Goose Creek      | Trailhd   |                   | 250        | 2         |           |                  |           |
|                 | Hall Valley      | Camp      | LOW               | 45         | 4         | 230       | 06S/75W          | RN        |
|                 | Handcart         | Camp      |                   | 50         | 5         |           |                  |           |
|                 | Indian Creek     | Camp      | HIGH              | 50         | 4         | 260       | 08S/69W          | RN        |
|                 | Indian Creek     | Info      |                   | 60         | 1         |           |                  |           |
|                 | Jackson Creek    | Camp      | LOW               | 45         | 3         | 160       | 09S/69W          | RN        |
|                 | Kelsey           | Camp      | LOW               | 85         | 7         | 160       | 08S/70W          | RN        |
|                 | Kenosha Pass     | Camp      | LOW               | 125        | 11        | 160       | 07S/75W          | RN        |
|                 | Kenosha Pass     | Trailhd   | LOW               | 50         | 1         |           |                  |           |
|                 | Lone Rock        | Camp      | LOW               | 95         | 5         | 160       | 09S/70W          | R         |
|                 | Molly Gulch      | Camp      | LOW               | 75         | 7         | 160       | 10S/71W          | RN        |
|                 | Top of the World | Camp      | LOW               | 35         | 9         | 160       | 08S/70W          | RN        |
|                 | Whiteside        | Camp      | LOW               | 25         | 2         | 280       | 06S/74W          | RN        |
|                 | Geneva Creek     | Picnic    |                   | 25         | 2         |           |                  |           |
|                 | Bailey           | Camp Grp  | LOW               | 50         | 2         | 160       | 07S/73W          | R         |
|                 | Bridge Crossing  | Picnic    | LOW               | 25         | 1         | 240       | 09S/70W          | R         |
|                 | Platte River     | Picnic    |                   | 50         | 4         |           |                  |           |
|                 | Scraggy View     | Picnic    | LOW               | 15         | 1         | 160       | 08S/70W          | R         |
|                 | Topaz Point      | Picnic    | LOW               | 25         | 2         | 160       | 09S/69W          | RN        |
|                 | Willow Bend      | Picnic    | LOW               | 25         | 2         | 160       | 08S/70W          | R         |
|                 | Abyss            | Trailhd   | LOW               | 150        | 1         | 160       | 05S/74W          | RN        |
|                 | Gibson Lake      | Trailhd   | LOW               | 20         | 1         | 160       | 06S/75W          | RN        |
|                 | Lower Wigwam     | Trailhd   | LOW               | 35         | 1         | 160       | 09S/71W          | RN        |
|                 | Rolling Creek    | Trailhd   | LOW               | 35         | 1         | 160       | 08S/71W          | RN        |
|                 | Sunset Point     | Trailhd   | LOW               | 65         | 1         | 160       | 08S.69W          | RN        |
|                 | Wigwam           | Trailhd   | LOW               | 125        | 1         | 160       | 09S/70W          | RN        |

**Exhibit B-3  
Active Timber Sales**

| MAP # | DISTRICT   | TIMBER SALE NAME   | LEGAL DESCRIPTION                                       | SALE AREA          | PLANNED TERMINATION |
|-------|------------|--------------------|---|--------------------|---------------------|
| 1     | Salida     | Mineral Basin      | T15S, R81W, Sec. 11, 12, 13<br>T15S, R80W, Sec. 7       | 306 Acres          | 7/20/91             |
| 2     | Salida     | Ptarmigan          | T14S, R80W, Sec. 29, 30, 31                             | 274 Acres          | 8/17/91             |
| 3     | Salida     | Herring            | T15S, R76W, Sec. 19, 20, 29, 30<br>T15S, R77W, Sec. 25  | 465 Acres          | 12/31/91            |
| 4     | Salida     | Jones Mt.          | T14S, R81W, Sec. 23-26, 35, 36                          | 455 Acres          | 9/12/90             |
| 5     | Salida     | Sands              | T51N, R7E, Sec. 25, 26, 35                              | 574 Acres          | 12/31/91            |
| 6     | Salida     | Kreutzer           | T15S, R81W, Sec. 12                                     | 40 Acres           | 9/30/92             |
| 7     | San Carlos | Little Froze II    | T23S, R70W, Sec. 11-15;<br>T23S, R69W, Sec. 6, 7        | 430 Acres          | 12/31/93            |
| 8     | San Carlos | Snowslide II       | T24S, R69W, Sec. 11-14                                  | 328 Acres<br>(Net) | 12/31/91            |
| 9     | Pikes Peak | Davis Gulch        | T11S, R70W, Sec. 26, 34, 35<br>T12S, R70W, Sec. 2, 3, 4 | 672 Acres          | 8/25/91             |
| 10    | Pikes Peak | Plum Creek         | T10S, R68W, Sec. 20, 21, 28, 29                         | 267 Acres          | 6/30/91             |
| 11    | Pikes Peak | Border Salvage     | T12S, R70W, Sec. 13                                     | 111 Acres          | 9/30/91             |
| 12    | Pikes Peak | Manchester Salvage | T12S, R69W, Sec. 7; T12S, R70W,<br>Sec. 12 & 13         | 106 Acres          | 9/30/91             |
| 13    | South Park | No Name Resale     | T9S, R73W, Sec. 4, 5, 8, 9                              | 485 Acres          | 9/30/91             |
| 14    | South Park | Hourglass          | T9S, R73W, Sec. 10, 11, 15, 16                          | 354 Acres          | 3/31/92             |
| 15    | South Park | South Northfork    | T8S, R73W, Sec. 33, 34, 35, 36<br>T9S, R73W, Sec. 2 & 3 | 459 Acres          | 9/30/91             |

| MAP # | DISTRICT                | TIMBER SALE NAME          | LEGAL DESCRIPTION  | SALE AREA | PLANNED TERMINATION |
|-------|-------------------------|---------------------------|--|-----------|---------------------|
| 16    | South Park<br>510 Acres | Michigan Creek<br>3/31/92 | T7S, R76W, Sec. 16-18, 20-30,32,33   |           |                     |
| 17    | South Park              | Crooked Creek             | T8S, R77W, Sec. 35;<br>T9S, R77W, Sec. 2-4, 10, 15, 16                             | 384 Acres | 9/30/93             |
| 18    | South Park              | Puma Heartbreak           | T12S, R72W, Sec. 31, 32 & 33   | 600 Acres | 7/31/91             |
| 19    | So. Platte              | Sugar Creek               | T9S, R69W, Sec 7, 18-21<br>T9S, R70W, Sec. 1, 12, 13                               | 997 Acres | 12/31/91            |
| 20    | So. Platte              | Dakan Mmountain           | T9S, R68W, Sec. 19, 30, 31<br>T9S, R69W, Sec. 24-26, 35 & 36<br>T10S, R69W, Sec. 1 | 317 Acres | 6/30/91             |
| 21    | So. Platte              | Brush Creek (D)           | T9S, R70W, Sec. 4-9  | 911 Acres | 9/30/90             |
| 22    | So. Platte              | Noddles                   | T8S, R69W, Sec. 29-32  | 204 Acres | 9/30/91             |
| 23    | So. Platte              | Dake                      | T7S, R75W, Sec. 10, 11, 14, 15   | 132 Acres | 12/31/91            |
| 24    | So. Platte              | Sheeprock II              | T10S, R71W, Sec. 5 & 8   | 39 Acres  | 12/31/91            |
| 25    | So. Platte              | Meridian II               | T6S, R73W, Sec. 22   | 13 Acres  | 9/30/91             |
| 26    | So. Platte              | Buffalo Baldy             | T8S, R71W, Sec. 1-3 & 9-12   | 918 Acres | 12/31/92            |
| 27    | So. Platte              | Hoosier Creek III         | T7S, R75W, Sec. 21   | 36 Acres  | 12/31/91            |

Active sales per December, 1990 Automated Timber Sales Accounting System "Transfer of Earned Timber Sale Receipts"

NOTE: Active sale status will change through the course of the planning period. Whenever post-leasing activity is proposed on lease parcels with merchantable size timber, the District Minerals Staff must coordinate with the District Forester and/or the Forest ATSA Data Base Coordinator to determine if active sales exist on the lease parcel.

Exhibit B-4  
Planned Timber Sales

| MAP # | DISTRICT   | TIMBER SALE NAME    | LEGAL DESCRIPTION   | SALE AREA | PLANNED SALE YR |
|-------|------------|---------------------|---|-----------|-----------------|
| 1     | Salida     | Eddy Creek          | T15S, R78W, Sec. 31<br>T15S, R79W, Sec. 36                                | 210       | 1991            |
| 2     | Salida     | Kaufman Ridge       | T14S, R76W, Sec. 6<br>T13S, R76W, Sec. 31<br>T13S, R77W, Sec. 36          | 120       | 1991            |
| 3     | Salida     | Ouray               | T48N, R7E, Sec. 19-20   | 150       | 1994            |
| 4     | Salida     | Beaver Creek        | T48N, R7E, Sec. 13, 14  | 100       | 1992            |
| 5     | Salida     | Monarch Park        | T49N, R6E, Sec. 17  | 30        | 1993            |
| 6     | Salida     | Starvation          | T48N, R7E, Sec. 31, 32  | 100       | 1993            |
| 7     | Salida     | Ptarmigan           | T14S, R80W, Sec. 30, 31   | 60        | 1995            |
| 8     | San Carlos | East Williams II    | T23S, R70W, Sec. 36;<br>T23S, R69W, Sec. 31;<br>T24S, R69W, Sec. 6        | 400       | 1992            |
| 9     | San Carlos | Little Saint        | T24S, R69W, Sec. 13, 24   | 500       | 1995            |
| 10    | Pikes Peak | Rule Ridge Salvage  | T11S, R69W, Sec. 32, 33;<br>T12S, R69W, Sec. 4-8                          | 600       | 1991            |
| 11    | Pikes Peak | Trout Creek         | T11S, R69W, Sec. 3, 4, 9 & 10   | 350       | 1993            |
| 12    | Pikes Peak | Signal Butte Salvag | T11S, R70W, Sec. 23, 26-27, 33-34<br>T12S, R70W, Sec. 4, 5 & 8            | 200       | 1992            |
| 13    | Pikes Peak | Painted Rocks       | T11S, R69W, Sec. 9, 10, 15 & 16   | 350       | 1993            |
| 14    | South Park | Schoolmarm Re-sale  | T10S, R73W, Sec. 30-32;<br>T10S, R74W, Sec. 25, 36;<br>T11S, R73W, Sec. 6 | 255       | 1991            |

| MAP # | DISTRICT   | TIMBER SALE NAME  | LEGAL DESCRIPTION  | SALE AREA | PLANNED SALE YR |
|-------|------------|-------------------|--|-----------|-----------------|
| 15    | South Park | Jones Hill        | T12S, R78W, Sec. 1, 2, 12;<br>T12S, R77W, Sec. 3-7;<br>T11s, R77W, Sec. 31, 32 | 403       | 1991            |
| 16    | South Park | Pulver Salvage    | T12S, R72W, Sec. 18, 19<br>T12S, R73W, Sec. 11-14                              | 375       | 1992            |
| 17    | South Park | 39 Mile Mountain  | T14S, R73W, Sec. 3-10  | 960       | 1992            |
| 18    | South Park | Badger Salvage    | T11S, R73W, Sec. 9-10,<br>15, 16, 21, 28                                       | 350       | 1993            |
| 19    | South Park | Wagon Tongue Salv | T13S, R71W, Sec. 5-8   | 500       | 1994            |
| 20    | South Park | Caylor I, II Salv | T13S, R72W, Sec. 3-5   | 500       | 1991 & 1995     |
| 21    | So. Platte | Sheepnose         | T10S, R70W, Sec. 20 & 21   | 350       | 1992            |
| 22    | So. Platte | Pits              | T8S, R70W, Sec. 1, 2, 10, 11, 15   | 418       | 1992            |
| 23    | So. Platte | Hunter            | T10S, R70W, Sec. 17 & 20   | 397       | 1993            |
| 24    | So. Platte | Schoonover        | T10S, R70W, Sec. 8-9, 16-17  | 559       | 1993            |
| 25    | So. Platte | Stoney Pass       | T9S, R71W, Sec. 3, 10  | 250       | 1994            |
| 26    | So. Platte | Payne Gulch       | T7S, R73W, Sec. 25-26, 35-36   | 350       | 1994            |
| 27    | So. Platte | Dake-Hoosier      | T7S, R75W, Sec. 9, 16-17, 21-22  | 200       | 1995            |
| 28    | So. Platte | Bergen Rock       | T9S, R68W, Sec. 6  | 400       | 1996            |
| 29    | So. Platte | Shinglemill II    | T8S, R71W, Sec. 13-14, 24  | 500       | 1994            |

Planned timber sales per September, 1990 Pike and San Isabel NF 5 Year Timber Sale Action Plan

**NOTE:** The 5 Year Timber Sale Action Plan is subject to annual updates. Whenever post-leasing activity is proposed on lease parcels with merchantable size timber and/or acres suitable for timber production, the District Minerals Staff must coordinate with the District Forester and/or R2RIS Data Base Coordinator to determine if planned sales exist within the lease parcel, per the current 5 Year Timber Sale Action Plan at that time.



# NOTES

1 "Standard Lease Terms and Conditions" Sec.6. Conduct of Operation.

## PRODUCTION

The Parties hereby agree that the production of oil and gas from the land hereunder shall be subject to the provisions of this lease and the provisions of the lease shall apply to the production of oil and gas from the land hereunder.

The production of oil and gas from the land hereunder shall be subject to the provisions of this lease and the provisions of the lease shall apply to the production of oil and gas from the land hereunder.

The production of oil and gas from the land hereunder shall be subject to the provisions of this lease and the provisions of the lease shall apply to the production of oil and gas from the land hereunder.

The production of oil and gas from the land hereunder shall be subject to the provisions of this lease and the provisions of the lease shall apply to the production of oil and gas from the land hereunder.

## DEFINITIONS

The words and phrases used in this lease shall have the meanings herein assigned to them and shall not be construed to have any other meaning.

Unless otherwise specified, all words and phrases used in this lease shall have the meanings herein assigned to them.



## APPENDIX C

### REASONABLY FORESEEABLE ACTIVITY

#### INTRODUCTION

The Forest Service Rules and Regulations for Oil and Gas Leasing, 36 CFR 228.102 (c)(3), state that the Forest Service will *Project the type/amount of post-leasing activity that is reasonably foreseeable as a consequence of conducting a leasing program consistent with that described in the proposal and for each alternative.* In (c)(4) they further direct the Forest Service to *Analyze the reasonable foreseeable impacts of post-leasing activity projected under paragraph (c)(3) of this section.*<sup>1</sup>

This appendix deals with the development of reasonable foreseeable post-leasing activity. For the purposes of this document we will refer to this projected post-leasing development as Reasonably Foreseeable Development, or RFD. RFD is a projection based on historical and existing oil and gas activities, leasing patterns and industry interest, previous exploration, potential for fluid mineral occurrence, U.S. Geological Survey estimates, and professional judgment.<sup>2</sup>

The Bureau of Land Management staff is considered to be the experts in the oil and gas leasing program because they manage all federal subsurface minerals. The BLM, through interagency agreement has provided, or worked with Forest Service staff to develop, the RFD figures for the Unit. The Forest Service specialists took that information and extrapolated it to develop on the ground activities from which effects could be projected. The process for development of those activities is disclosed. Also included are the projected activities that are not related to oil and gas leasing and development that will allow for the disclosure of anticipated cumulative effects.

For analysis purposes we have identified a second RFD on the mountain districts of the Unit. The RFD provided to us by the BLM for the mountains was very dispersed and results in minimal impacts. In order to be able to disclose effects that would result if actual post-leasing activity were to occur in a more concentrated manner, or on more sensitive lands, a "Concentrated RFD" was created for use in the analysis. This Concentrated RFD will allow the Forest Supervisor to identify a range of anticipated effects to base a decision on and is further defined and explained later in this Appendix.

#### DETERMINATION OF RFD

The Colorado State BLM Office developed the RFD for the Pike and San Isabel National Forests and Comanche National Grasslands. A copy of their evaluation and projection is attached as Exhibit C-1 of this appendix. The Cimarron National Grassland is in the State of Kansas under jurisdiction of the Oklahoma BLM Office. RFD was developed by the Forest Service minerals staff on the Cimarron and approved by the BLM Oklahoma Office. The analysis and BLM concurrence are attached as Exhibit C-2.

Different RFD figures were developed for the Unit that reflect the different levels of anticipated development.

## RFD Well Numbers

The BLM provided RFD on the Pike and San Isabel National Forests is one well every four years over the next 15 years for a total of 4 wells.

The BLM provided RFD on the Comanche is a total of 3 wells per year over the next 15 years for a total of 45 wells.

The BLM approved RFD on the Cimarron is 11 wells per year over the next 15 years for a total of 165 wells.<sup>3</sup>

## Levels of Development

Oil and gas development consists of two levels of ground disturbing activity: exploration and production. Exploratory wells are drilled to try to find oil and gas minerals. Activities in support of exploratory drilling are generally temporary in nature with drilling completed, on average, within 3 weeks. Exploratory wells are often referred to as "wildcat" wells.

A wildcat well is a well drilled in unproved territory. Only by drilling a wildcat well will the oil company know if the subsurface area contains oil or gas. Nationally, about one in 16 wildcat wells produces significant amounts of oil or gas.<sup>4</sup>

A discovery well is a wildcat well that yields commercial quantities of oil or gas. When a discovery well becomes a producing well, additional development wells will be drilled to confirm the discovery, establish the extent of the field, and efficiently drain the reservoir. The procedures for drilling production wells are about the same as for wildcats.<sup>5</sup> The BLM identified the anticipated levels of development as follows:

**Table C-1**  
**Anticipated Levels of Development**

| Area               | Exploratory | Production |
|--------------------|-------------|------------|
| Mountains          | 100%        |            |
| Comanche Grassland | 42%         | 58%        |
| Cimarron Grassland | 19%         | 81%        |

## PROBABLE LOCATIONS OF DEVELOPMENT

The Forest Service conducted an evaluation of the potential for mineral resources as a part of the Forest Planning efforts. It identified the existence of locatable and leasable mineral deposits on the Unit. The "potential levels," determined as high, medium, and low, were based on current information and may change, depending on the mineral economy, technological advances, and further exploration. The potential maps were reviewed by the BLM for this analysis.

The potential was established based on the following:

**Table C-2  
Mineral Potential Levels**

| Potential Rating | Geology & Structure | Mineral Occurrence | Economic Value        | Activity Level |
|------------------|---------------------|--------------------|-----------------------|----------------|
| High             | favorable           | known              | valuable              | field activity |
| Moderate         | favorable           | known              | unknown or uneconomic | occasional     |
| Low              | unfavorable         | unknown            | uneconomic            | little or none |

Mapping of potential on the Mountains and the Grasslands are found in Appendix K of this EIS. Additional information on mineral occurrences, production, and geologic environment is found in the Mineral Potential Report for the Pike and San Isabel National Forests in Appendix H of the Forest Plan.

#### **RFD Drilling using Mineral Potential**

In order to assess the effects of RFD activities the Forest Service "placed" wells to use in the analysis. In this way the site specific effects of drilling and its associated developments could be analyzed. The BLM provided expertise to identify probable locations where the RFD wells might be drilled based on information from the RFD analysis, the potential maps, and current activity analysis.

The Forest Service identified actual RFD well sites, for analysis purposes, on the Mountain Districts because there were only 4 wells. These wells will be analyzed as if a Surface Use Plan of Operations had been received. The combined RFD on the Grasslands is over 200 wells so general areas where development is expected were identified. Wells are grouped based on the soil/ecosystem type they are expected to occur on.

#### **Mountains**

##### **Well Distribution**

The four RFD wells were placed on currently leased lands. Two of the wells are on lands with high mineral potential in the Rampart Range. One is located east of South Park on moderate potential lands. The fourth well is located on moderate potential lands in the northeastern section of the Wet Mountains.

A map of the Mountain well locations is displayed in Chapter II.

**Acres Disturbed**

|        |                                 |                  |
|--------|---------------------------------|------------------|
| Well 1 | Pad 4.13 + Roads 0.15 = 4.28 ac | = 4 ac disturbed |
| Well 2 | Pad 4.51 + Roads 0.82 = 5.33 ac | = 5 ac disturbed |
| Well 3 | Pad 3.41 + Roads 1.31 = 4.72 ac | = 5 ac disturbed |
| Well 4 | Pad 3.41 + Roads 0.16 = 3.57 ac | = 4 ac disturbed |

18 total disturbed acres

**Grasslands**

The Cimarron and Comanche are composed of 4 major landforms characterized by sandy lands, hard lands, canyon lands, and riparian areas. The distribution of these lands is as follows:

**Cimarron**

|              |     |
|--------------|-----|
| Sandy Lands  | 61% |
| Hard Lands   | 35% |
| Canyon Lands | 0%  |
| Riparian     | 4%  |

**Well Distribution**

**Table C-3  
Expected Well Distribution - NG's**

|                 | Major Soil/Ecosystem Type |            |          |
|-----------------|---------------------------|------------|----------|
|                 | Sandy Lands               | Hard Lands | Riparian |
| Number of wells | 101                       | 57         | 7        |

**Acres Disturbed.**

Statistical analysis indicates that 95% of the wells already existing on the Cimarron disturbed less than 2.39 acres and the average disturbance was 2.0 acres.<sup>6</sup> For the purpose of the analysis the team will use 2.39 acres disturbed per well on the Cimarron, total effects will be rounded to the nearest whole acre. The following table indicates the total acres disturbed by major soil/ecosystem type on the Cimarron:

**Table C-4  
Disturbed Acres - Cimarron NG**

|                 | Major Soil/Ecosystem Type |            |          |
|-----------------|---------------------------|------------|----------|
|                 | Sandy Lands               | Hard Lands | Riparian |
| Disturbed acres | 241                       | 136        | 17       |

**Comanche**

|              |     |
|--------------|-----|
| Sandy Soils  | 67% |
| Hard Soils   | 29% |
| Canyon Lands | 2%  |
| Riparian     | 2%  |

**Well Distribution**

**Table C-5  
Expected Well Distribution - Cimarron NG**

|                 | Major Soil/Ecosystem Type |            |              |          |
|-----------------|---------------------------|------------|--------------|----------|
|                 | Sandy Lands               | Hard Lands | Canyon Lands | Riparian |
| Number of wells | 30                        | 13         | 1            | 1        |

**Acres Disturbed**

Statistical analysis indicated that 95% of the wells already existing on the Comanche disturbed less than 1.81 acres and the average disturbance was 1.41 acres.<sup>7</sup> For the purpose of the analysis the team will use 1.81 acres disturbed per well on the Comanche, total effects will be rounded to the nearest whole acre. The following table indicates the total acres disturbed by major soil/ecosystem type on the Comanche:

**Table C-6  
Disturbed Acres - Comanche NG**

|                 | Major Soil/Ecosystem Type |            |              |          |
|-----------------|---------------------------|------------|--------------|----------|
|                 | Sandy Lands               | Hard Lands | Canyon Lands | Riparian |
| Disturbed acres | 54                        | 23         | 2            | 2        |

## **SITE DEVELOPMENT**

The RFD, to this point, has included only the number and types of wells and where they might be located. We must now describe what the wells will look like and what activities may be expected.

### **Access and Clearing**

For each well a road and pad must be cleared and developed. The road will vary based on location, length, topography, and resource protection needs. A well pad is generally 300 feet by 300 feet and will include a contained pond, or reserve pit. The pad is occupied by a drilling rig, walkways, storage facilities, and living quarters, if needed. Haul trucks may be used, or a well drilled to provide the water necessary for drilling.

In the study of historical activity on the Grasslands it was determined that the development needs for both exploratory and producing wells are very similar. A statistical analysis was completed that demonstrates that similarity.<sup>8</sup> Standard values for the clearing will be used on both the Cimarron and Comanche. Those values are 2.39 and 1.81 acres.

With no historical data on the Mountains, the well sites were located and road access identified by an engineer. The actual acres disturbed was calculated for each well.

### **Facilities**

#### ***Exploratory Well***

Once a site has been identified and a Surface Plan of Operations approved the location must then be prepared for the drilling rig. Land is leveled, earthen pits are excavated and lined with plastic to serve as reserve pits, the drilling rig is then brought in and "rigged up." A substructure, which supports the drilling mast is assembled. Stairways, walkways, guardrails, storage facilities, living quarters, and auxiliary equipment including a water well or water supply line is installed.

The primary drilling machine, mounted within the mast, is the rotary rig. Rotary drilling involves rotating the drill bit, which is attached to a long string of drill pipe. Most rotary drill rigs utilize a fluid circulating system. The fluid, called "drilling mud", is pumped down the inside of the drill pipe and out through the bit at the bottom of the hole. The drilling mud carries the fragments of broken rock back to the surface.

#### ***Production***

If the "wildcat" well accesses oil or gas resources then a lessee is likely to ask for the improvements necessary to develop the field. The level of development that would occur cannot be accurately predicted. However, a standard level of development is described below.

The time needed to drill a production well to a total depth of 4,200 feet would normally be one to three weeks. The greatest amount of human, vehicular, and equipment activity and accompanying noise, etc., would occur during drilling activities.



## **Gas**

Surface facilities would include the drill rig, mud pumps, reserve pit, generators, pipe racks and tool house. Natural gas appears to be the most likely product that would come from wells in the analysis area. Once the well was drilled the surface area required for a flowing gas well is usually a 20' by 20' fenced area together with an access road and turnaround area. A "Christmas tree" to control gas flow, metering and treatment facilities, and compressor equipment would be installed on the well.

In some instances water in association with the gas may enter the well and choke off the gas flow. A pump would then be needed to remove the column of water, and would be installed on the existing site. Flowlines are installed to transport the gas from the wellhead to a collector pipeline system which would carry the gas to the gas plant. An electrical system is needed to supply electricity to the facilities. Flowlines, collector lines and powerline cables are buried, whenever possible, within the roadways to minimize surface disturbance.

## **Oil**

Development of an oil producer is very similar to the natural gas producer described. Oil wells, at some time during production, will have a pump and the surface facilities would include storage tanks for the oil. Additional traffic would occur to drain the storage tanks and remove the oil by truck.

### **MAINTENANCE & OPERATIONS**

During production little activity would occur at the well site except for periodic maintenance and daily to weekly visits to assure the well is operating properly. The maintenance traffic is pickup unless service with a workover rig is needed.

Normal operations for oil wells include transport by truck on a daily to monthly basis, depending on production rates. Pipeline (oil or saltwater) leaks or spills may occur at unpredictable intervals on the Mountains. All disturbed areas will be reclaimed to Forest Service standards. The estimated life of a typical field, is 15 to 25 years.

### **ABANDONMENT & RECLAMATION**

Wells are plugged and abandoned upon depletion of the resource. Truck mounted equipment is used to plug formerly producing wells, all surface equipment is removed, and the site is restored. Specific plugging and abandonment requirements vary based on the rock formations, subsurface water conditions, and the specific well site.

The surface will be reshaped to allow revegetation and restore the landform as near as possible to its original contour. Stockpiled topsoil will be replaced and the site will be revegetated. Fencing may be provided to insure the revegetation is successful.

Reclamation activities will occur within one growing season of disturbance on abandoned wells, roads and 50 percent of each production well pad. Reclamation success will likely vary by soil type.

Roads on the Mountains developed for exploration or production will be closed to public use.

### **Abandonment Rates**

For analysis purposes the following abandonment rates will be used.

|                       |   |
|-----------------------|---|
| Mountains             | All wells are exploratory and will be abandoned within one year of drilling   |
| Cimarron and Comanche | Exploratory wells will be abandoned within one year of drilling. Abandonment of producers will be in the 20th year after drilling |

### **Reclamation Rates**

All reclamation activities will be completed within five years of initiation. Exploratory wells will be fully reclaimed as soon as they are abandoned.

Production wells are reclaimed in stages. Once the well is in a maintenance stage the improvements needed for drilling are removed and the available areas of the pad are reclaimed. This averages out to approximately 50% of the pad acres disturbed for development. Once production is completed and the well is abandoned the rest of the pad, and the road segments accessing it, are reclaimed.

The following information was developed in the specialist report for vegetation. Computations can be found there.

#### ***Production Well Reclamation***

##### ***Cimarron***

The pad size to be used in the analysis on the Cimarron is 1.97 acres. When the well goes to a maintenance stage .99 acres will be reclaimed immediately. The remaining .99 acre pad and .42 acre road will not be reclaimed until the well is abandoned.

##### ***Comanche***

The pad size to be used in the analysis on the Comanche is 1.49 acres. When the well goes to a maintenance stage .75 acres will be reclaimed immediately. The remaining .75 acre pad and .32 acre road will not be reclaimed until the well is abandoned.

#### ***Anticipated Reclamation***

##### ***Mountains***

The first 3 wells and roads drilled would be reclaimed at the end of the planning period. The last well would not because, based on BLM RFD, it would not be drilled until late in the planning period. For analysis purposes we will use well 4 as the unreclaimed well.

**Table C-7  
Anticipated Reclamation - Mountains**

| Well         | Acres     |                    |           |                      |
|--------------|-----------|--------------------|-----------|----------------------|
|              | Disturbed | Reclaimed<br>Alt 4 |           | Unreclaimed<br>Alt 4 |
| 1            | 4         | 4                  | 4         | 0 0                  |
| 2            | 5         | 5                  | 5         | 0 0                  |
| 3            | 5         | 5                  | 5         | 0 0                  |
| 4            | 4         | 0                  | 4         | 4 0                  |
| <b>Total</b> | <b>18</b> | <b>14</b>          | <b>18</b> | <b>4 0</b>           |

**Grasslands**

**Cimarron**

RFD Wells by major soil/ecosystem type:

**Table C-8  
RFD Wells by Soil/Ecosystem - Cimarron NG**

| Soil/Ecotype | Number of Wells |             |            |
|--------------|-----------------|-------------|------------|
|              | Total           | Exploratory | Production |
| Sandy Lands  | 101             | 19          | 82         |
| Hard Lands   | 57              | 11          | 46         |
| Riparian     | 7               | 1           | 6          |

**Abandonment and reclamation for RFD**

For each dry well 2.39 acres will be disturbed and reclaimed.

For each producing well .99 acres will be reclaimed within 5 years of development.

Unreclaimed acres will remain at the end of the planning period. The following identifies the amount of reclaimed and unreclaimed acres, by soil/ecotype, at the end of the planning period:

**Table C-9  
Reclamation Figures - Cimarron NG**

| Soil/Ecotype | Acres      |            |             |
|--------------|------------|------------|-------------|
|              | Disturbed  | Reclaimed  | Unreclaimed |
| Sandy Lands  | 241        | 84         | 157         |
| Hard Lands   | 136        | 48         | 88          |
| Riparian     | 17         | 6          | 11          |
| <b>Total</b> | <b>394</b> | <b>138</b> | <b>256</b>  |

**Comanche**

**Table C-10  
RFD Wells by Soil/Ecosystem - Comanche NG**

| Soil/Ecotype | Number of Wells |             |            |
|--------------|-----------------|-------------|------------|
|              | Total           | Exploratory | Production |
| Sandy Lands  | 30              | 6           | 24         |
| Hard Lands   | 13              | 3           | 10         |
| Canyon Lands | 1               | 0           | 1          |
| Riparian     | 1               | 0           | 1          |

**Abandonment and Reclamation for RFD**

For each dry well 1.81 acres will be disturbed and reclaimed.

For each producing well .75 acres will be reclaimed within 5 years of development.

Unreclaimed acres will remain at the end of the planning period. The following identifies the amount of reclaimed and unreclaimed acres, by soil/ecotype, at the end of the planning period:

**Table C-11  
Reclamation Figures - Comanche NG**

| Soil/Ecotype | Acres     |           |             |
|--------------|-----------|-----------|-------------|
|              | Disturbed | Reclaimed | Unreclaimed |
| Sandy Lands  | 54        | 24        | 30          |
| Hard Lands   | 23        | 11        | 12          |
| Canyon Lands | 2         | 1         | 1           |
| Riparian     | 2         | 2         | 1           |
| <b>Total</b> | <b>81</b> | <b>37</b> | <b>44</b>   |

**CONCENTRATED RFD**

The Forest Service interdisciplinary team developed a "Concentrated RFD" for the Mountains. The rate and level of activity is the same as provided by the BLM but the locations have been concentrated to increase the possible effects. The low level of the BLM provided RFD and potential effects were considered to be extremely limited. The team relocated the four RFD wells to locations that they felt, based on professional judgement, would be most sensitive, in order to analyze their effects. This will provide a range of possible effects from the post-leasing activity. These wells are identified on a map found in Chapter II.

**Table C-12  
Concentrated RFD Well Locations**

| Well No. | Legal Description       |
|----------|-------------------------|
| 1R       | T9S, R69W, Sec 22, NWNW |
| 2R       | T9S, R69W, Sec 22, SWNW |
| 3R       | T9S, R69W, Sec 23, NWSE |
| 4R       | T9S, R69W, Sec 26, NWSW |

**Acres Disturbed**

The acres disturbed by these wells was determined in the same manner as for the BLM provided RFD wells. The acres disturbed is as follows:

|         |                                       |                    |
|---------|---------------------------------------|--------------------|
| Well 1C | Pad 5.50 + Roads 7.07 = 12.57 acres = | 13 acres disturbed |
| Well 2C | Pad 5.50 + Roads 5.71 = 11.21 acres = | 11 acres disturbed |
| Well 3C | Pad 8.34 + Roads 2.29 = 10.63 acres = | 11 acres disturbed |
| Well 4C | Pad 8.34 + Roads 0.89 = 9.23 acres =  | 9 acres disturbed  |

44 total acres

**Table C-13  
Reclamation of Concentrated RFD**

| Well  | Acres     |           |             |
|-------|-----------|-----------|-------------|
|       | Disturbed | Reclaimed | Unreclaimed |
| 1R    | 13        | 0         | 13          |
| 2R    | 11        | 0         | 11          |
| 3R    | 11        | 0         | 11          |
| 4R    | 9         | 0         | 9           |
| Total | 44        | 0         | 44          |

Analysis of the soils and vegetation on the Concentrated RFD wells indicate that none of the well sites would be reclaimed at the end of the planning period.

**EFFECTS OF ALTERNATIVES ON RFD**

The actual number of RFD wells projected on the entire unit are not affected by the alternatives because the amount of available acres is not limiting. Under the No Leasing Alternative, Alternative IV, there will be no impacts to currently unleased lands, but impacts will occur from development on existing leases. The substantial number of currently leased acres provides an adequate land base to allow for the anticipated development.

The alternatives will, however, affect the distribution of the wells and their potential effects. Several well locations have stipulations that apply under some alternatives that will not allow occupancy on the original site. These wells have been relocated, by the specialists based on the identified stipulations, to the nearest location that can be occupied. The following table briefly displays the effects of alternatives on the well locations:

**Table C-14  
Effects of Alternatives - Mountains**

| Alternative | Number of Wells Relocated by Alternative |                  |
|-------------|--|------------------|
|             | BLM RFD                                  | Concentrated RFD |
| I           | 9  | 13               |
| II          | 0  | 0                |
| III         | 9  | 13               |
| IV          | 0  | 0                |

The Mountain Concentrated RFD wells are relocated as are the Grassland RFD wells originally located in riparian and canyon land ecosystems. Alternatives I and III require special stipulations that move wells from sensitive resource areas.

## Mountains

The Mountain RFD wells, jointly developed with the BLM, do not need to be moved by any of the alternatives. Stipulations that apply in Alternatives I and III do not prevent occupancy of the well site. All of the concentrated RFD well locations have stipulations that apply under some alternatives that will not allow occupancy on the original site. These wells have been relocated to the nearest location that can be occupied. That location is mapped in Chapter II.

### **Relocated Concentrated RFD**

The locations of the relocated concentrated RFD wells can be found on a map in Chapter II. Legal descriptions of relocated concentrated RFD wells are as follows:

**Table C-15  
Locations of Relocated Concentrated RFD Wells**

| Well No. | Legal Description       |
|----------|-------------------------|
| 1R       | T9S, R69W, Sec 21, SWSE |
| 2R       | T9S, R69W, Sec 22, NESW |
| 3R       | T9S, R69W, Sec 14, SWSE |
| 4R       | T9S, R69W, Sec 26, SWSE |

### **Acres Disturbed**

|         |                                 |                  |
|---------|---------------------------------|------------------|
| Well 1R | Pad 6.64 + Roads 1.31 = 7.95 ac | = 8 ac disturbed |
| Well 2R | Pad 3.97 + Roads 4.92 = 8.89 ac | = 9 ac disturbed |
| Well 3R | Pad 4.91 + Roads 2.61 = 7.52 ac | = 8 ac disturbed |
| Well 4R | Pad 3.39 + Roads 0.44 = 3.83 ac | = 4 ac disturbed |

29 total disturbed acres

This relocation, required by stipulations in Alternatives I and III, results in 15 acres less disturbance than Alternatives II and IV for the Mountain concentrated RFD.

**Table C-16  
Reclamation Figures - Mountains**

| Well         | Acres     |           |             |
|--------------|-----------|-----------|-------------|
|              | Disturbed | Reclaimed | Unreclaimed |
| 1R           | 8         | 8         | 0           |
| 2R           | 9         | 9         | 0           |
| 3R           | 8         | 8         | 0           |
| 4R           | 4         | 0         | 4           |
| <b>Total</b> | <b>29</b> | <b>25</b> | <b>4</b>    |

Again, three of the four wells drilled would be reclaimed at the end of the planning period. For analysis purposes we will use well 4R as the unreclaimed well.

**Grasslands**

**Acres Disturbed**

In alternatives I and III all wells in the Riparian and Canyon Lands on the Grasslands have to be moved. On the Comanche this results in an increase of two wells on the hard lands. On the Cimarron it results in an increase of six wells on sandy lands and one well on hard lands. The resultant Acres Disturbed is as follows:

**Table C-17  
Acres Disturbed - GL's**

| Disturbed Acres | Major Soil/Ecosystem Type |            |              |          |
|-----------------|---------------------------|------------|--------------|----------|
|                 | Sandy Lands               | Hard Lands | Canyon Lands | Riparian |
| Cimarron        | 256                       | 138        | 0            | 0        |
| Comanche        | 54                        | 27         | 0            | 0        |

This reflects an increase of 15 acres of disturbed sandy lands, 6 acres of disturbed hard lands; and a reduction of 19 acres of disturbed riparian, and 2 acres of disturbed canyon lands.

**Reclamation**

The following figures were developed in the same manner as reclamation for the RFD wells.

**Cimarron**

**Table C-18  
RFD Wells by Soil/Ecotype - Cimarron NG**

| Soil/Ecotype | Number of Wells |             |            |
|--------------|-----------------|-------------|------------|
|              | Total           | Exploratory | Production |
| Sandy Lands  | 107             | 20          | 87         |
| Hard Lands   | 58              | 11          | 47         |



**Table C-19  
Reclamation Figures - Cimarron NG**

| Soil/Ecotype | Acres      |            |             |
|--------------|------------|------------|-------------|
|              | Disturbed  | Reclaimed  | Unreclaimed |
| Sandy Lands  | 256        | 90         | 166         |
| Hard Lands   | 138        | 48         | 90          |
| <b>Total</b> | <b>394</b> | <b>138</b> | <b>256</b>  |

**Comanche**

**Table C-20  
RFD Wells by Soil/Ecotype - Comanche NG**

| Soil/Ecotype | Number of Wells |             |            |
|--------------|-----------------|-------------|------------|
|              | Total           | Exploratory | Production |
| Sandy Lands  | 30              | 13          | 17         |
| Hard Lands   | 15              | 6           | 9          |

**Table C-21  
Reclamation Figures - Comanche NG**

| Soil/Ecotype | Acres     |           |             |
|--------------|-----------|-----------|-------------|
|              | Disturbed | Reclaimed | Unreclaimed |
| Sandy Lands  | 54        | 24        | 30          |
| Hard Lands   | 27        | 13        | 14          |
| <b>Total</b> | <b>81</b> | <b>37</b> | <b>44</b>   |

## **CUMULATIVE EFFECTS**

### **Oil and Gas Post-Leasing Activity**

#### ***Foreseeable Activity Relating to Existing Wells***

The analysis must include an analysis of cumulative effects. In order to do that some trends must be identified for the oil and gas development activities which are already underway within the planning area. The BLM provided RFD incorporates current leasing activity but does not deal with what is likely to happen to already existing wells. The following identifies the level of activity, disturbance, and abandonment that can be expected during the planning period.

#### ***Existing Well Disturbance***

##### **Mountains - None**

##### **Comanche**

26 wells with 19 total unreclaimed acres:

26 wells x 1.06 unreclaimed acre/well pad = 28 unreclaimed acres

Total unreclaimed acres by major soil/ecosystem type (all alternatives):

|              |                                       |
|--------------|---------------------------------------|
| Sandy Lands: | 19 acres (67% x 28 unreclaimed acres) |
| Hard Lands:  | 9 acres (33% x 28 unreclaimed acres)  |
| Total        | 28 acres                              |

##### **Cimarron**

280 wells with 392 total unreclaimed acres:

280 wells x 1.40 unreclaimed acre/well pad = 392 unreclaimed acres

Total unreclaimed acres by major soil/ecosystem type (all alternatives):

|              |   |
|--------------|---|
| Sandy Lands: | 255 acres (65% x 392 unreclaimed acres) |
| Hard Lands:  | 137 acres (35% x 392 unreclaimed acres) |
| Total        | 392 acres                               |

#### **Foreseeable Non-Oil and Gas Activities**

This section will concentrate on the other types of activities, and their locations, occurring within the planning area during the planning period. In this way we will disclose the cumulative effects of post-leasing and other management activities combined with anticipated natural occurrences. These activities will not vary by leasing alternative.

Primary activities considered for this analysis include:

Mountains - Timber sales, prescribed fires and past wildfires in the same watersheds as RFD wells.

Grasslands - Prescribed fires and wildfires on sandy soils that require rehabilitation.

All necessary reclamation activities will be completed within 5 years of disturbance.

### **BLM RFD**

#### **Mountains**

##### **Timber Sales and Prescribed Fires:**

There are no past, current or foreseeable future timber sales or prescribed burns in the same watersheds as the BLM RFD wells.

##### **Disturbed Acres**

###### **Wildfires:**

Berry Fire in 1989 affected a total of 1,000 acres near Well 3 (Monument Work Center), including 600 acres of ponderosa pine and 100 acres of Gambel oak.

##### **Reclamation Acres**

1,000 acres will be reclaimed early in the planning period.

#### **Comanche**

##### **Disturbed Acres**

###### **Prescribed Fire**

3,000 acres affected by prescribed fire. 200 acres per year are planned on hard lands.

##### **Reclamation Acres**

2,000 acres will be reclaimed during the planning period. The 1,000 acres to be burned in years 11 through 15 will not be reclaimed (recovered) until after the planning period.

1,000 acres will be unreclaimed at the end of the planning period.

#### **Cimarron**

##### **Disturbed Acres**

###### **Wildfires on sandy lands**

1,500 acres will be disturbed during the planning period (100 acres/year).

###### **Prescribed fire**

6,000 acres will be disturbed during the planning period (400 acres/year) on the following major soil types:

|              |             |
|--------------|-------------|
| Sandy Lands: | 3,000 acres |
| Hard Lands:  | 3,000 acres |
| Total        | 6,000 acres |

**Reclamation Acres**

**Wildfires on sandy lands**

1,000 acres will be reclaimed during the planning period. The 500 acres to be burned in years 11 through 15 will not be reclaimed until after the planning period.

500 acres will be unreclaimed at the end of the planning period.

**Prescribed fire**

4,000 acres will be reclaimed during the planning period.

|              |                       |
|--------------|-----------------------|
| Sandy Lands: | 2,000 acres           |
| Hard Lands:  | 2,000 acres           |
| Total        | 4,000 acres reclaimed |

The 2,000 acres to be burned in years 11 through 15 will not be reclaimed (recovered) until after the planning period.

|              |                         |
|--------------|-------------------------|
| Sandy Lands: | 1,000 acres             |
| Hard Lands:  | 1,000 acres             |
| Total        | 2,000 acres unreclaimed |

**Concentrated RFD**

**Mountains**

**Disturbed Acres**

**Timber Sales**

Past timber sales: None

Current timber sale:

150 acres disturbed, to be disturbed as follows:

- 25 total disturbed acres for specified road
- 20 total disturbed acres for clearcut
- 105 acres affected by partial cut (2-step shelterwood)
- 150 total acres

Planned timber sale:

400 acres to be disturbed as follows:

- 25 total disturbed acres for specified road

25 total disturbed acres for clearcut  
 350 acres affected by partial cut  
 (2-step shelterwood, commercial thinning)  
 400 total acres

**Reclamation Acres**

Current timber sale:

20 acre clearcut will be reforested early in the planning period.  
 105 acre partial cut will have skid trails and temporary roads reclaimed early in the planning period.

Planned timber sale:

25 acre clearcut will be reforested late in the planning period.  
 350 acre partial cut will have skid trails and temporary roads reclaimed late in the planning period.

Specified roads will not be reclaimed.

**CUMULATIVE EFFECTS OF ALL ACTIVITIES**

**BLM RFD**

**Table C-22  
 Total Affected Acres - Mountains**

| Well Location | Acres     |           |             |
|---------------|-----------|-----------|-------------|
|               | Disturbed | Reclaimed | Unreclaimed |
| 1             | 4         | 4         | 0           |
| 2             | 5         | 5         | 0           |
| 3             | 5         | 5         | 0           |
| 4             | 1004      | 1000      | 4           |
| Total         | 1018      | 1014      | 4           |

**Table C-23  
Total Affected Acres - Comanche NG**

| Soil/Ecotype  | Acres       |             |             |
|---------------|-------------|-------------|-------------|
|               | Disturbed   | Reclaimed   | Unreclaimed |
| Sandy Lands   | 73          | 34          | 39          |
| Hard Lands    | 3032        | 2015        | 1017        |
| Canyon Lands  | 2           | 1           | 1           |
| Riparian      | 2           | 1           | 1           |
| <b>Totals</b> | <b>3109</b> | <b>2051</b> | <b>1058</b> |

**Table C-24  
Total Affected Acres - Cimarron NG**

| Soil/Ecotype  | Acres       |             |             |
|---------------|-------------|-------------|-------------|
|               | Disturbed   | Reclaimed   | Unreclaimed |
| Sandy Lands   | 4996        | 3113        | 1883        |
| Hard Lands    | 3273        | 2063        | 1210        |
| Riparian      | 17          | 6           | 11          |
| <b>Totals</b> | <b>8286</b> | <b>5182</b> | <b>3104</b> |

**Concentrated RFD**

**Table C-25  
Total Affected Acres - Mountains**

| Well               | Acres     |           |             |
|--------------------|-----------|-----------|-------------|
|                    | Disturbed | Reclaimed | Unreclaimed |
| 1C-4C <sup>1</sup> | 594       | 500       | 94          |
| 1R-4R <sup>2</sup> | 579       | 525       | 54          |

<sup>1</sup>Applies to Alternatives II and IV.

<sup>2</sup>Applies to Alternatives I and III.

Supporting calculations for disturbed, reclaimed and unreclaimed acres can be found in Appendix F to the Vegetation Resource Report.

REASONABLE FORESEEABLE DEVELOPMENT ACTIVITY  
WITHIN THE  
PIKE AND SAN ISABEL NATIONAL FOREST  
AND THE  
COMANCHE NATIONAL GRASSLAND

INTRODUCTION

Forest lands administered by the Pike and San Isabel National Forest (PSINF) are situated within parts of the Denver basin, Park basins, Uinta-Piceance-Eagle basins, Albuquerque-Santa Fe-San Luis Rift basins, Raton basin-Sierra Grande uplift, Las Animas arch, and Anadarko basin U. S. Geological Survey petroleum resource assessment provinces. Of those seven, only the Anadarko basin province contains PSINF administered lands that have high potential for the occurrence and development of oil and gas, while the Park basins, Las Animas arch, and Raton basin-Sierra Grande uplift provinces contain a moderate potential for occurrence and development.

The Anadarko basin province is the only province that contains producing oil and gas wells on PSINF lands. The eastern portion of the Comanche National Grasslands (CNG) lies adjacent to the western margin of the Greenwood Topeka trend (Beams, 1982). The trend is named for the Greenwood field and its primary gas producer, the Pennsylvanian Topeka Formation. Several small oil and gas fields are located within the boundaries of the grasslands.

Oil and Gas Activity

Historical Background

A review of the historical and active well database (Hotline, 1991) failed to identify any exploratory oil and gas drilling on either the Pike or San Isabel national forests. There was one stratigraphic test drilled within the Pike National Forest by Shell Oil Company during 1955 in the NW1/4NW1/4, Section 32, T. 11 S., R. 67 W. with a total depth of 569 feet.

Oil and gas exploration and development within the CNG has been predominately within Baca County. Otero and Las Animas counties have had minor exploratory drilling with no discoveries reported. Eleven wells have been drilled and completed as dry holes in Otero County, including one well completed on CNG. No shows were reported. Drilling activity in the Las Animas County portion of the CNG has been slight. Six wells were drilled and completed as dry holes with no shows reported. Of those six, two were drilled on CNG. The last well drilled within the boundary of the CNG in Las Animas County was in 1975.

A total of 117 wells were reported drilled in the Baca County portion of the CNG. Of those, approximately 34 percent (%) or 43 wells were reported as completed for production. Wells drilled on

CNG in Baca county accounts for 57 or 49 % of the 117 wells, while only 28 % of the 200 wells drilled in Baca County for the same period. Figure 1 illustrates drilling activity for Baca County for the period 1950 through 1990 and shows that drilling averaged approximately five wells per year.

There are six formally designated oil and gas fields that occur either wholly or partly within the CNG: 1.) Vilas, 2.) Flank Northwest, 3.) Prairie Dog, 4.) Campo, 5.) Rooster, and 6.) Fortuna. Of the six the Vilas, Prairie Dog, and Campo contain wells that were drilled on federal lands. Field status, reservoir(s), and production history are illustrated in Table 1.

### Present Activity

The only field being actively developed and produce on PSINF managed lands is the Campo field. At present the field has 24 wells capable of production and one P&A's oil well, of which 4 oil wells, one water disposal well, and the P&A'd well are located on federal lands. Oxy U. S. A., Inc. reached total depth in their Comanche Federal B #1 well in the Lansing Formation on February 6, 1991, selectively perforated the Lansing, and at last report was preparing to test the well for production. The Lansing reservoir of the Campo field is an anticlinal trap with well defined oil/water contact and is therefore of limited size.

A remote wildcat is being planned by Murfin Drilling company for the CNG in Otero County (Western Oil World, 1991). The well location is reported to be in NE<sup>1/4</sup> SE<sup>1/4</sup>, Section 8, T. 25 S., R. 54 W., and is scheduled to be drilled to a depth of approximately 6,100 feet to test the Pennsylvanian Morrow Formation (Dwights, 1991).

### Reasonable Foreseeable Development Activity (RFD)

The RFD will be discussed for the Pike and San Isabel National Forests and the Comanche National Grasslands. To date the only production from the CNG has been from the Pennsylvanian Topeka, Lansing, Kansas City, Marmaton, and Cherokee formations. Any drilling activity outside of the high potential area or Pennsylvanian play in Baca County is expected to be exploratory and concentrated in the moderate potential areas, such as Las Animas and Otero counties, as well as along the easter margin of South Park basin.

Drilling activity projections are based on historical trends for the Baca County portion of the CNG and drilling frequency, or lack of, for the remainder of the PSINF. Descriptive statistics, linear least squared regression, and trend analysis were conducted for Baca County for the period or 1950 to 1990, and represents the period of time of exploratory and development drilling to delineate all of the oil and gas fields in the county. The results of these analyses are illustrated in Figure 2, which compares the drilling history with a linear regression plot, and the forecast that was



# NUMBER OF WELLS DRILLED

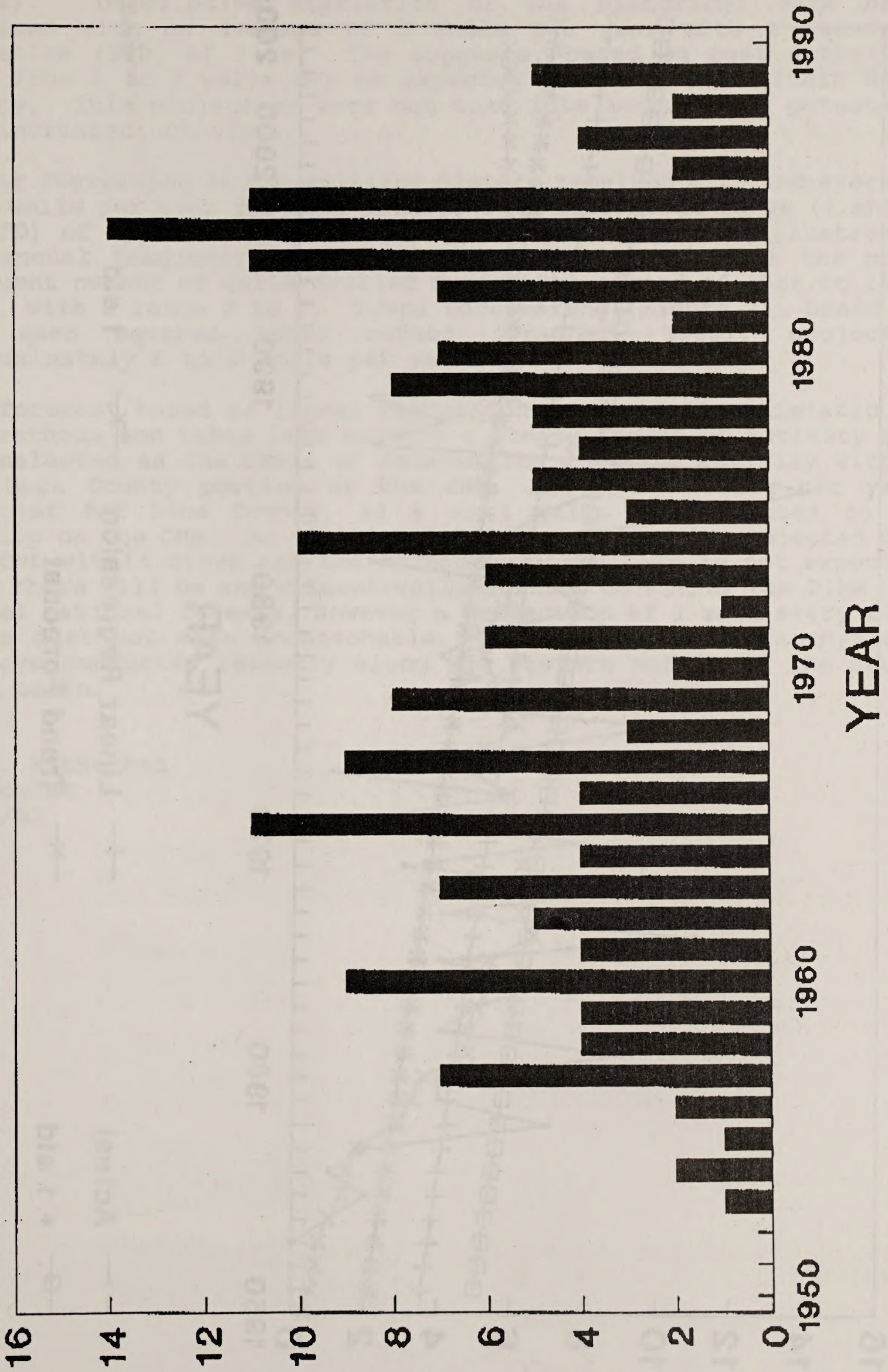


Figure 1. Drilling history-Baca County.

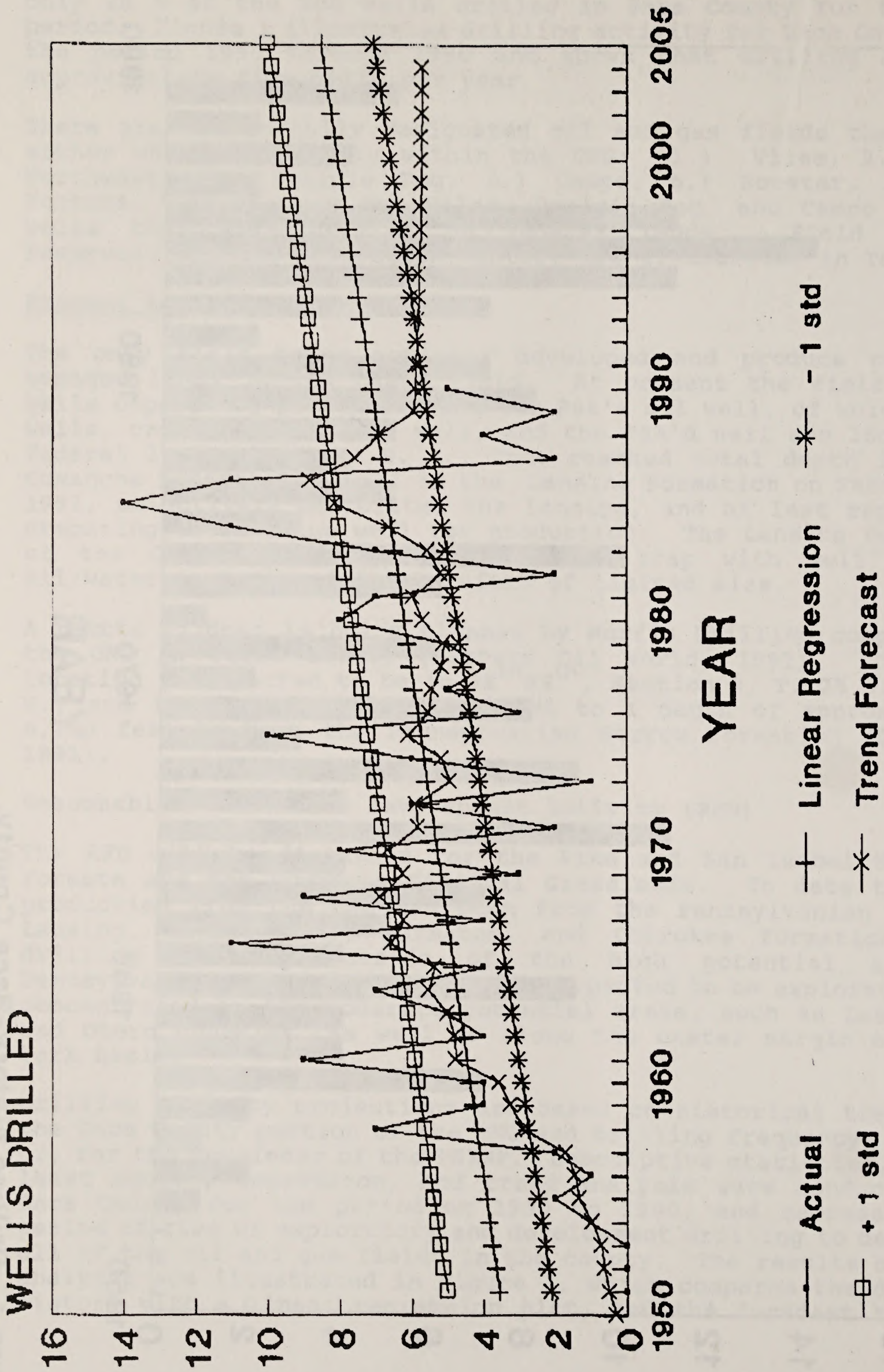


Figure 2. Drilling activity forecast.

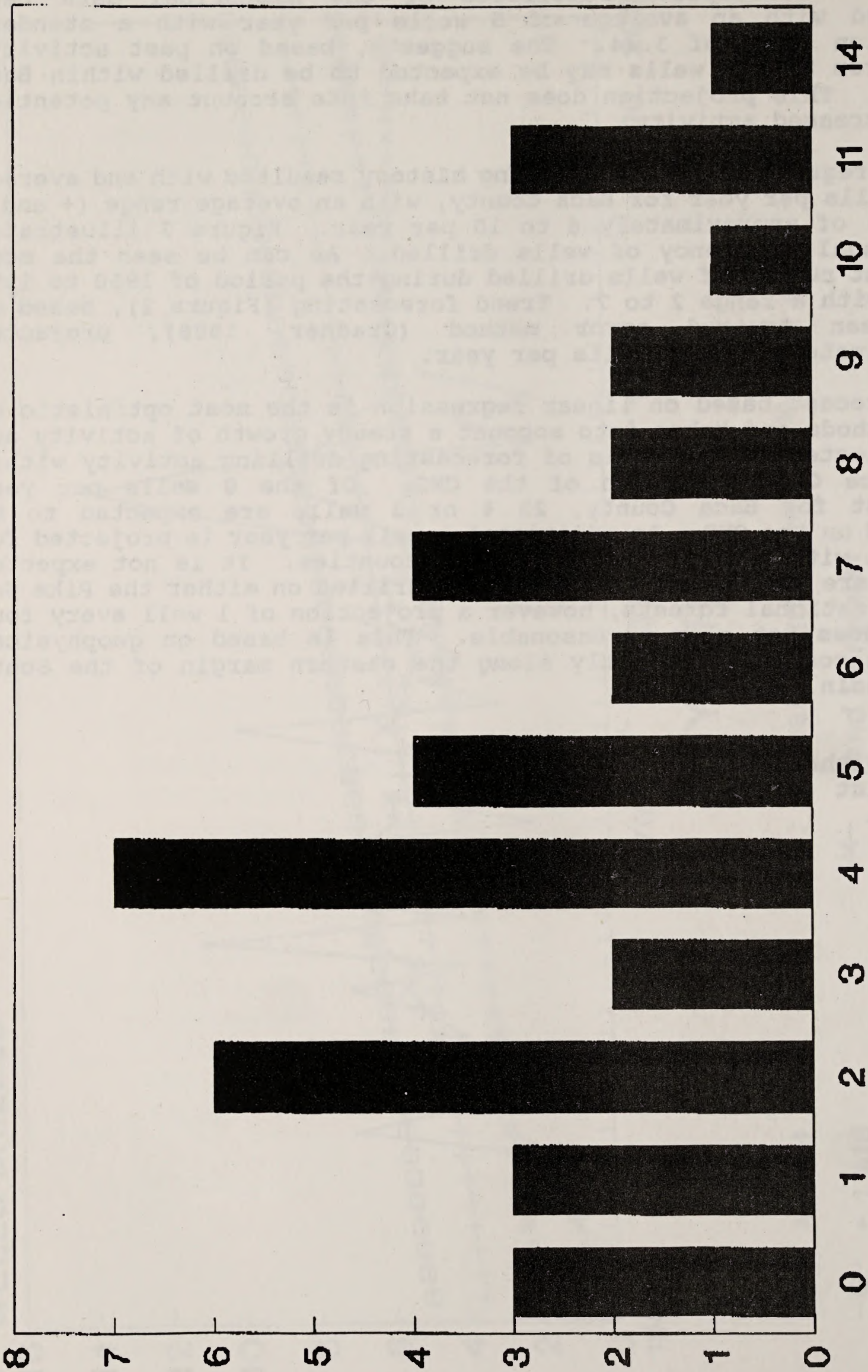
developed using a trend comparison model described by Gradner (1988). Descriptive statistics of the historical data base resulted with an average of 5 wells per year with a standard deviation (STD) of 3.44. This suggests, based on past activity, that from 2 to 8 wells may be expected to be drilled within Baca County. This projection does not take into account any potential for increased activity.

Linear regression of the drilling history resulted with an average of 8 wells per year for Baca County, with an average range (+ and - 1 STD) of approximately 6 to 10 per year. Figure 3 illustrates the annual frequency of wells drilled. As can be seen the most frequent number of wells drilled during the period of 1950 to 1990 is 4, with a range 2 to 7. Trend forecasting (Figure 2), based on the mean squared error method (Gradner, 1988), projected approximately 5 to 6 wells per year.

The forecast based on linear regression is the most optimistic of the methods and takes into account a steady growth of activity and was selected as the basis of forecasting drilling activity within the Baca County portion of the CNG. Of the 8 wells per year forecast for Baca County, 23 % or 2 wells are expected to be drilled on the CNG. An additional 1 well per year is projected for the CNL within Otero and Las Animas counties. It is not expected that there will be any wildcat wells drilled on either the Pike San Isabel national forests, however a projection of 1 well every four years does not seem unreasonable. This is based on geophysical surveys conducted recently along the eastern margin of the South Park basin.

K. G. Witherbee  
Geologist  
4/26/91

NUMBER OF YEARS



WELLS DRILLED

Figure 3. Frequency graph-Baca County.

## REFERENCES CITED

- Beams, R. J., 1982, Greenwood Topeka Trend, in, Oil and Gas Fields of Colorado-Nebraska and Adjacent Areas: Rocky Mountain Association of Geologists, p. 217-219.
- Gardner, E. S., Forecasting with exponential trends: Lotus, V. 4, No. 3, p. 27-30.
- Dwights, 1991, Action Line: Dwights/A SoftSearch Co., V. 91, No. 16, p. 2.
- Western Oil World, 1991, Activity Highlights: V. 48, No. 4, p. 36.



Exhibit C-2  
Analysis and BLM Concurrence

United States  
Department of  
Agriculture

Forest  
Service

Cimarron National  
Grassland

P.O. Box J  
242 Highway 56 E.  
Elkhart, KS 67950

Reply to: 2820

Date: March 1, 1991

Subject: Reasonably Foreseeable Development  
Analysis Assumptions, Cimarron National Grassland

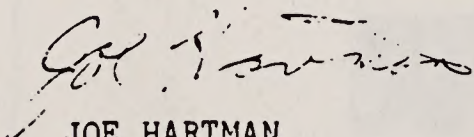
To: Forest Supervisor

The first well drilling venture in Morton County occurred in 1929. This site was located in the SE 1/4 of Section 22-T34S-R43W (currently Cimarron National Grassland surface) it was a dry hole. First production occurred on April 2, 1930. There were very few wells drilled on surfaces currently administered by the Cimarron National Grasslands until the 1950's; based on conversations with long time industry representatives, local citizens and historical accounts stated within "Cornerstone of Kansas" Morton County's Historical book (pages attached).

Based on the Cimarron District's well inventory files, there have been approximately 450 oil and gas wells drilled on grassland surface. As previously stated very few wells (estimate 20 wells) were drilled prior to 1950. Subsequently, approximately 430 wells were drilled from 1950 through 1990 on the Cimarron National Grassland.

This represents a 40 year time period and an average of eleven (11) wells drilled per year. The eleven (11) well average, establishes a good analysis trend, reflecting the mini boom/bust periods, the energy industry has incurred over a forty year period of time during varying economical and political situations.

Utilizing the eleven well average, there would be approximately 165 wells drilled on the Cimarron National Grassland within the next 15 years.

  
JOE HARTMAN  
District Ranger

RJB:db



Caring for the Land and Serving People



**MEMBERS OF THE STATE LINE CLUB . . . Shown In 1950 at a birthday party (left to right) Rachel Lawless, Marie Roberts, Ella Ebenhaus, Mrs. William Zimmert, Helen McCormick, Mrs. Ben Linder, Leona Hardwick, Bessie Shrauner, Josephine Randolph, Myrtle Munyon, Mrs. Derrington (Mildred Sweet's mother), Ada Gore and Lenora Ferguson.**

### MORTON COUNTY OIL BOOMS

*By Bob Posey*

*Certified Petroleum Geologist — No. 2808*

What was the biggest factor contributing to the change in economic conditions of Morton County?

Everyone would agree that it was the discovery of oil and gas. Approximately 54 years ago, Fred Casper and Jim Heinz worked out one of the first drilling deals for Morton County in the SE/4 Sec. 22-34s-43w, about 4 miles west and 4 miles north of Elkhart.

About that same time John Brown, with the help of Cleal Winters, an experienced oil man from Wichita, leased thousands of acres of land for oil and gas in eastern Colorado and Morton County. Mr. Brown turned the greater part of these leases to the Argus Gas Company, Hugoton, Kansas.

That venture in 1929, just might have changed the whole economic picture of the area a quarter of a century earlier had the promoters come a mile farther west or gone 1,000 feet deeper. Drilling stopped 3,500 feet.

It was dry. But, the most fanciful dreams of these pre-depression era drillers certainly never conjured up anything to compare with what has happened in the county. The 1929 location northwest of Elkhart today is within sight of the Interstate oil field which was opened up in 1954.

The first commercial production pay was along the extreme east side of Morton County which lies in the vast Hugoton gas field embayment. Gas production from the shallow Case Group of Permian formations began early in the 1930's.

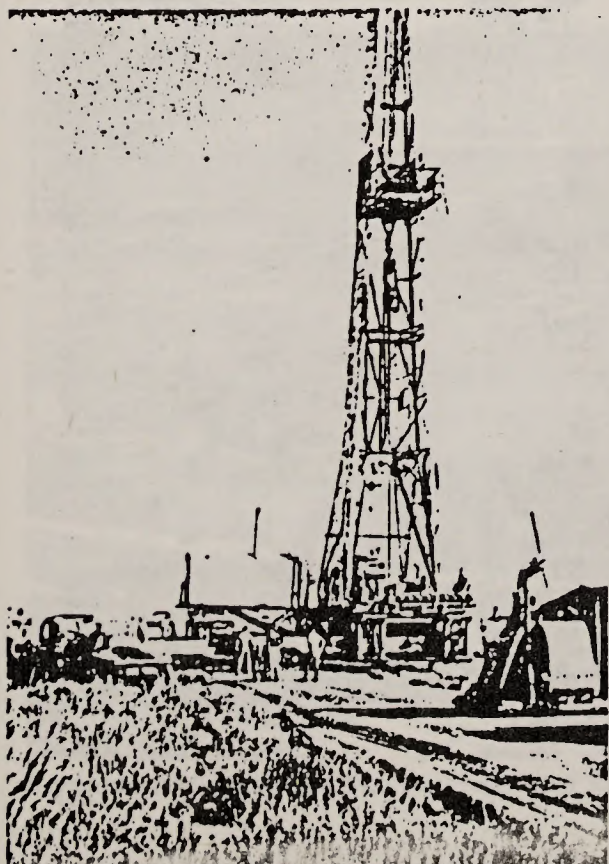
Morton County's Hugoton gas production generally is from 2,200 to 2,400 feet deep.

Morton County consists of approximately 729 square miles, of which 558 are oil and gas productive. Geologically, Morton County is located just west of the center of the Hugoton Embayment of the prolific Anadarko Basin.

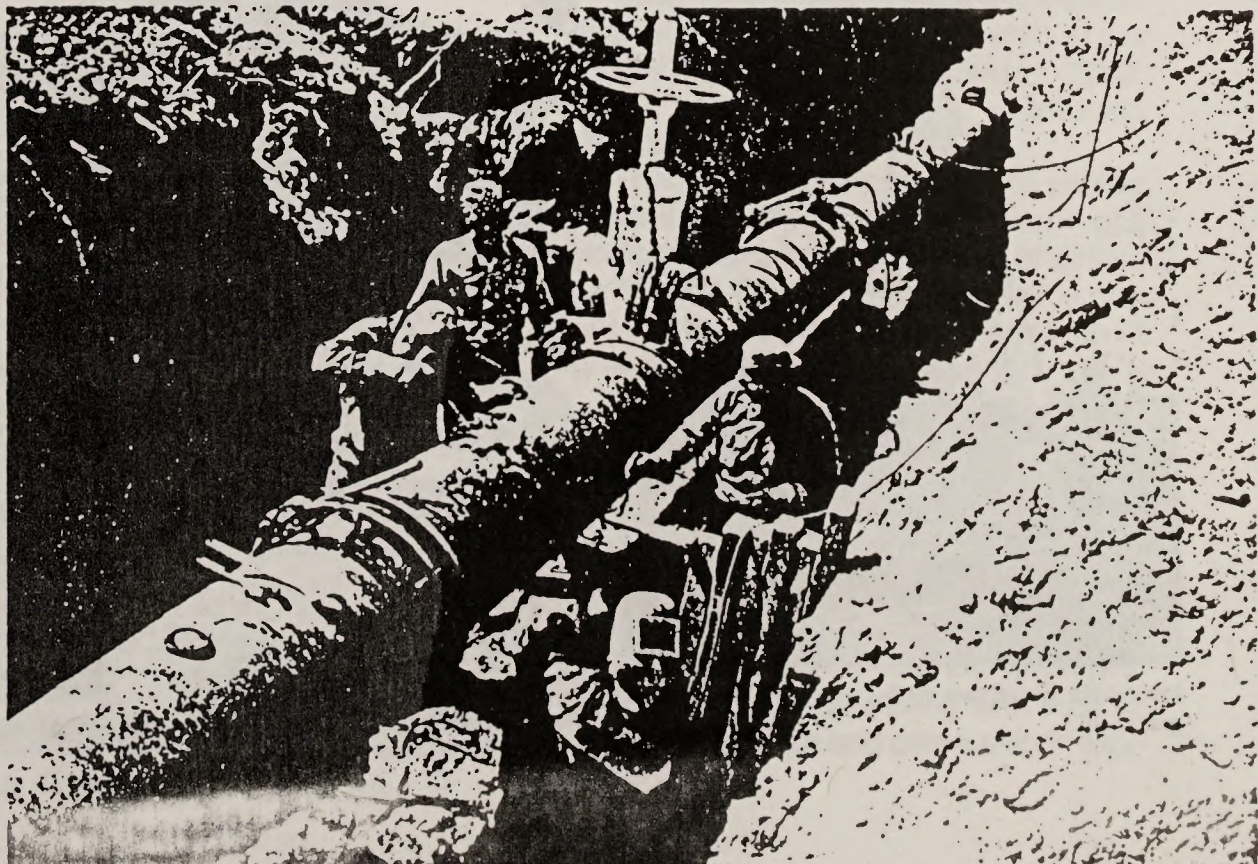
According to my well records, the first significant drilling boom commenced March 5, 1930. Argus Pipeline Company drilled 22 gas wells east of Rolla extending the Hugoton Gas Field into Morton County. The gas pay was encountered at 2500-2900 feet. There were only 35 Hugoton gas wells at the end of 1944, and development continued until approximately 300 Hugoton wells produce at present. Until the



**Wind power pumping salt water off Red Cave Gas Wells in Interstate Oil Field.**



**Moving drilling rig - Interstate Oil Field (1956).**



**PEPL welder, Gene Brown, welding on line.**

1970's, this was a portion of the largest Gas Field in the world - THE HUGOTON GAS FIELD.

April 2, 1930, Hydraulic spudded the #1 State in section 22-34S-43W, northwest of Elkhart; which recorded gas shows that later lead to the discovery of the Red Cave Gas Field by Anadarko Production Company in 1960. The gas pay zone was encountered at 1200-1250.

In 1948, Stanolind (Amoco) discovered the Richfield Field just northeast of the original county seat. Panhandle Eastern and Vickers added other pays in 1956 and 1957 respectively.

March 1951, Cities Service discovered the prolific Greenwood Field which produces from 17 separate porous limestone beds encountered at 2600-3400 feet. Panhandle Eastern, Cities Service, and Colorado Interstate basically developed this 260 well field, which is the second largest gas field in Kansas with reserves expected to be in excess of one trillion cubic feet of gas. The Boehm (Morrow) Field was discovered by Cities Service by drilling of a test whose farm name was the Greenwood B-1 and the Greenwood Field was discovered by a well called the Boehm A-1.

April 1954, Stanolind discovered the prolific Interstate Oil Field which is located northwest of Elkhart. Huber, Panhandle Eastern, Musgrove, and Cities Service developed the Interstate Field, which has produced 24,165,553

barrels of oil as of December 1984. Anadarko Production Company operates the secondary recovery operation, which has produced 17 of the 24 million barrels of oil.

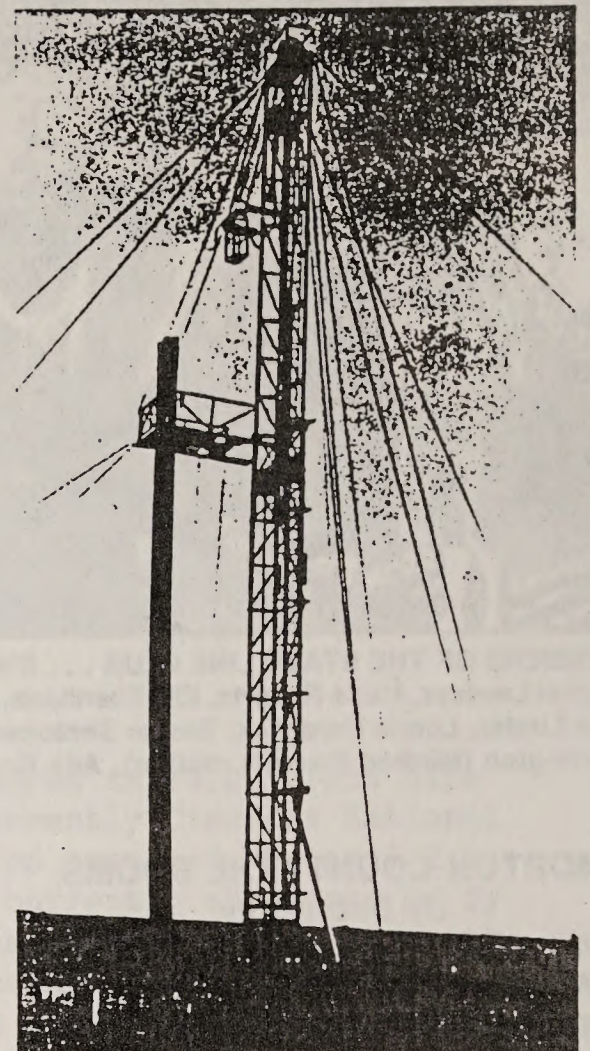
July 1954, Huber discovered the Sparks Gas Field on a Superior farmout with Carter and Skelly support. Colorado Interstate Gas Company provides the marketing facilities for this tremendous gas field.

July 1955, the Taloga Field, located northeast of Elkhart, was discovered by Colorado Oil and Gas. Panhandle Eastern and Carter added other pays later. Panhandle Eastern gathers the gas.

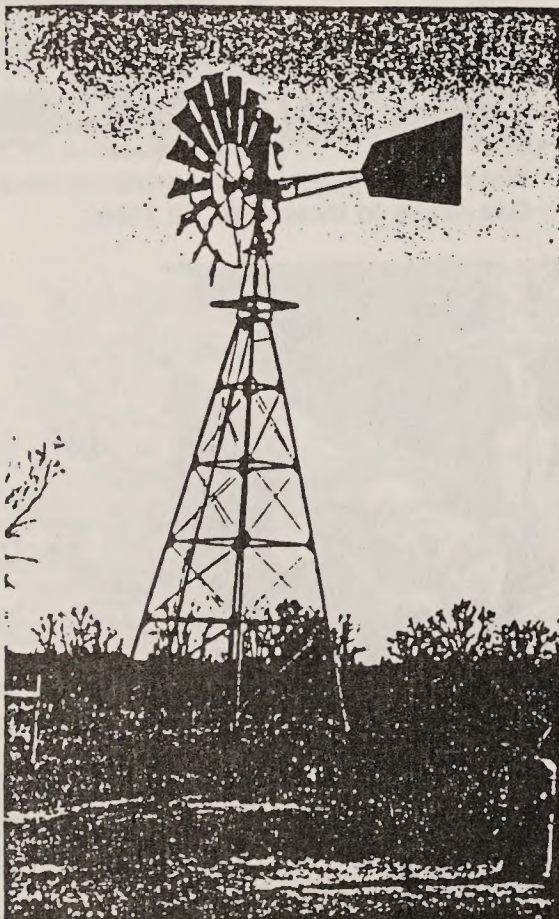
April 1955, Panhandle Eastern spudded the Jones #1-11, which was the discovery well for the Elkhart Field. Anadarko Production Company developed the field and the Elkhart West Field.

April 1957, Panhandle Eastern discovered the Patsy Field. Production: 4.8 billion cubic feet of gas.

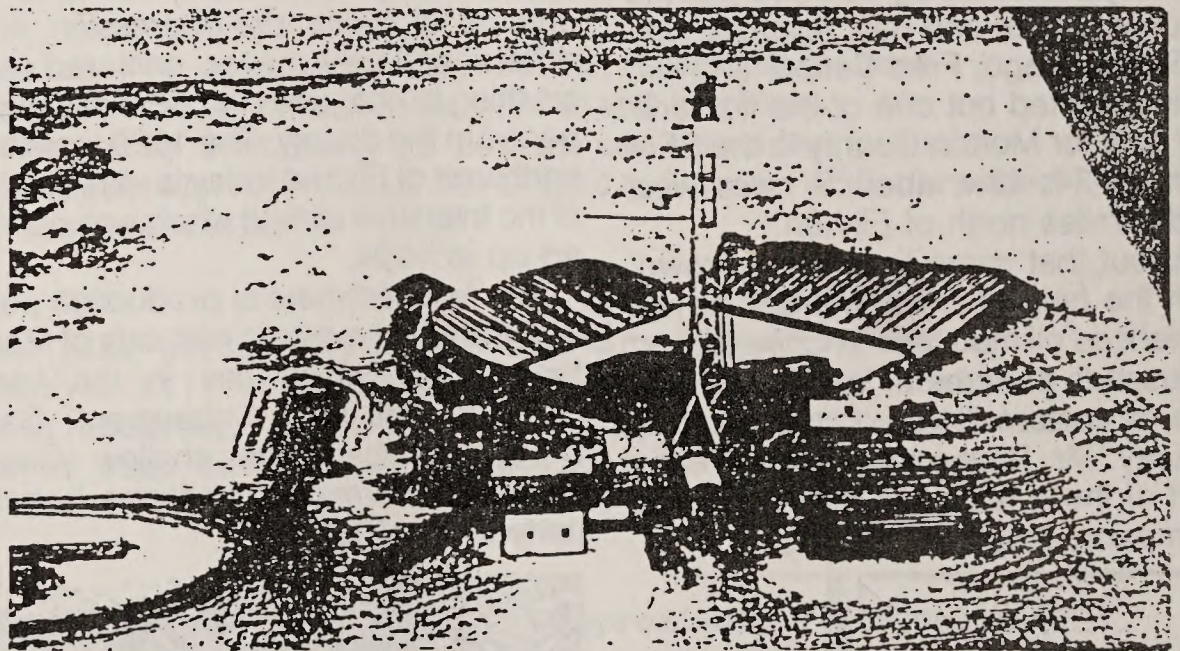
March 1959, Cities Service spudded the Wilburton Gas and Oil Field discovery well. The oil field has produced in excess of 10 million barrels of oil.



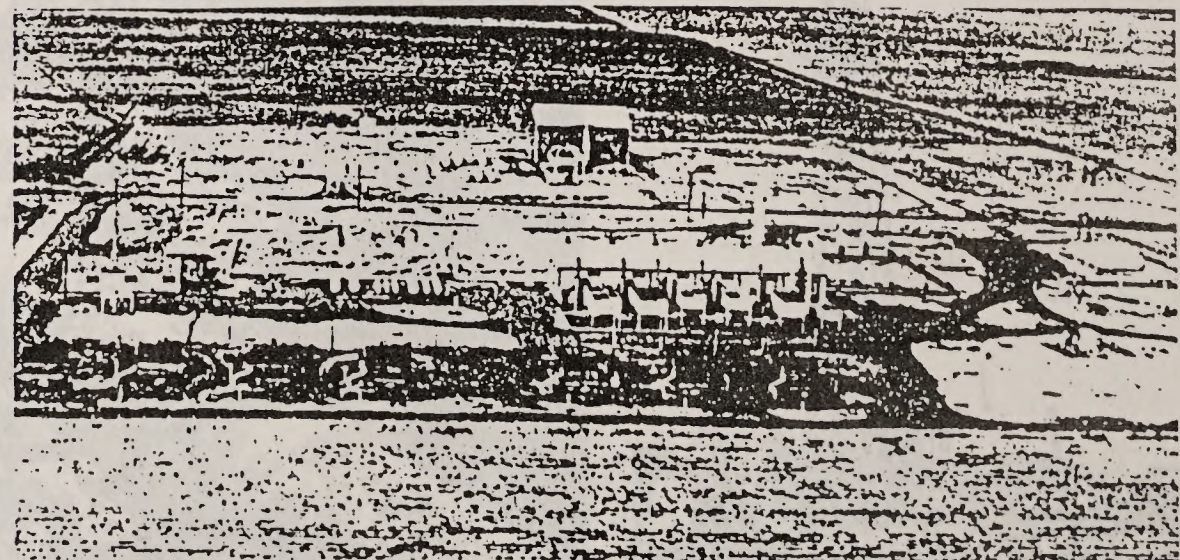
Oil field pulling unit.



Interstate Red Cave #2 Pumping salt water off gas well.

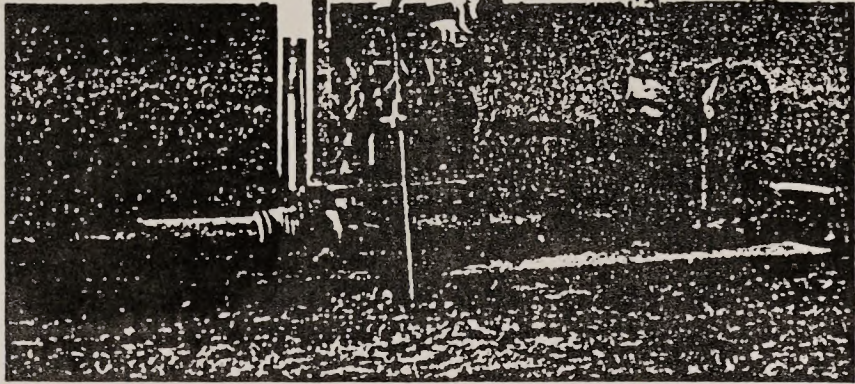


Drilling Rig.

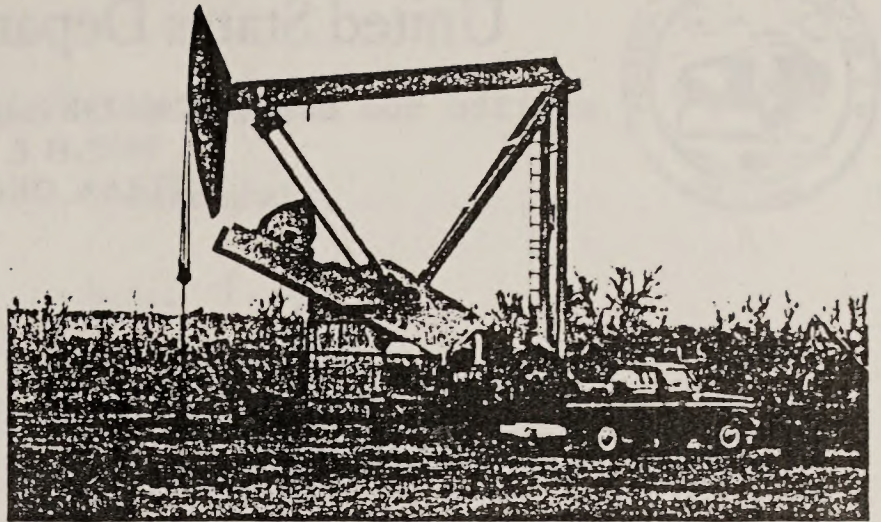


Panhandle Eastern Pipeline Company Elkhart Station.





Irrigation Well & Pump



Interstate Oil Field.

This field lead to the extension of Wilburton North and Wilburton Northwest Fields.

November 1959, Pan American (Amoco) discovered the Kinsler Field which produces from the Council Grove, Marmaton, Morrow, and St. Louis. Amoco has recently developed the Council Grove on their high acreage block in the northeast portion of Morton County. Production: 76 billion cubic feet of gas.

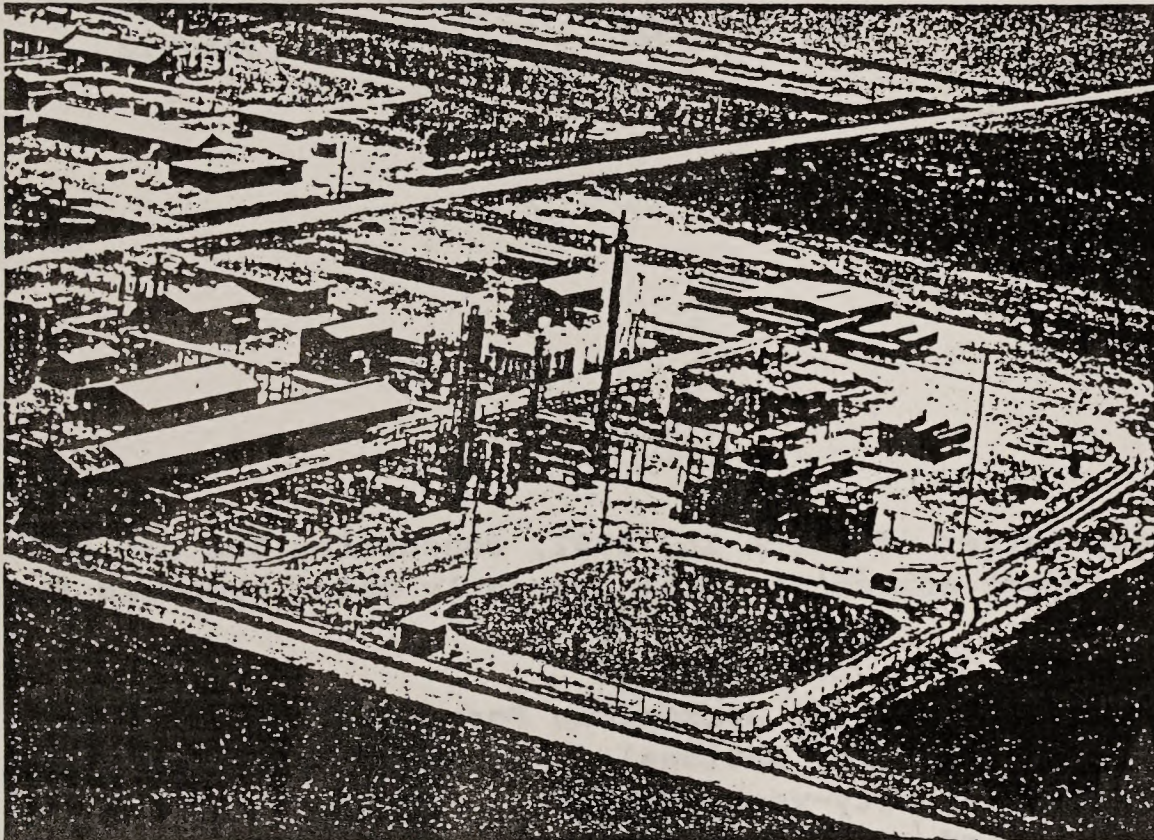
February 1962, Thomas & Brewer confirmed the Berryman Field on a Panhandle Eastern farmout. Anadarko Production Company and Cities Service Oil developed the remainder of the field. Ladd Petroleum at the present has the secondary phase. Production: 3,596,117 barrels of oil.

November 1963, Anadarko Production Company discovered the prolific Cimarron Valley Field which was produced 2.8 million barrels of oil. This lead to the discovery of the Santa Fe Trail Field in 1978. It has produced a million barrels of oil and 8.2 billion cubic feet of gas.

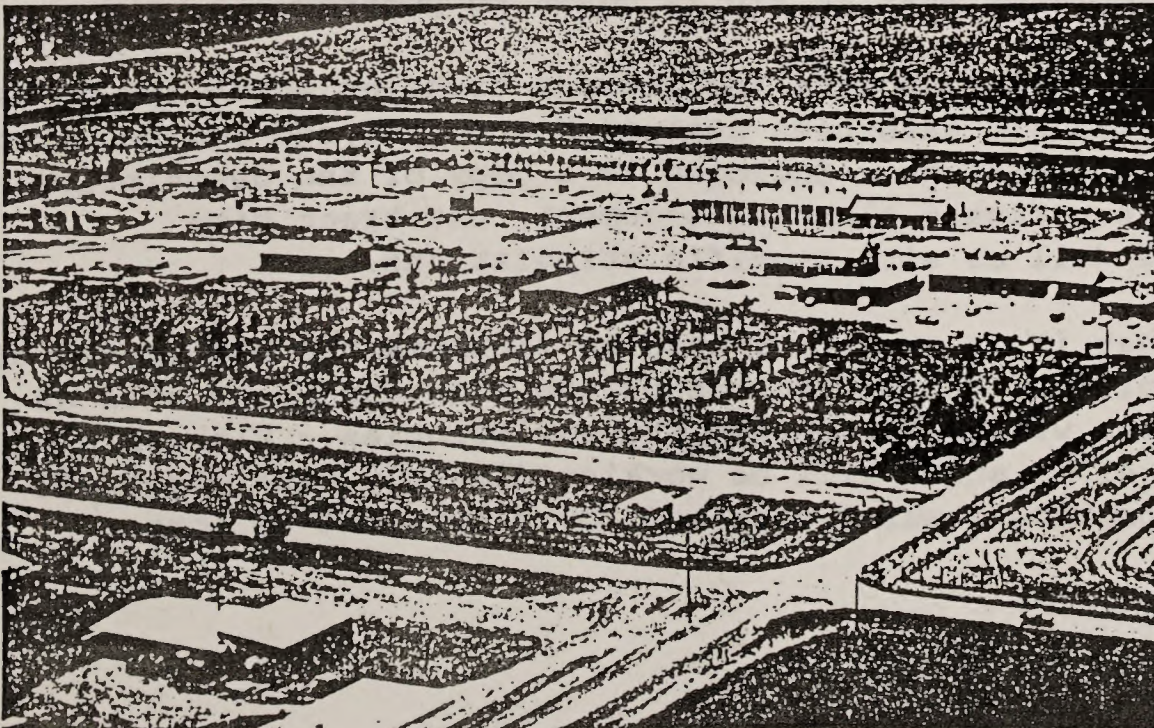
June 1978, Cities Service discovered the Winter Gas Field, which lead to the prolific Winter North Oil Field in 1980. This field has already produced 706,902 barrels of oil.

These are some of the more prolific oil and gas discoveries. The oil and gas industry have invested billions of dollars in Morton County and have had a major impact on the economical growth of this county.

Today it is a different story in this region where a little over 50 years ago thousands of acres of land could be purchased for a few dollars an acre, or for paying delinquent taxes. The man or woman who used to "drag a washtub on a chain picking up cowchips for fuel in the cook stove", has now been provided a comfortable living with their investment of time and ownership in Morton County.



Helium Plant.

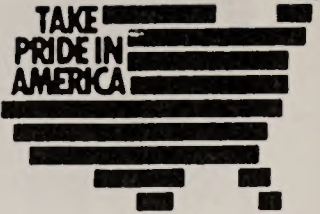


Colorado Interstate Gas Plant across from Taloga School'



# United States Department of the Interior

BUREAU OF LAND MANAGEMENT  
9522-H E. 47TH PLACE  
TULSA, OKLAHOMA 74145



IN REPLY REFER TO:  
KS RMP  
1610 (047)

Your Reference 2820

MAR 26 1991

Mr. Jack Weissling  
Forest Supervisor  
Pike & San Isabel National Forest  
Comanche & Cimarron National  
Grasslands  
1920 Valley Drive  
Pueblo, CO 81008-1797

Dear Mr. Weissling:

This is in response to your letter of March 18, 1991, concerning the oil and gas leasing environmental impact statement (EIS) currently being prepared for the Forest.

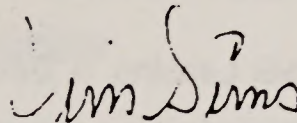
We have completed a review of the revised Reasonable Foreseeable Development (RFD) scenario prepared for the Cimarron National Grassland. We concur with the estimates derived by use of a forty-year historical average which encompasses the most active period of oil and gas activity in Morton County. The estimate of 165 wells for the life of the planning effort is reasonable and entirely within the scope of what an RFD is meant to portray.

The BLM split estate tracts within Morton and Stevens Counties which are to be included in your Forest Plan EIS have been evaluated and analyzed for required BLM oil and gas leasing stipulations. Enclosed is a copy of the description of our stipulations from our Kansas planning document, the tract site descriptions by county as well as site specific stipulations.

Additionally, we agree that it is important that we finalize the Memorandum of Understanding (MOU) for oil and gas operations on the Cimarron NG as well as for the split estate tracts within Morton and Stevens Counties. With this goal in mind Brian Mills of my staff will be working directly with personnel from the Cimarron NG to produce a multi-faceted MOU beneficial to both agencies.

We look forward to the continued cooperation between our offices.

Sincerely,

  
Jim Sims  
District Manager

1 Enclosure

cc:

Cimarron National Grasslands (w/encl)

Box J

Elkhart, KS 67950

## NOTES

<sup>1</sup> USDA, Forest Service; Final Rule, Oil and Gas Resources, 36 CFR Parts 228 and 261; Federal Register, Vol. 55, No. 55; March 21, 1990.

<sup>2</sup> USDI, BLM, Colorado O&G Leasing & Development, Final Environmental Impact Statement, January, 1991.

<sup>3</sup> Letter of March 26, 1991, from USDI, BLM, Tulsa, Oklahoma.

<sup>4</sup> USDI, BLM, Colorado O&G Leasing & Development, Final Environmental Impact Statement, January, 1991.

<sup>5</sup> *ibid.*

<sup>6</sup> USDA, Forest Service; Smith, Eugene L; Oil and Gas Leasing Transportation System Report, Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands; Pueblo, Colorado, April 10, 1991.

<sup>7</sup> *ibid.*

<sup>8</sup> *ibid.*

## **APPENDIX D**

### **VALIDATION OF SUPPLEMENTAL STIPULATIONS**

#### **INTRODUCTION**

The purpose of this appendix is to disclose the need for supplemental stipulations be identified and discussed. The Reasonable Foreseeable Post-leasing Activities (RFD) that the Bureau of Land Management (BLM) identified in the mountains did not allow for full disclosure on all lands that may be made available in the Record of Decision (ROD). In order to provide this disclosure, the Forests and Grasslands were divided into land units with similar physical features.<sup>1</sup> The Interdisciplinary Team (IDT) utilized an ecosystem concept to delineate homogeneous areas (areas of similar environmental characteristics). The criteria used to determine and delineate similar land areas were: landform, geology, climate, vegetation, and soils. The climatic patterns were used primarily to infer broad vegetative groups. The delineation of homogeneous areas followed the boundaries of watersheds on the Forests and Grasslands in the affected environment.<sup>2</sup> The homogeneous land areas are referred to as "Geographic Zones" in this Environmental Impact Statement (EIS). A location map of the thirteen Geographic Zones is found in Figures D-1 through D-3. The watersheds were further subdivided into smaller similar types of land features by using slope ranges of 0-15%, 16-40%, over 40%, Riparian, and Alpine.

EXPERIMENTAL PROCEDURES

The purpose of this experiment is to determine the effect of temperature on the rate of reaction between hydrogen peroxide and potassium iodide. The reaction is as follows:

INTRODUCTION

The purpose of this experiment is to determine the effect of temperature on the rate of reaction between hydrogen peroxide and potassium iodide. The reaction is as follows:  $2H_2O_2 \rightarrow 2H_2O + O_2$ . The rate of reaction is measured by the volume of oxygen gas produced over a fixed period of time. The experiment is carried out at different temperatures and the results are compared. The rate of reaction is found to increase with increasing temperature. This is due to the fact that at higher temperatures, the molecules have more kinetic energy and are more likely to collide with sufficient energy to overcome the activation energy barrier. The experiment is carried out using a fixed volume of hydrogen peroxide and potassium iodide solution, and the volume of oxygen gas produced is measured using a gas syringe. The results are plotted on a graph of volume of oxygen gas produced versus time, and the rate of reaction is determined from the gradient of the line. The rate of reaction is found to increase with increasing temperature, and this is due to the fact that at higher temperatures, the molecules have more kinetic energy and are more likely to collide with sufficient energy to overcome the activation energy barrier.

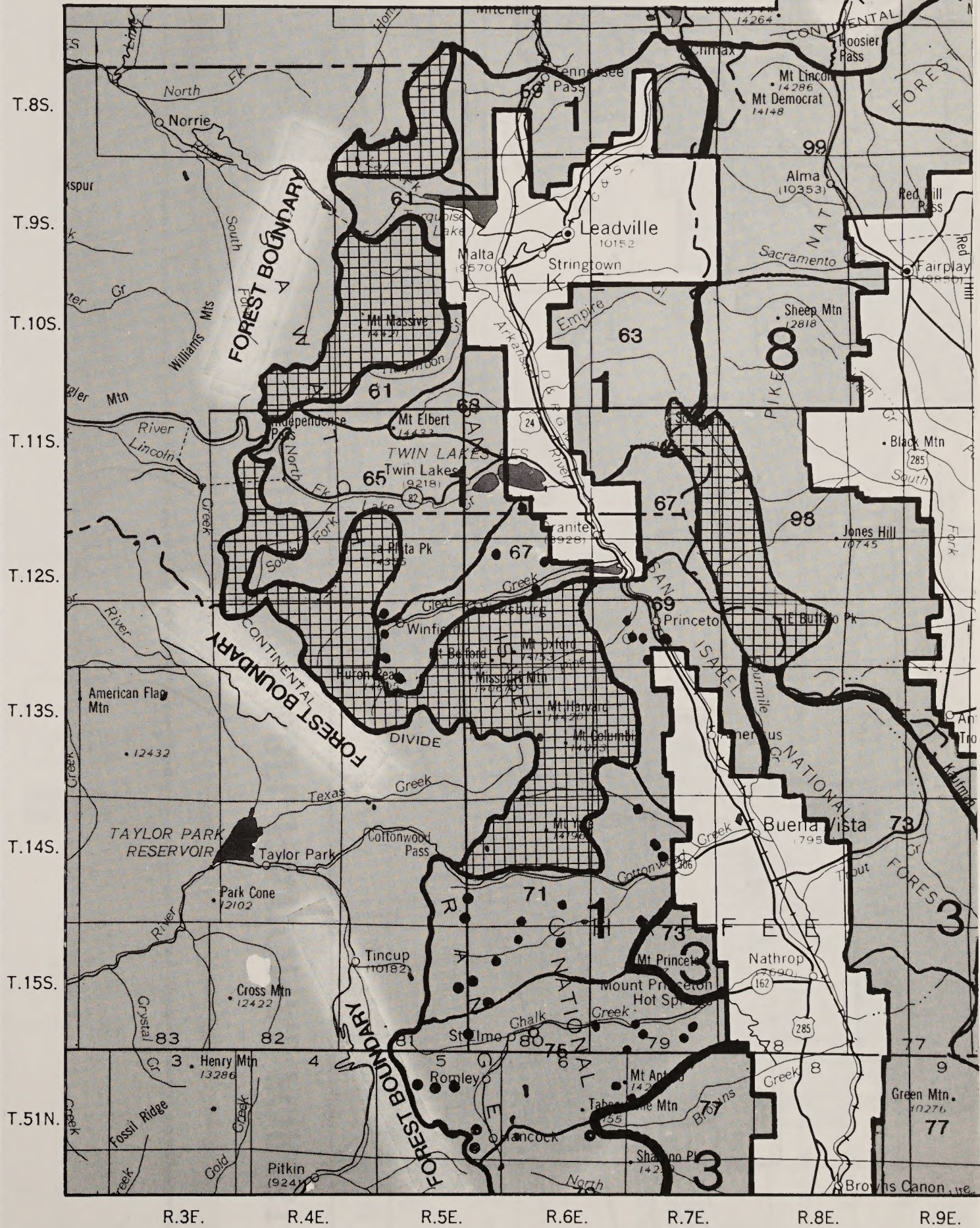
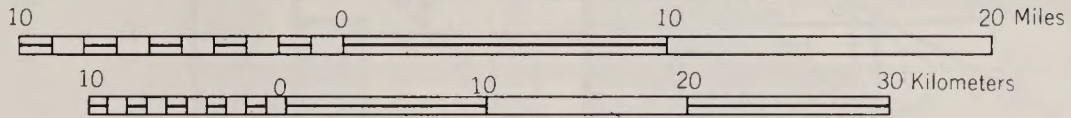
R.77W.

LEGEND

- ⊛ State capital
- ⊙ County seat
- City, town, or village
- ✈ Scheduled service airport
- Interstate highway (70)
- U. S. highway (40)
- State highway (89)
- Other principal roads

Scale 1:500,000

1 inch equals approximately 8 miles



R.3E. R.4E. R.5E. R.6E. R.7E. R.8E. R.9E.

ANALYSIS OF MULTIPLE-CRITICAL INCIDENTS

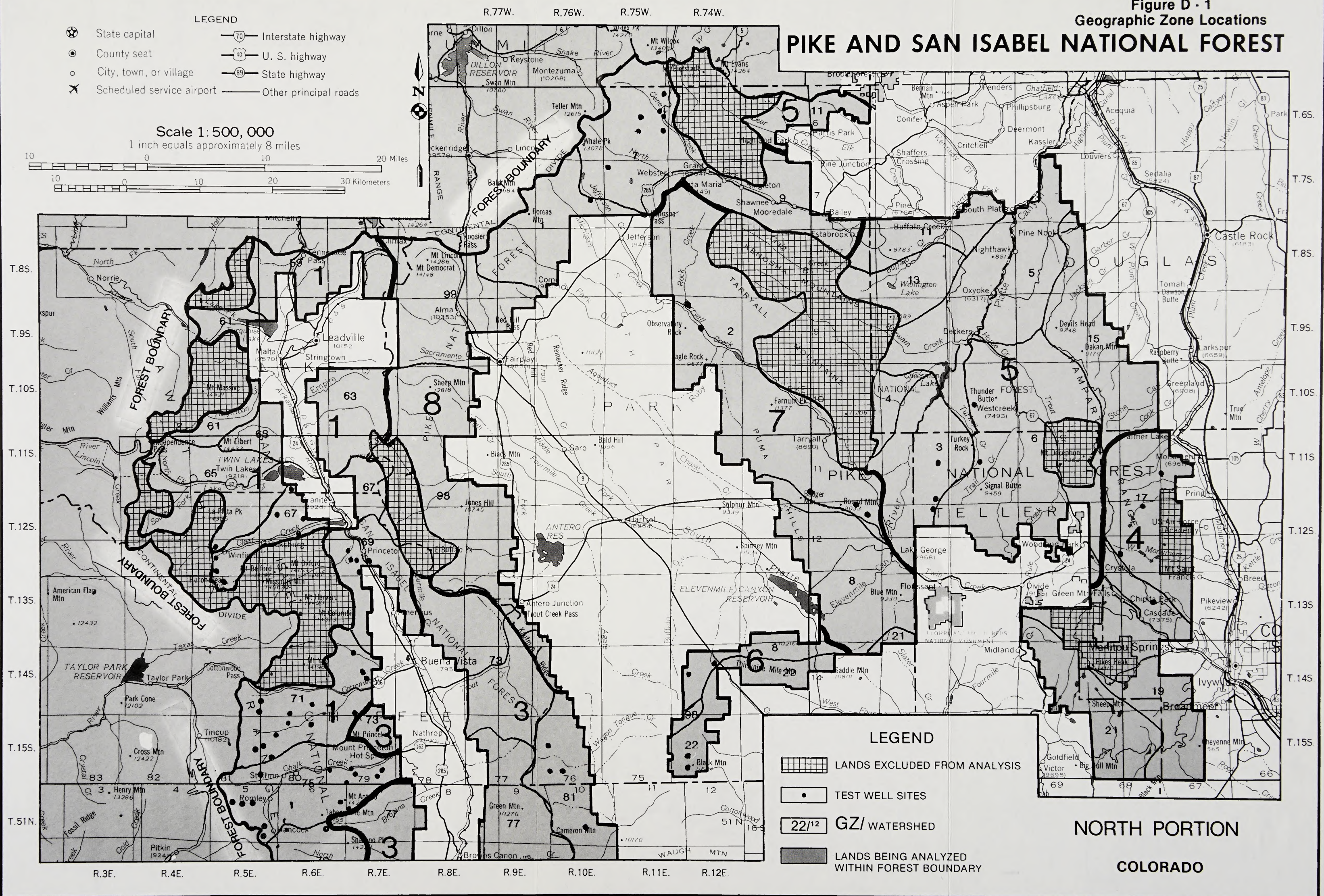
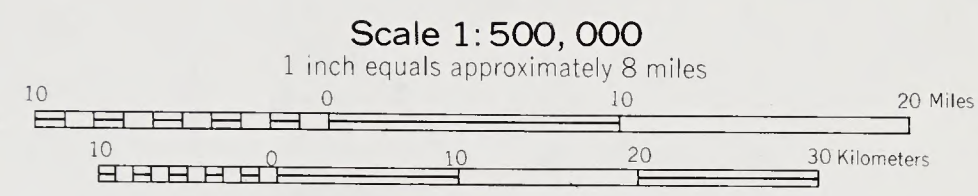
INTRODUCTION

The purpose of this appendix is to describe the method for analyzing multiple incidents by identifying and classifying the incidents. The incidents are classified into three categories: (1) incidents that are caused by human error, (2) incidents that are caused by equipment failure, and (3) incidents that are caused by organizational factors. The incidents are classified into these categories by using a set of criteria. The criteria are based on the following factors: (1) the nature of the incident, (2) the location of the incident, (3) the time of the incident, (4) the severity of the incident, (5) the frequency of the incident, (6) the impact of the incident, (7) the cause of the incident, (8) the consequences of the incident, (9) the prevention of the incident, and (10) the recovery from the incident. The incidents are classified into these categories by using a set of criteria. The criteria are based on the following factors: (1) the nature of the incident, (2) the location of the incident, (3) the time of the incident, (4) the severity of the incident, (5) the frequency of the incident, (6) the impact of the incident, (7) the cause of the incident, (8) the consequences of the incident, (9) the prevention of the incident, and (10) the recovery from the incident.



Figure D - 1  
Geographic Zone Locations  
**PIKE AND SAN ISABEL NATIONAL FOREST**

- LEGEND**
- ⊛ State capital
  - ⊙ County seat
  - City, town, or village
  - ✈ Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads



**NORTH PORTION**  
**COLORADO**

# LEGEND



LANDS EXCLUDED FROM ANALYSIS



TEST WELL SITES



GZ/ WATERSHED



LANDS BEING ANALYZED WITHIN FOREST BOUNDARY

## LEGEND



State capital



County seat



City, town, or village



Scheduled service airport

— Interstate highway

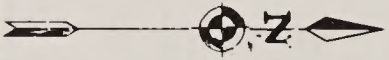
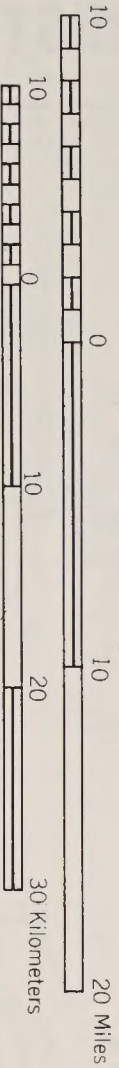
— U. S. highway

— State highway

— Other principal roads

Scale 1:500,000

1 inch equals approximately 8 miles



# SOUTH PORTION COLORADO

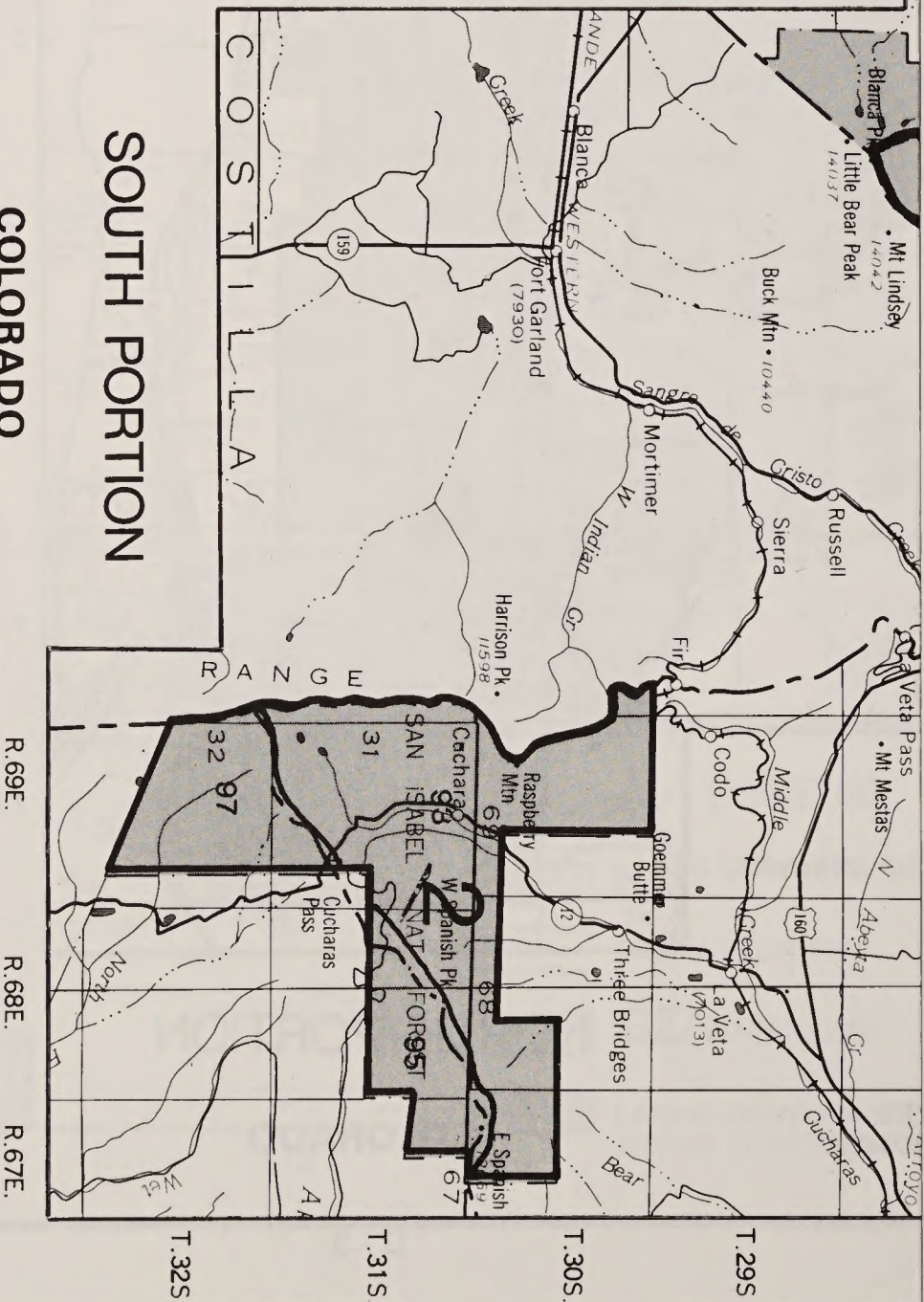
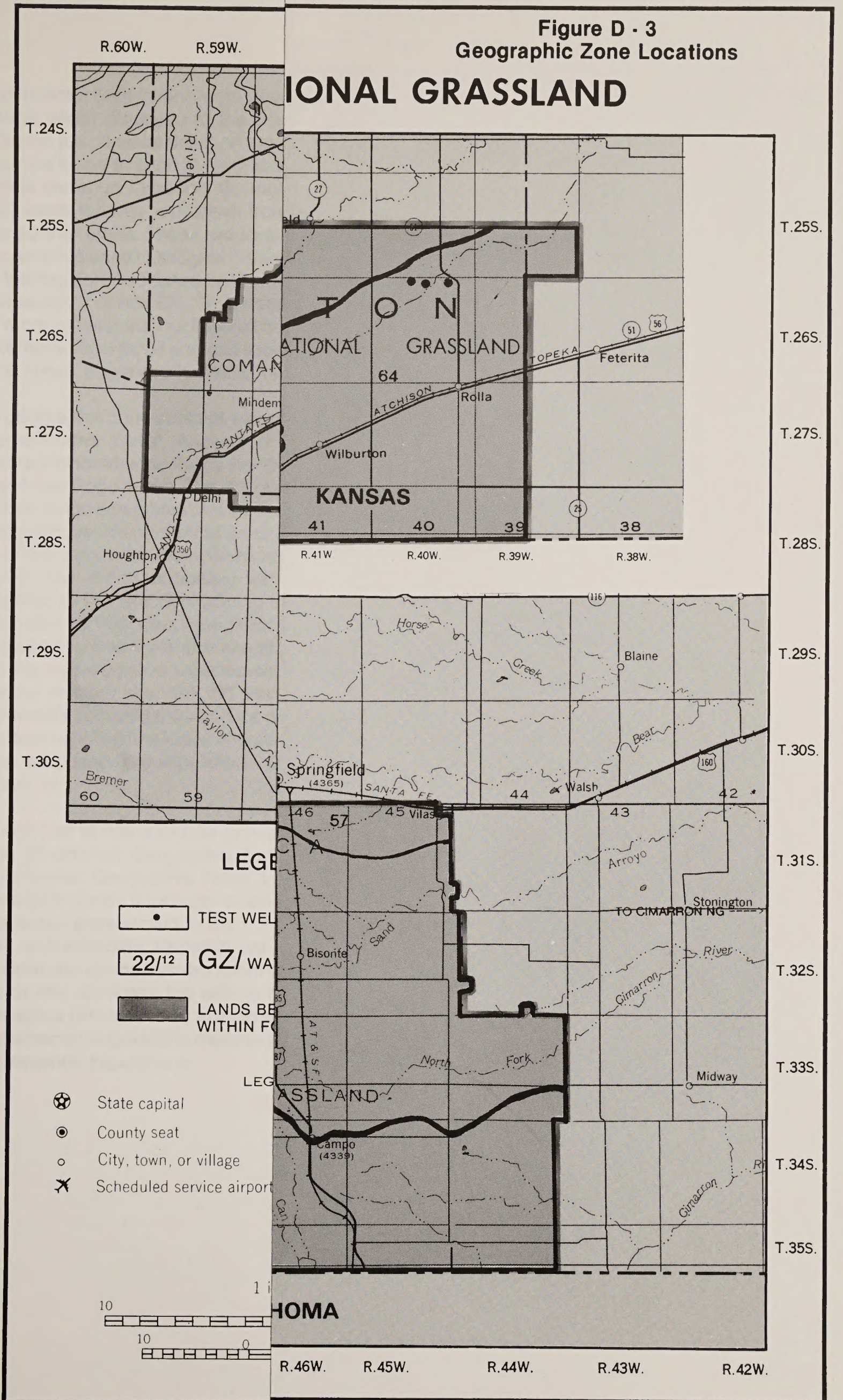
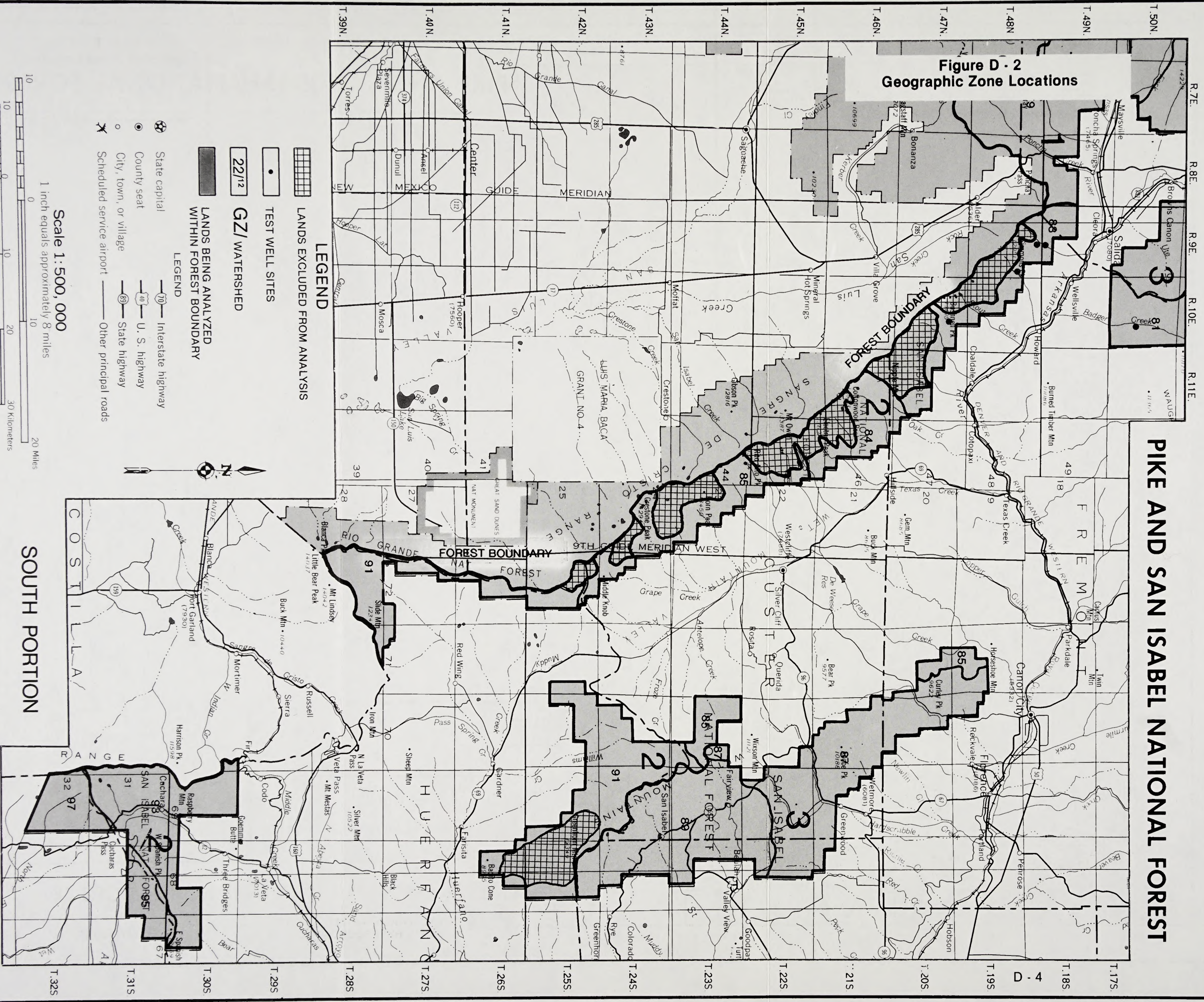


Figure D - 3  
Geographic Zone Locations



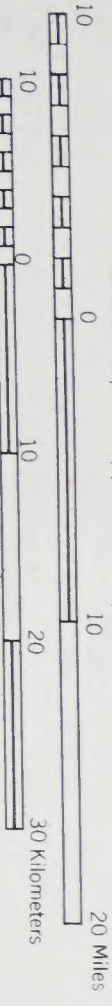
# PIKE AND SAN ISABEL NATIONAL FOREST

**Figure D - 2  
Geographic Zone Locations**



- LEGEND**
- LANDS EXCLUDED FROM ANALYSIS
  - TEST WELL SITES
  - GZ/ WATERSHED
  - LANDS BEING ANALYZED WITHIN FOREST BOUNDARY
- LEGEND**
- State capital
  - County seat
  - City, town, or village
  - Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

Scale 1:500,000  
1 inch equals approximately 8 miles

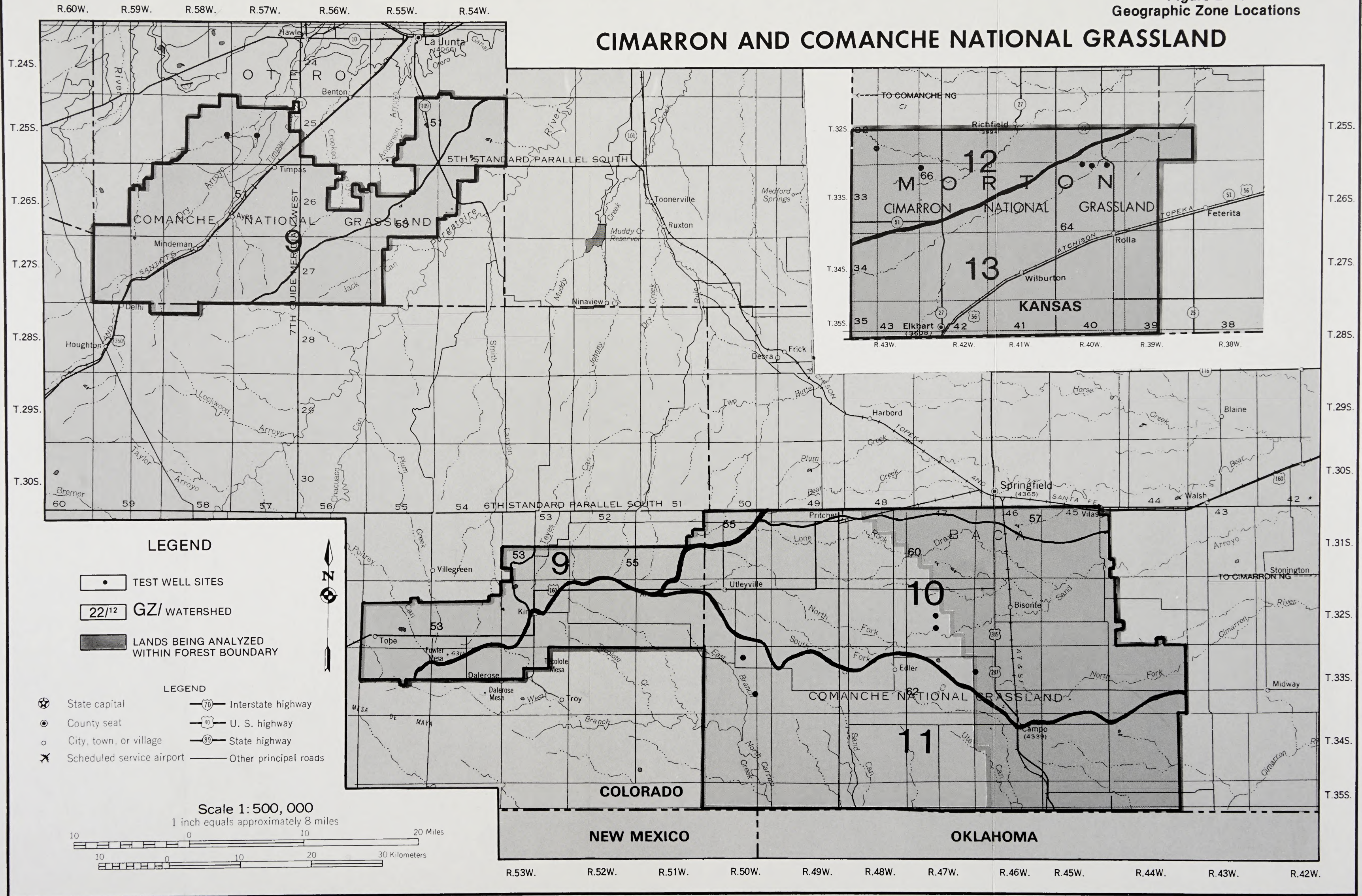


**SOUTH PORTION  
COLORADO**

R. 69E R. 68E R. 67E  
T. 325 T. 315 T. 305 T. 295 T. 285 T. 275 T. 265 T. 255 T. 245 T. 235 T. 225 T. 215 T. 205 T. 195 T. 185 T. 175

Figure D - 3  
Geographic Zone Locations

# CIMARRON AND COMANCHE NATIONAL GRASSLAND



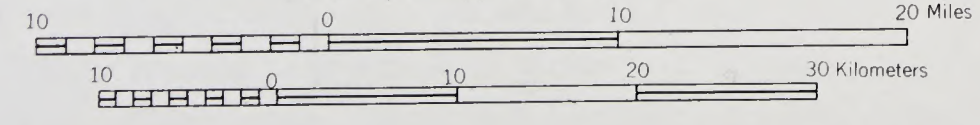
**LEGEND**

- TEST WELL SITES
- GZI WATERSHED
- LANDS BEING ANALYZED WITHIN FOREST BOUNDARY

**LEGEND**

- State capital
- County seat
- City, town, or village
- Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scale 1:500,000  
1 inch equals approximately 8 miles



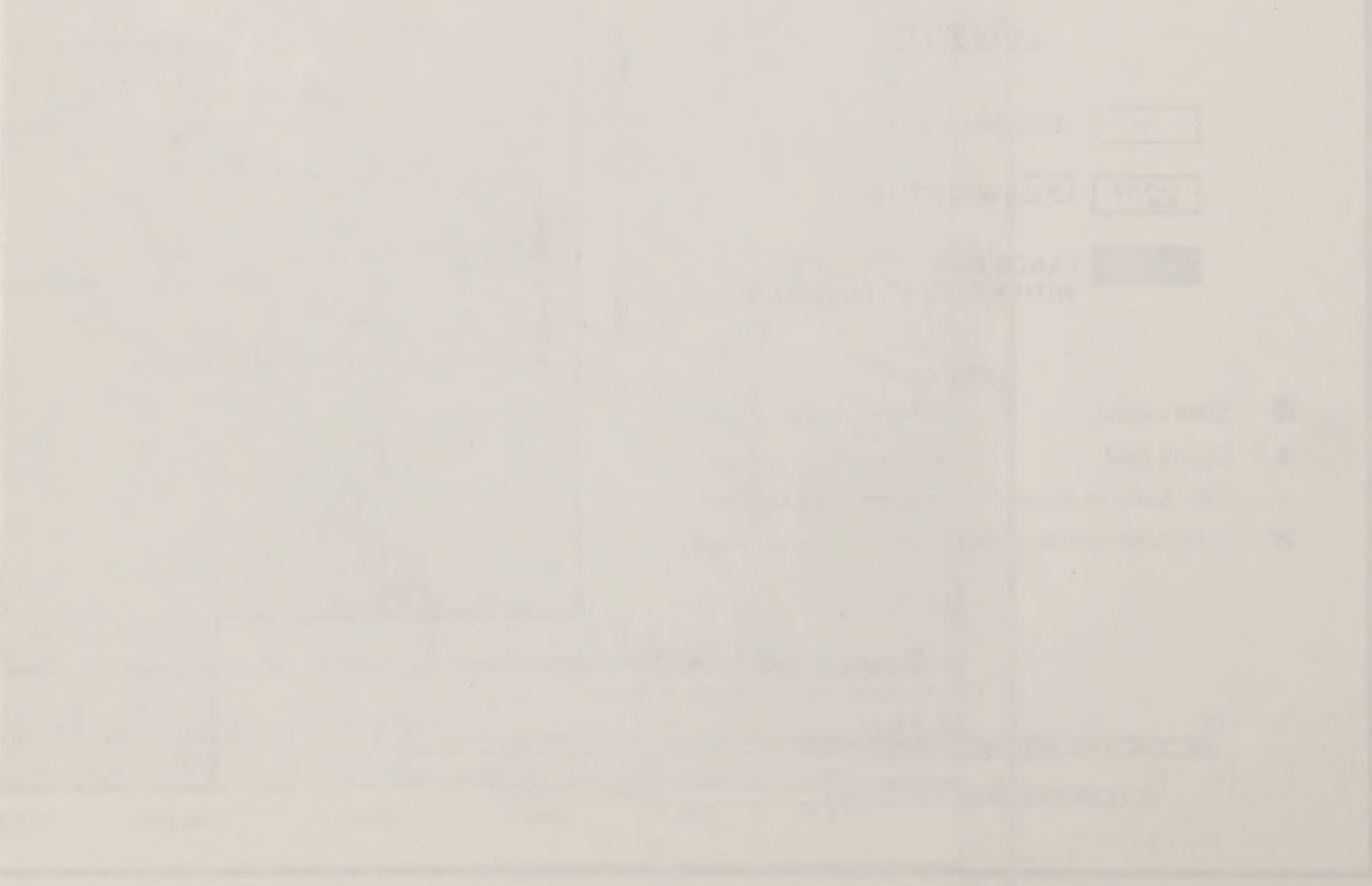
CIMARON



100  
 200  
 300  
 400  
 500  
 600  
 700  
 800  
 900  
 1000

LEGEND

- 
- SS
- LAND



Supplemental Stipulations were developed in the following manner: The IDT developed a set of overlays which displayed all the existing surface natural resources, as well as support element resources (i.e., Special Uses) on topographic quadrangles (1:24,000). They displayed the specific resources found in each of the watersheds within the 13 geographic zones. An example of these maps is shown in Appendix G. Another layer of mylar quads displayed National Forest System (NFS) lands formally withdrawn from oil and gas leasing, including designated wilderness and other special areas. These two layers were used to develop the Supplemental Stipulations map layer, which is used to mitigate the environmental impacts resulting from proposed potential oil and gas leasing activities (used in Alternatives I and III). A discussion of specific stipulations is found in Appendix B of this EIS. These more detailed stipulation maps (1:24,000) were converted over to a more general map so it would be easier to display to the public [see Appendix F]. A complete set of maps used for oil and gas leasing analysis decisions on available NFS lands can be viewed at the Forest Supervisor's Office, 1920 Valley Drive, Pueblo, Colorado.

The geographic zone concept was used to locate hypothetical oil and gas drill sites referred to as "Representative Wells". Analysis of these wells meets the site-specificity requirements of the National Environmental Policy Act (NEPA) and displays the need for stipulations required by the Oil and Gas Regulations. The IDT placed these drill sites in specific locations within identified sites by slope range categories to evaluate the effects of oil and gas leasing activities. The drill sites used in this exercise are numbered and identified by legal description. A list of sites is found as Exhibit D-1 of this appendix. After the identification of geographic zones, representative well sites were located. The effects of leasing with Standard Lease Terms (Alternative II) was analyzed and compared to the effects of leasing under Standard Lease Terms and Supplemental Stipulations (Alternative III). Well sites were distributed throughout slope classes in all of the geographic zones. Geographic zones were also identified and analyzed for the grasslands. The analysis of effects from the representative wells considered the pad and road configurations which were projected to occur at each site. The IDT identified effects from the representative wells on the affected environment to justify the need for any stipulations, as well as effects remaining after stipulations have been applied to a lease. Mitigation of effects can occur through compliance of standard lease terms, supplementary stipulations, Standard Conditions of Approval, Onshore orders, Notices to lessees, etc.

The first part of this appendix provides the reader with descriptions of the affected environments of the 13 different Geographic Zones which are contained within the mountain and grassland environments. Geographic Zones 1 through 8 are contained in the Mountain Environment, while Geographic Zones 9 through 13 are contained in the Grassland Environment. The descriptions of the affected environment in the Forest Plan are incorporated in this appendix by reference. The social and economic elements are described in Appendix J. The second part of this appendix describes the affected environment of each of the Representative Well sites within each geographic zone and discloses the effects of Standard Lease Terms (Alternative II) and Supplemental Stipulations (Alternative III) at each well site. Comparisons can then be made of the differences the Supplemental Stipulations make in protecting the environments, thus, validating the need for the Supplemental Stipulations.

## **AFFECTED ENVIRONMENT BY EACH GEOGRAPHIC ZONE**

### **THE MOUNTAIN ENVIRONMENT**

#### **Geographic Zone 1**

##### ***Vegetation***

At the north end of this zone, dominant vegetation is dense stands of lodgepole pine, with smaller quantities of spruce-fir near timberline. Aspen, willow and grassland areas are interspersed with the conifers. The south end is dominated by spruce-fir. Localized areas have experienced silvicultural treatments, typically shelterwood or selection methods, resulting in light to moderately dense canopy cover. Unmanaged areas typically have dense canopy cover. Aspen, mountain grassland areas and nonforested riparian types are interspersed with the conifers. A vegetation type summary follows this appendix as Exhibit D-2

##### ***Soils***

Shallow soil depths occur on residual side slopes in complex patterns with rock outcrop, and deeper soils are associated with colluvial footslopes, glacial moraines, and alluvial terraces. Medium to coarse soils have primarily developed from metamorphic and igneous parent materials. Very gravelly sandy loams are typical on upland landforms, and finer textures such as loams, sandy clay loams, and clay loams are generally confined to the depositional landforms. Surface and internal rock fragments vary by amounts and sizes, but most soil profiles on upland landforms have greater than 35 percent rock by volume.

Critical soil management concerns are areas of high geologic hazard for mass failure, high surface erosion rates on steep slopes, and fragile alpine ecosystems.

##### ***Water***

The streams are all located in the upper Arkansas River watershed. The average annual runoff varies from 1 acre foot per acre to 1.5 acre feet per acre (AF/ac). The highest water producing areas are those draining Mt. Massive and Mt. Elbert. Most of the precipitation occurs as snow between October and May. The highest streamflows occur during the spring and early summer as a result of snowmelt runoff.

This zone has the greatest amount of transmountain diversions on the Forest. Eight diversions bring water from the west slope to the Arkansas basin. These include Wurtz Ditch, Columbine Ditch, Ewing Ditch, Homestake Tunnel, Bousted Tunnel, Busk-Ivanhoe Tunnel, Twin Lakes irrigation tunnel and Larkspur Ditch. They bring an average of 120,000 acre feet of additional water into the Arkansas Basin annually.<sup>3</sup>

There are major water quality problems resulting from old mining activities.<sup>4</sup> St. Kevin Gulch, Iowa Gulch, the East Fork of the Arkansas River, Box Creek, Chalk Creek, Lake Creek and the South Arkansas River have heavy metal concentrations that exceed state standards. Some of the water quality problems in Lake Creek are a result of natural weathering of pyritized rocks in the vicinity of Red Mountain.



Many of the sediment problems in the streams are the result of damage caused by increased flows from transmountain diversions. Many of these streams are still actively eroding even though some of the diversions are from 50 to 100 years old. The Board of Water Works of Pueblo, CO, installed drop structures on the Wurtz Ditch and on the Ewing Ditch to safely convey water down steep eroded slopes. They also have ongoing stream improvement projects on Lake Creek below the Twin Lakes Tunnel.

Other streams that exhibit extensive bank erosion and sand bar formations include East Tennessee Creek, Chalk Creek, Silver Creek, Poncha Creek and the upper section of the South Arkansas River above Monarch Park. No studies have been done on any of these streams yet to determine what is causing the erosion problem. However, significant rilling and gulying below Highway 50 is good indication that excess runoff from the highway is a major sediment contributor to the South Fork of the Arkansas River.

### ***Wildlife and Fishery Resources***

Management Indicator Species (MIS) for this zone can be found in Exhibit D-3 of this appendix.

Over 48,735 acres of deer and elk winter range have been identified in this zone. Current winter range supports an estimated 3000 elk and 4500 deer. An estimated 450 bighorn sheep and an estimated 400 mountain goat occur within the Zone. Critical habitat for all species has been identified through the use of the CDOW.

High elevation lakes and streams provide anglers with opportunities to catch brook trout and several different subspecies of cutthroat trout. Limited angling opportunities currently exist for the federally threatened greenback cutthroat trout in the Rock Creek and Lake Fork watersheds. Brown trout and rainbow trout are found in most stream systems below 8,500 feet.<sup>5</sup> Lower elevation, larger order streams are generally more productive than smaller, higher ones due to increased habitat conditions and overall stream temperature. Turquoise Lake has been managed by supplementing a self-sustaining lake trout and brown trout with a variety of other salmonid fish.<sup>6</sup> Over 140,000 trout were stocked in 1990 alone.<sup>7</sup> Native fish currently existing in Turquoise Lake include western white suckers and longnose suckers. Twin Lakes is the most heavily used lake fishery. Over 180,000 salmonid fish were planted in 1990 alone. A trophy size lake trout fishery also exists in both lakes.

### ***Riparian Resources***

Riparian resources are found in the foothills at 8,200 feet to the alpine beginning at approximately 11,500 feet. Most of the riparian areas are found in the montane zone. Riparian vegetation includes a variety of woody and herbaceous species, with the willow - sedge community dominating the vegetation.<sup>8</sup> Cottonwoods and alders become more prevalent at lower elevations. Riparian areas are generally associated with stream corridors, wet meadow and standing water environments. See Exhibit D-4 in this appendix for a summary of riparian area acres.

### ***Threatened and Endangered Species***

This zone is considered to be within the historical distribution range of the greenback cutthroat trout.<sup>9</sup> Endemic to the mountainous areas of the South Platte and Arkansas River drainages, this colorful trout has been eliminated throughout most of its original range as a result of competition and hybridization with non-native species, as well as physical habitat degradation of its habitat by man. Five populations of greenbacks are found in the Lake Fork drainage and Rock Creek drainage. A segment of the Lake Fork watershed is outside of the boundary on NFS lands.

The yellowfin trout was historically found in Twin Lakes.<sup>10</sup> This subspecies is currently considered to be extinct, unless isolated or currently unknown populations exist. Threatened and endangered species under consideration in this zone are listed in Exhibit D-5 for wildlife and Exhibit D-6 for plants.

### ***Range Resource***

Several livestock grazing allotments occurring in this zone contain land that is accessible to livestock and capable of producing forage on a sustained yield basis. Many areas are not suitable for livestock grazing: i.e., rocky outcrops, steep slopes and dense timber. Suitable range acres and permitted grazing use for this zone is identified in Exhibit D-7 of this appendix.

### ***Visual Resource***

This zone is visible from the Colorado and Continental Divide Trails, several Wilderness Areas, numerous 4WD roads and several picnic areas and campgrounds.

### ***Cultural, Paleontological, and Cave Resources***

#### ***Cultural Resources***

Known significant historic properties include mining properties such as mines, mills, camps, landscapes, railroad history resources, and historic logging resources. Interlaken and the Twin Lakes Historic District are two National Register listed tourism-related properties in the Lake Creek drainage. Properties related to other historic themes, for example, ranching, and recreation are present, but in lesser densities. The potential for undiscovered significant resources relating to these other themes is low to moderate.

Prehistoric cultural properties have been identified in moderate densities. Prehistoric resource types identified and recorded in this zone include prehistoric camps, stone quarries, games drives and hunters' kill sites, and culturally scarred trees.

Significant resources related to the mining boom of the late 19th century, and resources on the surface are the ones which have the most potential to be affected by projected oil and gas development.

#### ***American Indian Sacred Sites***

Hortense Hot Springs at the mouth of Chalk Creek canyon and the Monarch Game Drive are potential American Indian Sacred Sites in this zone. Because a systematic study of these resources has not been done, the potential for additional sacred sites exists.

#### ***Paleontological Resources***

There are small exposures of the Dry Union Formation of Miocene Age in the extreme southern portion of the Sawatch Range, and of the Minturn Formation of Middle Pennsylvanian Age in the northern Mosquito Range. Whether these formations contain scientifically valuable fossils has not been assessed. For the zone as a whole, the potential for oil and gas development to affect significant fossils is very low.

## **Cave Resources**

There are no known significant caves in Zone 1. Based on the characteristics of the local bedrock formations, the chances of discovering new significant caves is virtually nil.

## **Recreation**

The zone has a high capacity for recreation visitors due to accessibility, land diversity, seasonal recreational diversity, and public and commercial accommodations. Developed recreation sites concentrated in the north portion of the zone around Turquoise Lake and Twin Lakes include 450 camp sites, several picnic grounds, boating sites, trailheads, fisherman parking lots and group use sites. An additional 300 camp sites are located in the southern portion of the zone. All of the sites have high occupancy rates.

Automobile touring and viewing scenery are popular activities in this zone. All roads entering the zone except one cross scenic mountain passes and many go over the Continental Divide. Some of these passes are popular four-wheel drive routes. There is an extensive network of trails for hiking, horseback riding, cross country skiing and some motorized vehicle use. A 120 mile segment of the Colorado Trail and an 80 mile segment of the Continental Divide Trail cross the zone. Many trails provide access to or near the summits of the fourteen 14,000 foot peaks located in the zone.

The zone offers a variety of historical sites as evidence of the 19th century mining boom. Some of these sites are National Register properties.

The zone contains three Wilderness areas including the Holy Cross, Mt. Massive and Collegiate Peaks with a total of 120,000 acres.

A considerable amount of mountain based outfitting and guiding activity occurs in the zone. Populations of wildlife provide recreation opportunities for the hunter, viewer, or photographer.

## **Transportation**

The area is traversed by U.S. Highways 50, 285, 24, and Colorado Highways 82, 300, 91, 306, and 162. There are many miles of county and Forest roads; 1,160 miles of these roads are shown on the Forest's Transportation Inventory System (TIS).<sup>11</sup> There are also noninventoried roads and "travel ways," most of which resulted from previous mining activity. The average road density of inventoried roads for the zone is 1.39 miles per square mile.

## **Special Use**

Special uses found in this area include recreation residences, ski areas, and communication sites. A complete list of special uses for this zone is found in Exhibit D-8 of this appendix.

## **Geographic Zone 2**

### **Vegetation**

In the subalpine zone, vegetation is dominated by spruce-fir, interspersed with aspen and grassland areas of various sizes. At mid-elevation, Douglas-fir and aspen are the dominant vegetation types, mixed with smaller amounts of Gambel oak and grassland areas. The drier, lower slopes are typically covered by ponderosa pine and pinyon-juniper. Most vegetation is over 100 years old,

due to low levels of silvicultural treatment and wildfire suppression. Refer to Exhibit D-2 for the vegetation summary for this zone.

### **Soils**

Shallow soil depths occur on residual side slopes in complex patterns with rock outcrop. Deeper soils are associated with colluvial footslopes, glacial moraines, and alluvial terraces. Medium to coarse textured soils have primarily developed from metamorphic and igneous parent materials, sedimentary rock layers, and transported glacial or fluvial materials. Typical soil texture for most igneous parent materials is very gravelly sandy loam. Finer textures such as loams, sandy clay loams, and clay loams have generally developed from volcanic, sedimentary, or alluvial materials. Soils generally have weak to moderate development and low to moderate fertility ratings. Surface and internal rock fragments vary by amounts and sizes; but most soil profiles have greater than 35 percent rock by volume, and rocky surfaces are most common on the steeper landforms.

These geologically young mountain ranges have moderate erosion hazard and geologic hazard ratings. Soils associated with severe erosion hazard are confined to areas with very steep slopes. Particular soil management concerns are controlling surface erosion by maintaining adequate ground cover, protecting alluvial bottom land from gully formations, and protecting fragile alpine ecosystems.

### **Water**

All the streams in this zone are tributary to the Arkansas River. Most of the streams flowing out of the Sangre de Cristo Range are perennial. The annual runoff is about 1.1 AF/ac.<sup>12</sup> The Spanish Peaks area has both perennial and intermittent channels. The annual runoff is around .5 AF/ac. The west side of the Wet Mountains is dry and most of the streams are intermittent. The annual water yield from this area only averages around .1 AF/ac.

Water quality in most streams of this zone is good enough to support a cold water fishery. Taylor Creek exhibits low severity effects from abandoned mining. Streams that have a significant amount of erosion include Cucharas Creek and White Creek in the Spanish Peaks area. Roads contribute to some of the sediment problem in Cucharas Creek. The cause of the sediment problem in White Creek isn't as clear; however, White Creek cuts through some fairly fine material that is easily eroded during high flows. There are several drainages in the Williams Creek/Wylie Gulch area on the west side of the Wet Mountains that are severely eroded. Overgrazing and poor road locations during the early development of the area caused erosion problems.

### **Wildlife and Fishery Resources**

Management Indicator Species (MIS) for this zone can be found in Exhibit D-3 of this appendix.

Over 37,905 acres of deer and elk winter range have been identified in this zone. Current winter range supports an estimated 3000 elk and 5500 deer. An estimated 650 bighorn sheep occur within the zone. Critical habitat for all species has been identified through the use of the Colorado Division of Wildlife Data Base.

This zone encompasses high elevation glacier formed lakes and gradient headwater streams in the Sangre De Cristo Mountains to intermittent gullies and arroyos in the Wet Mountain area. The most productive systems are located in the southern portion of the zone in the upper Purgatoire drainage, and along the eastern portions of the remaining Sangre De Cristo range. The Wet Mountains also contain self-sustaining as well as hatchery supplemented populations of rainbow, brook, brown and cutthroat trout which are accessible to the public (Melby, 1989).

A number of high elevation lakes throughout the Sangre De Cristo Range provide anglers with destination type fishing opportunities. The CDOW manages these lakes primarily by periodic stockings with cutthroat trout.<sup>13</sup> Most of these lakes have inadequate inlets or outlets for spawning or rearing habitat. They have to be periodically planted to maintain fishable populations. Blue and Bear Lakes, located in the Cucharas Creek watershed receive more intensive management, due to their accessibility and high use.

The vast majority of permanent stream systems in the Sangre De Cristo range contain self-sustaining salmonid populations, with several supplemented with hatchery reared fish.<sup>14</sup> Others, such as the North Fork of the Purgatoire River, Cuchara Creek and the Huerfano River have vehicle access along their length. Physical stream habitat conditions in these streams are currently limited in this zone.

### ***Riparian Resources***

Riparian resources are found from the foothills to the alpine. Most of the riparian areas are found in the montane zone. Riparian vegetation includes a variety of woody and herbaceous species, with the willow-sedge community dominating throughout most of the zone.<sup>15</sup> Cottonwoods and alders are more prevalent at lower elevations. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

This zone is within the historical distribution of the greenback cutthroat trout.<sup>16</sup> Endemic to the mountainous areas of this zone, this colorful trout has been eliminated from most of its original range as a result of competition and hybridization with non-native salmonids, as well as physical habitat degradation by man. The only two native populations of greenbacks in this zone reside in Cascade Creek and South Apache Creek. A reintroduced population resides in Cottonwood Creek. Other threatened and endangered species under consideration are listed in Exhibit D-5 for wildlife and Exhibit D-6 for plants.

### ***Range Resource***

Several livestock grazing allotments occur within this zone. These allotments contain land that is accessible to livestock and capable of producing forage on a sustained yield basis. Many areas are not suitable for livestock grazing. Suitable range acres and permitted grazing use for this zone is identified in Exhibit D-7 of this appendix.

### ***Visual Resource***

This zone is visible from the Colorado and Continental Divide Trails, several Wilderness Areas, numerous 4WD roads and several picnic areas and campgrounds.

This area can be viewed while driving along Highways 69, 50, 60 and 12. Because of the rugged country the area is a favorite for 4WD enthusiasts. Only two paved roads cross the range.

### ***Cultural, Paleontological, and Cave Resources***

#### ***Cultural***

According to the available information, prominent themes in Colorado mountain history or prehistory are not well represented in this zone, nor does there seem to be high potential for large quantities of significant cultural resources in areas that have not been examined for historic or

archaeological sites. The known significant historic resources are associated with the mining and transportation themes.

### ***American Indian Sacred Sites***

There are several potential American Indian Sacred Sites in this zone. These are the Spanish Peaks ("Huajatollah" to American Indian peoples) which are prominent in the legends of the Ute and other tribes. Mount Blanca is considered sacred by the Ute and Navajo and possibly other groups. The potential exists for additional identifications.

### ***Paleontological Resources***

There are some substantial deposits of potentially fossiliferous bedrocks in Zone 2. Sangre de Cristos (including the southern portion west of the Spanish Peaks) contain large exposures of the Sangre de Cristo Formation, a known fossil-producing deposit dating to the Permian and Pennsylvanian Periods. Although this formation is known to contain large amounts of plant fossils (including the "crinoid" fossils near Marble Mountain), the scientific value of these deposits has not been assessed. Also known are less extensive exposures of other Pennsylvania Period Devonian and Ordovician Age sedimentary. The potential for significant fossils in the former is unknown, while the Ordovician deposits apparently do contain some plant fossils of scientific merit.

On the lower southwest and southeast slopes is a band of Cretaceous age sedimentary sandstones and shales. The fossiliferous content of this band of sedimentary bedrock has not been evaluated. The potential for oil and gas development affecting paleontological resources in this zone is rated as moderate to high for the Sangre de Cristos, and low for the southern Wet Mountain and Spanish Peaks.

### ***Cave Resources***

The Marble Cave system in the Sangre de Cristo Range is a significant cave resource in this zone; the system includes Spanish Cave, White Marble Halls Cave, Bridal Cave, and other less prominent caves in this locality.

### ***Recreation***

The Sangre de Cristo Range provides opportunities for recreation experiences involving a degree of adventure, challenge and risk. Visitors seeking these experiences are attracted to the area from all parts of Colorado and the United States.

The face of Crestone Peak has become a favorite among rock climbers. This face and the north face of Blanca Peak rank as two of the most challenging for technical climbing in Colorado. Approximately 50 small lakes are destination attractions for fishermen in particular and also for hikers and backpackers. Another unique high adventure recreation activity in the Sangres is cave exploration. Several limestone caves are located above timberline in the area around Marble Mountain.

The zone has limited vehicular access. Most of the roads that provide access in this zone are low standard and do not accommodate passenger cars. Access depends on a system of trails totalling approximately 225 miles. The most important is the 100 mile long Rainbow Trail. A series of trails diverge from the Rainbow Trail to the lakes and several continue over the crest. The Rainbow Trail is open to motorized trail use, but most of the side trails are closed to protect the wilderness character of the high country.

Four developed campgrounds located along the zone provide base campsites for pursuing dispersed recreation activities in the high country. Six trailheads provide access and disperse the users.

In the Spanish Peaks portion, the main recreational attraction is the scenic landscape. The Spanish Peaks are very scenic in all seasons and may be viewed from Colorado Highway 12, US 160 and I-25. This route has been designated a Scenic Byway by the Forest Service and the State of Colorado. Hiking and mountain climbing are also popular activities. The summits of the Spanish Peaks afford outstanding views of the plains to the east and mountain ranges to the north, west and south. The peaks are not technically difficult to climb but provide a challenge to many with rewarding views from the summits.

Three campgrounds and two picnic grounds are located in this zone. Use at these sites is near capacity during the summer months. Trout fishing is a popular activity for visitors to the zone. Blue and Bear Lakes and Cuchara Creek and the North Fork of the Purgatoire River receive the most use. Big game hunting for deer, elk, bear and turkey occur around the Peaks.

The other portion of the zone contains the south one-third of the Wet Mountains. Recreation activities consist mainly of hiking, hunting and viewing the scenery while driving the limited number of roads. The area is particularly known for turkey hunting along with bear, elk and deer.

The majority of the 22,300 acre Greenhorn Mountain WSA occurs in this zone. In addition, there are 61,657 acres in the Sangre de Cristo WSA. The Spanish Peaks portion of the zone contains a 19,570 acre WSA that was not recommended for Wilderness designation.

### ***Special Interest Areas***

The Spanish Peaks National Natural Landmark is located in this zone.

### ***Transportation***

The forest area is traversed only by Colorado 12. The zone is crossed by U.S. 160 and Colorado Highways 69, 165, and 96. There are many miles of county and Forest roads; approximately 315 miles of these roads are included in the Forest's Transportation Inventory System (TIS).<sup>17</sup> There are noninventoried roads and "travel ways," most of which resulted from ranching and recreation activities. The average road density of inventoried roads for the Geographic Zone is .61 miles per square mile.

### ***Special Uses***

Special uses in the area include recreation residences and two ski areas. Additional information on special uses is found in Exhibit D-8 of this appendix.

## **Geographic Zone 3**

### ***Vegetation***

Vegetation is characterized by mixed conifer stands dominated by Douglas-fir or ponderosa pine, frequently interspersed with aspen. Grassy parks and Gambel oak are interspersed with conifer at mid to lower elevations. Much of the mountain grassland is found within the alpine zone. Spruce-fir dominates the subalpine vegetation, although aspen and smaller grassland areas are scattered throughout this zone. Spruce-fir with relatively dense canopy cover typically occupies

steeper slopes. On gentler upper slopes and ridgetops, past silvicultural treatments have created a pattern of young spruce-fir stands, interspersed with older spruce-fir stands. A vegetation summary follows this appendix as Exhibit D-2.

### **Soils**

Shallow soil depths occur on residual side slopes in complex patterns with rock outcrop. Deeper soils are associated with colluvial footslopes, and transported glacial or alluvial materials. Soils formed in place from weathered granite typically have coarse sandy textures with weak development and low fertility. Medium textured soils have developed from sedimentary formations and depositional parent materials which are generally more productive. Surface and internal rock fragments vary by amounts and sizes; but most soil profiles have greater than 35 percent rock by volume, with rocky surfaces common over most landforms.

Soil management concerns for this geographic zone relate to controlling surface erosion and gullies on granitic soils and steep slopes. Gully formations on gently sloping alluvial bottom land can also be a problem if vegetative cover is not properly managed. Geologic hazard for mass failure is not a major concern for soils and landforms of this area.

### **Water**

All the streams in this zone are tributary to the Arkansas River. Most of the streams in the Arkansas Hills are intermittent. Precipitation is low and intense summer thunderstorms are commonplace. The highest peak flows result from summer thunderstorms. This area was severely eroded at the turn of the century from overgrazing, overcutting, and from fires. Watershed restoration work was undertaken in the early 1930's and continues today to correct some of these problems. Streams in this area are small and are usually located in the bottom of old gullies. The gullies are usually well vegetated on the bottom and sparsely vegetated on the sides. The streams that flow through them are fairly stable meandering channels. Badger Creek has been identified as an area of concern for erosion. The Forest Service is doing erosion control work in this watershed as funding becomes available. Runoff from this area is low, around .1 AF/ac.

The streams on the southeastern side of the Wet Mountains are perennial since they receive a lot of their precipitation from upslope storms during the winter and spring months. Most of the channels are fairly stable. Streams in the northern portion of the Wet Mountains are mostly intermittent due to low precipitation. These channels also appear to be stable with no significant erosion problems evident. Some pollution in the St. Charles River has resulted from individual sewage disposal systems in the small community of San Isabel. Runoff from this area varies from .2 AF/ac in the northern portion to .5 AF/ac. in the southern part.

### **Wildlife and Fishery Resources**

MIS for this zone can be found in Exhibit D-3 of this appendix.

Over 73,102 acres of deer and elk winter range have been identified in this zone. Current winter range supports an estimated 3,000 elk and 5,500 deer. An estimated 650 bighorn sheep also occur within the Zone.

Most of the perennial streams contain self-sustaining populations of either brook, brown, rainbow or cutthroat trout, with brook trout being the dominant species.<sup>18</sup> In 1990, the CDOW planted more than 15,000 rainbow, cutthroat and brook trout in the streams in this zone, with the majority being catchable size rainbow trout.<sup>19</sup>



In 1990, 2,000 rainbow trout-cutthroat trout hybrids were planted in Lake Isabel to supplement a self-sustaining brook trout population. Browns Lake is also periodically stocked with cutthroat trout. Recently, a cooperative project between the Forest Service and the CDOW resulted in the construction of several fishing ponds in the Castle Rock Gulch area.<sup>20</sup>

### ***Riparian Resources***

Riparian resources are found exclusively in the montane and foothills zones. Riparian vegetation includes a variety of woody and herbaceous species, with willows and sedges dominating the community.<sup>21</sup> Alders and cottonwoods become more prevalent at lower elevations, with blue spruce apparent below 9,000 feet. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

Threatened and endangered species under consideration in this zone are listed in Exhibit D-5 for wildlife and Exhibit D-6 for plants.

Confirmed sightings of at least two pair of Mexican spotted owls have been made on the southern end of this zone. The bird is a candidate for Federal listing.

This zone is considered to be within the historical range of the greenback cutthroat trout.<sup>22</sup> The greenback has been eliminated from this zone, due to hybridization and competition with non-native salmonid fish, and habitat degradation. During the fall of 1990, 2,000 adult greenbacks were reintroduced into the headwaters of Greenhorn Creek.<sup>23</sup>

### ***Range Resource***

Several livestock grazing allotments occurring in this zone contain land that is accessible to livestock and capable of producing forage on a sustained yield basis. Many areas are not suitable for livestock grazing. Refer to Exhibit D-7 in this appendix for suitable range acres and permitted grazing use.

### ***Visual Resource***

This area is visible from I-25, the towns of Beulah, Westcliffe and Gardner. Several recreation developments including Lake Isabel are located within this zone.

Within this zone several viewing platforms are potentially affected. The Rampart Range Road, Interstate 25, the South Platte River, Lost Creek Wilderness, State Highway 24, numerous county and Forest Service roads, campgrounds and picnic areas are all within this zone.

### ***Cultural, Paleontological, and Cave Resources***

#### ***Cultural***

Zone 3 contains several known significant historic period resources, especially mining-related properties. There is a high potential in this zone for additional, currently unrecorded historic resources that are significant. The important historic themes and presently known significant historic resources within this zone include historic mines, mining camps and ghost settlements, railroad related properties, logging related properties, and other significant or potentially significant cultural properties.

The Arkansas Hills and the western portion of the zone in the area of Brown's Creek and Sand Creek are known to contain a substantial number of significant prehistoric archeological sites including quarries, camps, and scarred trees.

#### ***American Indian Sacred Sites***

There are no known American Indian sacred sites in Zone 3.

#### ***Paleontological Resources***

While most of the bedrocks of Zone 2 are metamorphic or igneous in origin, there also are some substantial deposits of potentially fossiliferous bedrocks. The Sangre de Cristos (including the southern portion west of the Spanish Peaks) contain large exposures of the Sangre de Cristo Formation, a known fossil-producing deposit dating to the Permian and Pennsylvanian Periods. While this formation is known to contain large amounts of plant fossils (including the "crinoid" fossils near Marble Mountain), the scientific value of these deposits has not been assessed. Also known are less extensive expanses of other Pennsylvania Period sedimentary formations.

#### ***Cave Resources***

There may be significant caves in the limestone outcrops of the canyons west of Beulah in the Wet Mountains. This area has not been scientifically mapped or assessed relative to the presence of caves or their significance.

### ***Recreation***

The majority of the recreation in the Wet Mountains occurs in this area and is centered around the Lake Isabel recreation area. The lake is popular for fishing, motorless boating, camping, picnicking, hiking, winter play, snowmobiling and ice fishing. There are three campgrounds in the zone. Private facilities include an RV Park, cabin rentals, restaurants, and three youth camps (Boy Scouts, Girl Scouts and YMCA).

Recreation consists primarily of dispersed activities with 170 miles of trails of which 130 are open to motorized users. There are 70 miles of groomed snowmobile trails for a variety of users. Driving the highways and forest roads to enjoy the scenery is a popular activity because of the zone's proximity to Pueblo.

Recreation activities in the Mosquito Range are dispersed with no developed sites in the zone. The primary activity is driving the forest roads to view the scenery. Few trails exist and very little live water is present. Some fishing does occur at some watershed improvement dams. Big game hunting for deer and elk is available. Mining in the late 1800's left remnants of that era for those interested in viewing old towns, mines and related structures.

### ***Transportation***

The area is traversed by U.S. Highways 24/285, 50 and Colorado Highways 96 and 78. There are many miles of county and Forest roads; 1,005 miles of these roads are included in the Forest's TIS.<sup>24</sup> Noninventoried roads and "travel ways" resulted from ranching, recreation, and mining activity. The average road density of inventoried roads for the Geographic Zone is 1.75 miles per square mile.

## **Special Uses**

Recreation uses include the Columbine Girl Scout Camp, a boat dock, two trail shelters and an isolated cabin. Special uses in this zone are outlined in Exhibit D-8 of this appendix.

## **Geographic Zone 4**

### **Vegetation**

The majority of this zone is characterized by mixed conifer stands dominated by Douglas-fir or ponderosa pine, interspersed with lesser amounts of aspen, grassy openings, Gambel oak and rocky outcrops. Spruce-fir occurs at higher elevations, notably below timberline on Pikes Peak, and on moister sites. Most bristlecone pine occurs in the south portion of this zone, primarily on upper slopes, ridges and poorer sites. Alpine vegetation is interspersed with talus slopes and rocky outcrops above timberline, primarily in the vicinity of Pikes Peak. A summary of vegetation types for this zone can be found in Exhibit D-2 following this appendix.

### **Soils**

Pikes Peak granite weathers into large coarse-grained crystals with little binding material. Soils formed from this type of granite are coarse textured, weakly developed, and low in fertility. Although soil depth widely varies, shallow depths commonly occur on steeper side slopes in complex patterns with rock outcrop, and moderately deep to deep soils occur on colluvial footslopes and alluvial fans. Soils typically have coarse sandy textures with coarser surface textures as slope gradients increase. Loamy soil textures are generally confined to minor areas of sedimentary parent materials and in depositional areas. Surface and internal rock fragments are typically very gravelly, and rock content generally increases with soil depth.

Soil management concerns relate to the physical properties of fragile soils and their susceptibility to accelerated erosion and gully formations. Soils lack inherent fertility which makes it questionable whether natural recovery can keep pace with geologic erosion even under complete protection.

### **Water**

All streams in this zone are tributary to the Arkansas River. They flow through the Pikes Peak granite which are some of the most erodible soils on the forest. Gravel makes up a significant portion of the beds and banks of streams in this area. This fine material makes the streams extremely susceptible to erosion. These streams also carry high sediment loads during high flows because the material is small and easily moved.

Beaver Creek was identified in the Forest Plan<sup>25</sup> as a stream that has exceeded its sediment threshold due to the numerous roads and trails in the watershed. Roads and trails are the major influence on the water quality in this zone. Erosion and excess sediment can be found along any road or trail in this zone.

Runoff in this zone varies from .3 AF/ac to .6 AF/ac. Several reservoirs in this zone provide water to Colorado Springs and the surrounding areas.

### **Wildlife and Fishery Resources**

MIS for this zone and the reason for their selection as an indicator species can be found in Exhibit D-3 of this appendix.

Over 18,952 acres of deer and elk winter range have been identified in this zone. Current winter range supports an estimated 300 elk and 1500 deer. An estimated 150 bighorn sheep occur within the Zone.

Self-sustaining populations of salmonid fish, predominantly brook trout inhabit most perennial streams in the zone, with minor supplementation by the CDOW with hatchery reared fish.<sup>26</sup> Rampart and Nichols Reservoirs are probably the most intensively managed lake systems, in terms of fishery resource associated with the National Forest. A variety of salmonid fish inhabit Rampart Reservoir, with a self-sustaining lake trout fishery a unique quality. Rainbow smelt, native gamefish in the northern and eastern states, have been planted for several years as a food source for the lake trout, as well as a potential gamefish. Rainbow trout and brook trout are stocked annually in both reservoirs.<sup>27</sup>

### ***Riparian Resources***

Riparian resources are found primarily in the foothills and montane sections of the Pike National Forest. There is limited alpine riparian environment in the south central portion of this zone. Riparian vegetation includes a variety of woody and herbaceous species, with the willow-sedge community dominating the vegetation throughout most of the zone. Cottonwoods and alders become more prevalent in the lower elevations. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

Threatened and endangered species under consideration in this zone are listed in Exhibit D-5 for wildlife and Exhibit D-6 for plants.

Although no recent Mexican spotted owl sightings have been made, there are historic records and one study skin at the Denver Museum of Natural History from this zone. The steep canyons dominated by mixed forests of Douglas fir, ponderosa pine and white fir are components of preferred Mexican spotted owl habitat.

This zone is considered to be within the historical distribution of the federally threatened greenback cutthroat trout.<sup>28</sup> However, through hybridization and competition with non-native fishes, there are currently no populations on Forest Service lands in this zone. One reintroduction has occurred in the city of Colorado Springs Water Supply Reservoir #2. There is also a population of greenback cutthroat trout located on the Fort Carson Military Reservation (Lytle Pond) east of the Pike National Forest.

### ***Range Resource***

Refer to Exhibit D-7 in this appendix for suitable range acres and permitted grazing use for this zone. Several livestock grazing allotments occur within this zone. These allotments contain land that is accessible to livestock and capable of producing forage on a sustained yield basis. Many areas are not suitable for livestock grazing.

### ***Visual Resource***

This zone is the backdrop for towns such as Woodland Park, Colorado Springs and Manitou Springs. Interstate 25, Pikes Peak Highway, Gold Camp Road, the Old Stage Road and Rampart Range Road are major travel routes through the zone. The Barr Trail, Pikes Peak Summit, Cog Railroad, Rampart Reservoir and St. Peter's Dome are other important resources.

## ***Cultural, Paleontological, and Cave Resources***

### ***Cultural***

There are known significant historic resources concentrated in the Pikes Peak area. Pikes Peak is listed as a National Historic Landmark; during the Colorado Gold Rush in 1859 and 1860, the first view of the Peak by fortune seekers from the east meant their journey was near an end. After the Gold Rush, the Peak was developed as a tourists' attraction; it commands a spectacular vista of the High Plains reaching nearly to the eastern border. The recognized historic themes and significant sites in this zone include recreation-related historic resources and Forest Service and forestry history.

Prehistoric resources appear to be of low density in this zone. No significant sites have been recorded, although some are known in the Manitou Experimental Forest. There is potential for future discoveries.

### ***American Indian Sacred Sites***

Pikes Peak is a potential sacred site in this zone as it is closely associated with the history and lore of the Ute. A systematic search for candidates and evaluation has not been done.

### ***Paleontological Resources***

Virtually all of the bedrock in Zone 4 is metamorphic gneisses or igneous granites. Thus, the potential to affect significant fossil resources in this zone is virtually nil.

### ***Cave Resources***

Cave of the Winds, a famous cave and visitors' attraction is within the Forest boundary on private land; limestone formations that produced this cave continue on Forest lands in the Waldo and Williams Canyon area. There is a potential for discovering new caves.

## ***Recreation***

The recreation activities are centered primarily around the summit of Pikes Peak which has three routes leading to it: the Pikes Peak Highway, the Barr National Recreation Trail and the Pikes Peak Cog Railway. Another area for viewing scenery is the Gold Camp Road along the south side of Pikes Peak.

Recreation to the north of Pikes Peak is centered around Rampart Reservoir. The reservoir is popular for fishing, camping, picnicking, hiking and mountain biking. The Waldo Canyon Trail, located off U.S. 24, receives a high amount of use, year around, as this trail provides panoramic views of Colorado Springs and the plains to the east. The Rampart Range Road from Garden of the Gods to Rampart Reservoir is another route used to enjoy the scenery of the area. Dispersed activities of big game hunting for deer and elk is the primary activity associated with off road users.

### ***Special Interest and Research Natural Areas***

The Queen's Canyon Geologic area established in 1963 is located in this zone. This area contains 1,130 acres, and features scenic geologic features and canyon areas.

The Hurricane Canyon Research Natural Area (RNA) established on 520 acres in 1931 is located in this zone. It is characterized by steep slopes and either boulder-filled canyons or narrow bottoms

of colluvial soil. There are two primary canyons, cut by the North and South Forks of French Creek, and several secondary canyons.

### ***Transportation***

The area is cut in two by U.S. Highway 24 from Colorado Springs to Woodland Park. Other major roads include Colorado Highway 67, the Rampart Range Road, the Gold Camp Road and the Old Stage road. There are many miles of county, city and Forest roads; approximately 515 miles of these roads are included in the Forest's TIS.<sup>29</sup> In addition, there are noninventoried roads and "travel ways," most of which resulted primarily from homesteading, recreation, and mining activity. The average road density of inventoried roads for the Geographic Zone is 1.60 miles per square mile.

### ***Special Uses***

Special uses in this area include recreation uses and communication sites. The special uses are outlined in Exhibit D-8 of this appendix.

## **Geographic Zone 5**

### ***Vegetation***

Front Range vegetation typically consists of mixed conifer stands dominated by Douglas-fir or ponderosa pine, frequently interrupted by grassy openings or Gambel oak. Open ponderosa pine stands on southerly aspects project a park-like appearance. Stands on northerly aspects are more dense and are usually dominated by Douglas-fir. Past and current silvicultural treatments have reduced canopy cover in localized areas. Most treated acres still have mature overstories. A vegetation summary for this zone can be found in Exhibit D-2 following this appendix.

### ***Soils***

Soils formed from Pikes Peak granite are coarse textured, weakly developed, and low in fertility. Although soil depth varies widely, shallow depths commonly occur on steeper side slopes in complex patterns with rock outcrop, and moderately deep to deep soils occur on colluvial foot-slopes and alluvial fans. Soils typically have coarse sandy textures with increasingly coarser surface textures as slope gradients increase. Finer soil textures generally develop from some of the metamorphic and sedimentary parent materials. Loamy textures also occur in alluvial bottoms and areas of deposition. Surface and internal rock fragments are typically very gravelly, and rock content generally increases with soil depth.

Particular soil management concerns for this area are the physical properties of fragile granitic soils and their susceptibility to accelerated erosion and gully formations. Soils lack inherent fertility which makes it questionable whether natural recovery can keep pace with geologic erosion even under complete protection.

### ***Water***

All of the streams in this zone are tributary to the South Platte River. This zone is also located mostly in granitic soils. The streams are sensitive and carry high sediment loads like the streams in Zone 4. Streams found to be over their sediment thresholds during the Forest planning effort include Tail Creek, Jackson Creek and a tributary to Plum Creek. There are numerous roads and trails in the

watersheds that contribute sediment to the streams. This zone is a favorite area for off-road vehicle recreation.

Runoff is greatest in the late spring and early summer during snowmelt. Intense thunderstorms do occur in the spring and summer. Some of the largest floods in this zone result from thunderstorms that occur early in the summer when the streams are flowing high with snowmelt runoff. Runoff varies from .2 AF/ac to .5 AF/ac in this zone.

### ***Wildlife and Fishery Resources***

MIS for this zone and the reason for their selection as an indicator species can be found in Exhibit D-3 of this appendix.

Over 10,830 acres of deer and elk winter range have been identified in this zone. Current winter range supports an estimated 1000 elk and 3000 deer. An estimated 150 bighorn sheep occur within the Zone.

This zone includes a wide variety of fishery resources, including one of the most intensively managed cold water river systems in the state, the South Platte River. There are a number of smaller order streams that sustain a cold water fishery. Creel census information collected in 1979 and 1980 revealed that over 11,000 fishermen used a relatively small (less than 3 miles) section of the South Platte River between May and October, with over 34,000 trout caught.<sup>30</sup> Sampling information collected by the CDOW indicates that rainbow and brown trout dominate the salmonid population in the South Platte River in this zone. Estimates range from 744 kg/ha in the Cheesman Canyon area downstream of Cheesman Reservoir to 46 kg/ha near Scraggy View.<sup>31</sup>

The river from Beaver Creek to Cheesman Reservoir is categorized as Wild Trout Water by the CDOW. This designation is given to streams which are self-sustaining and are not supplemented with hatchery reared fish. The section of river downstream of Cheesman Reservoir to the Forest Service boundary is classified as Gold Medal by the CDOW. These streams or lakes are of the highest quality in the state and must consistently have a standing crop of 40 lbs/acre with at least 12 fish per acre 14 inches or larger. This section of river also contains self-sustaining populations of rainbow and brown trout, with biomass values consistently greater than 400 lbs/acre. The section of river, from the Forest Service boundary upstream of Deckers to the confluence with the North Fork of the South Platte River, is also Gold Medal. Trout populations are greatest in the section of stream between the Forest Service boundary and the Scraggy View Campground. Trout in this section are protected with special regulations on harvest, and there is no stocking. Populations downstream of the Scraggy View Campground are considerably lower than upstream, the result of more liberal creel limits, reduced physical habitat and/or loss of the reduced influence of the tailwater effects produced by Cheesman Reservoir. The trout population downstream of Strontia Springs Reservoir to the Forest Service boundary is dominated by brown trout, although a self-sustaining rainbow trout population also exists. This section was closed from 1978-1980, while Strontia Springs dam was being constructed. This section of river is supplemented by stocking with hatchery reared rainbow trout and is accessible only by foot from the lower portion of Waterton Canyon.

Physical habitat measurements of the South Platte River reveal that adult brown and rainbow trout habitat is greatest in the section between Cheesman Reservoir and the Forest Service - Wigwam Club boundary downstream.<sup>32</sup> Minimum adult habitat for rainbow trout was located downstream of Strontia Springs Reservoir. Adult brown trout habitat exhibits minimum values downstream of Elevenmile Reservoir. Discharge-habitat relationships indicate that adult and juvenile trout habitat is at a minimum during the snowmelt runoff period in the late spring and summer months. This is because of excessive stream velocities.

Most tributaries of the South Platte River in the zone have been documented in terms of trout populations as a result of the Denver Water Board's Environmental Report Analyses.<sup>33</sup> Fish populations vary, but rainbow, brook and brown trout dominate. Maximum size of the trout is generally smaller than the mainstream populations, probably due to the limited habitat.

### ***Riparian Resources***

This zone is located entirely in the montane and foothills sections of the Pike National Forest. Riparian vegetation along the South Platte River has been restricted to a small area along most of its length, due to its development in a confined valley. Riparian vegetation includes a variety of woody and herbaceous plants. The most riparian environments in this area are associated with wet meadow environments and cottonwood-willow-sedge communities. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

Threatened and endangered species under consideration in this zone are listed in Exhibit D-5 for wildlife and Exhibit D-6 for plants.

The Pawnee Montane Skipper is a recent addition to the federal threatened species list. The habitat of this species is located in the upper portion of the South Platte River drainage. The species is associated with a vegetative community of open ponderosa pine woodlands with a dominance of mountain mahogany in the understory. The ground cover consists of blue grama grass and prairie gayfeather plant, an important nectar source for adult Pawnee Montane Skippers.

Historical records exist of the Mexican spotted owl in this zone. No recent sightings have been made.

This zone is within the historical distribution range of the federally threatened greenback cutthroat trout.<sup>34</sup> There is one population of greenback cutthroats, located in the headwaters of Jackson Creek. This native salmonid most likely inhabited most of the perennial stream systems in this zone, from the smaller systems to the South Platte River.

### ***Range Resource***

Refer to Exhibit D-7 in this appendix for suitable range acres and permitted grazing use for this zone. Several livestock grazing allotments occur within this zone. These allotments contain land that is accessible to livestock and capable of producing forage on a sustained yield basis. Many areas are not suitable for livestock grazing: i.e., rocky outcrops, steep slopes and dense timber.

### ***Visual Resource***

This zone is visible from areas that include Highways 24, 9, 285, 165 and 96, Boreas Pass (proposed scenic byway), Guanella Pass Scenic Byway, Mount Evans and Lost Creek Wildernesses, Continental Divide Trail Corridor, Colorado Trail and other lesser roads, trails and recreation facilities. This zone is also the background for several mountain communities such as Rye, McKenzie Junction, Lake George, Hartsell Beulah and San Isabel.

Within this zone several viewing platforms are potentially affected. The Rampart Range Road, Interstate 25, the South Platte River, Lost Creek Wilderness, State Highway 24, numerous county and Forest Service roads, campgrounds and picnic areas are all within this zone.



## **Cultural, Paleontological, and Cave Resources**

### **Cultural**

A fair amount of pertinent information has been gathered from results of compliance investigations completed in the recent past. Several of the important historic themes pertinent to this area and associated significant or potentially significant known cultural properties are railroads, recreation and tourism, logging, prohibition era, and Forest Service administration. The North Fork Historic District is centered on the North Fork of the South Platte River above (west) of the confluence. This resource includes the South Platte Hotel and numerous other turn of the century buildings between the hotel and the modern town of Pine. Other significant recreation and tourism history-related cultural properties in this zone include the Estabrook Historic District (listed on the National Register), Deckers Resort (Daffodil), the Wigwam Club, and Glen Isle. All of these historically-significant sites are on private lands within the boundary of the Pike National Forest.

There is a fair quantity of information regarding prehistoric resources within this zone. The relatively open valley of the South Fork between the Wigwam Club and South Platte apparently was a preferred area, and many large campsites have been recorded in this section of the river corridor. Culturally-scarred trees also have been recorded in Zone 5; notable among this class of resources is the Webster Park Grove northwest of Cheesman Reservoir.

### **American Indian Sacred Sites**

The Meadows Campground area on Buffalo Creek is a sacred site important to several American Indian tribes. Mount Evans, and Tahana and Kataka Peaks are potential sacred sites based on their prominence in Ute history and lore. The Webster Park Scarred Tree Area is a fourth potential resource of this type. A systematic study and evaluation has not been done.

### **Paleontological Resources**

Virtually all of the bedrock strata in Zone 5 are metamorphic gneisses or igneous granites representing the Pikes Peak Batholith. There are small exposures of the Fountain Formation (sandstones and conglomerates of the Pennsylvanian Period), and of Manitou limestone of the Ordovician Period in the vicinity of Ute Pass and Manitou Park-West Creek. The fossil content of these sedimentary formations is unknown.

### **Cave Resources**

The Lost Creek Caves system is a significant cave resource in this zone.

### **Recreation**

This zone provides an expansive combination of developed site and dispersed area recreation opportunities. Day use activities predominate. The most prevalent activities are the motorized travel for scenic enjoyment, viewing wildlife, picnicking and hiking. An extensive area for motorized activity is the Rampart Range Motorcycle Area with 115 miles of system trails especially designed and designated for all classes of motorcycle riders. Campgrounds, picnic grounds and trailheads are located along the Rampart Range Road to accommodate motorcycle enthusiasts. In addition to the 115 miles of system trails, there are 30 miles of non-system trails. Also there are 75 miles of non-system motorcycle trails that have been closed but to date have not been revegetated.

Waterton Canyon provides opportunities for fishing, hiking, jogging, bicycling, and viewing wildlife, particularly bighorn sheep. The northern terminus of the Colorado Trail begins here and winds its way for 40 miles across the zone providing opportunities for hiking, bicycling and horseback riding.

The South Platte River Corridor includes 20 miles of the North and South Forks of the South Platte River. The river is directly accessible from a paralleling road. The dispersed recreation activities that occur along the river include fishing, swimming, tubing, rafting, hiking and rock climbing. Camping and picnicking occur in the developed sites scattered along the river. The South Fork of the river is one of the most productive and popular fisheries in Colorado.

Developed recreation is centered in the Manitou Park area with several large campgrounds, picnic areas, and group areas. Manitou Lake is a popular year round area for picnicking and fishing with one campground open year round to accommodate the demand. The Buffalo Creek recreation area is another area with a concentration of developed sites for day use, overnight use and group use. It is also a popular fishery.

Other popular activities scattered throughout the zone include mountain bicycling, horseback riding, big game hunting for deer, elk and turkey, winter sports of snowmobiling and cross country skiing.

The Lost Creek and Mt. Evans Wilderness are located in the western part of the zone. They contain 139,217 acres and reported 75,000 RVD's of use in 1990.

### ***Transportation***

The area is traversed by Colorado Highway 96 and Douglas County Roads 67 and 126. There are many miles of county and Forest roads; approximately 1,170 miles of these roads are included in the Forest's TIS.<sup>35</sup> In addition, there are noninventoried roads and "travel ways," most of which resulted from homesteading, recreation, and mining activity. The average road density of inventoried roads for the zone is 1.39 miles per square mile.

### ***Special Uses***

Special uses in the area include recreation residences and communication sites. Additional information on special uses is found in Exhibit D-8 of this appendix.

## **Geographic Zone 6**

### ***Vegetation***

Near Thirtynine Mile Mountain, ponderosa pine savannah is interrupted by large, grassy openings at lower elevations. At mid to upper elevations, spruce usually forms mixed conifer stands with Douglas-fir, or mixed conifer-aspen stands. Aspen stands tend to occur on steeper slopes. Bristlecone pine occurs on the upper slopes of Thirtynine Mile Mountain and in semi-open stands with ponderosa pine and brush. Near Black Mountain, mixed conifer-aspen stands tend to form "islands" within large, grassy openings. Grassy parks are found throughout the elevational range. A vegetation summary follows this appendix in Exhibit D-2.

### ***Soils***

Soils have formed from extrusive-igneous parent materials with medium textures and deep, well developed profiles. Inherent fertility is considered moderate to high. Surface horizons of mountain

grassland soils are high in organic matter with high forage production potential. Surface and internal rock fragments vary by amounts and sizes. Most soil profiles have greater than 35 percent rock by volume, and rocky surfaces are most common on the steeper landforms.

Soils in this zone have moderate water erosion and geologic hazard ratings. Although inherent soil properties are considered relatively resistant to sheet and rill erosion, existing gully formations are indicative of past abuse. Management implications for this area relate to controlling surface runoff and concentrated flows by maintaining adequate ground cover protection.

### ***Water***

This zone lies in both the South Platte River watershed and in the Arkansas River watershed. The streams on the north slope of Thirtynine Mile mountain flow into the South Platte River and the streams on the south side of Thirtynine Mile Mountain and Black Mountain flow into the Arkansas River. Streams in this zone are all similar. They have cobble and gravel bottoms with a few boulders present, and are in fairly stable condition, although some bank erosion is evident.

There are numerous, unconstructed two-track roads in this zone and many of them occur right along the streams. Sediment from the roads can flow directly into the streams during rainfall and snowmelt runoff. Part of the Thirtynine Mile watershed was identified in the Forest Plan as being over sediment threshold due. Runoff in this area is around .4 AF/ac.

### ***Wildlife and Fishery Resources***

MIS for this zone can be found in Exhibit D-3 of this appendix.

Over 13,537 acres of deer and elk winter range have been identified in this zone. Current winter range supports an estimated 300 elk and 400 deer.

Perennial streams probably contain self-sustaining populations of salmonid fish, although sampling records are limited.<sup>36</sup> According to existing information, stocking by the CDOW is limited to Simms Creek. There does not appear to be a substantial fishery resource in this zone.

### ***Riparian Resources***

Riparian resources in this zone are found primarily in the montane zone and are generally associated with headwater streams. Riparian areas associated with alpine environments are restricted in the vicinity of Black Mountain and Thirtynine Mile Mountain. Riparian vegetation in this zone includes a variety of woody and herbaceous species, with the willow-sedge community dominating the vegetation throughout most of the zone.<sup>37</sup> See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

Threatened and endangered species under consideration in this zone are listed in Exhibit D-5 for wildlife and Exhibit D-6 for plants.

### ***Range Resource***

Refer to Exhibit D-7 in this appendix for suitable range acres and permitted grazing use for this zone. Several livestock grazing allotments occur within this zone. These allotments contain land that is accessible to livestock and capable of producing forage on a sustained yield basis. Many areas are not suitable for livestock grazing: i.e., rocky outcrops, steep slopes and dense timber.

## **Visual Resource**

This zone is visible from areas that include Highways 24, 9, 285, 165 and 96, Boreas Pass (proposed scenic byway), Guanella Pass Scenic Byway, Mount Evans and Lost Creek Wildernesses, Continental Divide Trail Corridor, Colorado Trail and other lesser roads, trails and recreation facilities. This zone is also the background for several mountain communities such as Rye, McKenzie Junction, Lake George, Hartsell Beulah and San Isabel.

Within this zone several viewing platforms are potentially affected. The Rampart Range Road, Interstate 25, the South Platte River, Lost Creek Wilderness, State Highway 24, numerous county and Forest Service roads, campgrounds and picnic areas are all within this zone.

## **Cultural, Paleontological, and Cave Resources**

### **Cultural**

Although a systematic cultural resources inventory of the entire area has not been completed, large portions of the Thirtynine Mile Mountain vicinity are known in this regard. The historic themes especially pertinent to this zone and individual contributing cultural properties are historic logging and early prehistoric montane occupations.

### **American Indian Sacred Sites**

A systematic study and evaluation has not been done, so the potential for undiscovered sacred place resources exists.

### **Paleontological Resources**

All of the exposed bedrock strata in this zone are geologically recent ash flows and andesitic lavas from volcanic activity. Hence, the potential for significant fossils in this area is virtually nil.

### **Cave Resources**

No known significant caves exist in Zone 6. The potential for discovering new significant cave systems is virtually nil, based on the bedrock geology.

## **Recreation**

The entire zone may be referred to as the "Thirtynine Mile Mountain" with Black Mountain at 11,654 feet being the high point in the zone. Several roads provide access for a variety of dispersed recreation activities. Hunting for deer and elk is the primary activity associated with dispersed camping. Use is approximately 7500 RVD's.

## **Research Natural Areas**

The Saddle Mountain RNA, approximately 480 acres, established in 1951, is located in this zone. The fertile soil, derived from basaltic rocks, supports a variety of plant communities. Wide meadows are covered by an unusual climax stand of oat-grass. A large stand of bristlecone pine covers portions of the RNA.

### **Transportation**

The area is bisected by Colorado Highway 9 for approximately two miles. The remaining roads are forest access roads including approximately 50 miles of roads shown on the Forest's TIS.<sup>38</sup> In addition, there are noninventoried roads and "travel ways" open to use, most of which resulted from recreation and mining activity. The average road density of inventoried roads for the zone is 2.51 miles per square mile.

### **Special Uses**

The special uses in this zone are outlined in Exhibit D-8 of this appendix.

## **Geographic Zone 7**

### **Vegetation**

Near Kenosha Pass at the north end of this zone, spruce composes mixed conifer stands with lodgepole pine or bristlecone pine. South of the Kenosha Pass area, aspen and mixed conifer stands (dominated by spruce or Douglas-fir) are interspersed with numerous, large openings. The Tarryall Mountains are a prominent feature with generally steep slopes occupied by spruce or spruce/Douglas-fir stands interspersed with rock.

In the south part of the zone, the lower elevation vegetation is characterized by mixed conifer stands dominated by ponderosa pine or Douglas-fir, interspersed with large, grassy parks at lower elevations. Douglas-fir and aspen are characteristic on northerly aspects, while ponderosa pine savannah is common on drier sites. Mountain mahogany is a common understory species in the ponderosa pine type.

Mixed conifer-aspen stands comprised of Douglas-fir, spruce, lodgepole pine and aspen are typical at higher elevations. A vegetation summary for this zone follows this appendix in Exhibit D-2.

### **Soils**

An area of Pikes Peak granite occurs west of Lake George in the vicinity of Elevenmile Canyon, and there are alluvial deposits in valley bottoms. Slope gradients range from 10 to 50 percent over most landforms. Steep slopes of 40 to 70 percent occur around mountain summits and rocky escarpments. Nearly level to gently sloping landforms with 0 to 15 percent slopes include ridges, plateaus, and valley bottom land.

Shallow soils occur on residual side slopes in complex patterns with rock outcrop, and deeper soils are associated with colluvial footslopes and transported alluvial materials. Medium to coarse textured soils have developed from parent materials derived from igneous and metamorphic sources. Typical textures consist of sandy loams on residual landforms, and loams or clay loams are common in deeper soil profiles. Soils generally have weak to moderate development and low to moderate fertility ratings. Surface horizons of the mountain grassland soils are high in organic matter with high forage production potential. Surface and internal rock fragments vary by amounts and sizes; but most soil profiles have greater than 35 percent rock by volume, and rocky surfaces are most common on the steeper landforms.

Soils in this zone generally have moderate to severe erosion hazard and low to moderate geologic hazard ratings. Soil management concerns are mainly confined to protecting areas of Pikes Peak

granite with severe erosion hazard, controlling surface erosion on steeper slopes, and protecting alluvial bottom land from gully formations by maintaining adequate ground cover.

### **Water**

The streams in this zone are all tributary to the South Platte River. Streams are mostly intermittent in this zone although perennial streams occur at the higher elevations. The intermittent streams are mostly small stable streams that are inside larger, old drainages or gullies. Most of these streams were severely eroded early in the century. Overgrazing was most likely the main cause of the erosion. As the vegetation improved, the gully bottoms started to stabilize. Runoff was not as flashy since vegetation tends to hold more of the precipitation on site and lets it infiltrate the soil rather than run off.

Runoff occurs during snowmelt and after summer thunderstorms. Runoff in this area averages about .2 AF/ac in the lower, drier part of the zone and .8 AF/ac in the higher elevations.

### **Wildlife and Fishery Resources**

Management Indicator Species (MIS) for this zone can be found in Exhibit D-3 of this appendix.

Over 27,075 acres of deer and elk winter range have been identified in this zone. Current winter range supports an estimated 1,000 elk and 2,000 deer. An estimated 650 bighorn sheep occur within the Zone.

This zone encompasses a wide variety of fishery resources, from small headwater streams to the South Platte River. Elevenmile Reservoir located on the South Platte River is a heavily used recreational fishery resource.

Stocking of Elevenmile Reservoir included a variety of gamefish, including rainbow, lake, and cutthroat trout, kokanee salmon and walleye. Northern pike were planted to control sucker populations. Fish grow relatively fast in this reservoir due to its high productivity. Tarryall Reservoir is also an important reservoir fishery, although it does not receive as intensive use as Elevenmile Reservoir. Spinney Mountain Reservoir is a high quality fishery located upstream of Elevenmile Reservoir. This reservoir should not be affected by oil and gas leasing on Forest Service lands and will not be included in this analysis.

Tarryall Creek is located primarily on private land, with approximately 6 miles on NFS lands. Streambank erosion, caused primarily by agricultural practices, has led to this stream being classified as a non-point source upstream of Tarryall Reservoir.<sup>39</sup> Although Tarryall Reservoir acts as a catchment for most of the upstream suspended sediment, similar conditions exist along much of the privately owned stretches downstream of the reservoir. A total of 16,500 brown and rainbow trout were planted in Tarryall Creek, both upstream and downstream of the reservoir.<sup>40</sup> A section of Tarryall Creek (approximately 3 miles in length) upstream of the confluence with the South Platte River is managed as a self-sustaining fishery.

Access to fishing sites is good throughout most of its length. The two most abundant trout on the South Platte River are brown and rainbow trout, with the highest biomass occurring downstream of Cheesman Reservoir. Populations in the Elevenmile Canyon area are varied, with both brown and rainbow trout stocked yearly.<sup>41</sup> White and longnose suckers dominate the fish biomass in the upper, lower gradient portion of the canyon, while trout dominate in the steeper canyon areas. Northern pike and kokanee salmon are also periodically found in the canyon area as a result of swimming or being swept over the Elevenmile Reservoir spillway.

### ***Riparian Resources***

Riparian resources in this zone are found in the alpine, montane and foothills areas of the Pike National Forest. Riparian vegetation in this zone includes a variety of woody and herbaceous species relative to elevations in this area.<sup>42</sup> The willow-sedge community is dominant, with relatively large willow complexes growing in the Craig, Lost and Tarryall Creek drainages. Cottonwoods and alders are more abundant in the lower elevations of this zone; mostly cottonwoods grow along the South Platte River. ERO Consultants discovered that the willow-sedge and wet meadow communities dominated the riparian areas in the Hacket Mountain and Cheesman Lake area.<sup>43</sup> They also found that willow and willow-alder stands comprised a relatively high proportion of the total riparian.

This zone contains some relatively large riparian areas in stream valleys, comprising a small percentage of all the public land. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

This zone is considered to be within the historical distribution range of the Federally threatened greenback cutthroat trout.<sup>44</sup> Currently, no populations exist in this zone.

Two plants are of concern in this zone. These are the Weber monkey flower found in the Tarryall Mountains and Porter's Feathergrass found in the Lost Park area. Both plants are under review for formal Federal listing.

Threatened and endangered species under consideration in this zone are listed in Exhibit D-5 for wildlife and Exhibit D-6 for plants.

### ***Range Resource***

Refer to Exhibit D-7 in this appendix for suitable range acres and permitted grazing use for this zone. Several livestock grazing allotments occur within this zone. These allotments contain land that is accessible to livestock and capable of producing forage on a sustained yield basis. Many areas are not suitable for livestock grazing: i.e. rocky outcrops, steep slopes and dense timber.

### ***Visual Resource***

This zone is visible from areas that include Highways 24, 9, 285, 165 and 96, Boreas Pass (proposed scenic byway), Guanella Pass Scenic Byway, Mount Evans and Lost Creek Wildernesses, Continental Divide Trail Corridor, Colorado Trail and other lesser roads, trails and recreation facilities. This zone is also the background for several mountain communities such as Rye, McKenzie Junction, Lake George, Hartsell Beulah and San Isabel.

Within this zone several viewing platforms are potentially affected. The Rampart Range Road, Interstate 25, the South Platte River, Lost Creek Wilderness, State Highway 24, numerous county and Forest Service roads, campgrounds and picnic areas are all within this zone.

### ***Cultural, Paleontological, and Cave Resources***

#### ***Cultural***

This area is not well-known in terms of either prehistoric or historic resources. Probably the greatest potential for significant resources is the vicinity of the eastern and southern slopes of the Puma

Hills where historic mining activity was pervasive. The especially pertinent historic themes for this zone and associated significant resources are historic mining activity and railroading. Elevenmile Canyon, in the southern portion of this zone, is the historic route for the Midland Railroad, the first standard gauge line to penetrate the central Colorado mountains.

### ***American Indian Sacred Sites***

There are no known sacred sites in this zone. A systematic study and evaluation has not been done, so the potential for undiscovered sacred place resources exists.

### ***Paleontological Resources***

Near Lake George are exposures of Oligocene age sedimentary shales and tuffs associated with the Florissant Lakes Beds; these are proven sources of significant fossils. For the zone as a whole, the potential for oil and gas development to affect significant paleontological resources is low, but for the Lake George locality it is moderate to high.

### ***Cave Resources***

No known significant caves exist in Zone 7. The potential for discovering new significant cave systems is virtually nil, based on the characteristics of the local bedrock geology.

## ***Recreation***

The prominent developed recreation area in this zone is Elevenmile Canyon recreation area which is a series of campgrounds and picnic grounds along the South Platte River from Lake George to Elevenmile Canyon Dam. A parallel road affords easy river access for a variety of activities including fishing, tubing, rafting, wading, sunbathing and technical rock climbing. During summer weekends, Elevenmile Canyon takes on the character of an intensively used urban river parkway. The six campgrounds and four picnic grounds are usually filled to capacity on weekends. Many users simply drive the road that parallels the river to view the scenery and people enjoying the outdoors. The road follows the bed of the abandoned Colorado Midland Railroad and proceeds through tunnels. The road and related historic features are significant cultural resources and of interest to many visitors to the canyon. This segment of the river has been determined to be eligible for addition to the National Wild and Scenic Rivers System. The determination found that this segment meets the "recreation river" eligibility criteria under the Wild and Scenic Rivers Act.

West of Lake George on U.S. 24, Wilkerson Pass has a Forest Service administered visitor information center that is potentially one of the most important in Colorado. The site is an outstanding scenic overlook, as well as an opportune rest stop. It is favorably located for providing visitor information pertaining to every National Forest, Park and Monument in Colorado as well as most State Parks. The site's location and service capabilities are suitable for introducing every highway traveler to the purpose and mission of the Forest Service.

The Tarryall Creek from Lake George to Jefferson is popular for fishing and various forms of water play. Destination users find the Spruce Grove Campground an ideal site from which to go fishing or hiking into the Lost Creek Wilderness. There are trailheads and DOW facilities for providing additional creek and Wilderness access. The Tarryall Road is also popular for scenery and wildlife viewing. Much of the remaining zone is used for big game hunting and associated dispersed camping.



### ***Transportation***

The area is traversed by Park County Road 77 (Tarryall Rd.) and U.S. Highway 24. There are many miles of county and Forest roads; approximately 245 miles of these roads are shown on the Forest's TIS.<sup>45</sup> In addition there are noninventoried roads and "travel ways," most of which resulted from recreation and ranching activity. The average road density of inventoried roads for this zone is .960 miles per square mile.

### ***Special Use***

Special uses for this zone include the Sleeping Tom Summer Home Group and the Badger Mountain Communication Site. Additional information on special uses is found in Exhibit D-8 of this appendix.

## **Geographic Zone 8**

### ***Vegetation***

The north part of this zone is characterized by lodgepole pine, spruce and aspen stands, interspersed with grassy areas. Grassy parks become larger and more frequent from Hoosier Pass, south to Trout Creek Pass.

The south part of this zone has a more diverse mixture of conifer and aspen. Common coniferous species include lodgepole pine, spruce, Douglas-fir, ponderosa pine and bristlecone pine. Sagebrush grows in natural openings. A vegetation summary for this zone follows this appendix in Exhibit D-2.

### ***Soils***

Shallow soil depths occur on residual side slopes and benches in complex patterns with rock outcrop, and deeper soils are associated with colluvial footslopes, glacial moraines, and alluvial terraces. Medium to coarse textured soils have developed from igneous and metamorphic rocks, sedimentary rock layers, and transported glacial or fluvial materials. Typical soil texture for most igneous parent materials is very gravelly sandy loam. Finer textures such as loams, sandy clay loams, and clay loams have generally developed from volcanic, sedimentary, or alluvial materials. Surface and internal rock fragments vary by amounts and sizes, but most soil profiles on upland landforms have greater than 35 percent rock by volume.

Most of this geographic zone has moderate erosion hazard and geologic hazard ratings. Soil management concerns relate to controlling surface erosion on the steeper slopes and gullies on alluvial bottom land by maintaining adequate ground cover protection.

### ***Water***

The streams in this zone are the headwaters of the South Platte River, and for the most part are stable. Some of the streams that exhibit erosion problems are those in the Buffalo Peaks area such as Pony Creek, Buffalo Creek and Salt Creek. This area was severely eroded during the early part of the century when most of the main drainages were gullied. Most of the streams have stabilized within these gullied drainage ways. These drainages have good vegetation in the bottom with small, stable, meandering stream channels in them. The banks of the gullies are not completely healed and are still sensitive to impacts. Rough and Tumbling Creek has some eroded banks that were probably caused by livestock.

Old mining activities have left their impacts on some streams in this zone. They include the South Fork of the South Platte River, Twelvemile Creek and Mosquito Creek. The North Fork of the South Platte River carries elevated levels of heavy metals. The metals originate in Hall Valley from Handcart Gulch and from Geneva Creek. The metals in Geneva Creek are from old mining activity and from naturally occurring iron bogs and iron springs.

Runoff in this zone occurs mostly from snowmelt. Runoff varies considerably in this zone from around .4 AF/ac in the Buffalo Peaks area to 1.0 AF/ac in the northern portion of the zone.

### ***Wildlife and Fishery Resources***

MIS for this zone can be found in Exhibit D-3 of this appendix.

Over 40,612 acres of deer and elk winter range have been identified in this zone. Current winter range supports an estimated 4,000 elk and 6,500 deer. An estimated 450 bighorn sheep occur within the Zone.

The North Fork of the South Platte River extends through this zone. Brown trout are the dominant trout species in the North Fork, although brook and rainbow trout are also present.<sup>46</sup> Rainbow trout are planted yearly in public stretches of the North Fork, and cutthroat were planted as well in 1990.<sup>47</sup> Elevational segregation and competition may have a large influence on the distribution of different salmonid fish species in this zone, with brook trout being the dominant species in the higher elevation small order streams.

Physical habitat conditions for this zone are limited primarily to the North Fork of the South Platte River. Habitat measurements in the North Fork indicate that physical habitat for rainbow and brown trout is most limiting during the summer months during the snowmelt runoff period.<sup>48</sup> Spawning habitat appears to be especially limiting for this stream. High stream velocity during the runoff period is the primary factor resulting in the decreased habitat during the summer months.

Historical mining activities in this zone have resulted in poor water quality conditions in several watersheds (Water Quality Control Commission, 1988). Specific streams systems identified include: Twelvemile Creek, South Fork Mosquito Creek, Handcart Gulch, Geneva Creek, and the North Fork of the South Platte River. Results from benthic macroinvertebrate samples indicate that the majority of toxic metal concentrations in the North Fork are found upstream of the confluence with Geneva Creek.<sup>49</sup>

Jefferson Lake is probably the most intensively managed lake system in this zone. In 1990, a total of 75,000 kokanee salmon and 36,000 rainbow trout were planted in this reservoir.<sup>50</sup> Also, a self-sustaining lake trout population exists in this lake. Several other smaller lake systems in this zone are periodically planted with hatchery reared trout, including Wheeler Lake and Shelf Lake.

### ***Riparian Resources***

Riparian resources in this zone are found entirely in the alpine and montane areas of Pike National Forest. Riparian vegetation includes a variety of woody and herbaceous species, with the willow-sedge community dominating throughout the zone.<sup>51</sup> Blue spruce grows in the riparian at lower elevations. Narrow bands of riparian are found along all permanent streams, and most temporary streams with numerous isolated areas that are periodically saturated with water and contain emergent or willow complexes. Riparian tracts are extensive in some Forest areas, especially on the South Park valley floor. Most, however, are outside National Forest boundaries.

Although this zone contains some of the larger riparian areas on the Forest, they still comprise a relatively small proportion of total Forest land. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

This zone is considered to be within the historical distributional range of the federally threatened greenback cutthroat trout. Currently, there is one drainage that contains this native salmonid, Bruno Gulch.

Fifteen T&E plants are found in this zone. None of the plants have been federally listed. The Forest Service intends to protect their habitats from deterioration pending completion of review by the U.S. Fish and Wildlife Service. Refer to Exhibits D-5 and D-6 in this appendix for a listing of threatened and endangered wildlife and plants for this zone.

### ***Range Resource***

Refer to Exhibit D-7 in this appendix for suitable range acres and permitted grazing use for this zone. Several livestock grazing allotments occur within this zone. These allotments contain land that is accessible to livestock and capable of producing forage on a sustained yield basis. Many areas are not suitable for livestock grazing: i.e. rocky outcrops, steep slopes and dense timber.

### ***Visual Resource***

This zone is visible from areas that include Highways 24, 9, 285, 165 and 96, Boreas Pass (proposed scenic byway), Guanella Pass Scenic Byway, Mount Evans and Lost Creek Wildernesses, Continental Divide Trail Corridor, Colorado Trail and other lesser roads, trails and recreation facilities. This zone is also the background for several mountain communities such as Rye, McKenzie Junction, Lake George, Hartsell Beulah and San Isabel.

The Buffalo Peaks WSA is in this area. The proposed Boreas Pass Scenic Byway, Highways 285 and 9 are the major roads in the zone. In addition to numerous smaller trails the Continental Divide Trail and Colorado Trail traverse the zone.

### ***Cultural, Paleontological, and Cave Resources***

#### ***Cultural***

Cultural resources knowledge of this zone is fairly extensive although there are large gaps in the systematic coverage of the area. It has a relatively high density of significant cultural resources, notably mining related historic period properties and prehistoric sites. The historic themes that are particularly applicable to this zone and known historic properties are mines and mining-related sites, railroad history, the timber and charcoal industry, and transportation routes. There are several identified prehistoric sites in the Mosquito Range area; these are camps probably dating to the 18th and 19th century use of the area by historically-known tribes. There also are scarred ponderosa tree groves and stone quarry sites that are significant or potentially significant.

#### ***American Indian Sacred Sites***

A study to identify such sites has not been accomplished so the potential for such sites in this zone exists. It is possible that American Indian groups would consider some of the known prehistoric archaeological locations within this zone as sacred sites.

### ***Paleontological Resources***

The eastern slopes of the Mosquito Range and the northern Arkansas Hills have large scale exposures of sedimentary rock including sandstones and conglomerates of the Middle Pennsylvanian age and limestones of the Upper Cambrian and Devonian Periods. These deposits have not been investigated for their possible fossil content. Based on this summary, the potential to affect significant paleontological resources in the northern part of Zone 8 is very low, while for the middle and southern portions, it is rated as moderate.

### ***Cave Resources***

Cave Creek Cavern southwest of Fairplay in the Mosquito Range is a potentially significant cave resource in this zone. There is low potential for discovering new significant cave resources in this zone.

### ***Recreation***

This zone has two highly developed recreation complexes, Jefferson Creek and Geneva Creek. The Jefferson Creek enclave features scenic 190 acre Jefferson Lake, three campgrounds, three picnic grounds, fishing and boating access, trailheads and fisherman parking lots. The area is so popular with the Denver urban area that the demand for campsites exceeds the capacity throughout the summer season. High fishing use occurs both at the lake and creeks during the summer.

Geneva Creek from Grant to Guanella Pass is also a complex of developed sites with three campgrounds, two picnic grounds and two trailheads. Geneva Creek is paralleled by the Guanella Pass road, a designated Scenic Byway. This Scenic Byway between Georgetown and Grant is a popular loop trip from the Denver metropolitan area. The road also parallels a portion of the Mt. Evans Wilderness with several trails leaving the road and providing access to the Wilderness.

U.S. 285 over Kenosha Pass travels through the zone and parallels the North Fork of the South Platte River. This highway provides extensive viewing opportunities of National Forest scenery between Bailey, Fairplay and Antero Junction. Other roads that provide scenic views of the National Forest are Hoosier Pass (Colorado 9), Boreas Pass, Georgia Pass and Webster Pass. Driving for scenic pleasure is a popular activity in this zone.

A 13 mile segment of the Colorado Trail traverses the zone as does a 35 mile segment of the proposed Continental Divide National Scenic Trail. Additional trails scattered throughout the zone provide dispersed recreation activities. Developed campgrounds are also scattered throughout to provide base camps to accommodate a variety of dispersed activities including hiking, horseback riding, mountain biking, big game hunting, viewing and photographing historical sites and fishing. The zone also provides many opportunities for winter activities of snowmobiling, snowshoeing and cross country skiing. Snow conditions and terrain in this zone lend themselves to these activities.

### ***Special Interest and Research Natural Areas***

The Windy Ridge Bristlecone Pine Scenic Area, designated in 1966, features a wind swept ridge with old growth bristlecone pine over 1,000 years old. The area has unique biological values as well as outstanding scenery.

Mt. Bross, West Hoosier and Iron Mountain Botanical Areas, are proposed Special Interest Area candidates for designation because of the presence of populations of the Federally Endangered Alpine braya plant. This is a small herbaceous perennial that occurs in the alpine tundra and is

a rare plant separated from its nearest relative in Canada. Colorado Natural Areas Program has been working with the Forest to determine the proper boundaries and extent of the population.

The Lost Park Botanical Area proposed for Special Interest designation contains the largest known occurrence of Porter Needlegrass, a USFWS Category 2 species (candidate species for listing pending further data). This rare species grows on large, springy floating mats capable of supporting a person. The genus has one representative in North America and a total of three representatives worldwide.

A 695 acre area, the Hoosier Ridge RNA, is proposed for this zone. The area is above timberline where the Continental Divide runs east and west. Moist bogs with mossy ground cover provide the necessary habitat for *Eutremia penlandii*, a plant now under consideration by the US Fish and Wildlife Service as a threatened species. The area also provides habitat for *Sausseria weberi* and *A. maritima sibirica*, species that are distinct from other arctic and high alpine areas; that is, they occur in the far north and in a few Colorado sites and nowhere in between. The nearest occurrence of *A. maritima sibirica*, a plant characteristic of arctic seashores, is found in Labrador. One theory is that these plants are relict species from the Great Ice Age which covered much of North America during the Pleistocene.

### **Transportation**

The zone is accessed from U.S. Highway 285 with Colorado Highway 9 bisecting the area north of Fairplay. Other major roads in the area are the Boreas Pass Road, the Weston Pass Road and U.S. Highway 24/285. There are many miles of county and Forest roads; approximately 685 miles of these roads are shown on the Forest's TIS.<sup>52</sup> In addition, there are noninventoried roads and "travel ways," most of which resulted from recreation and ranching activity. The average road density of inventoried roads for this zone is 1.2 miles per square mile.

### **Special Uses**

Special uses includes recreation, summer homes, and communication sites. The special uses in this zone are outlined at the end of this appendix in Exhibit D-8.

## **THE GRASSLAND ENVIRONMENT**

### **Geographic Zone 9**

#### **Vegetation**

Shortgrass prairie is the dominant type, but this zone also includes about one percent pinyon-juniper. The pinyon-juniper type appears as an open forest with small, rounded trees. Rocky Mountain juniper is the dominant species. Common understory species include several grama grasses and buffalo grass, with some oak brush and mountain mahogany in the shrub layer. The pinyon-juniper type provides year-round range for mule deer. Its darker color and rougher texture also offers good visual relief from the prairie landscape.

#### **Soils**

Soils of the upland plain are shallow to moderately deep over limestone geology. Loam surface textures and silty clay loam subsoils typically contain high amounts of lime. These "hard land" soils are well drained and have water-holding capacities that are somewhat limited due to soil depth.

The canyon escarpments and steeper terrain have shallow soils on rocky bluffs and deeper soils on colluvial footslopes. Soils on these landscapes have typically developed from sandstone parent materials, although some are associated with basalt breaks. Soil textures consist of stony sandy loams and limy loams; slightly heavier textures are derived from basalt materials.

This geographic area has moderate erosion hazard. Most soil management concerns relate to controlling water erosion on steeper slopes and alluvial bottom land by maintaining adequate ground cover protection.

### ***Water***

The drainages at the north end of this zone drain into Timpas Creek. The drainages at the south end of the zone drain into the Purgatoire River and into Mustang Creek. All of the drainages in this zone are intermittent except for Timpas Creek. Runoff occurs as a result of rainfall. Runoff from snowmelt is rare. The average runoff for this zone is only about .03 AF/ac.

The water is high in salts due to the saline soils that are present in the area. Any ground disturbing activities can contribute more salts to the streams. Suspended sediments appear to be high, although we haven't done any sediment measurements on the streams in the Grasslands. The murky color of the water after a rainstorm give some indication of the high suspended sediment loads being transported.

Many of the drainages have small stock dams and erosion control dams constructed on them for the purpose of slowing the runoff and allowing water to percolate into the soils. The dams also provide much needed water for the wildlife and livestock that use the area. Wells provide a more reliable source of water. Some of the larger wells have electric pumps and a series of pipelines that provide water to stock tanks over a large area.

### ***Wildlife and Fishery Resources***

MIS for this zone and the reason for their selection as an indicator species can be found in Exhibit D-2 of this appendix.

Timpas Creek is the largest permanent stream system on the Comanche National Grassland. Results from the CDOW indicate that there are at least eleven species of fish inhabiting this watershed.<sup>53</sup> The only non-native fish sampled during the three year sampling period was carp. Gamefish sampled included black bullheads and green sunfish. Sampling conducted in Purgatoire River, the watershed adjacent to Timpas Creek River revealed similar results, with the addition of channel catfish. Channel catfish may also be present in the Timpas Creek system, as a result of migrations from the Arkansas River. The fish species found in these watersheds are typical of the Arkansas River plains environment.

### ***Riparian Resources***

This zone contains the largest stream riparian zone on the Grassland, Timpas Creek. Riparian areas are limited primarily to depressions in the land and narrow stream channels. Numerous temporarily moist depressions exist that contain vegetation that is characteristic of riparian conditions (e.g., sedges) but are only periodically saturated as a result of rains and/or snowmelt. Streams are mostly temporary or intermittent and exhibit restricted or narrow riparian areas. Woody riparian vegetation includes primarily cottonwoods, willows, and salt cedar.<sup>54</sup> Herbaceous plants in the area include those species that have evolved to withstand periodic droughts and desiccation in the semiarid conditions, as well as those that are restricted to the few permanent aquatic habitats available. The salt cedar, was introduced from Asia and has been spreading in the Arkansas valley

since the early 1890's. This hardy riparian species appears to have spread rapidly and displaced native vegetation throughout this geographic zone. Diversity of herbaceous plants was less in the presence of native salt cedar stands with only those species tolerant of soluble salts able to survive. The relatively small percentage of riparian areas in this zone is primarily the result of the semiarid conditions. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

Threatened and endangered wildlife and plant species under consideration in this zone are listed in Exhibits D-5 and D-6 respectively.

Two species of fish found in this zone are Colorado listed as threatened: the Arkansas darter and the southern red-bellied dace. The Arkansas darter is also a Federal candidate for listing.

### ***Range Resource***

This zone is a typical area on the Grasslands, suitable for very intensive livestock operations. There are very few areas that cannot be used by livestock; in most cases use is precluded only by range fences and the availability of water. Grazing within this zone is carried out under agreement with the Timpas and Kim Grazing Associations.

### ***Visual Resource***

This zone is visible from the town of LaJunta, Highways 350, 109 and 71, the Santa Fe National Historic Trail and the Vogel Canyon Trail.

### ***Cultural, Paleontological, and Cave Resources***

#### ***Cultural***

Cultural resources knowledge of this zone is fairly extensive although there are large gaps in the systematic coverage of the area. There are several very significant prehistoric and historic resources in this area, notably preserved rock art and several resources associated with the Mountain Branch of the Santa Fe Trail. The historic themes that are particularly applicable to this zone and known significant cultural properties are prehistoric resources, the Santa Fe Trail, Hispanic settlements, and homesteads and the Depression Era. Vogel Canyon contains numerous prehistoric campsites and associated intact archaeological deposits and rock art. It is a proposed National Historic District. There are other known significant rock art sites and playa-associated archaeological sites. The Comanche National Grasslands contain several significant prehistoric resources including stone alignments and structures.

#### ***American Indian Sacred Sites***

Vogel Canyon is a potential American Indian Indian sacred site; the potential for additional sites in this zone is high.

#### ***Paleontological Resources***

The Purgatoire River Dinosaur Trackway, a paleontological resource with international significance is located in the Comanche National Grasslands. The potential for discovering new significant paleontological resources in this zone is high, especially in the Morrison and Dakota sandstone formations along the Purgatoire River.

### **Cave Resources**

No significant cave resources are known in Zone 9. The potential for discovering such resources in the future is low, based on the characteristics of the local bedrock formations.

### **Recreation**

This zone consists of recreation activities closely associated with the wildlife, history and archaeology of the zone. Two drainages, Timpas Creek and Purgatoire River influence the habitat and abundance of wildlife in the zone. Hunting for upland birds, waterfowl, big game and small mammals is one of the predominant activities as well as bird watching with over 250 species of birds in the zone.

The route of the Santa Fe Trail, a National Historic Trail, travels through the zone. Ruts from the wagon trains are still visible and of interest to many visitors each year. Other history buffs enjoy viewing and photographing the old homesteads in the area, particularly those made of native stones. Still others enjoy visiting the prehistoric Indian sites of rock wall, caves and overhangs many of which contain rock art left by the Indian inhabitants. Vogel Canyon contains prehistoric rock art and is managed to further the public's understanding and appreciation of this resource.

### **Transportation**

The area is traversed by U.S. Highway 350 and Colorado Highways 71 and 109. There are many miles of county roads; Grassland roads generally are those needed for direct access into fields and activity locations. Most roads in the area result from agricultural and land management activities.

### **Special Uses**

The special uses in this zone are outlined in Exhibit D-8 at the end of this appendix. The La Junta Communication Site is located in this zone.

## **Geographic Zone 10**

### **Vegetation**

Shortgrass prairie is the dominant type, with midgrass prairie occurring on less than half of the zone. Visual variety is generally limited to seasonal color changes in grasses and riparian vegetation.

### **Soils**

The landscape is characterized as nearly level to gently undulating uplands, and composition is split between loamy "hard lands" and sandy plains. Slope gradients range from 0 to 10 percent, but slightly steeper slopes may occur in narrow drainageways. Relatively fertile soils support native mid and short grass prairies. The loamy uplands consist of deep soils developed from loess deposits, and they are well drained with high water holding capacity. Typical soil textures consist of loam and clay loam on the surface, and subsoil textures include silt loam, silty clay loam, and clay. The undulating sandy plains consist of deep soils developed from wind-deposited eolian sands, and soil profiles typically have sandy loam and loamy sand textures.



Landtypes sustain both wind and water erosion, but accelerated wind erosion is the greatest hazard on the sandy plains and alluvial floodplains. Soil management objectives are to maintain vegetative ground cover protection for erosion control.

### **Water**

This zone includes Sand Arroyo, Lone Rock Draw and the headwaters of the North Fork of the Cimarron River. The main drainage is Sand Arroyo which is intermittent, as are all other drainages in this zone. They flow only during floods. Runoff averages about .03 AF/ac.

Sediment movement is high during runoff due to the predominance of sand in the watershed. Stock dams and erosion control dams have been built in the drainages in the western end of this zone where the soils aren't as sandy. Wells are an important source of water in this zone.

### **Wildlife and Fishery Resources**

MIS for this zone and the reason for their selection as an indicator species can be found in Exhibit D-3 of this appendix.

There are a number of fish in this portion of the Grassland that are adapted to the harsh environment. As a result of poor sampling information and the intermittent nature of the streams, fish populations have not been fully quantified.

### **Riparian Resources**

Riparian areas are limited primarily to depressions in the land and narrow stream channels. The relatively small percentage of riparian areas is primarily the result of the semiarid conditions in this zone. Although there are numerous arroyos and intermittent streams in this zone, there are no permanent streams or lakes to enhance riparian conditions. Temporarily moist depressions contain vegetation that is characteristic of riparian conditions (e.g., sedges) but are only periodically saturated as a result of rains and/or snowmelt. Many of these depressions contain species (e.g., *Distichlis spicata*) which are tolerant of saline conditions, typical of these environments.<sup>55</sup> Streams are mostly intermittent and exhibit narrow riparian areas. Woody riparian vegetation includes primarily cottonwoods, willows and salt cedar.<sup>56</sup> Herbaceous plants that inhabit the area include those species that have evolved to withstand periodic droughts and desiccation in the semiarid conditions, as well as those that are restricted to the few permanent aquatic habitats available. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### **Threatened and Endangered Species**

Threatened and endangered wildlife and plant species under consideration in this zone are listed in Exhibits D-5 and D-6 respectively.

Two species of fish found in this zone are Colorado listed as threatened: the Arkansas darter and the southern red-bellied dace. The Arkansas darter is also a Federal candidate for listing.

### **Range Resource**

Grazing on NFS land is carried out under agreement with the Pritchett Grazing Associations. This zone is suitable for very intensive livestock operations.

## ***Visual Resource***

Visitors can view this analysis zone while on the Santa Fe Historic Trail, Highways 56, 51 and 27, 287, 385 and 160 or while recreating at Point of Rocks, Cimarron Recreation Area, Middle Spring, Picture and Carrizo Canyons, all of which provide recreation facilities.

## ***Cultural, Paleontological, and Cave Resources***

### ***Cultural***

Cultural resources survey coverage for this zone is spotty; several significant sites are known and there is high potential for a discovery of additional significant sites based on extrapolation from the known data. The most prominent historic themes in this zone and known significant properties are prehistoric resources, the Santa Fe Trail, the cattle ranch era and the homestead and depression era.

### ***American Indian Sacred Sites***

There are no known sacred sites in this zone, although a systematic study to identify these types of resources has not been done. The potential for identifying such sites in this area is low, based on our knowledge of the history and archaeology of the zone.

### ***Paleontological Resources***

There are no known significant paleontological resources in this zone; based on the characteristics of the local bedrock geology, the potential for undiscovered resources is very low.

### ***Cave Resources***

There are no known significant cave resources in Zone 10 and the potential to discover resources of this type in this area is virtually nil.

## ***Recreation***

Most of the recreation activity is associated with bird watching, with over 250 species available, and hunting of big game (deer and antelope), small game and upland birds. The viewing and photographing of stone homesteads also occurs.

## ***Special Interest Areas***

Part of the Carrizo Botanical Area occurs within this zone. The Botanical Area has two populations of the Colorado green gentian, which is designated as a sensitive species in Colorado, and is being considered for formal federal listing.

## ***Transportation***

The area is traversed by U.S. Highways 160, 287/385, and Colorado Highway 100. There are many miles of county roads; Grassland roads generally are those needed for direct access to fields and activity locations. Most roads in the area resulted from agricultural and land management activities.

## **Special Uses**

Special uses include the SE Colorado Experiment Station which occupies 3,908 acres and the Springfield Communication Site. The special uses in this zone are outlined in Exhibit D-8 at the end of this appendix.

## **Geographic Zone 11**

### **Vegetation**

Shotgrass prairie and midgrass prairie occur in roughly equal proportions, but are complemented by about one percent of pinyon-juniper. The pinyon-juniper type is similar to that found in this zone. Sand sage and yucca areas in the eastern part of this zone provide year-round habitat for the lesser prairie chicken.

### **Soils**

The landscape is characterized as nearly level to gently undulating uplands which are dissected by drainageways with strongly sloping to moderately steep canyon escarpments and rocky bluffs. Composition of the upland plains is split between loamy "hard lands" and sandy plains with slope gradients of 0 to 10 percent. The canyon lands generally comprise the southwestern corner of the Carrizo Unit and slopes commonly range from 10 to 30 percent. Steeper slopes are often associated with sandstone outcroppings.

The loamy uplands consist of deep soils developed from loess deposits which generally have loam, silty clay loam, and clay loam textures. The undulating sandy plains consist of deep soils developed from eolian sands. These soils typically have sandy loam and loamy sand textures. The canyon lands and steeper landforms have shallow soils on rocky bluffs and deeper soils on colluvial footslopes. Most of these soils have come from sandstone parent materials, but certain areas south of Campo, Colorado consist of shallow-gravelly loams that overlie caliche.

Soil erosion problems are complex and moderate to severe ratings exist throughout this geographic zone. Accelerated wind erosion on the undulating sandy plains is by far the greatest soil management concern, but potential for serious water erosion exists on the shallow soils and steeper slopes.

### **Water**

This zone includes Carrizo Creek and all its tributaries. Carrizo Creek is the only other perennial stream besides Timpas Creek on the Comanche National Grasslands. Most of the tributaries to Carrizo Creek are intermittent. The average runoff is .03 AF/ac. There is only a milelong stretch of Carrizo Creek on the Grasslands. Most of the stream is on private land.

This zone has many canyon lands along the Colorado-New Mexico and Colorado-Oklahoma borders. Springs are located in many of these canyons. They provide a more reliable source of water for the wildlife in the area.

Stock dams and erosion control dams are located in the intermittent drainages. They also provide water for livestock and wildlife, but they are not as reliable as the springs and wells.

## ***Wildlife and Fishery Resources***

Management Indicator Species (MIS) for this zone and the reason for their selection as an indicator species can be found in Exhibit D-3 of this appendix.

This zone encompasses a relatively wide range of aquatic environments, including dry arroyos, as well as permanent and semipermanent stream systems. Although surface flows may not be apparent year round, many of these streams contain deep water pools that are permanent and contain fish.<sup>57</sup> Sampling of the Carrizo Creek watershed in 1982 revealed that at least nine different species of fish inhabit this system. Smallmouth bass and white crappie were the only non-native species collected. Sampling conducted south of the Grassland on Chacuaco Creek showed similar results in terms of species composition. Other perennial streams probably contain similar fish fauna as the Carrizo Creek watershed.

Permanent deep water pools located within the Carrizo Creek watershed are also periodically stocked by the CDOW. In 1990, 200 channel catfish of catchable size were planted in these ponds. In addition, the USFS and CDOW manage man-made ponds in the Picture Canyon area. Although they were not stocked in 1990, these ponds are periodically planted with gamefish.

### ***Riparian Resources***

Riparian areas are limited primarily to depressions in the land and narrow stream channels. Temporarily moist depressions exist that contain vegetation that is characteristic of riparian conditions (e.g., sedges) but are only periodically saturated as a result of rains and/or snowmelt. Many of these depressions contain species which are tolerant of saline conditions. Streams are mostly temporary or intermittent and exhibit restricted or narrow riparian areas. Wood riparian vegetation includes primarily cottonwood, willow and salt cedar.<sup>58</sup> Herbaceous plants that inhabit the area include those species that have evolved to withstand periodic droughts and desiccation in the semiarid conditions, as well as those that are restricted to the few permanent aquatic habitats available.

The relatively small percentage of riparian areas is primarily the result of the semiarid conditions. Although there are numerous arroyos and perennial streams in this zone, there are no permanent streams or lakes to enhance riparian conditions. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

Threatened and endangered wildlife and plant species under consideration in this zone are listed in Exhibits D-5 and D-6 respectively.

Two species of fish found in this zone are Colorado listed as threatened: the Arkansas darter and the southern red-bellied dace. The Arkansas darter is also a Federal candidate for listing.

### ***Range Resource***

The Pritchett Grazing Association is responsible for livestock grazing in this zone. It is very suitable for intensive livestock operations. Fences and the availability of water are the main hindrances to livestock grazing. The rough canyons of this zone also provide some natural, physical barriers to grazing animals.

## **Visual Resource**

This analysis zone is visible from the Santa Fe National Historic Trail, Vogel Canyon and Highways 350, 71, 109, 287, 160 and 385.

### **Cultural, Paleontological, and Cave Resources**

#### **Cultural**

Zone 11 has not been systematically explored for cultural resources. There are several known significant cultural properties and the potential to discover additional significant sites is high, based on our current knowledge. The most prominent historic themes represented in this zone, the exploration era, the cattle ranch era, and the homestead and depression eras. The Picture Canyon area has a high density of significant prehistoric resources including campsites, sites with stone architecture, rock shelters, and rock art. The canyon is a proposed National Historic District because of its heritage values. Also, Holt Canyon, Carrizo Creek, and Sand Canyon near the Oklahoma border contain significant prehistoric resources.

#### **American Indian Sacred Sites**

Picture Canyon and the area of Carrizo Creek near the picnic area are likely candidates based on their history of traditional use by American Indians and their well-preserved settings. There is the potential for additional resources of this type in this zone.

#### **Paleontological Resources**

There are no known significant paleontological resources in this zone. However, the potential of discovering such resources in the future is high, especially in exposures of the Morrison Formation in the vicinity of Carrizo Creek and in the Dakota sandstone outcrops in many of the main canyons. Some dinosaur tracks are known in the vicinity of Holt Canyon, but this site has not been evaluated.

#### **Cave Resources**

There are no known significant caves in this zone. There are some small sandstone caves (for example, the Crack Cave in Picture Canyon); these are thought to be not significant as they do not contain any cave formations or cave-adapted plant or animal life.

### **Recreation**

This area is home and habitat to a varied and abundant population of wildlife and approximately 250 species of birds that attract bird watchers to the zone. Hunting for big and small game and upland birds occurs in the zone.

Visiting archaeological and historical sites and learning about the past appeals to a wide spectrum of users to the zone. They enjoy viewing and photographing the old homesteads, particularly those made of native stones, and Indian rock art that is found in the caves and overhangs. Carrizo Picnic Ground, the only developed site in the zone, is in a scenic canyon that rock art visitors can enjoy while hiking. Picture Canyon is being developed to interpret the rock art and to construct a network of hiking and horseback riding trails.

### **Research Natural Areas**

The Campo RNA, established in 1987, is 35 acres. It is a prime representative of shortgrass plains, with grama-buffalo grass in an undisturbed condition. The area has been established for a research and study bench mark.

### **Special Interest Areas**

The Carrizo Botanical Area, proposed as a special interest area, is 400 acres encompassing four different sites (two sites in Zone 10). Sites include the Colorado green gentian, which is designated as a sensitive species on the Colorado State List and is being considered for formal Federal listing. This species is endemic to Las Animas, Baca and Prowers Counties. The ecological community in which this species exists is unusual and interests ecologists. There are two sites in zone 11 where this plant grows. Plant populations found to date appear to be vigorous and healthy. Reproduction is apparently very successful, with no predation and threats to habitat, health or numbers.

The Comanche Lesser Prairie Chicken Zoological Area containing 9212 acres, was established in 1987 to preserve the concentration of booming areas (leks) and nesting sites for the lesser prairie chicken. This area is also discussed under Threatened and Endangered Species.

### **Transportation**

The area is traversed by U.S. Highway 287/385. There are fewer miles of county roads than in some other parts of the Grasslands and Forest areas; Grassland roads generally are those needed for direct access into fields and activity locations. Most roads in the area resulted from agricultural and land management activities.

### **Special Uses**

The special uses in this zone are outlined in Exhibit D-8 at the end of this appendix.

## **Geographic Zone 12**

### **Vegetation**

This zone is essentially all shortgrass prairie. Visual variety is generally limited to color changes in grasses and riparian vegetation.

### **Soils**

The northern portion of the Cimarron National Grassland has undulating topography along the North Fork of the Cimarron River, and a relatively flat upland plain extends to the northern boundary of the grassland. The nearly level to gently sloping upland landscape is comparatively featureless with slope gradients generally under 5 percent. Some dissection exists from drainageways, and gully formations are common.

Moderately deep to deep soils have primarily developed from loess deposits and are often referred to as the "hard lands." Soils are well drained and have high water holding capacity. Surface soil textures consist of loam, fine sandy loam, and silt loam; and finer subsoil textures include clay loam, sandy clay loam, and silty clay loam. Although these loamy soils are subject to both wind and water erosion, most of this area has moderate erosion hazard.

Soil management concerns are generally confined to sandy areas associated with the rolling topography along the North Fork of the Cimarron River where soils are more susceptible to wind erosion.

### ***Water***

Only 10 percent of the Cimarron National Grassland is in this zone. The zone includes a portion of the North Fork of the Cimarron River and its tributaries. All of the drainages are intermittent. The average runoff is very low, only .01 acre feet per acre. Many of the drainages are gullied and woody draws provide crucial habitat. Some stock ponds exist on the side drainages of the North Fork of the Cimarron River. Other water that is available to wildlife and livestock is provided by wells.

### ***Wildlife Resource***

Management Indicator Species (MIS) for this zone can be found in Exhibit D-3 of this appendix.

This zone contains habitat that is suitable for year-round use by deer. A recent transplant of Rocky Mountain elk to the Cimarron River may also use a part of this zone. Most of this zone is also grazed by livestock. There is a good population of upland game birds within the zone, as well as other non-game species.

### ***Riparian Resources***

Riparian resources in this geographic zone are restricted to the semiarid plains of the Cimarron National Grassland. They are limited primarily to isolated, temporary depressions with emergent vegetation. Some riparian environment exists along the North Fork of the Cimarron River which extends through most of the zone. Woody vegetation is limited primarily to the North Fork corridor. The relatively low percentage of riparian areas in this geographic zone is primarily a result of few permanent or temporary stream systems. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

Wildlife species which the State of Kansas (Kansas Department of Wildlife and Parks, 1989) has listed as State Category 2 candidate T&E species known or likely to occur on the Cimarron National Grassland are:

- Eastern Spotted Skunk - Riparian
- Checkered Garter Snake - Riparian
- Kansas Glossy Snake - Dry plains
- New Mexico Blind Snake - Riparian
- Texas Longnose Snake - Prairie
- Western Green Toad - Arid Prairie-Historic

Other threatened and endangered wildlife species under consideration in this zone are listed in Exhibit D-5 in this appendix.

Two species of fish found in this zone are Colorado listed as threatened: the Arkansas darter and the southern red-bellied dace. The Arkansas darter is also a Federal candidate for listing.

### ***Range Resource***

The zone is typical of most areas on the National Grasslands, being very suitable for intensive livestock operations. Livestock can reach most areas unless prevented by fences or lack of water. Forty percent of the land in Federal ownership in Morton County is controlled by the Morton County Grazing Association within this zone.

### ***Visual Resource***

Visitors can view this analysis zone while on the Santa Fe National Historic Trail, Highways 56, 51 and 27, 287, 385 and 160 or while recreating at Point of Rocks, Cimarron Recreation Area, Middle Spring, Picture and Carrizo Canyons, all of which provide recreation facilities.

### ***Cultural, Paleontological, and Cave Resources***

#### ***Cultural***

This zone has been examined systematically for prehistoric resources, but not for historic resources. Several prehistoric campsites have been recorded on the Cimarron Grassland, two of which are potentially eligible to the National Register. No significant historic properties have been recorded in this zone and the probability of discovering significant sites in the future is very low, based on our current knowledge.

#### ***American Indian Sacred Sites***

There are no known sacred sites in this zone although a thorough study has not been done. The probability of discovering such resources in this zone based on our current historical and archaeological knowledge is very low.

#### ***Paleontological Resources***

There are no known significant paleontological resources in this zone. The probability of discovering such resources in the future is very low, based on the characteristics of the bedrock geology.

#### ***Cave Resources***

There are no significant caves in this zone and the possibility of discovering significant cave systems in the future is virtually nil.

### ***Recreation***

Recreation use is principally upland bird hunting. A variety of nature study activities also occurs in the zone.

### ***Transportation***

The area is traversed by Kansas Highways 27 and 51. There are fewer miles of county roads than in other parts of the Grasslands and Forest areas; Grassland roads generally are those needed for direct access into fields and activity locations. Most roads in the area resulted from agricultural activities, land management activities, and Oil and Gas development.



## **Special Uses**

The special uses in this zone are outlined in Exhibit D-8 at the end of this appendix.

### **Geographic Zone 13**

#### **Vegetation**

This zone is about 70 percent midgrass prairie and 30 percent shortgrass prairie. Visual variety is generally limited to small contrast between the two prairie types, and seasonal color changes in grasses and riparian vegetation. Sand sage and yucca areas provide year-round habitat for the lesser prairie chicken.

#### **Soils**

The southern portion of the Cimarron National Grassland is characterized by the flood plain and river escarpments on both sides of the Cimarron River channel, comparatively minor areas of loamy "hard lands," and extensive areas of rolling to hilly sandy uplands. Relief is nearly level to undulating with slope gradients ranging from 0 to 15 percent, but hummocky sand hills with dune-like relief can have slope inclusions up to 30 percent. Moisture is readily absorbed so there is not much runoff to develop pronounced drainage patterns.

Deep, coarse soils have developed from wind-deposited eolian sands and sandy sediments. Both surface and subsoil textures typically consist of fine sand, loamy fine sand, and fine sandy loam. Soils are susceptible to both water and wind erosion, but accelerated wind erosion is the greatest hazard. The loamy "hard land" soils have moderate erosion hazard.

Soil management concerns for the entire zone focus on maintaining adequate vegetative ground cover protection. Severe wind erosion of coarse textured soils produces movement of sand particles on the surface which causes considerable damage to vegetation and makes management difficult.

#### **Water**

The Cimarron River is a wide, shallow, sandy river. Flows are intermittent. This was not always the case. At the turn of the century, the Cimarron River in Kansas was a narrow, deep, stable stream with perennial flows of clear water.<sup>59</sup> The average river width was 50 feet in 1874. Beginning in 1914 and continuing intermittently until 1942, the channel widened until almost all of the floodplain was destroyed. The channel widening began during the major flood of May 1914. This flood is the greatest of record. The period 1943-54 consisted of channel narrowing and floodplain construction. The period of 1955-60 showed relatively minor changes from the previous period. Measured channel widths in Morton County in 1960 varied from 150 feet to 1650 feet with an average width of 900 feet.

The narrow reaches of the Cimarron River seem to maintain a surface flow for most of the year. The flow is sufficient to support some aquatic life. The wider reaches of the river very seldom have a surface flow, but water remains close to the surface. The subsurface water supports an extensive riparian area. Most of the tributary drainages to the Cimarron River are on the north side of the river where the soils are less sandy. These drainages are fairly well gullied and many of them support a woody draw habitat.

Some stockwater dams exist on these drainages and provide water for livestock and wildlife use whenever they have water. Water wells are more prevalent and they provide a more reliable source of water. Groundwater has been called the most important natural resource in southwest Kansas.

Another major water resource in this zone is Middle Springs. This spring keeps a couple of ponds full year-around. The springs are fenced off to livestock but provide water for wildlife. A picnic ground is also located at the spring.

Numerous oil and gas wells are located on the Cimarron National Grassland. They have had impacts on the water quality and, in some instances, benefits for the water resource. Some of the water wells drilled in conjunction with the oil and gas wells have been left in production to provide water for wildlife. Some water quality problems have been detected that may be due to oil and gas fields.

The Southwest Kansas Groundwater Management District No. 3 has a groundwater monitoring network.<sup>60</sup> Several of their test wells are on or near the Cimarron National Grasslands. Some of these wells have high specific conductance. As the mineral content increases, the value for the specific conductance (numerical expression of the ability of water to conduct electricity) increases. These wells are located along the Cimarron River in the areas of old oil and gas fields.

### ***Wildlife and Fishery Resources***

MIS for this zone and the reason for their selection as an indicator species can be found in Exhibit D-3 of this appendix.

This zone contains habitat that is suitable for year-round use by deer. A recent transplant of Rocky Mountain elk to the Cimarron River use a part of this zone. Most of this Zone is also grazed by livestock. There is also a good population of upland game birds within the zone, as well as other non-game species.

There are at least twelve species of fish inhabiting the Cimarron River in Kansas, with the majority of fish species being of the minnow family.<sup>61</sup> The river exhibits surface flows only during short periods during the year. During these short durations, fish migrate upstream from more permanent pools interspersed in the stream channel. During most of the year, fish survival is limited to selectively small refuges provided by beaver dams and other permanent pools.

The Kansas Department of Game and Parks in cooperation with the U.S. Forest Service constructed several fishing ponds on the Grassland. These ponds are maintained by the Department of Game and Parks, which plants a variety of gamefish annually. Stocked fish include channel catfish, redear sunfish, bluegill and rainbow trout. In addition, white amur are planted for aquatic vegetation control.

### ***Riparian Resources***

Riparian resources in this zone include the largest continuous riparian area in either the Comanche or Cimarron Grassland, the Cimarron River. The Cimarron riparian area is dominated by areas of temporarily flooded scrub/shrub-emergent wetlands, intermittent streambeds and mature cottonwood stands. The Cimarron River flows overground only periodically, with limited permanent stands of water occurring in small pools and marshes. The dominant woody vegetation in the Cimarron Riparian area are cottonwoods and willows. Willows appear to be more restricted to the main river channels, where soil moisture conditions are high, while cottonwoods grow throughout the area, dominating the drier areas. Herbaceous plants include cattails. Sedges grow where soils are saturated at least part of the year. Based on available NWI maps, it appears that the composi-

tion and distribution of riparian conditions along the Cimarron River are constantly changing, as the river channel moves. These dynamic conditions in the river proper are due primarily to dewatering upstream from irrigation. The riparian areas in the remainder of this geographic zone are limited to a relatively few temporary depressions and "flatwater" environments with characteristic emergent vegetation. There are also a few narrow, temporary stream riparian conditions that comprise a relatively small percentage of the total riparian area for this geographic zone.

Riparian areas comprise a considerably higher percentage of the total Grassland area than the other zone on the Cimarron Grassland. However, riparian area still comprises a relatively low percentage of the entire zone. See Exhibit D-4 in this appendix for a summary of riparian area acres for this zone.

### ***Threatened and Endangered Species***

Threatened and endangered wildlife species under consideration in this zone are listed in Exhibit D-5 in this appendix.

Two minnow species, the Arkansas River shiner and the flathead chub are listed as State category 2 candidate threatened and Endangered species and have historically been found in the Cimarron River.<sup>62</sup> The Cimarron Grassland is also within the historical range of the Arkansas darter. Cross et al. concluded that historical dewatering of the Cimarron River resulted in considerable change, notably a reduction of the fish fauna in the upper Cimarron River. A species similar to the Arkansas River shiner, the Red River shiner is apparently replacing the Arkansas River shiner in much of its historical range in the Cimarron River. Although habitat appears to be much reduced from historical records, the Cimarron River should be closely monitored, because it is within the range of several rare fish.

Two other species of fish found in this zone are Colorado listed as threatened: the Arkansas darter and the southern red-bellied dace. The Arkansas darter is also a Federal candidate for listing.

### ***Range Resource***

Grazing in this zone is carried out under agreement with the Morton County Grazing Association. The zone is very suitable for intensive livestock operations. Fences and the availability of water are probably the only hindrances to livestock grazing throughout most of the zone. Sixty percent of the land in Federal ownership in Morton County is controlled by the Grazing Association within this zone.

### ***Visual Resource***

Visitors can view this analysis zone while on the Santa Fe National Historic Trail, Highways 56, 51 and 27, 287, 385 and 160 or while recreating at Point of Rocks, Cimarron Recreation Area, Middle Spring, Picture and Carrizo Canyons, all of which provide recreation facilities.

### ***Cultural, Paleontological, and Cave Resources***

#### ***Cultural Resources***

This zone has been examined systematically for prehistoric resources but not for historic resources. The zone is rich in cultural resources associated with use of the Cimarron Cutoff Branch of the Santa Fe Trail and contains several significant resources related to other themes. Prominent historic themes for this zone and known significant cultural properties are prehistoric resources,

the exploration era, the Santa Fe Trail, the cattle ranch era, and the homestead and depression eras.

### ***American Indian Sacred Sites***

No known sacred sites are located within this zone. Because a systematic study to identify possible locations has not been done, there is the potential to identify such resources in the future.

### ***Paleontological Resources***

There are no known paleontological resources in Zone 13 and the characteristics of the local soil and bedrock geology suggest that the probability of discovering significant fossils in this zone is very low. It is common to discover fragmented and disarticulated buffalo bones in erosional contexts in Zone 13. These are not considered significant, but the discovery of an articulated skeleton or a bone bed with several individuals might be significant. These bones are not fossilized, but this phenomenon probably should be considered a potential paleontological resource.

### ***Cave Resources***

No significant caves are present in this zone and the probability of discovering such resources in the future is very low, based on the characteristics of the local bedrock geology.

### ***Recreation***

This is a significant area for a variety of recreation activities. The National Historic Santa Fe Trail parallels the Cimarron River and is visited by many who want to see the route and the ruts from the wagon trains, as well as other historical sites from the homesteading era. Hunting for big game (deer, antelope and elk), upland game birds and waterfowl is popular in this zone. A wide variety of habitats attracts the game as well as over 250 species of non-game birds. This unusually large number of birds attracts many bird watchers during the various seasons to see the birds that migrate through the area, as well as those that are there year-round.

Fishing in the zone is a somewhat limited but popular activity for many residents in the area, because it is their only opportunity to fish. There are several stockwater dugouts developed by the Department of Wildlife and Parks along the Cimarron River and regularly stocked with bass, catfish, bullheads, and bluegills.

Abundant nongame wildlife in the zone, with numerous species of mammals, amphibians and reptiles, provides many opportunities for observation.

Despite limited developed facilities, many users camp and picnic in the shade along the river while participating in hiking, horseback riding and motorized vehicle use.

### ***Research Natural Areas***

There is one proposed Research Natural Area for this zone. This is the Cimarron RNA and is representative of the Kuchler K-70 Sandsage-Bluestem Prairie Potential Natural Community. The area is located four miles northwest of Elkhart, Kansas and is approximately 310 acres. Management emphasis will be on research, study, observations, monitoring and educational activities that retain the area in an unmodified condition.

## **Transportation**

The area is traversed by U.S. Highway 56 and Kansas Highways 27 and 51. There are fewer miles of county roads than in other parts of the Grasslands and Forest areas; Grassland roads generally are those needed for direct access into fields and activity locations. Most roads in the area result from agricultural activities, land management activities, and oil and gas development.

## **Special Uses**

The special uses in this zone are outlined in Exhibit D-8 at the end of this appendix.

## **STANDARD LEASE TERMS VERSUS SUPPLEMENTAL STIPULATIONS** (Analysis by Representative Wells by Geographic Zones)

### **Introduction**

The purpose of this section is to validate the need for supplemental stipulations on land areas that are not included in the "Reasonably Foreseeable Development (RFD)" effects disclosure. Representative wells were analyzed for Alternatives II and III, and results were used to display the need for Supplemental Stipulations as required in the Leasing Analysis. This section describes the affected environments for different well locations and discusses the effects between the Standard Lease Terms (Alternative II) and the Supplemental Stipulations (Alternative III). Descriptions of the Supplemental Stipulations can be found in Appendix B - Mitigation. Additional information on the analysis between the alternatives can be found in the individual Specialist Reports. In the following examples, Alternative II would only allow the Standard Lease Terms to apply, while Alternative III would allow both the Standard Lease Terms **and** the Supplement Stipulations to apply.

### **Geographic Zone 1**

#### **Site 15**

**Representative Well Site:** The drill pad occurred on a deep, somewhat poorly to poorly drained alluvial soil (Riparian). A typical undisturbed site on a 16 percent slope with 80 percent ground cover has a soil loss rate of approximately 1 ton/acre/year. The site is in an opening surrounded by dense vegetation. The site is visible from the Continental Divide and a wilderness area. It is not in any critical winter range, Big Game production area, or will effect any Management Indicator Species (MIS) or T&E habitats.

Potential soil loss after disturbance would increase to about 11 tons/acre/year or nearly 3 times the soil loss tolerance rate. Erosion hazard rates Moderate and revegetation could be limited by soil wetness. Short-term soil losses would occur prior to effective mitigation, and on-site erosion could be controlled to less than the soil loss tolerance value. However, soils on these landscape positions are also susceptible to gully formations from possible stream flow alterations and compaction or rutting damage to soil physical properties. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-1  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Drill pad acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|-----------------|-------------------------------|-------------------------|
| 16      | 11                     | 4                      | 4.13            | 45                            | 8                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow adequate protection through relocation of the drill pad outside the stream terrace or floodplain. This would also protect the fisheries from increased sediment, and give more flexibility in mitigating the effects on visuals (well site could be moved more than 200 meters). To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied. The well site would not be allowed in the riparian area.

**Access Road:** Road access required 1.65 acres of disturbance on a soil type with Moderate erosion hazard. (Road doesn't go through any riparian areas.)

**Mitigation:** Affects to soils could be mitigated under Standard Terms and Conditions of Approval.

**Site 18**

**Representative Well Site:** The drill pad occurred on a deep, well-drained colluvial soil with moderate limitations. A typical undisturbed site on a 16 percent slope with 80 percent ground cover has a soil loss rate of approximately 1 ton/acre/year. The site is within a natural opening, and is visible from the Colorado Trail and a Wilderness Area. It is also in an Elk Winter Range.

Potential soil loss after disturbance would increase to about 4 tons/acre/year which equates to the soil loss tolerance value. Erosion hazard rates Slight on this gently sloping bench area, and revegetation would have moderate limitations. Short-term soil losses would occur prior to effective mitigation.

**Table D-2  
USLE Predicted Surface Erosion for Drill Pad and Road**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>16  | 4                      | 4                      | 4.13      |            | 17                            | 3                       |
| ROAD<br>40 | 13                     | 4                      |           | 20         | 260                           | 46                      |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. A Timing Limitation Stipulation (For Elk Winter Range) would be applied to restrict exploration, drilling, and development activities between December 1 and April 15. A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows

movement of well site greater than 200 meters). This would give more flexibility on moving the well site to an area screened from view of the trail and wilderness area.

**Access Road:** Road access required approximately 20 acres of disturbance on soils and other erosion factors that have moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. The road would be closed between December 1 and April 15 (Timing Limitation Stipulation) to protect the critical elk winter range. The CSU (Visuals) could also be used to move the road to mitigate impacts to visuals.

**Site 22**

**Representative Well Site:** The drill pad occurred on a deep, well-drained residual soil in the alpine ecosystem. A typical undisturbed site on a 12 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.3 ton/acre/year. The site is in a Mountain Goat Concentration Area and an elk winter range. It is also in the elk Management Indicator Species habitat.

Potential soil loss after disturbance would only increase to about 3 tons/acre/year which is less than the soil loss tolerance value. Although erosion hazard rates Slight for water erosion, exposed bare ground is also subject to Severe wind erosion on mountain summits. Alpine soils are considered sensitive because harsh climatic conditions only provide limited opportunity for soil formation, and processes are reduced even further when vegetation has been removed. Revegetation potential is rated Severe, and long-term reductions to soil productivity could result from surface impacts. Disturbance of alpine soils should be minimized to the extent possible.

**Table D-3  
USLE Predicted Surface Erosion for Drill Pad and Road**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD 12  | 3                      | 4                      | 3.81      |            | 12                            | 1                       |
| ROAD 40 | 13                     | 4                      |           | 13         | 169                           | 30                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation and other special forms of mitigation which may be required to adequately protect the soil resource. For the protection of wildlife, Timing stipulations would be applied to protect the Mountain Goat Concentration Area, Elk Winter Range, and an Elk Calving Area. The stipulations would restrict activities between December 1 and July 1 to protect wildlife. The Controlled Surface Use (Alpine Ecosystems) would be applied to mitigate the effects on the fragile alpine ecosystem.

**Access Road:** Road access required approximately 13 acres of disturbance on forested soils adjacent to the alpine ecosystem. Erosion factors have moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. The Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife. The CSU (Alpine Ecosystem) stipulation would be used to mitigate the impacts to the Alpine environment.

### Site 24

**Representative Well Site:** The drill pad occurred on a deep, somewhat excessively drained glacial soil. A typical undisturbed site on a 12 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.4 tons/acre/year. The site is within an Abert's Squirrel Winter Concentration Area, Elk and Mule Deer Winter Range, and is in Elk, Albert's Squirrel and Mule Deer Management Indicator Species habitat.

Potential soil loss after disturbance would increase to about 4 tons/acre/year which equates to the soil loss tolerance value. Erosion hazard rates Slight on this gently sloping ground moraine, but revegetation potential is limited by droughty moisture conditions and surface rock. Short-term soil losses would occur prior to effective mitigation.

**Table D-4  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 12      | 4                      | 4                      | 3.81           | 15                            | 3                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. Timing Stipulations would be applied to protect the wildlife. It would restrict activities in the area from December 1 through July 1.

**Access Road:** Road access required minimal disturbance on a soil type with Slight erosion hazard. **Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. The Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife.

### Site 25

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 12 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.3 tons/acre/year. The site is in a natural opening and is visible from Cottonwood Creek. It is also in a Mule Deer Winter Range and an Elk Calving Area.

Potential soil loss after disturbance would increase to about 3 tons/acre/year or approximately 3 times the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.



**Table D-5  
USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>12  | 3                      | 1                      | 3.81      |            | 11                            | 2                       |
| ROAD<br>12 | 3                      | 1                      |           | 0.07       | 0.2                           | 0                       |
| 16         | 4                      | 4                      |           | 2.75       | 11                            | 2                       |
| 30         | 13                     | 4                      |           | 1.57       | 21                            | 4                       |
| 40         | 13                     | 4                      |           | 1.48       | 19                            | 3                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the drill pad and a short segment of road (12 percent slope) beyond 200 meters where deeper soils may exist. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1.

**Access Road:** Road access required approximately 6 acres of disturbance on soils and other erosion factors that have moderate erosion potential.

**Mitigation:** If the small segment of road on 12 percent slope could be moved to a deeper soil in close proximity, the Standard Terms and Conditions of Approval would allow adequate soil resource protection for remaining road segments. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife.

### Geographic Zone 2

#### Site 44

**Representative Well Site:** The drill pad occurred on a deep, somewhat poorly to moderately well-drained alluvial soil (Riparian). A typical undisturbed site on a 20 percent slope with 80 percent ground cover has a soil loss rate of approximately 1 ton/acre/year. The site is visible from a 4WD road. It is in Mule Deer Winter Range, a Turkey Winter Range and Concentration Area, an Elk Production/Calving Area, and a Deer fawning area.

Potential soil loss after disturbance would increase to about 14 tons/acre/year which exceeds the soil loss tolerance rate by over 3 times. Erosion hazard rates Moderate and revegetation could be limited by soil wetness. Short-term soil losses would occur prior to effective mitigation, and on-site erosion could be controlled to less than the soil loss tolerance value. However, soils on these landscape positions are also susceptible to gully formations from possible stream flow alterations and compaction or rutting damage to soil physical properties. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-6**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 20      | 14                     | 4                      | 4.52           | 63                            | 12                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow adequate protection through relocation of the drill pad outside the stream terrace or floodplain. This would also protect the fisheries from increased sediment, and give more flexibility in mitigating the effects on visuals (well site could be moved more than 200 meters). In addition, Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1. To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area).

**Access Road:** Road access required minimal disturbance on the same riparian soil type and potential for significant adverse impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain. The NSO (Water) would require the road out of the riparian area. Timing stipulations would restrict road use between December 1 and July 1 to protect wildlife.

**Site 45**

**Representative Well Site:** The drill pad occurred on a deep, well-drained colluvial soil with moderate limitations. A typical undisturbed site on a 20 percent slope with 80 percent ground cover has a soil loss rate of approximately 1 ton/acre/year. The site is visible from a 4WD road. It is in a Mule Deer Winter Range, a Turkey Winter Range and Concentration Area, and a Mule Deer fawning area.

Potential soil loss after disturbance would increase to about 10 tons/acre/year which exceeds the soil loss tolerance rate by over 3 times. Erosion hazard rates Moderate, and revegetation potential would have moderate limitations. Short-term soil losses would occur prior to effective mitigation.

**Table D-7**  
**USLE Predicted Surface Erosion for Drill Pad and Road**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>20  | 10                     | 4                      | 4.52      |            | 18                            | 8                       |
| ROAD<br>30 | 15                     | 3                      |           | 2.22       | 33                            | 6                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 and July 1.

**Road Construction:** Road access required approximately 2 acres of disturbance on a moderately deep soil with moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife.

**Site 46**

**Representative Well Site:** The drill pad occurred on a moderately deep, well-drained residual soil with Severe limitations. A typical undisturbed site on a 40 percent slope with 80 percent ground cover has a soil loss rate of approximately 2 tons/acre/year. The road and well site are visible from the rainbow trail. It is not in any critical winter range, Big Game production areas, or will effect any Management Indicator Species or T&E habitat.

Potential soil loss after disturbance would increase to about 18 tons/acre/year which exceeds the soil loss tolerance rate by 6 times. Erosion hazard rates Severe, and revegetation potential would have Severe limitations. The risk of significant impacts and long-term reductions to soil productivity would result from surface impacts on this soil.

**Table D-8  
USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>40  | 18                     | 3                      | 8.35      |            | 150                           | 28                      |
| ROAD<br>30 | 26                     | 4                      |           | 6.01       | 159                           | 30                      |
| 50         | 27                     | 3                      |           | 3.19       | 86                            | 16                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation to an area with less slope gradient. If relocation is not possible, special mitigation and conservation practices may be required to adequately protect the soil from long-term damage.

**Access Road:** Road access required approximately 9 acres of disturbance on soil types with severe management implications. Access Road on steep slopes should be avoided to prevent significant amounts of accelerated erosion. The road segment on 30 percent slope occurred in a riparian ecosystem where potential exists for long-term detrimental impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation to avoid unnecessary impacts to fragile soils on steep slopes and/or riparian drainageways.

**Site 47**

**Representative Well Site:** The drill pad occurred on a shallow, well-drained residual soil in the alpine ecosystem. A typical undisturbed site on a 12 percent slope with 80 percent ground cover

has a soil loss rate of approximately 0.1 ton/acre/year. The road is visible from the Rainbow Trail and the Hayden Creek Campground. It is not in any critical winter range, Big Game production areas, or will effect any Management Indicator Species or T&E habitat.

Potential soil loss after disturbance would only increase to about 5 tons/acre/year which exceeds the soil loss tolerance value by 5 times. Although erosion hazard rates Slight for water erosion, exposed bare ground is also subject to Severe wind erosion on mountain summits. Alpine soils are considered sensitive because harsh climatic conditions only provide limited opportunity for soil formation, and processes are reduced even further when vegetation has been removed. Revegetation potential is rated Severe, and long-term reductions to soil productivity could result from surface impacts.

**Table D-9  
USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>12  | 5                      | 1                      | 3.81      |            | 19                            | 2                       |
| ROAD<br>30 | 15                     | 3                      |           | 3.53       | 53                            | 9                       |
| 40         | 19                     | 3                      |           | 33.38      | 634                           | 116                     |
| 50         | 27                     | 3                      |           | 2.37       | 64                            | 12                      |
| 60         | 32                     | 3                      |           | 1.71       | 55                            | 10                      |

**Mitigation:** Disturbance of alpine soils should be minimized to the extent possible, and the Controlled Surface Use (Soils) stipulation offers opportunity for relocation and other special forms of mitigation which may be required to adequately protect the soil resource. The Controlled Surface Use (Alpine Ecosystems) would be applied to mitigate the effects on the fragile alpine ecosystem.

**Access Road:** Road access required approximately 41 acres of disturbance on forested soils adjacent to the alpine ecosystem. Erosion factors have Severe erosion potential on 90 percent of the anticipated road locations.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation to areas with less slope gradient to reduce impacts on these fragile soil types. The CSU (Alpine Ecosystem) would also be applied to the road to reduce the impacts to the Alpine ecosystem.

**Site 48**

**Representative Well Site:** The drill pad occurred on a deep, well-drained glacial soil with moderate limitations. A typical undisturbed site on a 8 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.3 tons/acre/year. It is not in any critical winter range, Big Game production areas, or will effect any Management Indicator Species or T&E habitat.

Potential soil loss after disturbance would increase to about 3 tons/acre/year which equates to the soil loss tolerance value. Erosion hazard rates Slight on this gently sloping bench area, and revegetation would have moderate limitations. Short-term soil losses would occur prior to effective mitigation.

**Table D-10  
USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD 8   | 3                      | 4                      | 3.53      |            | 10                            | 2                       |
| ROAD 30 | 15                     | 4                      |           | 4.05       | 60                            | 11                      |
| 40      | 19                     | 3                      |           | 2.23       | 43                            | 8                       |
| 50      | 27                     | 3                      |           | 2.77       | 75                            | 14                      |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate protection to all resources.

**Access Road:** Road access required approximately 9 acres of disturbance on soils and other erosion factors that have Severe erosion potential. Access Road on steep slopes should be avoided to prevent significant amounts of accelerated erosion.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation to areas with less slope gradient to reduce significant impacts on these fragile soil types.

**Geographic Zone 3**

**Site 49**

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 40 percent slope with 80 percent ground cover has a soil loss rate of approximately 1 ton/acre/year. The site is in a Mule Deer Winter Range and a Deer fawning area.

Potential soil loss after disturbance would increase to about 23 tons/acre/year which significantly exceeds the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-11  
USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD 40  | 23                     | 1                      | 8.34      |            | 192                           | 35                      |

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| ROAD    |                        |                        |           |            |                               |                         |
| 20      | 8                      | 4                      |           | 6.42       | 51                            | 9                       |
| 40      | 23                     | 1                      |           | 2.23       | 51                            | 9                       |
| 50      | 33                     | 1                      |           | 0.56       | 19                            | 3                       |
| 60      | 38                     | 1                      |           | 11.15      | 424                           | 77                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the drill pad beyond 200 meters where deeper soils may exist. If relocation is not possible, special mitigation and conservation practices may be required to adequately protect the soil from long-term damage. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1.

**Access Road:** Road access required approximately 20 acres of disturbance on shallow soils with Severe management implications. Access Road on shallow soils with steep slopes should be avoided to prevent significant amounts of accelerated erosion and long-term impacts to the soil resource.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of road segments to areas with less slope gradient and possibly deeper soils. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife.

#### Site 50

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 8 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.3 tons/acre/year. The well site is visible from a Forest Service road (FDR 187). The site is in a Mule Deer Winter Range and Fawning area.

Potential soil loss after disturbance would increase to about 4 tons/acre/year or approximately 4 times the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-12**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 8       | 4                      | 1                      | 3.53           | 15                            | 2                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the drill pad and a short segment of road beyond 200 meters where deeper soils may exist. If relocation is not possible, special mitigation and conservation practices may be required to adequately protect the soil from long-term damage. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1. A Controlled Surface Use (Visuals)

stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on a gentle slope with the same shallow soil.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the access road and drill pad to a deeper soil. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife. The CSU (Visuals) would also be used to mitigate the impacts of the road on visuals.

**Site 51**

**Representative Well Site:** The drill pad occurred on a deep, somewhat poorly to moderately well-drained alluvial soil (Riparian). A typical undisturbed site on a 20 percent slope with 80 percent ground cover has a soil loss rate of approximately 1 ton/acre/year. The site is in a Mule Deer Winter Range and Fawning area.

Potential soil loss after disturbance would increase to about 14 tons/acre/year which exceeds the soil loss tolerance rate by over 3 times. Erosion hazard rates Moderate and revegetation could be limited by soil wetness. Short-term soil losses would occur prior to effective mitigation, and on-site erosion could be controlled to less than the soil loss tolerance value. However, soils on these landscape positions are also susceptible to gully formations from possible stream flow alterations and compaction or rutting damage to soil physical properties. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-13  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 20      | 14                     | 4                      | 4.52           | 63                            | 12                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow adequate protection through relocation of the drill pad outside the stream terrace or floodplain. This would also protect the fisheries from increased sediment. Timing Stipulations would also be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1. To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area). A Controlled Surface Use (Visuals) stipulation would also be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on the same riparian soil type and potential for significant adverse impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain. The NSO (Water) stipulation would require the road outside the riparian area (other than to cross the riparian). Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife. The CSU (Visuals) could also be used to mitigate impacts of the road on visuals.

### Site 52

**Representative Well Site:** The drill pad occurred on a shallow, well-drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 4 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.04 tons/acre/year. The site is in a Mule Deer Winter Range and Fawning area.

Potential soil loss after disturbance would increase to about 1 ton/acre/year which equates to the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-14**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 4       | 1                      | 1                      | 3.30           | 3                             | 0.4                     |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the drill pad and a short segment of road beyond 200 meters where deeper soils may exist. If relocation is not possible, special mitigation and conservation practices may be required to adequately protect the soil from long-term damage. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1.

**Access Road:** Road access required minimal disturbance on a gentle slope with the same shallow soil.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the access road and drill pad to a deeper soil. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife.

### Site 53

**Representative Well Site:** The drill pad occurred on a shallow, well-drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 6 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.2 tons/acre/year. The site is within a Big Horn Sheep Concentration Area and Lambing Area, and Mule Deer Winter Range and Fawning Area.

Potential soil loss after disturbance would increase to about 3 tons/acre/year or approximately 3 times the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.



**Table D-15**  
**USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>6   | 3                      | 1                      | 3.41      |            | 10                            | 2                       |
| ROAD<br>30 | 18                     | 1                      |           | 8.63       | 155                           | 28                      |
| 50         | 33                     | 3                      |           | 1.73       | 57                            | 10                      |
| 30         | 13                     | 1                      |           | 2.48       | 33                            | 6                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the drill pad beyond 200 meters where deeper soils may exist. If relocation is not possible, special mitigation and conservation practices may be required to adequately protect the soil from long-term damage. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1.

**Access Road:** Road access required approximately 13 acres of disturbance on shallow soils with Severe management implications on over 85 percent of the road acres. Access Road on shallow erodible soils should be avoided to prevent significant amounts of accelerated erosion and long-term impacts to the soil resource.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of road segments to areas with less slope gradient and/or deeper soils. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife.

**Site 54**

**Representative Well Site:** The drill pad occurred on a deep, well-drained alluvial-outwash soil. A typical undisturbed site on a 10 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.1 tons/acre/year. The site is in a Mule Deer Winter Range and Fawning area.

Potential soil loss after disturbance would increase to about 4 tons/acre/year which equates to the soil loss tolerance value. Erosion hazard rates Slight on this gently sloping alluvial fan, but revegetation potential is often limited by droughty moisture conditions and surface rock. Short-term soil losses would occur prior to effective mitigation.

**Table D-16**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 10      | 4                      | 4                      | 3.66           | 15                            | 1                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1.

**Access Road:** Road access required minimal disturbance on a soil type with Slight erosion hazard.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife.

#### Geographic Zone 4

#### Site 55

**Representative Well Site:** The drill pad occurred on a deep, moderately well-drained alluvial soil (Riparian). A typical undisturbed site on level relief with 80 percent ground cover has a no appreciable soil loss. It is not in any critical winter range, Big Game Production Area, or will not effect any Management Indicator Species or T&E habitat.

Potential soil loss after disturbance would increase to about 0.3 tons/acre/year which is less than the soil loss tolerance value. Erosion hazard rates Slight and revegetation could be limited by soil wetness. Short-term soil losses would occur prior to effective mitigation, and on-site erosion could be controlled to less than the soil loss tolerance value. However, soils on these landscape positions are also susceptible to gully formations from possible stream flow alterations and compaction or rutting damage to soil physical properties. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-17  
USLE Predicted Surface Erosion for Drill Pad and Road**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>0   | 0.3                    | 4                      | 3.10      |            | 1                             | 0.1                     |
| ROAD<br>40 | 17                     | 1                      |           | 7.23       | 123                           | 24                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow adequate protection through relocation of the drill pad outside the stream terrace or floodplain. This would also protect the fisheries from increased sediment, and give more flexibility in mitigating the effects on visuals (well site could be moved more than 200 meters). To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area).

**Access Road:** Road access required approximately 7 acres of disturbance on a shallow soil with Severe management implications. Access Road on shallow soils with steep slopes should be avoided to prevent significant amounts of accelerated erosion and long-term impacts to the soil resource. (The road doesn't go through any riparian areas.)

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road to areas with less slope gradient and/or deeper soils.

**Site 56**

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 14 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.4 tons/acre/year. It is not in any critical winter range, Big Game Production Area, or will not effect any Management Indicator Species or T&E habitat. The site is in a drainage which is over its' Sediment Threshold Limit.

Potential soil loss after disturbance would increase to about 4 tons/acre/year or approximately 4 times the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-18  
USLE Predicted Surface Erosion for Drill Pad and Road**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>14  | 4                      | 1                      | 3.96      |            | 16                            | 3                       |
| ROAD<br>20 | 7                      | 1                      |           | 8.13       | 57                            | 10                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of activities to areas where deeper soils may exist, but direct impacts on moderate slopes can generally be mitigated through carefully applied erosion-control Conditions of Approval. The Controlled Surface Use (Water) stipulation would be applied to protect the drainage from increased sediment loading. No sediment producing activities (Well site, road, etc.) would be allowed until the drainage is brought down below its' sediment threshold limit.

**Access Road:** Road access required approximately 8 acres of disturbance on a shallow soil with Severe management implications. Access Road on shallow erodible soils should be avoided where possible to prevent significant amounts of accelerated erosion and potential long-term impacts.

**Mitigation:** Direct impacts on moderate slopes can generally be mitigated through carefully applied erosion-control Conditions of Approval (for soils). The CSU (Water) stipulation would be needed to limit the amount of road sediment because the drainage is at its' sediment threshold limit.

**Site 57**

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained residual soil on a ridgetop with management limitations associated with soil depth. A typical undisturbed site on a 16 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.5 tons/acre/year. The well site and road is visible from the Rampart Range Road.

There is sparse vegetation for cover. It is not in any critical winter range, Big Game Production Area, or will not effect any Management Indicator Species or T&E habitat. The site is in a drainage which is over its' Sediment Threshold Limit.

Potential soil loss after disturbance would increase to about 6 tons/acre/year or approximately 6 times the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-19**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 16      | 6                      | 1                      | 4.13           | 25                            | 4                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of activities to areas where deeper soils may exist, but direct impacts on moderate slopes can generally be mitigated through carefully applied erosion-control Conditions of Approval. If relocation is not an option, special mitigation and conservation practices may be required to adequately protect the soil from potential long-term damage. The Controlled Surface Use (Water) stipulation would be applied to protect the drainage from increased sediment loading. No sediment producing activities (Well site, road, etc.) would be allowed until the drainage is brought down below its' sediment threshold limit. A No Surface Occupancy (Visuals) stipulation would be applied to mitigate impacts to visuals.

**Access Road:** Road access required minimal disturbance on a gentle slope with the same shallow soil. Access Road on shallow erodible soils should be avoided where possible to prevent significant amounts of accelerated erosion and potential long-term impacts.

**Mitigation:** Direct impacts on gentle slopes can generally be mitigated through carefully applied erosion-control Conditions of Approval (for soils). Because the drainage is at its' sediment threshold limit, the CSU (Water) stipulation would have to be used to mitigate the effects of the sediment produced by the road. The NSO (Visuals) would also be used to mitigate the effects of the road on the visual resource.

### Site 58

**Representative Well Site:** The drill pad occurred on a deep, well-drained soil. A typical undisturbed site on a 12 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.2 tons/acre/year. The access road is visible, but not the well site. The site is within a Mule Deer Winter Range and Fawning area. The site is in a drainage which is over its' Sediment Threshold Limit.

Potential soil loss after disturbance would increase to about 3 tons/acre/year which is less than the soil loss tolerance value. Erosion hazard rates Slight on this gently sloping alluvial fan, and revegetation potential is rated Moderate. Short-term soil losses would occur prior to effective mitigation.

**Table D-20  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 12      | 3                      | 4                      | 3.81           | 11                            | 2                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1. The Controlled Surface Use (Water) stipulation would be applied to protect the drainage from increased sediment loading. No sediment producing activities (Well site, road, etc.) would be allowed until the drainage is brought down below its' sediment threshold limit. A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on a soil type with Slight erosion hazard.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. Timing Stipulations would restrict road use between December 1 and July 1. Because the drainage is at its' sediment threshold limit, the CSU (Water) stipulation would have to be used to mitigate the effects of the sediment produced by the road. The NSO (Visuals) would also be used to mitigate the effects of the road on the visual resource.

**Geographic Zone 5**

**Site 59**

**Representative Well Site:** The drill pad occurred on a deep, well-drained soil. A typical undisturbed site on a 6 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.1 tons/acre/year. The well site is visible from the Cedar Mountain Road. The site is not in any critical winter range, Big Game Production Areas, or will effect any Management Indicator Species, or T&E habitat.

Potential soil loss after disturbance would increase to about 4 tons/acre/year which equates to the soil loss tolerance value. Erosion hazard rates Moderate on this gently sloping alluvial fan, and revegetation potential is rated Slight. Short-term soil losses would occur prior to effective mitigation.

**Table D-21  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 6       | 4                      | 4                      | 3.41           | 14                            | 1                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection.

**Access Road:** Road access required minimal disturbance on a soil type with Moderate erosion hazard.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection.

*Site 60*

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 8 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.2 tons/acre/year. Both the well site and access road are visible from the Cedar Mountain Road. The site is not in any critical winter range, Big Game Production Areas, or will effect any Management Indicator Species, or T&E habitat.

Potential soil loss after disturbance would increase to about 3 tons/acre/year or approximately 3 times the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-22  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 8       | 3                      | 1                      | 3.53           | 11                            | 2                       |

**Mitigation:** Direct impacts on moderate slopes can generally be mitigated through carefully applied erosion-control Conditions of Approval. If relocation is not an option, special mitigation and conservation practices may be required to adequately protect the soil from potential long-term damage.

**Access Road:** Road access required minimal disturbance on a gentle slope with the same shallow soil. Access Road on shallow erodible soils should be avoided where possible to prevent significant amounts of accelerated erosion and potential long-term impacts.

**Mitigation:** Direct impacts on gentle slopes can generally be mitigated through carefully applied erosion-control Conditions of Approval.

*Site 61*

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 16 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.5 tons/acre/year. The site would be seen be Forest Service Road 204 (Foreground). The site is within a Mule Deer Winter Range and Fawning Area.

Potential soil loss after disturbance would increase to about 6 tons/acre/year or approximately 6 times the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses

can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-23  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 16      | 6                      | 1                      | 4.13           | 25                            | 4                       |

**Mitigation:** Direct impacts on moderate slopes can generally be mitigated through carefully applied erosion-control Conditions of Approval. If relocation is not an option, special mitigation and conservation practices may be required to adequately protect the soil from potential long-term damage. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1.

**Access Road:** Road access required minimal disturbance on a gentle slope with the same shallow soil. Access Road on shallow erodible soils should be avoided where possible to prevent significant amounts of accelerated erosion and potential long-term impacts.

**Mitigation:** Direct impacts on gentle slopes can generally be mitigated through carefully applied erosion-control Conditions of Approval. Timing Stipulations would restrict road use between December 1 and July 1 for wildlife.

**Site 62**

**Representative Well Site:** The drill pad occurred on a deep, somewhat poorly to moderately well-drained alluvial soil (Riparian). A typical undisturbed site on a 30 percent slope with 80 percent ground cover has a soil loss rate of approximately 1 ton/acre/year. The site is visible from Turkey Creek and Lost Valley Ranch. The site is not in any critical winter range, Big Game Production Areas, or will effect any Management Indicator Species, or T&E habitat.

Potential soil loss after disturbance would increase to about 19 tons/acre/year which exceeds the soil loss tolerance rate by over 4 times. Erosion hazard rates Moderate and revegetation could be limited by soil wetness. Short-term soil losses would occur prior to effective mitigation, and on-site erosion could be controlled to less than the soil loss tolerance value. However, soils on these landscape positions are also susceptible to gully formations from possible stream flow alterations and compaction or rutting damage to soil physical properties. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-24  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 30      | 19                     | 4                      | 5.88           | 111                           | 10                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow adequate protection through relocation of the drill pad outside the stream terrace or floodplain. To protect the water

resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area). A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on the same riparian soil type and potential for significant adverse impacts. The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain. The NSO (Water) stipulation would not allow the road in the riparian, other than to cross it. The CSU (Visuals) stipulation would be used to mitigate the effects of the road on the visuals resource.

### Site 63

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 8 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.2 tons/acre/year. The well site and access road are visible from Forest Service Road 523. The site is not in any critical winter range, Big Game Production Areas, or will effect any Management Indicator Species, or T&E habitat.

Potential soil loss after disturbance would increase to about 3 tons/acre/year or approximately 3 times the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-25**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 8       | 3                      | 1                      | 3.53           | 11                            | 2                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the drill pad and a short segment of road beyond 200 meters where deeper soils may exist. This would also allow flexibility to mitigate the effects on visuals. If relocation is not possible, special mitigation and conservation practices may be required to adequately protect the soil from long-term damage.

**Access Road:** Road access required minimal disturbance on a gentle slope with the same shallow soil.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the access road and drill pad to a deeper soil.

## Geographic Zone 6

### Site 64

**Representative Well Site:** The drill pad occurred on a deep, somewhat poorly to poorly drained alluvial soil (Riparian). A typical undisturbed site on a 8 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.2 tons/acre/year. The well site is adjacent to an existing road.



The site is not in any critical winter range, Big Game Production Areas, or will effect any Management Indicator Species, or T&E habitat.

Potential soil loss after disturbance would increase to about 5 tons/acre/year which exceeds the soil loss tolerance rate. Erosion hazard rates Moderate and revegetation could be limited by soil wetness. Short-term soil losses would occur prior to effective mitigation, and on-site erosion could be controlled to less than the soil loss tolerance value. However, soils on these landscape positions are also susceptible to gully formations from possible stream flow alterations and compaction or rutting damage to soil physical properties. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-26**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 8       | 5                      | 4                      | 3.53           | 18                            | 2                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow adequate protection through relocation of the drill pad outside the stream terrace or floodplain. This would also protect the fisheries from increased sediment. To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area). A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on the same riparian soil type and potential for significant adverse impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain. The NSO (Water) would not allow the road in the riparian, other than to cross it. The CSU (Visuals) would be used to mitigate the effects of the road on the visuals resource.

#### Site 65

**Representative Well Site:** The drill pad occurred on a deep, well-drained residual soil with moderate limitations. A typical undisturbed site on a 10 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.1 ton/acre/year. The well site is visible below an existing road. The site is not in any critical winter range, Big Game Production Areas, or will effect any Management Indicator Species, or T&E habitat.

Potential soil loss after disturbance would increase to about 5 tons/acre/year which exceeds the soil loss tolerance rate. Erosion hazard rates Moderate, and revegetation potential would have moderate limitations. Short-term soil losses would occur prior to effective mitigation.

**Table D-27  
USLE Predicted Surface Erosion for Drill Pad and Road**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>10  | 5                      | 4                      | 3.66      |            | 18                            | 2                       |
| ROAD<br>16 | 8                      | 3                      |           | 0.64       | 5                             | 1                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection.

**Access Road:** Road access required less than 1 acre of disturbance on the same soil type with moderate erosion potential.

Mitigation: The Standard Terms and Conditions of Approval would allow adequate soil resource protection.

**Site 66**

**Representative Well Site:** The drill pad occurred on a deep, well-drained residual soil with moderate limitations. A typical undisturbed site on a 16 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.7 ton/acre/year. The site is not in any critical winter range, Big Game Production Areas, or will effect any Management Indicator Species, or T&E habitat.

Potential soil loss after disturbance would increase to about 8 tons/acre/year which exceeds the soil loss tolerance rate by 2 times. Erosion hazard rates Moderate, and revegetation potential has moderate limitations. Short-term soil losses would occur prior to effective mitigation.

**Table D-28  
USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>16  | 8                      | 4                      | 4.13      |            | 33                            | 6                       |
| ROAD<br>12 | 6                      | 3                      |           | 1.78       | 11                            | 1                       |
| 16         | 8                      | 4                      |           | 0.73       | 6                             | 1                       |
| 20         | 10                     | 3                      |           | 1.61       | 16                            | 3                       |
| 30         | 20                     | 4                      |           | 3.78       | 76                            | 13                      |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection.

**Access Road:** Road access required approximately 8 acres of disturbance on similar soils with moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection.

**Site 67**

**Representative Well Site:** The drill pad occurred on a deep, well-drained residual soil with moderate limitations. A typical undisturbed site on a 16 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.7 ton/acre/year. The site is not in any critical winter range, Big Game Production Areas, or will effect any Management Indicator Species, or T&E habitat.

Potential soil loss after disturbance would increase to about 8 tons/acre/year which exceeds the soil loss tolerance rate by 2 times. Erosion hazard rates Moderate, and revegetation potential has moderate limitations. Short-term soil losses would occur prior to effective mitigation.

**Table D-29  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| PAD 16  | 8                      | 4                      | 4.13           | 33                            | 6                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection.

**Access Road:** Road access required minimal disturbance on the same soil type with moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection.

**Geographic Zone 7**

**Site 68**

**Representative Well Site:** The drill pad occurred on a deep, somewhat poorly to poorly drained alluvial soil (Riparian). A typical undisturbed site on a 8 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.2 tons/acre/year. The access road is visible from U.S. Hwy 40, hilly terrain hides the well site. The site is within Elk and Mule Deer Winter Range, Elk calving area, and a Deer Fawning area.

Potential soil loss after disturbance would increase to about 5 tons/acre/year which exceeds the soil loss tolerance rate. Erosion hazard rates Moderate and revegetation could be limited by soil wetness. Short-term soil losses would occur prior to effective mitigation, and on-site erosion could be controlled to less than the soil loss tolerance value. However, soils on these landscape positions are also susceptible to gully formations from possible stream flow alterations and compaction or rutting damage to soil physical properties. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-30  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 8       | 5                      | 4                      | 3.53           | 18                            | 2                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow adequate protection through relocation of the drill pad outside the stream terrace or floodplain. This would also protect the fisheries from increased sediment. Timing Stipulations would also be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1. To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area). A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on a shallow soil with Severe management implications. Access Road on shallow erodible soils should be avoided to prevent significant amounts of accelerated erosion and long-term impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the access road to a more gentle slope and/or deeper soil. Timing Stipulations would restrict road use between December 1 and July 1. The CSU (Visuals) would be used to mitigate the effects of the road on visuals.

**Site 69**

**Representative Well Site:** The drill pad occurred on a shallow, well-drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 5 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.04 tons/acre/year. The access road is visible from Forest Service Road 842. The site is within Elk and Mule Deer Winter Range, Elk calving area, and a Deer Fawning area.

Potential soil loss after disturbance would increase to about 2 ton/acre/year which exceeds the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-31  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 5       | 2                      | 1                      | 3.35           | 7                             | 0.4                     |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the drill pad and a short segment of road beyond 200 meters where deeper soils may exist. If relocation is not possible, special mitigation and conservation practices may be required to adequately

protect the soil from long-term damage. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1.

**Access Road:** Road access required minimal disturbance on a gentle slope with the same shallow soil.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the access road and drill pad to a deeper soil. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife.

#### Site 70

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained residual soil with management limitations associated with soil depth. A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The site is within a Mule Deer Winter Range and Fawning Area.

Potential soil loss after disturbance would increase to about 0.2 tons/acre/year which is less than the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible. However, the risk of erosion damage in this case is reduced by lack of slope gradient.

**Table D-32**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 0       | 0.2                    | 1                      | 3.10           | 0.6                           | 0                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection if mitigative measures are carefully implemented. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1. A No Surface Occupancy (Visuals) stipulation would be applied to mitigate impacts to visuals.

**Access Road:** Road access required minimal disturbance on level ground with the same shallow soil.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection if mitigative measures are carefully implemented. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife. The NSO (Visuals) would be used to mitigate the effects of the road.

#### Site 71

**Representative Well Site:** The drill pad occurred on a deep, well-drained colluvial soil with moderate limitations. A typical undisturbed site on a 20 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.1 tons/acre/year. The site is within a Big Horn Sheep, Elk, and Mule Deer Wintering Area.

Potential soil loss after disturbance would increase to about 5 tons/acre/year which exceeds the soil loss tolerance value. Erosion hazard rates Moderate on this moderately sloping foot slope, and revegetation has moderate limitations. Short-term soil losses would occur prior to effective mitigation.

**Table D-33**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| PAD 20  | 5                      | 4                      | 4.51           | 23                            | 4                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. Timing Stipulations would be applied to protect wildlife. It would restrict activities in the area from December 1 to July 1. A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on the same soil type and erosion factors that have moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. Timing Stipulations would restrict road use between December 1 and July 1 to protect wildlife. The CSU (Visuals) would be used to mitigate the effects of the road.

**Site 72**

**Representative Well Site:** The drill pad occurred on a shallow, well-drained residual soil with management limitations associated with soil depth. A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The site is within an Elk and Mule Deer Winter Range, Elk and Deer Calving and Fawning areas, and Bald Eagle Winter Habitat/Winter Range (T&E species).

Potential soil loss after disturbance would increase to about 0.1 tons/acre/year which is less than the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible. However, the risk of erosion damage in this case is reduced by lack of slope gradient.

**Table D-34**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 0       | 0.1                    | 1                      | 3.10           | 0.3                           | 0                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection if mitigative measures are carefully implemented. Timing Stipulations would be applied

to protect wildlife. It would restrict activities in the area from November 15 to July 1. A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on level ground with the same shallow soil.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection if mitigative measures are carefully implemented. Timing Stipulations would restrict road use between November 15 and July 1. The CSU (Visuals) would be used to mitigate the effects of the road on visuals.

### Geographic Zone 8

#### Site 73

**Representative Well Site:** The drill pad occurred on a deep, well-drained residual soil in the alpine ecosystem. A typical undisturbed site on a 12 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.3 ton/acre/year. The site is located in an alpine meadow. It is not in any critical winter range, Big Game Production Areas, or will affect any Management Indicator Species or T&E habitat.

Potential soil loss after disturbance would only increase to about 3 tons/acre/year which is less than the soil loss tolerance value. Although erosion hazard rates Slight for water erosion, exposed bare ground is also subject to Severe wind erosion on mountain summits. Alpine soils are considered sensitive because harsh climatic conditions only provide limited opportunity for soil formation, and processes are reduced even further when vegetation has been removed. Revegetation potential is rated Severe, and long-term reductions to soil productivity could result from surface impacts. Disturbance of alpine soils should be minimized to the extent possible.

**Table D-35  
USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>12  | 3                      | 4                      | 3.81      |            | 12                            | 1                       |
| ROAD<br>30 | 10                     | 4                      |           | 7.06       | 71                            | 13                      |
| 40         | 13                     | 4                      |           | 3.89       | 51                            | 9                       |
| 50         | 27                     | 4                      |           | 1.94       | 52                            | 10                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation and other special forms of mitigation which may be required to adequately protect the soil resource. The Controlled Surface Use (Alpine Ecosystems) would be applied to mitigate the effects on the fragile alpine ecosystem.

**Access Road:** Road access required approximately 13 acres of disturbance on forested soils with moderate to steep slopes. Approximately 2 acres of disturbance is anticipated on soils with Severe erosion potential.

**Mitigation:** The Controlled Surface Use (Soils) stipulation allows relocation of this road segment to a more gentle slope. The Standard Terms and Conditions of Approval would adequately protect soils on sections of road under 40 percent slope. The CSU (Alpine Ecosystem) stipulation would be applied to mitigate the effects of the road on this fragile environment.

#### **Site 74**

**Representative Well Site:** The drill pad occurred on a deep, well-drained glacial soil. A typical undisturbed site on a 12 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.4 tons/acre/year. The well site and access road is adjacent to the Colorado Trail, and may be visible from the Beaver Ponds Picnic Area. It is not in any critical winter range, Big Game Production Areas, or will affect any Management Indicator Species or T&E habitat.

Potential soil loss after disturbance would increase to about 4 tons/acre/year which equates to the soil loss tolerance value. Erosion hazard rates Moderate on this gently sloping ground moraine, and revegetation potential has moderate limitations. Short-term soil losses would occur prior to effective mitigation.

**Table D-36  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 12      | 4                      | 4                      | 3.81           | 15                            | 3                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. A No Surface Occupancy (Visuals) stipulation would be applied to mitigate impacts to visuals.

**Access Road:** Road access required minimal disturbance on a soil type with Slight erosion hazard.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. The NSO (Visuals) would be applied to help mitigate the effects of the road on visuals.

#### **Site 75**

**Representative Well Site:** The drill pad occurred on a deep, poorly drained alluvial soil (Riparian). A typical undisturbed site on level ground with 80

percent ground cover has no appreciable soil loss. The well site is located within Geneva Park, which is visible from Colorado Hwy 62. The site is within an Elk calving area. The Greenback cutthroat trout is within the drainage of the well site (T&E fish species).

Potential soil loss after disturbance would increase to about 0.4 tons/acre/year which is less than the soil loss tolerance rate. Erosion hazard rates Slight and revegetation could be limited by soil wetness. Short-term soil losses would occur prior to effective mitigation, and on-site erosion could be controlled to less than the soil loss tolerance value. However, soils on these landscape positions are also susceptible to gully formations from possible stream flow alterations and compaction or



rutting damage to soil physical properties. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-37  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 0       | 0.4                    | 4                      | 3.10           | 1                             | 0                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow adequate protection through relocation of the drill pad outside the stream terrace or floodplain. This would also protect the fisheries from increased sediment. Timing Stipulations would also be applied to protect wildlife. It would restrict activities in the area from April 15 to July 1. To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area). A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on the same riparian soil type and potential for significant adverse impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain. Timing Stipulations would restrict road use between April 15 and July 1. The CSU (Visuals) would be used to mitigate the effects of the road on visuals.

**Site 76**

**Representative Well Site:** The drill pad occurred on a deep, well-drained alluvial soil. A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The well site is located within Geneva Park, which is visible from Colorado Hwy 62. The Greenback cutthroat trout is within the drainage of the well site (T&E fish species).

Potential soil loss after disturbance would increase to about 0.2 tons/acre/year which is less than the soil loss tolerance value. Erosion hazard rates Slight on this gently sloping alluvial fan, and revegetation potential is rated Moderate. Short-term soil losses would occur prior to effective mitigation.

**Table D-38  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 0       | 0.2                    | 4                      | 3.10           | 0.6                           | 0                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on a soil type with Moderate erosion hazard.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. The CSU (Visuals) would be used to mitigate the effects of the road on visuals.

**Site 77**

**Representative Well Site:** The drill pad occurred on a moderately deep, well-drained residual soil with moderate limitations. A typical undisturbed site on a 12 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.3 tons/acre/year. The Greenback cutthroat trout is within the drainage of the well site (T&E fish species).

Potential soil loss after disturbance would increase to about 3 tons/acre/year which equates to the soil loss tolerance value. Erosion hazard and revegetation potential both have Moderate ratings. Short-term soil losses would occur prior to effective mitigation.

**Table D-39  
USLE Predicted Surface Erosion for Drill Pad**

| Slope %   | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|-----------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| PAD<br>12 | 3                      | 3                      | 3.81           | 11                            | 1                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required minimal disturbance on a deep soil with Moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. The CSU (Visuals) stipulation would be used to mitigate the effects of the road on visuals.

**Site 78**

**Representative Well Site:** The drill pad occurred on a deep, well-drained glacial soil. A typical undisturbed site on a 30 percent slope with 80 percent ground cover has a soil loss rate of approximately 1 ton/acre/year.

Potential soil loss after disturbance would increase to about 15 tons/acre/year which exceeds the soil loss tolerance value by nearly 4 times. Erosion hazard rates Moderate on this moderately sloping ground moraine, and revegetation potential has moderate limitations. Short-term soil losses would occur prior to effective mitigation.

**Table D-40**  
**USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>30  | 15                     | 4                      | 5.88      |            | 15                            | 16                      |
| ROAD<br>30 | 15                     | 4                      |           | 1.31       | 20                            | 2                       |
| 40         | 19                     | 4                      |           | 1.11       | 21                            | 2                       |
| 50         | 27                     | 4                      |           | 1.51       | 41                            | 4                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. A Controlled Surface Use (Visuals) stipulation would be applied to mitigate the effects on visuals (allows movement of well site greater than 200 meters).

**Access Road:** Road access required approximately 4 acres of disturbance on deep soils with moderate to steep slopes. Approximately 2.5 acres of disturbance is anticipated on soils with Severe erosion potential.

**Mitigation:** The Controlled Surface Use (Soils) stipulation allows relocation of this road segment to a more gentle slope. The Standard Terms and Conditions of Approval would adequately protect soils on sections of road under 40 percent slope. The CSU (Visuals) stipulation would be used to mitigate the effects of the road on visuals.

**Site 79**

**Representative Well Site:** The drill pad occurred on a shallow, well-drained residual soil with management limitations associated with soil depth. A typical undisturbed site on a 7 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.1 tons/acre/year. The Greenback cutthroat trout is within the drainage of the well site (T&E fish species).

Potential soil loss after disturbance would increase to about 2 ton/acre/year which exceeds the soil loss tolerance value. Revegetation potential is limited by shallow rooting depths and droughty conditions. Accelerated soil loss on shallow soils is a concern because even minor losses can significantly reduce potential soil productivity. Disturbance of shallow soils should be minimized to the extent possible.

**Table D-41**  
**USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>7   | 2                      | 1                      | 3.47      |            | 7                             | 1                       |
| ROAD<br>20 | 5                      | 3                      |           | 2.41       | 12                            | 2                       |
| 30         | 10                     | 1                      |           | 3.67       | 37                            | 7                       |
| 40         | 13                     | 3                      |           | 5.19       | 67                            | 12                      |
| 40         | 26                     | 4                      |           | 1.85       | 48                            | 9                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the drill pad beyond 200 meters where deeper soils may exist. If relocation is not possible, special mitigation and conservation practices may be required to adequately protect the soil from long-term damage.

**Access Road:** Road access required approximately 13 acres of disturbance on forested soils with moderate to steep slopes. Approximately 5.5 acres of disturbance is anticipated on soils with Severe erosion potential.

**Mitigation:** The Controlled Surface Use (Soils) stipulation allows relocation of these road segments to more gentle slopes for soil resource protection.

**Site 80**

**Representative Well Site:** The drill pad occurred on a deep, well-drained glacial soil. A typical undisturbed site on a 30 percent slope with 80 percent ground cover has a soil loss rate of approximately 2 tons/acre/year. The site is within an Elk calving area. The Greenback cutthroat trout is within the drainage of the well site (T&E fish species).

Potential soil loss after disturbance would increase to about 20 tons/acre/year which exceeds the soil loss tolerance value by 5 times. Erosion hazard rates Severe on this moderately sloping glacial moraine, and revegetation potential has moderate limitations.

**Table D-42**  
**USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope %   | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|-----------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>30 | 20                     | 4                      | 5.88      |            | 118                           | 21                      |

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| ROAD    |                        |                        |           |            |                               |                         |
| 20      | 5                      | 4                      |           | 0.80       | 4                             | 1                       |
| 30      | 10                     | 4                      |           | 0.92       | 9                             | 2                       |
| 40      | 13                     | 4                      |           | 3.89       | 51                            | 9                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the drill pad to a more gentle slope. If relocation is not possible, special mitigation and conservation practices may be required to adequately protect the soil from long-term damage. Timing stipulation would be applied to protect wildlife. It would restrict activities in the area from April 15 to July 1.

**Access Road:** Road access required approximately 6 acres of disturbance on deep soils with moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval allow adequate soil resource protection. Timing Stipulations would restrict road use between April 15 and July 1 to protect wildlife.

### GRASSLAND ENVIRONMENT

#### Geographic Zone 9

#### Site 81

**Representative Well Site:** The drill pad occurred on a deep, well-drained alluvial soil (Riparian). A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The site isn't visible from the highway. It is within a Scaled Quail Winter Concentration Area.

Potential soil loss after disturbance would increase to about 0.4 tons/acre/year which is less than the soil loss tolerance rate. Surface erosion hazard by water rates Slight, and revegetation potential has slight limitations. Short-term soil losses would occur prior to effective mitigation, and on-site erosion could be controlled to less than the soil loss tolerance value. However, soils on these landscape positions are also susceptible to gully formations and accelerated soil loss by wind erosion. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-43**  
**USLE Predicted Surface Erosion for Drill Pad and Roads**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD     |                        |                        |           |            |                               |                         |
| 0       | 0.4                    | 4                      | 3.10      |            | 1                             | 0                       |
| ROAD    |                        |                        |           |            |                               |                         |
| 6       | 4                      | 4                      |           | 2.61       | 10                            | 2                       |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow adequate protection through relocation of the drill pad outside the stream terrace or floodplain. A Timing Stipulation would be applied to protect wildlife. It would restrict activities in the area from December 1 to April 15. To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area).

**Access Road:** Road access required disturbance on the same alluvial soil type (Riparian) and potential for significant adverse impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain. A Timing Stipulation would restrict road use between December 1 and April 15 to protect wildlife in this area. The NSO (Water) stipulation would move the road out of the riparian, other than to cross it.

### Site 82

**Representative Well Site:** The drill pad occurred on a moderately deep, well-drained upland soil. A typical undisturbed site on a 14 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.7 tons/acre/year. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species or T&E habitats.

Potential soil loss after disturbance would increase to about 7 tons/acre/year which exceeds the soil loss tolerance value by over 2 times. Surface erosion hazard by water and revegetation potential have moderate ratings. Short-term soil losses would occur prior to effective mitigation.

**Table D-44**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 14      | 7                      | 3                      | 4.10           | 29                            | 6                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate protection for all resources.

**Access Road:** Road access required minimal disturbance on a deep alluvial soil (Riparian) with moderate erosion potential. However, potential exists for adverse impacts from gully formations and accelerated wind erosion.

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain to avoid potential impacts (move more than 200 meters).

### Geographic Zone 10

### Site 83

**Representative Well Site:** The drill pad occurred on a deep, well-drained upland soil. A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species or T&E habitats.

Potential soil loss after disturbance would increase to about 0.4 tons/acre/year which is less than the soil loss tolerance value. Surface erosion hazard by water and revegetation potential have moderate ratings. Short-term soil losses would occur prior to effective mitigation.

**Table D-45  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 0       | 0.4                    | 4                      | 3.10           | 1                             | 0                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate protection for all resources.

**Access Road:** Road access required minimal disturbance on a deep upland soil with moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would provide adequate soil resource protection.

**Site 84**

**Representative Well Site:** The drill pad occurred on a deep, somewhat excessively drained alluvial soil (Riparian). A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species or T&E habitats.

Potential soil loss after disturbance would increase to about 0.3 tons/acre/year which is less than the soil loss tolerance rate, and surface erosion hazard by water rates Slight. However, potential soil loss from wind erosion would increase to about 134 tons/acre/year, and the wind erosion hazard rates Severe. Soils on these landscape positions are also susceptible to gully formations, but accelerated soil loss by wind erosion is the primary concern for this site. Revegetation potential has moderate limitations. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-46  
Predicted Surface Erosion for Drill Pad**

| Slope %         | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|-----------------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| WA-<br>TER<br>0 | 0.3                    | 4                      | 3.10           | 1                             | 0                       |
| WIND<br>0       | 134                    | 4                      | 3.10           | 415                           | 28                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the drill pad outside the stream terrace or floodplain. To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area).

**Access Road:** Road access required minimal disturbance on the same alluvial soil (Riparian) and potential for significant adverse impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain. The NSO (Water) would move the road out of the riparian area, other than to cross it.

**Site 85**

**Representative Well Site:** The drill pad occurred on a deep, excessively drained sandy soil. A typical undisturbed site on level ground with 80 percent ground cover has a soil loss rate of approximately 9 tons/acre/year from wind erosion. The site is visible from U.S. Hwy 287/385. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species or T&E habitats.

Potential soil loss after disturbance would increase to about 134 tons/acre/year which exceeds the soil loss tolerance rate by over 30 times. Natural soil loss amounts already exceed soil loss tolerance values, and the removal of existing ground cover protection significantly accelerates wind erosion soil losses. Surface erosion hazard by water rates Slight, but wind erosion hazard and revegetation potential have Severe ratings. Although revegetation is often difficult on sandy soils, the risk for significant impacts is reduced through carefully applied erosion-control Conditions of Approval. Erosion control netting and heavy applications of mulch are initially used to provide protective cover until revegetation can be accomplished. Successful reclamation from past and current leases has been demonstrated under Standard Lease Terms. Unavoidable soil losses would occur on barren surfaces, but losses should be short-term in nature until effective ground cover is restored through revegetation practices appropriate for the grassland environment. Treatment areas can be restored to soil loss levels commensurate with natural ecological conditions within 5 years.

**Table D-47  
Predicted Surface Erosion for Drill Pad and Road**

| Slope %   | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|-----------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>0  | 134                    | 4                      | 3.10      |            | 415                           | 28                      |
| ROAD<br>0 | 134                    | 4                      |           | 0.36       | 48                            | 3                       |

**Mitigation:** Carefully applied Standard Terms and Conditions of Approval would allow adequate protection of the soil resource. The Controlled Surface Use (Visuals) stipulation would be used to mitigate the effects on visuals (It would allow the site to be moved more than 200 meters).

**Access Road:** Road access required minimal disturbance on the same sandy soil with Severe management implications as the well site.



**Mitigation:** Impacts can be controlled through carefully applied erosion-control Conditions of Approval. The CSU (Visuals) stipulation would be used to mitigate the effects of the road on visuals.

### Geographic Zone 11

#### Site 86

**Representative Well Site:** The drill pad occurred on a deep, somewhat excessively drained sandy soil. A typical undisturbed site on a 4 percent slope with 80 percent ground cover has a soil loss rate of approximately 9 tons/acre/year from wind erosion. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species or T&E habitats.

Potential soil loss after disturbance would increase to about 134 tons/acre/year which exceeds the soil loss tolerance rate by over 30 times. Natural soil loss amounts already exceed soil loss tolerance values, and the removal of existing ground cover protection significantly accelerates wind erosion soil losses. Surface erosion hazard by water rates Slight, but wind erosion hazard and revegetation potential have Severe ratings. Although revegetation is often difficult on sandy soils, the risk for significant impacts is reduced through carefully applied erosion-control Conditions of Approval. Erosion control netting and heavy applications of mulch are initially used to provide protective cover until revegetation can be accomplished. Successful reclamation from past and current leases has been demonstrated under Standard Lease Terms. Unavoidable soil losses would occur on barren surfaces, but losses should be short-term in nature until effective ground cover is restored through revegetation practices appropriate for the grassland environment. Treatment areas can be restored to soil loss levels commensurate with natural ecological conditions within 5 years.

**Table D-48**  
**Predicted Wind Erosion for Drill Pad and Road**

| Slope %   | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|-----------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>4  | 134                    | 4                      | 3.30      |            | 442                           | 30                      |
| ROAD<br>4 | 134                    | 4                      |           | 0.70       | 94                            | 6                       |

**Mitigation:** Carefully applied Standard Lease Terms and Conditions of Approval would allow adequate protection of the soil resource.

**Access Road:** Road access required minimal disturbance on the same soil type with Severe management implications as the well site.

**Mitigation:** Impacts can be controlled through carefully applied erosion-control Conditions of Approval.

### Site 87

**Representative Well Site:** The drill pad occurred on a shallow, somewhat excessively drained upland soil of a canyon scarp slope. A typical undisturbed site on a 8 percent slope with 80 percent ground cover has a soil loss rate of approximately 0.5 tons/acre/year. Access road is visible from County Rd 539, the well site is not visible from the Carrizo Picnic Area. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species or T&E habitats.

Potential soil loss after disturbance would increase to about 6 tons/acre/year which exceeds the soil loss tolerance value by 6 times. Surface erosion hazard by water and revegetation potential have Severe ratings. Short-term soil losses would occur prior to effective mitigation.

**Table D-49  
USLE Predicted Surface Erosion for Drill Pad and Road**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>8   | 6                      | 1                      | 3.54      |            | 21                            | 4                       |
| ROAD<br>16 | 12                     | 1                      |           | 0.44       | 5                             | 1                       |

**Mitigation:** Slope lengths are generally short enough on these canyon side slopes that the Standard Terms would normally allow relocation to more stable sites. In the event relocation was required beyond 200 meters, the Controlled Surface Use (Soils) stipulation is used as a precaution to avoid and protect this fragile soil from adverse impacts.

**Access Road:** Road access required minimal disturbance on shallow soils with Severe management implications. Access Road on shallow soils should be avoided to prevent significant amounts of accelerated erosion and long-term impacts to the soil resource.

**Mitigation:** The Controlled Surface Use (Soils) stipulation offers opportunity for relocation of the access road to an area with less slope gradient and possibly deeper soils. This would also allow more flexibility in mitigating the effects on visuals (could move the road more than 200 meters).

### Geographic Zone 12

### Site 88

**Representative Well Site:** The drill pad occurred on a deep, well-drained alluvial soil (Riparian). A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The site is within the river corridor, and is not visible from the Santa Fe Trail. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species or T&E habitats.

Potential soil loss after disturbance would increase to about 0.3 tons/acre/year which is less than the soil loss tolerance rate, and surface erosion hazard by water rates Slight. However, potential soil loss from wind erosion would increase to about 134 tons/acre/year, and the wind erosion

hazard rates Severe. Soils on these landscape positions are also susceptible to gully formations, but accelerated soil loss by wind erosion is the primary concern for this site. Revegetation potential has moderate limitations. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-50  
Predicted Surface Erosion for Drill Pad**

| %               | tons/acre/yr | tons/acre/yr | acres | loss (tons/yr) | tons/yr |
|-----------------|--------------|--------------|-------|----------------|---------|
| WA-<br>TER<br>0 | 0.3          | 4            | 3.10  | 1              | 0       |
| WIND<br>0       | 134          | 4            | 3.10  | 415            | 28      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the drill pad outside the stream terrace or floodplain. To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area).

**Access Road:** Road access required minimal disturbance on the same alluvial soil (Riparian) and potential for significant adverse impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain. The NSO (Water) would move the road outside of the riparian area, other than to cross it.

**Site 89**

**Representative Well Site:** The drill pad occurred on a deep, well-drained upland soil. A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species or T&E habitats.

Potential soil loss after disturbance would increase to about 0.3 tons/acre/year which is less than the soil loss tolerance value. Surface erosion hazard by water and revegetation potential have moderate ratings. Short-term soil losses would occur prior to effective mitigation.

**Table D-51  
USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 0       | 0.3                    | 4                      | 3.10           | 1                             | 0                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate protection for all resources.

**Access Road:** Road access required minimal disturbance on a deep upland soil with moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would provide adequate soil resource protection.

### Geographic Zone 13

#### Site 90

**Representative Well Site:** The drill pad occurred on a deep, well-drained upland soil. A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The site is visible from the Sante Fe Trail. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species habitat. The Cimarron River has been a historical habitat for the Flathead Chub, Arkansas River Shiner, and Arkansas Chub (all T&E fish species). Although dewatering of the upper Cimarron River has occurred, the river should be closely monitored as being in the range of these rare fish.

Potential soil loss after disturbance would increase to about 0.3 tons/acre/year which is less than the soil loss tolerance value. Surface erosion hazard by water and revegetation potential have moderate ratings. Short-term soil losses would occur prior to effective mitigation.

**Table D-52**  
**USLE Predicted Surface Erosion for Drill Pad**

| Slope % | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|---------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| 0       | 0.3                    | 4                      | 2.07           | 0.6                           | 0                       |

**Mitigation:** The Standard Terms and Conditions of Approval would allow adequate soil resource protection. The Controlled Surface Use (Visuals) stipulation would be used to mitigate the effects on visuals (It would allow the site to be moved more than 200 meters).

**Access Road:** Road access required minimal disturbance on a deep upland soil with moderate erosion potential.

**Mitigation:** The Standard Terms and Conditions of Approval would provide adequate soil resource protection. The CSU (Visuals) would be used to mitigate the effects of the road on visuals.

#### Site 91

**Representative Well Site:** The drill pad occurred on a deep, well-drained alluvial soil Riparian). A typical undisturbed site on level ground with 80 percent ground cover has no appreciable soil loss. The site is visible from U.S. Hwy 51, and may be visible from the Sante Fe Trail. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species habitat. The Cimarron River has been a historical habitat for the Flathead Chub, Arkansas River Shiner, and Arkansas Chub (all T&E fish species). Although dewatering of the upper Cimarron River has occurred, the river should be closely monitored as being in the range of these rare fish.

Potential soil loss after disturbance would increase to about 0.3 tons/acre/year which is less than the soil loss tolerance rate, and surface erosion hazard by water rates Slight. However, potential soil loss from wind erosion would increase to about 134 tons/acre/year, and the wind erosion hazard rates Severe. Soils on these landscape positions are also susceptible to gully formations, but accelerated soil loss by wind erosion is the primary concern for this site. Revegetation potential has moderate limitations. The combined effects would have the potential for long-term detrimental impacts to soil productivity.

**Table D-53  
Predicted Surface Erosion for Drill Pad**

| Slope %    | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad/Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|------------|------------------------|------------------------|----------------|-------------------------------|-------------------------|
| WATER<br>0 | 0.3                    | 4                      | 1.38           | 1                             | 0                       |
| WIND<br>0  | 134                    | 4                      | 1.38           | 185                           | 12                      |

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the drill pad outside the stream terrace or floodplain. The Controlled Surface Use (Visuals) stipulation would also be used to mitigate the effects on visuals (It would allow the site to be moved more than 200 meters). To protect the water resource (Riparian), a No Surface Occupancy stipulation would be applied (the well site would not be allowed in the riparian area).

**Access Road:** Road access required minimal disturbance on the same alluvial soil and potential for significant adverse impacts.

**Mitigation:** The Controlled Surface Use (Soils) stipulation would allow relocation of the access road outside the stream terrace or floodplain. The NSO (Water) would move the road out of the riparian area, other than to cross it. The CSU (Visuals) would be used to mitigate the effects of the road on visuals.

### Site 92

**Representative Well Site:** The drill pad occurred on a deep, excessively drained sandy soil. A typical undisturbed site on level ground with 80 percent ground cover has a soil loss rate of approximately 9 tons/acre/year from wind erosion. The site is visible from Highway 51. The site is not in any critical winter range, Big Game Production Area, or will affect any critical Management Indicator Species habitat. The Cimarron River has been a historical habitat for the Flathead Chub, Arkansas River Shiner, and Arkansas Chub (all T&E fish species). Although dewatering of the upper Cimarron River has occurred, the river should be closely monitored as being in the range of these rare fish.

Potential soil loss after disturbance would increase to about 134 tons/acre/year which exceeds the soil loss tolerance rate by over 30 times. Natural soil loss amounts already exceed soil loss tolerance values, and the removal of existing ground cover protection significantly accelerates wind erosion soil losses. Surface erosion hazard by water rates Slight, but wind erosion hazard and revegetation potential have Severe ratings. Although revegetation is often difficult on sandy soils, the risk for significant impacts is reduced through carefully applied erosion-control Condi-

tions of Approval. Erosion control netting and heavy applications of mulch are initially used to provide protective cover until revegetation can be accomplished. Successful reclamation from past and current leases has been demonstrated under Standard Lease Terms. Unavoidable soil losses would occur on barren surfaces, but losses should be short-term in nature until effective ground cover is restored through revegetation practices appropriate for the grassland environment. Treatment areas can be restored to soil loss levels commensurate with natural ecological conditions within 5 years.

**Table D-54  
Predicted Wind Erosion for Drill Pad and Road**

| Slope %   | Potential tons/acre/yr | Tolerance tons/acre/yr | Pad acres | Road acres | Potential soil loss (tons/yr) | With mitigation tons/yr |
|-----------|------------------------|------------------------|-----------|------------|-------------------------------|-------------------------|
| PAD<br>0  | 134                    | 4                      | 2.07      |            | 277                           | 19                      |
| ROAD<br>0 | 134                    | 4                      |           | 0.31       | 42                            | 3                       |

**Mitigation:** Carefully applied Standard Lease Terms and Conditions of Approval would allow adequate protection of the soil resource. The Controlled Surface Use (Visuals) stipulation would be used to mitigate the effects on visuals (It would allow the site to be moved more than 200 meters).

**Access Road:** Road access required minimal disturbance on the same sandy soil with Severe management implications like the well site.

**Mitigation:** Impacts can be controlled through carefully applied erosion-control Conditions of Approval. The CSU (Visuals) would be applied to mitigate the effects of the road on visuals.

**Exhibit D-1  
WELL SITE LOCATIONS**

| LOC. CODE | GZ # | WATER-SHED | QUAD NAME        | QUAD SITE # | LEGAL DESCRIPTION      |
|-----------|------|------------|------------------|-------------|------------------------|
| 1-67-1    | 1    | 67         | WINFIELD         | 1           | T12S R81W SEC. 20 SENE |
| 1-67-2    | 1    | 67         | WINFIELD         | 2           | T12S R81W SEC. 29 SWSW |
| 1-67-3    | 1    | 67         | WINFIELD         | 3           | T12S R81W SEC. 32 NENE |
| 1-67-4    | 1    | 67         | WINFIELD         | 4           | T13S R81W SEC. 04 SWNE |
| 1-67-5    | 1    | 67         | WINFIELD         | 5           | T12S R81W SEC. 23 SWSE |
| 1-67-6    | 1    | 67         | GRANITE          | 1           | T12S R80W SEC. 13 NWNE |
| 1-67-7    | 1    | 67         | GRANITE          | 2           | T12S R80W SEC. 15 NWSW |
| 1-67-8    | 1    | 67         | GRANITE          | 3           | T12S R80W SEC. 05 NWSW |
| 1-67-9    | 1    | 67         | GRANITE          | 4           | T11S R80W SEC. 28 SESW |
| 1-67-10   | 1    | 67         | MT. ELBERT       | 1           | T12S R81W SEC. 20 NWNE |
| 1-67-11   | 1    | 67         | MT. ELBERT       | 2           | T12S R81W SEC. 14 NENW |
| 1-67-12   | 1    | 67         | SO. PEAK         | 1           | T11S R79W SEC. 20 NWSE |
| 1-67-13   | 1    | 67         | SO. PEAK         | 2           | T11S R79W SEC. 28 SESE |
| 1-67-14   | 1    | 67         | SO. PEAK         | 3           | T11S R79W SEC. 34 SWNW |
| 1-67-93   | 1    | 67         | SO. PEAK         | 4           | T11S R79W SEC. 28 SESE |
| 1-67-94   | 1    | 67         | SO. PEAK         | 5           | T11S R79W SEC. 27 NWNE |
| 1-71-15   | 1    | 71         | TINCUP           | 1           | T14S R81W SEC. 25 NWSW |
| 1-71-16   | 1    | 71         | TINCUP           | 2           | T14S R80W SEC. 31 SENW |
| 1-71-17   | 1    | 71         | TINCUP           | 3           | T15S R81W SEC. 12 SESE |
| 1-71-18   | 1    | 71         | MT. YALE         | 1           | T14S R79W SEC. 06 SWSE |
| 1-71-19   | 1    | 71         | MT. YALE         | 2           | T14S R80W SEC. 26 NWNW |
| 1-71-20   | 1    | 71         | MT. YALE         | 3           | T14S R80W SEC. 33 NWNW |
| 1-71-21   | 1    | 71         | MT. YALE         | 4           | T15S R80W SEC. 08 NESE |
| 1-71-22   | 1    | 71         | MT. YALE         | 5           | T14S R80W SEC. 33 NWSE |
| 1-71-95   | 1    | 71         | MT. YALE         | 6           | T14S R80W SEC. 30 SESE |
| 1-71-96   | 1    | 71         | MT. YALE         | 7           | T15S R80W SEC. 02 SENW |
| 1-71-97   | 1    | 71         | MT. YALE         | 8           | T15S R80W SEC. 05 SENW |
| 1-71-23   | 1    | 71         | BUENA VISTA WEST | 1           | T14S R79W SEC. 04 NWSW |
| 1-71-24   | 1    | 71         | BUENA VISTA WEST | 2           | T14S R79W SEC. 15 NENW |
| 1-71-25   | 1    | 71         | BUENA VISTA WEST | 3           | T14S R79W SEC. 33 NWSW |
| 1-71-98   | 1    | 71         | BUENA VISTA WEST | 4           | T14S R79W SEC. 15 NWSE |
| 1-71-26   | 1    | 71         | CUMBERLAND PASS  | 1           | T15S R81W SEC. 13 SWSW |
| 1-71-27   | 1    | 71         | CUMBERLAND PASS  | 2           | T15S R80W SEC. 18 SWNE |
| 1-71-28   | 1    | 71         | CUMBERLAND PASS  | 3           | T15S R80W SEC. 19 NWSW |

| LOC. CODE | GZ # | WATER-SHED | QUAD NAME       | QUAD SITE # | LEGAL DESCRIPTION      |
|-----------|------|------------|-----------------|-------------|------------------------|
| 1-75-29   | 1    | 75         | ST. ELMO        | 1           | T15S R80W SEC. 20 SESE |
| 1-75-30   | 1    | 75         | ST. ELMO        | 2           | T15S R80W SEC. 30 SWNE |
| 1-75-31   | 1    | 75         | ST. ELMO        | 3           | T15S R80W SEC. 27 SESW |
| 1-75-32   | 1    | 75         | SY. ELMO        | 4           | T15S R79W SEC. 30 SESW |
| 1-75-33   | 1    | 75         | ST. ELMO        | 5           | T51N R06E SEC. 23 SENW |
| 1-75-34   | 1    | 75         | CUMBERLAND PASS | 1           | T51N R05E SEC. 08 NWNW |
| 1-75-35   | 1    | 75         | CUMBERLAND PASS | 2           | T51N R05E SEC. 09 NWNE |
| 1-75-36   | 1    | 75         | CUMBERLAND PASS | 3           | T51N R05E SEC. 10 SESW |
| 1-75-37   | 1    | 75         | CUMBERLAND PASS | 4           | T51N R05E SEC. 27 NWNE |
| 1-75-38   | 1    | 75         | CUMBERLAND PASS | 5           | T51N R05E SEC. 23 SWSE |
| 1-75-39   | 1    | 75         | MT. ANTERO      | 1           | T15S R79W SEC. 28 NWSW |
| 1-75-40   | 1    | 75         | MT. ANTERO      | 2           | T15S R79W SEC. 28 SESE |
| 1-75-41   | 1    | 75         | MT. ANTERO      | 3           | T51N R06E SEC. 12 NESE |
| 1-75-42   | 1    | 75         | MT. ANTERO      | 4           | T51N R07E SEC. 18 NWNW |
| 1-75-43   | 1    | 75         | MT. ANTERO      | 5           | T15S R79W SEC. 26 SESE |
| 1-75-99   | 1    | 75         | MT. ANTERO      | 6           | T15S R79W SEC. 32 NENE |
| 1-75-100  | 1    | 75         | MT. ANTERO      | 7           | T15S R79W SEC. 26 NWSE |
| 1-75-101  | 1    | 75         | MT. ANTERO      | 8           | T15S R79W SEC. 26 SWNW |
| 2-83-44   | 2    | 83         | WELLSVILLE      | 1           | T48N R09E SEC. 03 NESW |
| 2-83-45   | 2    | 83         | WELLSVILLE      | 2           | T49N R09E SEC. 34 SWSW |
| 2-83-46   | 2    | 83         | WELLSVILLE      | 3           | T48N R09E SEC. 12 SESE |
| 2-83-47   | 2    | 83         | COALDALE        | 4           | T47N R11E SEC. 31 SESW |
| 2-83-48   | 2    | 83         | COALDALE        | 5           | T47N R10E SEC. 10 SENW |
| 3-81-49   | 3    | 81         | JACK HALL MTN.  | 1           | T50N R10E SEC. 23 SENW |
| 3-81-50   | 3    | 81         | CAMERON MTN.    | 2           | T15S R76W SEC. 17 SWSW |
| 3-81-51   | 3    | 81         | GRIBBLES PARK   | 3           | T51N R10E SEC. 22 SWSW |
| 3-81-52   | 3    | 81         | CAMERON MTN.    | 4           | T15S R76W SEC. 29 SESW |
| 3-81-53   | 3    | 81         | SALIDA EAST     | 5           | T50N R10E SEC. 31 NESW |
| 3-81-54   | 3    | 81         | CAMERON MTN.    | 6           | T15S R76W SEC. 28 NENW |
| 4-17-55   | 4    | 17         | PALMER LAKE     | 1           | T11S R67W SEC. 19 NWNW |
| 4-17-56   | 4    | 17         | PALMER LAKE     | 3           | T12S R68W SEC. 02 NENE |
| 4-17-57   | 4    | 17         | CASCADE         | 4           | T13S R68W SEC. 13 SESW |
| 4-17-58   | 4    | 17         | WOODLAND PARK   | 5           | T12S R68W SEC. 28 NWNW |
| 5-3-59    | 5    | 3          | HACKETT MTN.    | 1           | T11S R71W SEC. 36 SWNE |
| 5-3-60    | 5    | 3          | HACKETT MTN.    | 2           | T11S R71W SEC. 13 NESE |
| 5-3-61    | 5    | 3          | HACKETT MTN.    | 3           | T12S R71W SEC. 02 NWSW |
| 5-3-62    | 5    | 3          | SIGNAL BUTTE    | 4           | T11S R70W SEC. 16 NESW |
| 5-3-63    | 5    | 3          | WEST CREEK      | 5           | T10S R70W SEC. 21 SWSE |
| 6-22-64   | 6    | 22         | DICKS PEAK      | 1           | T14S R74W SEC. 10 SENW |
| 6-22-65   | 6    | 22         | DICKS PEAK      | 2           | T14S R74W SEC. 17 SESE |
| 6-22-66   | 6    | 22         | BLACK MTN.      | 3           | T15S R74W SEC. 29 NWSE |
| 6-22-67   | 6    | 22         | BLACK MTN.      | 4           | T15S R74W SEC. 20 SENW |



| LOC. CODE | GZ # | WATER-SHED | QUAD NAME        | QUAD SITE # | LEGAL DESCRIPTION      |
|-----------|------|------------|------------------|-------------|------------------------|
| 7-2-68    | 7    | 2          | OBSERVATORY ROCK | 1           | T09S R74W SEC. 16 NENE |
| 7-2-69    | 7    | 2          | OBSERVATORY ROCK | 2           | T09S R74W SEC. 05 SWSE |
| 7-2-70    | 7    | 2          | TARRYALL         | 4           | T12S R72W SEC. 02 NENW |
| 7-2-71    | 7    | 2          | TARRYALL         | 5           | T11S R73W SEC. 25 NWSE |
| 7-2-72    | 7    | 2          | TARRYALL         | 6           | T11S R72W SEC. 34 NENW |
| 8-7-73    | 8    | 7          | JEFFERSON        | 1           | T07S R75W SEC. 06 NWSW |
| 8-7-74    | 8    | 7          | JEFFERSON        | 2           | T07S R76W SEC. 23 SWNW |
| 8-7-75    | 8    | 7          | MT. EVANS        | 3           | T06S R75W SEC. 24 NWNE |
| 8-7-76    | 8    | 7          | MT. EVANS        | 4           | T06S R75W SEC. 13 SWNW |
| 8-7-77    | 8    | 7          | MT. EVANS        | 5           | T06S R75W SEC. 13 NWNW |
| 8-7-78    | 8    | 7          | MT. EVANS        | 6           | T06S R75W SEC. 01 SWNE |
| 8-7-79    | 8    | 7          | MONTEZUMA        | 7           | T06S R75W SEC. 22 NWNE |
| 8-7-80    | 8    | 7          | MONTEZUMA        | 8           | T06S R75W SEC. 15 NWNW |
| 9-51-81   | 9    | 51         | TIMPAS           | 1           | T25S R58W SEC. 24 SESW |
| 9-51-82   | 9    | 51         | TIMPAS           | 2           | T25S R57W SEC. 21 NENW |
| 10-60-83  | 10   | 60         | CAMPO NW         | 1           | T32S R47W SEC. 21 SENW |
| 10-60-84  | 10   | 60         | CAMPO NW         | 2           | T32S R47W SEC. 28 SWSW |
| 10-60-85  | 10   | 60         | CAMPO NW         | 3           | T33S R46W SEC. 18 SESW |
| 11-62-86  | 11   | 62         | CARRIZO MTN.     | 1           | T33S R50W SEC. 10 NWSE |
| 11-62-87  | 11   | 62         | CARRIZO MTN.     | 2           | T33S R50W SEC. 26 SWNW |
| 12-66-88  | 12   | 66         | ELKHART NW       | 1           | T32S R43W SEC. 28 SWNE |
| 12-66-89  | 12   | 66         | ELKHART NW       | 2           | T33S R42W SEC. 06 SENW |
| 13-64-90  | 13   | 64         | ROLLA NW         | 1           | T33S R40W SEC. 04 NWNW |
| 13-64-91  | 13   | 64         | ROLLA NW         | 2           | T33S R40W SEC. 03 NENE |
| 13-64-92  | 13   | 64         | ROLLA NW         | 3           | T33S R40W SEC. 02 SENE |

**Exhibit D-2**  
**Vegetation Summaries - Mountain Environment**  
**(NFS lands, excluding designated and recommended wilderness)**

| Forest Type      | GEOGRAPHIC ZONE 1 |                |               |  | Total          |
|------------------|-------------------|----------------|---------------|--|----------------|
|                  | 0-15%             | 16-40%         | > 40%         |  |                |
| Aspen            | 3,263             | 18,323         | 10,013        |  | 31,599         |
| Douglas-fir      | 724               | 8,433          | 10,585        |  | 19,742         |
| Ponderosa pine   | 2,485             | 4,000          | 3,109         |  | 9,594          |
| Lodgepole pine   | 10,043            | 41,019         | 25,160        |  | 76,222         |
| Spruce-fir       | 2,158             | 45,768         | 36,529        |  | 84,455         |
| Bristlecone pine | 0                 | 1,909          | 3,042         |  | 4,951          |
| Pinon-juniper    | 28                | 1,944          | 3,895         |  | 5,867          |
| <b>Total</b>     | <b>18,701</b>     | <b>121,396</b> | <b>92,333</b> |  | <b>232,430</b> |

| Non-Forest Type   | GEOGRAPHIC ZONE 1 |               |               |  | Total          |
|-------------------|-------------------|---------------|---------------|--|----------------|
|                   | 0-15%             | 16-40%        | > 40%         |  |                |
| Mtn. grassland    | 898               | 14,973        | 22,936        |  | 38,807         |
| Gambel oak        | 85                | 45            | 679           |  | 809            |
| Sagebrush         | 361               | 1,949         | 1,153         |  | 3,463          |
| Mtn. mahogany     | 0                 | 759           | 1,701         |  | 2,460          |
| SPECIAL ECOSYSTEM |                   |               |               |  |                |
| Alpine            | ---               | ---           | ---           |  | (28,654)       |
| Riparian          | ---               | ---           | ---           |  | (16,922)       |
| *Other            | 2,647             | 22,841        | 49,919        |  | 75,407         |
| <b>Total</b>      | <b>3,991</b>      | <b>40,567</b> | <b>76,388</b> |  | <b>120,946</b> |

| Forest Type      | GEOGRAPHIC ZONE 2 |               |               |  | Total          |
|------------------|-------------------|---------------|---------------|--|----------------|
|                  | 0-15%             | 16-40%        | > 40%         |  |                |
| Aspen            | 3,108             | 21,022        | 6,851         |  | 30,981         |
| Douglas-fir      | 3,913             | 21,226        | 22,175        |  | 47,314         |
| Ponderosa pine   | 3,797             | 7,825         | 4,685         |  | 16,307         |
| Lodgepole pine   | 309               | 5,237         | 1,546         |  | 7,092          |
| Spruce-fir       | 3,600             | 27,769        | 19,704        |  | 51,073         |
| Bristlecone pine | 15                | 1,018         | 7,243         |  | 8,276          |
| Pinon-juniper    | 1,904             | 8,970         | 4,880         |  | 15,754         |
| <b>Total</b>     | <b>16,646</b>     | <b>93,067</b> | <b>67,084</b> |  | <b>176,797</b> |

| Non-Forest Type   | GEOGRAPHIC ZONE 2 |               |               |  | Total         |
|-------------------|-------------------|---------------|---------------|--|---------------|
|                   | 0-15%             | 16-40%        | > 40%         |  |               |
| Mtn. grassland    | 6,927             | 7,112         | 6,039         |  | 20,078        |
| Gambel oak        | 79                | 3,526         | 5,034         |  | 8,639         |
| Sagebrush         | 0                 | 0             | 57            |  | 57            |
| Mtn. mahogany     | 57                | 40            | 648           |  | 745           |
| SPECIAL ECOSYSTEM |                   |               |               |  |               |
| Alpine            | ---               | ---           | ---           |  | (15,577)      |
| Riparian          | ---               | ---           | ---           |  | (9,049)       |
| *Other            | 907               | 2,062         | 16,654        |  | 19,623        |
| <b>Total</b>      | <b>7,970</b>      | <b>12,740</b> | <b>28,432</b> |  | <b>49,142</b> |

| Forest Type      | GEOGRAPHIC ZONE 3 |                |                |  | Total          |
|------------------|-------------------|----------------|----------------|--|----------------|
|                  | 0-15%             | 16-40%         | > 40%          |  |                |
| Aspen            | 5,074             | 13,244         | 5,283          |  | 23,601         |
| Douglas-fir      | 5,753             | 37,054         | 56,387         |  | 99,194         |
| Ponderosa pine   | 12,656            | 25,384         | 19,093         |  | 57,133         |
| Lodgepole pine   | 609               | 5,124          | 3,459          |  | 9,192          |
| Spruce-fir       | 2,644             | 14,323         | 12,458         |  | 29,425         |
| Bristlecone pine | 48                | 397            | 3,189          |  | 3,634          |
| Pinon-juniper    | 915               | 10,186         | 22,739         |  | 33,840         |
| <b>Total</b>     | <b>27,699</b>     | <b>105,712</b> | <b>122,608</b> |  | <b>256,019</b> |

| Non-Forest Type   | GEOGRAPHIC ZONE 3 |               |               |  | Total         |
|-------------------|-------------------|---------------|---------------|--|---------------|
|                   | 0-15%             | 16-40%        | > 40%         |  |               |
| Mtn. grassland    | 6,233             | 11,128        | 2,671         |  | 20,032        |
| Gambel oak        | 0                 | 3,661         | 9,521         |  | 13,182        |
| Sagebrush         | 0                 | 125           | 99            |  | 224           |
| Mtn. mahogany     | 18                | 901           | 2,499         |  | 3,418         |
| SPECIAL ECOSYSTEM |                   |               |               |  |               |
| Alpine            | ---               | ---           | ---           |  | (1,705)       |
| Riparian          | ---               | ---           | ---           |  | (10,737)      |
| *Other            | 1,574             | 2,144         | 7,607         |  | 11,325        |
| <b>Total</b>      | <b>7,825</b>      | <b>17,959</b> | <b>22,397</b> |  | <b>48,181</b> |

| Forest Type      | GEOGRAPHIC ZONE 4 |               |               |  | Total          |
|------------------|-------------------|---------------|---------------|--|----------------|
|                  | 0-15%             | 16-40%        | > 40%         |  |                |
| Aspen            | 755               | 7,137         | 3,856         |  | 11,748         |
| Douglas-fir      | 462               | 30,272        | 24,104        |  | 54,838         |
| Ponderosa pine   | 1,612             | 13,174        | 7,901         |  | 22,687         |
| Lodgepole pine   | 0                 | 420           | 232           |  | 652            |
| Spruce-fir       | 221               | 12,763        | 7,792         |  | 20,776         |
| Bristlecone pine | 124               | 8,315         | 5,178         |  | 13,617         |
| Pinon-juniper    | 0                 | 0             | 0             |  | 0              |
| <b>Total</b>     | <b>3,174</b>      | <b>72,081</b> | <b>49,063</b> |  | <b>124,318</b> |

| Non-Forest Type   | GEOGRAPHIC ZONE 4 |              |              |  | Total         |
|-------------------|-------------------|--------------|--------------|--|---------------|
|                   | 0-15%             | 16-40%       | > 40%        |  |               |
| Mtn. grassland    | 603               | 2,793        | 2,724        |  | 6,120         |
| Gambel oak        | 352               | 1,119        | 1,152        |  | 2,623         |
| Sagebrush         | 0                 | 0            | 0            |  | 0             |
| Mtn. mahogany     | 0                 | 0            | 0            |  | 0             |
| SPECIAL ECOSYSTEM |                   |              |              |  |               |
| Alpine            | ---               | ---          | ---          |  | (2,631)       |
| Riparian          | ---               | ---          | ---          |  | (7,792)       |
| *Other            | 805               | 2,031        | 4,176        |  | 7,011         |
| <b>Total</b>      | <b>1,760</b>      | <b>5,943</b> | <b>8,051</b> |  | <b>15,754</b> |

\*Other includes willow, krummholz, talus/rock and lake/pond.

Vegetation summaries continued -  
(NFS lands, excluding designated and recommended wilderness)

| Forest Type      | GEOGRAPHIC ZONE 5 |                |               | Total          |
|------------------|-------------------|----------------|---------------|----------------|
|                  | 0-15%             | 16-40%         | > 40%         |                |
| Aspen            | 2,528             | 3,268          | 0             | 5,796          |
| Douglas-fir      | 8,079             | 85,039         | 54,033        | 147,151        |
| Ponderosa pine   | 22,187            | 90,805         | 31,668        | 144,660        |
| Lodgepole pine   | 3,642             | 19,929         | 3,011         | 26,582         |
| Spruce-fir       | 1,477             | 7,892          | 1,017         | 10,386         |
| Bristlecone pine | 34                | 725            | 125           | 884            |
| Pinon-juniper    | 0                 | 1,037          | 231           | 1,268          |
| <b>Total</b>     | <b>37,947</b>     | <b>208,695</b> | <b>90,085</b> | <b>336,727</b> |

| Non-Forest Type   |              |              |              |
|-------------------|--------------|--------------|--------------|
| Mtn. grassland    | 2,635        | 898          | 53           |
| Gambel oak        | 75           | 1,009        | 1,865        |
| Sagebrush         | 0            | 52           | 0            |
| Mtn. mahogany     | 130          | 238          | 766          |
| SPECIAL ECOSYSTEM |              |              |              |
| Alpine            | ---          | ---          | ---          |
| Riparian          | ---          | ---          | ---          |
| *Other            | 1,393        | 136          | 641          |
| <b>Total</b>      | <b>4,233</b> | <b>2,333</b> | <b>3,325</b> |

| Forest Type      | GEOGRAPHIC ZONE 6 |               |              | Total         |
|------------------|-------------------|---------------|--------------|---------------|
|                  | 0-15%             | 16-40%        | > 40%        |               |
| Aspen            | 665               | 5,500         | 80           | 6,245         |
| Douglas-fir      | 512               | 2,896         | 199          | 3,607         |
| Ponderosa pine   | 613               | 1,627         | 0            | 2,240         |
| Lodgepole pine   | 0                 | 0             | 0            | 0             |
| Spruce-fir       | 278               | 8,225         | 162          | 8,665         |
| Bristlecone pine | 173               | 7,251         | 2,040        | 9,464         |
| Pinon-juniper    | 0                 | 0             | 0            | 0             |
| <b>Total</b>     | <b>2,241</b>      | <b>25,499</b> | <b>2,481</b> | <b>30,221</b> |

| Non-Forest Type   |              |               |           |
|-------------------|--------------|---------------|-----------|
| Mtn. grassland    | 2,871        | 11,498        | 0         |
| Gambel oak        | 0            | 0             | 0         |
| Sagebrush         | 0            | 0             | 0         |
| Mtn. mahogany     | 0            | 0             | 0         |
| SPECIAL ECOSYSTEM |              |               |           |
| Alpine            | ---          | ---           | ---       |
| Riparian          | ---          | ---           | ---       |
| *Other            | 0            | 61            | 30        |
| <b>Total</b>      | <b>2,871</b> | <b>11,559</b> | <b>30</b> |

\*Other includes willow, krummholz, talus/rock and lake/pond.

| Forest Type      | GEOGRAPHIC ZONE 7 |                |               | Total          |
|------------------|-------------------|----------------|---------------|----------------|
|                  | 0-15%             | 16-40%         | > 40%         |                |
| Aspen            | 3,818             | 7,273          | 200           | 11,291         |
| Douglas-fir      | 1,250             | 26,537         | 4,903         | 32,690         |
| Ponderosa pine   | 23,727            | 41,388         | 3,411         | 68,526         |
| Lodgepole pine   | 62                | 926            | 194           | 1,182          |
| Spruce-fir       | 2,158             | 17,693         | 2,006         | 21,857         |
| Bristlecone pine | 1,776             | 11,782         | 2,730         | 16,288         |
| Pinon-juniper    | 0                 | 32             | 0             | 32             |
| <b>Total</b>     | <b>32,791</b>     | <b>105,631</b> | <b>13,444</b> | <b>151,866</b> |

| Non-Forest Type   |               |               |            |
|-------------------|---------------|---------------|------------|
| Mtn. grassland    | 17,203        | 11,273        | 229        |
| Gambel oak        | 0             | 0             | 0          |
| Sagebrush         | 0             | 0             | 0          |
| Mtn. mahogany     | 86            | 186           | 11         |
| SPECIAL ECOSYSTEM |               |               |            |
| Alpine            | ---           | ---           | ---        |
| Riparian          | ---           | ---           | ---        |
| *Other            | 671           | 529           | 181        |
| <b>Total</b>      | <b>17,960</b> | <b>11,988</b> | <b>421</b> |

| Forest Type      | GEOGRAPHIC ZONE 8 |                |               | Total          |
|------------------|-------------------|----------------|---------------|----------------|
|                  | 0-15%             | 16-40%         | > 40%         |                |
| Aspen            | 7,042             | 20,165         | 1,968         | 29,175         |
| Douglas-fir      | 1,816             | 5,833          | 2,071         | 9,720          |
| Ponderosa pine   | 3,528             | 9,701          | 1,745         | 14,974         |
| Lodgepole pine   | 6,967             | 30,810         | 5,250         | 43,027         |
| Spruce-fir       | 4,519             | 45,630         | 8,858         | 59,007         |
| Bristlecone pine | 405               | 6,674          | 2,016         | 9,095          |
| Pinon-juniper    | 0                 | 0              | 0             | 0              |
| <b>Total</b>     | <b>24,277</b>     | <b>118,813</b> | <b>21,908</b> | <b>164,998</b> |

| Non-Forest Type   |              |               |               |
|-------------------|--------------|---------------|---------------|
| Mtn. grassland    | 4,916        | 25,625        | 14,884        |
| Gambel oak        | 0            | 0             | 0             |
| Sagebrush         | 0            | 0             | 0             |
| Mtn. mahogany     | 0            | 120           | 63            |
| SPECIAL ECOSYSTEM |              |               |               |
| Alpine            | ---          | ---           | ---           |
| Riparian          | ---          | ---           | ---           |
| *Other            | 2,968        | 11,901        | 14,057        |
| <b>Total</b>      | <b>7,884</b> | <b>37,646</b> | <b>29,004</b> |

Exhibit D-3  
Management Indicator Species (MIS)

| Species                       | Selection Criteria | Geographic Zones |   |   |   |   |   |   | Selection Criteria | Geographic Zones |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------------|--------------------|------------------|---|---|---|---|---|---|--------------------|------------------|---|----|----|----|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|                               |                    | 1                | 2 | 3 | 4 | 5 | 6 | 7 |                    | 8                | 9 | 10 | 11 | 12 | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Beaver                        | 2,3                | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bighorn Sheep                 | 1,2,3              | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mule Deer                     | 2                  | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Elk                           | 2                  | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pine Marten                   | 2                  | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Abert's Squirrel              | 1,2,5              | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mountain Bluebird             | 1,5                | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Peregrine Falcon              | 1,2,5              | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mallard                       | 2,5                | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Water Pipit                   | 2,5                | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Yellow-bellied Sapsucker      | 1,2,5              | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Green-tailed Towhee           | 5                  | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Turkey                        | 1,2,3              | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lewis' Woodpecker             | 1,2,5              | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Norther Three-toed Woodpecker | 1,2,5              | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Black-throated Gray Warbler   | 5                  | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Virginia's Warbler            | 5                  | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Wilson's Warbler              | 5                  | x                | x | x | x | x | x | x |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pronghorn                     | 2,3                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bobcat                        | 3,5                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mule Deer                     | 2,3                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| White-tailed Deer             |                    |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Black-tailed Prairie Dog      | 2,3,5              |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Black-tailed Jackrabbit       | 3                  |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bobwhite Quail                | 3,5                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Long-billed Curlew            | 2,5                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ferruginous Hawk              | 1,2                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Northern Oriole               | 5                  |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Turkey                        | 1,2,3,5            |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Burrowing Owl                 | 1,5                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Great Horned Owl              | 2,3,5              |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lesser Prairie Scaled Quail   | 2,3,4,5            |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cassin's Sparrow              | 3,5                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lewis' Woodpecker             | 5                  |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mourning Dove                 | 1,5                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bewick's Wren                 | 3                  |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cliff Swallow                 | 1,5                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mississippi Kite              | 3                  |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| McCown's Longspur             | 5                  |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Red-headed Woodpecker         | 1,5                |                  |   |   |   |   |   |   |                    |                  |   |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Criteria Selection Symbols

1. Has a special habitat need during some phase of the life cycle.
2. High public concern for the species or its habitat.
3. High public interest for hunting or viewing.
4. Threatened or Endangered Species.
5. Species presence indicates particular, very specific biological community.

Criteria Selection Symbols

1. Has a special habitat need during some phase of the life cycle.
2. High public concern for the species or its habitat.
3. High public interest for hunting or viewing.
4. Threatened or Endangered Species.
5. Species presence indicates particular, very specific biological community.

**Exhibit D-4**  
**Summary of Riparian Area Acres**  
**and % Composition of Riparian Total FS Lands**  
**Mountain and Grassland Environments**

| Geographic Zone | Riparian Acres | Total NFS Acres | % Riparian |
|-----------------|----------------|-----------------|------------|
| 1               | 16922          | 353376          | 5          |
| 2               | 9049           | 225939          | 4          |
| 3               | 10737          | 304200          | 4          |
| 4               | 7792           | 140072          | 6          |
| 5               | 18422          | 346608          | 5          |
| 6               | 1983           | 44681           | 4          |
| 7               | 22148          | 182235          | 12         |
| 8               | 21063          | 239532          | 9          |
| 9               | 3216           | 113030          | 3          |
| 10              | 4242           | 159718          | 3          |
| 11              | 4484           | 146349          | 3          |
| 12              | 140            | 9600            | 1          |
| 13              | 8340           | 98108           | 9          |



**Exhibit D-6  
Threatened and Endangered Plant Species**

| Species   | Status-Comments                      | Geographic Zones |   |   |   |   |   |   |   |   |    |    |    |    |  |  |  |  |  |  |
|---|--------------------------------------|------------------|---|---|---|---|---|---|---|---|----|----|----|----|--|--|--|--|--|--|
|   |                                      | 1                | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |  |  |  |  |  |  |
| Alpine Braya                                      | RF, EC-Variou sites                  | x                |   |   |   |   |   |   |   |   |    |    |    |    |  |  |  |  |  |  |
| Brandegei Wild<br>Buckwheat                       | RF-Droney Gulch                      |                  |   | x |   |   |   |   |   |   |    |    |    |    |  |  |  |  |  |  |
| Weber Monkey<br>Flower                            | RF-Tarryall Mtns.                    |                  |   |   |   |   |   |   |   |   |    |    |    |    |  |  |  |  |  |  |
| Degener Penstemon<br>Porter's<br>Feathergrass     | RF-Oak Creek Area<br>RF-Variou Sites |                  |   | x |   |   |   |   |   |   |    |    |    |    |  |  |  |  |  |  |
| Tundra Buttercup<br>Sea Pink                      | RF-Mt. Lincoln<br>SC-Hoosier Ridge   |                  |   |   |   |   |   |   |   |   |    |    |    |    |  |  |  |  |  |  |
| Dwarf Alpine<br>Hawksbeard                        | SC-Mt. Bross                         |                  |   |   |   |   |   |   |   |   |    |    |    |    |  |  |  |  |  |  |
| Penland Eutrema<br>Globe Gillia                   | SC-Variou Sites<br>SC-Variou Sites   |                  |   |   |   |   |   |   |   |   |    |    |    |    |  |  |  |  |  |  |
| Ice Grass<br>Lanate Willow                        | SC-Variou Sites<br>SC-Peerless Mtn.  |                  |   |   |   |   |   |   |   | x |    |    |    |    |  |  |  |  |  |  |
| Weber Saussera<br>Little Bulrush                  | SC-Variou Sites<br>SC-Four Mile      |                  |   |   |   |   |   |   |   | x |    |    |    |    |  |  |  |  |  |  |
| Prairie Goldenrod<br>Rocky Mountain<br>Cinquefoil | SC-Manitou Lake<br>FP, Category 2    |                  |   |   |   |   |   |   |   |   | x  |    |    |    |  |  |  |  |  |  |
| Diluvium Lady's<br>Truss                          | FP, Category 2                       |                  |   |   |   |   |   |   |   |   |    |    |    |    |  |  |  |  |  |  |

Status and Comments

RF - Under status review for formal Federal Listing.  
 SC - Colorado plants designated special concern plants.  
 FP - Appear to be rare potentials-conclusive information lacking.

Status and Comments

RF - Under status review for formal Federal Listing.  
 SC - Colorado plants designated special concern plants.

**Exhibit D-7**  
**Suitable Acres for Range and Permitted Use**  
**Mountain Environment**

| Geographic Zone | Suitable Acres | Permitted Numbers | Permitted AUM's |
|-----------------|----------------|-------------------|-----------------|
| GZ 1            | 41682          | 1157              | 2042            |
| GZ 2            | 51378          | 2278              | 8960            |
| GZ 3            | 53218          | 1565              | 7110            |
| GZ 4            | 4665           | 343               | 1176            |
| GZ 5            | 29735          | 553               | 2534            |
| GZ 6            | 17935          | 1114              | 4719            |
| GZ 7            | 62619          | 1637              | 8798            |
| GZ 8            | 44169          | 2044              | 10147           |
| Totals          | 305401         | 10691             | 45486           |



**Exhibit D-8  
Special Uses  
Mountain and Grassland Environments**

| KIND OF USE - GEOGRAPHIC ZONE 1    | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         | 38  | 1,511 |       |
| AGRICULTURE                        | 1   | 1     |       |
| COMMUNITY AND PUBLIC INFORMATION   | 2   | 2     | 1     |
| RESEARCH AND HISTORIC              | 2   | 3     |       |
| INDUSTRY                           | 6   | 43    |       |
| ENERGY GENERATION AND TRANSMISSION | 24  | 592   | 101   |
| TRANSPORTATION                     | 30  | 596   | 62    |
| COMMUNICATION                      | 36  | 82    | 49    |
| WATER                              | 31  | 2,130 | 28    |
| TOTAL USES                         | 170 | 4,960 | 240   |

| KIND OF USE - GEOGRAPHIC ZONE 2    | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         | 7   | 619   |       |
| AGRICULTURE                        | 10  | 788   |       |
| COMMUNITY AND PUBLIC INFORMATION   | 3   | 3     | 1     |
| RESEARCH AND HISTORIC              |     |       |       |
| INDUSTRY                           |     |       |       |
| ENERGY GENERATION AND TRANSMISSION | 4   | 10    | 2     |
| TRANSPORTATION                     | 10  | 475   | 26    |
| COMMUNICATION                      | 16  | 15    | 6     |
| WATER                              | 22  | 38    | 17    |
| TOTAL USES                         | 72  | 1,948 | 52    |

| KIND OF USE - GEOGRAPHIC ZONE 3    | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         | 5   | 49    |       |
| AGRICULTURE                        | 9   | 2,006 |       |
| COMMUNITY AND PUBLIC INFORMATION   | 2   | 1     |       |
| RESEARCH AND HISTORIC              |     |       |       |
| INDUSTRY                           | 2   | 3     |       |
| ENERGY GENERATION AND TRANSMISSION | 6   | 180   | 26    |
| TRANSPORTATION                     | 18  | 147   | 19    |
| COMMUNICATION                      | 14  | 31    | 14    |
| WATER                              | 22  | 55    | 16    |
| TOTAL USES                         | 78  | 2,472 | 75    |

| KIND OF USE - GEOGRAPHIC ZONE 4    | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         | 30  | 446   |       |
| AGRICULTURE                        |     |       |       |
| COMMUNITY AND PUBLIC INFORMATION   | 2   | 2     | 1     |
| RESEARCH AND HISTORIC              | 2   | 2     |       |
| INDUSTRY                           | 4   | 33    | 1     |
| ENERGY GENERATION AND TRANSMISSION | 13  | 137   | 46    |
| TRANSPORTATION                     | 26  | 933   | 45    |
| COMMUNICATION                      | 20  | 76    | 74    |
| WATER                              | 31  | 1,340 | 43    |
| TOTAL USES                         | 128 | 2,969 | 210   |

| KIND OF USE - GEOGRAPHIC ZONE 5    | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         | 116 | 391   | 1     |
| AGRICULTURE                        | 4   | 395   |       |
| COMMUNITY AND PUBLIC INFORMATION   | 8   | 6     | 1     |
| RESEARCH AND HISTORIC              |     |       |       |
| INDUSTRY                           |     |       |       |
| ENERGY GENERATION AND TRANSMISSION | 10  | 409   | 118   |
| TRANSPORTATION                     | 82  | 624   | 84    |
| COMMUNICATION                      | 16  | 192   | 151   |
| WATER                              | 17  | 411   | 8     |
| TOTAL USES                         | 253 | 2,428 | 367   |

| KIND OF USE - GEOGRAPHIC ZONE 6    | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         |     |       |       |
| AGRICULTURE                        |     |       |       |
| COMMUNITY AND PUBLIC INFORMATION   | 2   | 41    |       |
| RESEARCH AND HISTORIC              |     |       |       |
| INDUSTRY                           |     |       |       |
| ENERGY GENERATION AND TRANSMISSION |     |       |       |
| TRANSPORTATION                     |     |       |       |
| COMMUNICATION                      |     |       |       |
| WATER                              |     |       |       |
| TOTAL USES                         | 2   | 41    |       |

Special Uses Continued

| KIND OF USE - GEOGRAPHIC ZONE 7   | NO. | ACRES | LES |
|-----------------------------------|-----|-------|-----|
| RECREATION                        | 7   | 59    |     |
| AGRICULTURE                       | 7   | 554   | 2   |
| COMMUNITY AND PUBLIC INFORMATION  | 1   | 2     |     |
| RESEARCH AND HISTORIC             |     |       |     |
| INDUSTRY                          | 2   | 30    |     |
| POWER GENERATION AND TRANSMISSION | 6   | 669   | 106 |
| TRANSPORTATION                    | 18  | 36    | 10  |
| COMMUNICATION                     | 13  | 10    |     |
| WATER                             | 10  | 94    | 2   |
| TOTAL USES                        | 64  | 1,494 | 120 |

| KIND OF USE - GEOGRAPHIC ZONE 10   | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         | 1   | 10    |       |
| AGRICULTURE                        | 1   | 1     | 1     |
| COMMUNITY AND PUBLIC INFORMATION   |     |       |       |
| RESEARCH AND HISTORIC              | 1   | 3,908 |       |
| INDUSTRY                           |     |       |       |
| ENERGY GENERATION AND TRANSMISSION | 5   | 43    | 19    |
| TRANSPORTATION                     | 2   | 24    | 4     |
| COMMUNICATION                      | 5   | 36    | 13    |
| WATER                              | 1   | 1     | 1     |
| TOTAL USES                         | 15  | 4,022 | 37    |

| KIND OF USE - GEOGRAPHIC ZONE 8    | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         | 49  | 168   |       |
| AGRICULTURE                        | 2   | 62    |       |
| COMMUNITY AND PUBLIC INFORMATION   | 3   | 7     |       |
| RESEARCH AND HISTORIC              |     |       |       |
| INDUSTRY                           | 1   | 9     |       |
| ENERGY GENERATION AND TRANSMISSION | 3   | 190   | 18    |
| TRANSPORTATION                     | 26  | 728   | 118   |
| COMMUNICATION                      | 5   | 5     |       |
| WATER                              | 25  | 4,128 | 55    |
| TOTAL USES                         | 114 | 5,297 | 191   |

| KIND OF USE - GEOGRAPHIC ZONE 11   | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         |     |       |       |
| AGRICULTURE                        |     |       |       |
| COMMUNITY AND PUBLIC INFORMATION   | 2   | 12    | 1     |
| RESEARCH AND HISTORIC              |     |       |       |
| INDUSTRY                           | 3   | 35    |       |
| ENERGY GENERATION AND TRANSMISSION | 11  | 165   | 45    |
| TRANSPORTATION                     | 3   | 52    | 6     |
| COMMUNICATION                      |     |       |       |
| WATER                              | 1   | 1     | 1     |
| TOTAL USES                         | 20  | 265   | 53    |

| KIND OF USE - GEOGRAPHIC ZONE 9    | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         |     |       |       |
| AGRICULTURE                        | 1   | 1     | 1     |
| COMMUNITY AND PUBLIC INFORMATION   |     |       |       |
| RESEARCH AND HISTORIC              |     |       |       |
| INDUSTRY                           |     |       |       |
| ENERGY GENERATION AND TRANSMISSION | 6   | 66    | 37    |
| TRANSPORTATION                     | 1   | 128   | 7     |
| COMMUNICATION                      | 3   | 21    | 16    |
| WATER                              |     |       |       |
| TOTAL USES                         | 11  | 216   | 61    |

| KIND OF USE - GEOGRAPHIC ZONE 12   | NO. | ACRES | MILES |
|------------------------------------|-----|-------|-------|
| RECREATION                         |     |       |       |
| AGRICULTURE                        |     |       |       |
| COMMUNITY AND PUBLIC INFORMATION   | 1   | 1     |       |
| RESEARCH AND HISTORIC              |     |       |       |
| INDUSTRY                           |     |       |       |
| ENERGY GENERATION AND TRANSMISSION | 20  | 214   | 44    |
| TRANSPORTATION                     | 1   | 3     | 1     |
| COMMUNICATION                      |     |       |       |
| WATER                              |     |       |       |
| TOTAL USES                         | 22  | 218   | 45    |

| KIND OF USE - GEOGRAPHIC ZONE 13  | NO. | ACRES | MILES |
|-----------------------------------|-----|-------|-------|
| RECREATION                        | 1   | 11    |       |
| AGRICULTURE                       |     |       |       |
| COMMUNITY AND PUBLIC INFORMATION  |     |       |       |
| RESEARCH AND HISTORIC             |     |       |       |
| INDUSTRY                          | 13  | 136   |       |
| POWER GENERATION AND TRANSMISSION | 184 | 1,227 | 490   |
| TRANSPORTATION                    | 5   | 49    | 10    |
| COMMUNICATION                     | 2   | 55    | 22    |
| WATER                             | 6   | 44    | 32    |
| TOTAL USES                        | 211 | 1,522 | 554   |

## NOTES

- <sup>1</sup> Rodney K. Jorgensen, Soil Scientist, Specialist Report, April, 1991.
- <sup>2</sup> Forest Plan, Planning Action II, FLRMP.
- <sup>3</sup> U.S. Geological Survey (various years), Water Resources Data, Colorado.
- <sup>4</sup> Colorado Water Quality Control Division (1988), Colorado Nonpoint Assessment Report.
- <sup>5</sup> Vincent, R.E. and Miller, W.H. 1969. Altitudinal distribution of brown trout and other fishes in a headwater tributary of the South Platte River, Colorado. *Ecology* 3:464-466.
- <sup>6</sup> Finnell, L.M. 1977. Fryingpan-Arkansas Fish Research Investigations. Final Report. Colorado Department of National Resources. Fort Collins, Colorado.
- <sup>7</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47.
- <sup>8</sup> Johnston, B.C. 1987. Plant Associations of Region Two. USDA Forest Service. R2-ECOL-87-2, Denver, Colorado. Pages 47-48.
- <sup>9</sup> Behnke, R. and Zarn, M. 1976. Biology and management of threatened and endangered trouts. USDA Forest Service General Technical Report RM-28. Rocky Mountain Forest and Range Experimental Forest. Fort Collins, Colorado. Pages 19-22.
- <sup>10</sup> Trotter, P.C. 1987. Cutthroat: Native Trout of the West. Colorado Associated University Press, Boulder, Colorado. Pages 163-169.
- <sup>11</sup> May not include all county roads.
- <sup>12</sup> Londquist, Clark J. and Livingston, Russell K. (1978), Water Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado, U.S. Geological Survey, Water Resources Investigations, 78-1.
- <sup>13</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47.
- <sup>14</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47.
- <sup>15</sup> Johnston, B.C. 1987. Plant Associations of Region Two. USDA Forest Service. R2-ECOL-87-2, Denver, Colorado. Pages 47-48.
- <sup>16</sup> Behnke, R. and Zarn, M. 1976. Biology and management of threatened and endangered trouts. USDA Forest Service General Technical Report RM-28. Rocky Mountain Forest and Range Experimental Forest. Fort Collins, Colorado. Pages 19-22.
- <sup>17</sup> May not include all county roads.
- <sup>18</sup> Weber, D.A. 1986. Colorado Stream Data Bank Users' Guide. Colorado Division of Wildlife Technical Report. DOW W-R-M-2-86. Denver, Colorado. Pages 1-14.

- <sup>19</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47.
- <sup>20</sup> USDA Forest Service. 1989b. Interim Accomplishment Reports. Fish habitat improvement projects FY87, 88, & 89. Salida Ranger District, Salida, Colorado.
- <sup>21</sup> Johnston, B.C. 1987. Plant Associations of Region Two. USDA Forest Service. R2-ECOL-87-2, Denver, Colorado. Pages 47-48.
- <sup>22</sup> Behnke, R. and Zarn, M. 1976. Biology and management of threatened and endangered trouts. USDA Forest Service General Technical Report RM-28. Rocky Mountain Forest and Range Experimental Forest. Fort Collins, Colorado. Pages 19-22.
- <sup>23</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47.
- <sup>24</sup> May not include all county roads.
- <sup>25</sup> Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands, Planning Action 4, (1981), Analysis of the Management Situation, pg 252.
- <sup>26</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47.
- <sup>27</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47.
- <sup>28</sup> Behnke, R. and Zarn, M. 1976. Biology and management of threatened and endangered trouts. USDA Forest Service General Technical Report RM-28. Rocky Mountain Forest and Range Experimental Forest. Fort Collins, Colorado. Pages 19-22.
- <sup>29</sup> May not include all county roads.
- <sup>30</sup> Nehring, R.B. and Anderson, R. 1981. Stream Fisheries Investigations. Job Progress Report. Project F-51-R-6 Colorado Division of Wildlife, Denver, Colorado. Pages 27-31.
- <sup>31</sup> Nehring, R.B. 1986. Stream Fisheries Investigations. Federal Aid Project F-51-R Colorado Division of Wildlife, Denver, Colorado. Pages 26-28.
- <sup>32</sup> Chadwick and Associates. 1986a. Aquatic Baseline, Metropolitan Denver Water Supply Systemwide/Site-Specific Environmental Impact Statement. Submitted to the Denver Water Board, Denver, Colorado. Pages 3.1-01 to 3.1-67.
- <sup>33</sup> Chadwick and Associates. 1986b. Aquatic Baseline Metropolitan Denver Water Supply Systemwide/Site-Specific Environmental Impact Statement. Technical Appendices. Submitted to the Denver Water Board, Denver, Colorado. Pages A-1 to A-140.
- <sup>34</sup> Behnke, R. and Zarn, M. 1976. Biology and management of threatened and endangered trouts. USDA Forest Service General Technical Report RM-28. Rocky Mountain Forest and Range Experimental Forest. Fort Collins, Colorado. Pages 19-22.

- <sup>35</sup> May not include all county roads.
- <sup>36</sup> Colorado Division of Wildlife. 1990b. Unpublished results from creel census studies on Turquoise and Twin Lakes.
- <sup>37</sup> Johnston, B.C. 1987. Plant Associations of Region Two. USDA Forest Service. R2-ECOL-87-2, Denver, Colorado. Pages 47-48.
- <sup>38</sup> May not include all county roads.
- <sup>39</sup> Colorado Water Quality Control Division. 1988. Colorado Nonpoint Assessment Report, Denver, Colorado. pp. 36-62.
- <sup>40</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47,
- <sup>41</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47.
- <sup>42</sup> Johnston, B.C. 1987. Plant Associations of Region Two. USDA Forest Service. R2-ECOL-87-2, Denver, Colorado. Pages 47-48.
- <sup>43</sup> ERO Resources Corporation. 1986. Wetlands Introduction and Existing Environment, New Cheesman Alternative, Golden, Colorado. Pages 1-29.
- <sup>44</sup> Behnke, R. and Zarn, M. 1976. Biology and management of threatened and endangered trouts. USDA Forest Service General Technical Report RM-28. Rocky Mountain Forest and Range Experimental Forest. Fort Collins, Colorado. Pages 19-22.
- <sup>45</sup> May not include all county roads.
- <sup>46</sup> Chadwick and Associates. 1986a. Aquatic Baseline, Metropolitan Denver Water Supply Systemwide/Site-Specific Environmental Impact Statement. Submitted to the Denver Water Board, Denver, Colorado. Pages 3.1-01 to 3.1-67.
- <sup>47</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Page 1-47.
- <sup>48</sup> Chadwick and Associates. 1986b. Aquatic Baseline Metropolitan Denver Water Supply Systemwide/Site-Specific Environmental Impact Statement. Technical Appendices. Submitted to the Denver Water Board, Denver, Colorado. Pages A-1 to A-140.
- <sup>49</sup> Chadwick and Associates. 1986a. Aquatic Baseline, Metropolitan Denver Water Supply Systemwide/Site-Specific Environmental Impact Statement. Submitted to the Denver Water Board, Denver, Colorado. Pages 3.1-01 to 3.1-67.
- <sup>50</sup> Colorado Division of Wildlife. 1990a. 1990 Fish Planting Schedule. Denver, Colorado. Pages 1-47.
- <sup>51</sup> Johnston, B.C. 1987. Plant Associations of Region Two. USDA Forest Service. R2-ECOL-87-2, Denver, Colorado. Pages 47-48.

<sup>52</sup> May not include all county roads.

<sup>53</sup> Loeffler, C., Miller, D., Shuman, R., Winters, D. and Nelson, P. 1983. Arkansas River Threatened Fishes Survey. Performance Report SE-8-1. Colorado Division of Wildlife, Denver, Colorado. Appendices A, B1, B2, C.

<sup>54</sup> Lindauer, I.E. 1983. A comparison of the plant communities of the South Platte and Arkansas River drainages in eastern Colorado. *The Southwestern Naturalist* 28: 249-259.

<sup>55</sup> Johnston, B.C. 1987. Plant Associations of Region Two. USDA Forest Service. R2-ECOL-87-2, Denver, Colorado. Pages 47-48.

<sup>56</sup> Lindauer, I.E. 1983. A comparison of the plant communities of the South Platte and Arkansas River drainages in eastern Colorado. *The Southwestern Naturalist* 28: 249-259.

<sup>57</sup> Loewffler, C., Miller, D., Shuman, R., Winters, D. and Nelson, P. 1983. Arkansas River Threatened Fishes Survey. Performance Report SE-8-1. Colorado Division of Wildlife, Denver, Colorado. Appendices A, B1, B2, C.

<sup>58</sup> Lindauer, I.E., 1983. A comparison of the plant communities of the South Platte and Arkansas River drainages in eastern Colorado. *The Southwestern Naturalist* 28: 249-259.

<sup>59</sup> Schumm, S. A. and Lichty, R. W., 1963, Channel Widening and Flood-plain Construction Along the Cimarron River in Southwestern Kansas: U.S. Geological Survey Professional Paper 352-D, page 73.

<sup>60</sup> Shrauner, Georgia (1990), 1989 Report, Water Quality Program and Well Monitoring Network, Southwest Kansas Groundwater Management District No. 3.

<sup>61</sup> Cross, F.B., Moss, R.E. and Collins, J.T. 1985. Assessment of Dewatering Impacts on Stream Fisheries in the Arkansas and Cimarron Rivers. Museum of Natural History, Lawrence, Kansas. Page 1-28, 63-70.

<sup>62</sup> Cross, F.B., Moss, R.E. and Collins, J.T. 1985. Assessment of Dewatering Impacts on Stream Fisheries in the Arkansas and Cimarron Rivers. Museum of Natural History, Lawrence, Kansas. Pages 1-28, 63-70.

## APPENDIX E

### MAPS OF LEASING STATUS

The following maps display the specific land parcelling that is known to the Forest Supervisor and BLM at this time. Those lands are:

- |                        |   |
|------------------------|---|
| Pending Lease Requests | Lands for which industry has approached the BLM about leasing. These lands are currently unencumbered by any oil and gas rights. The lands, if determined to be available for leasing, could be authorized for leasing by the Deciding Officer in the record of decision.   |
| Leased Lands           | These lands are currently leased, generally with standard lease terms. When these leases expire the deciding officer may choose to authorize the BLM to readvertise the parcels. The conditions that are selected in the Leasing Availability decision will be applied at that time. The Forest Service will respond to proposals for leasing in the manner described in Chapter I. The identification of conditions at this time <b>does not</b> affect the existing lease conditions. |
| Split-Estate Lands     | These are lands that the BLM has requested be included in the analysis. The Forest Service Deciding Officer has no authority to make any decisions regarding these lands. A separate decision document will be signed by the BLM Authorized Officer relating to these lands.  |
| All Other Lands        | These lands are within the analysis area but are as yet unidentified in terms of proposed lease parcelling. When specific parcels are identified in the future the Forest Service will implement the Record of Decision in the manner described in Chapter 1.   |





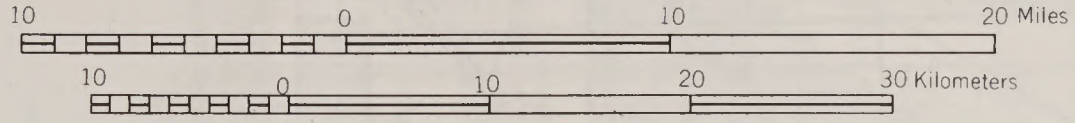
R.77W.

LEGEND

- ⊗ State capital
- ⊙ County seat
- City, town, or village
- ✈ Scheduled service airport
- Interstate highway (70)
- U. S. highway (40)
- State highway (89)
- Other principal roads

Scale 1: 500, 000

1 inch equals approximately 8 miles



Faint, illegible text covering the majority of the page, likely bleed-through from the reverse side.

**Figure E-1**  
Leasing Status

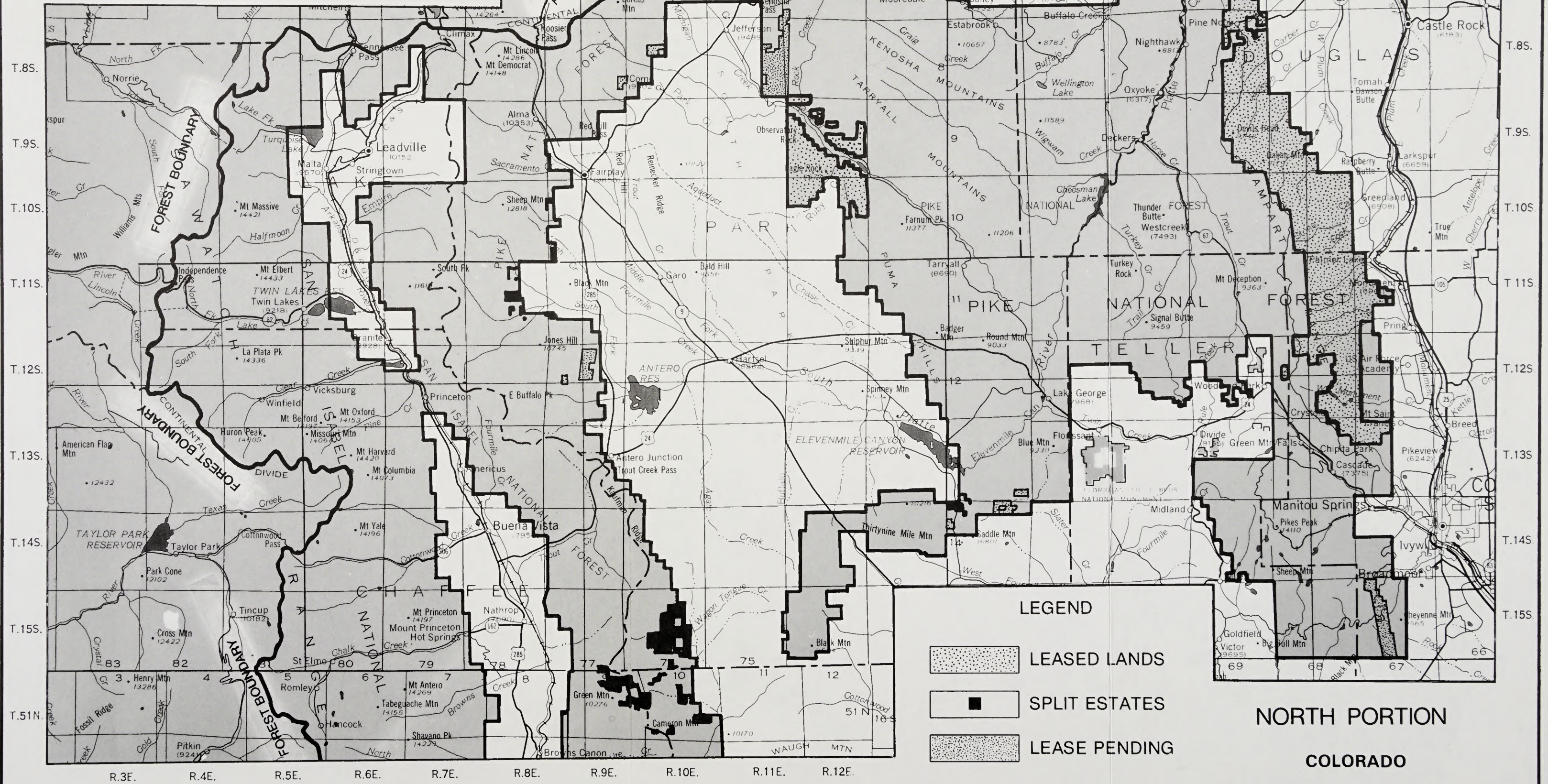
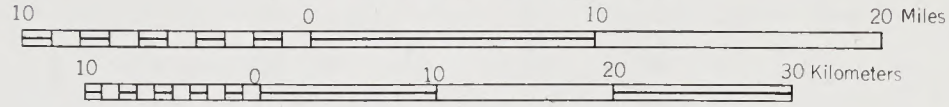
**PIKE AND SAN ISABEL NATIONAL FOREST**

**LEGEND**

- ⊙ State capital
- ⊙ County seat
- City, town, or village
- ✈ Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scale 1: 500, 000

1 inch equals approximately 8 miles

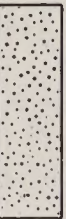


**LEGEND**

- LEASED LANDS
- SPLIT ESTATES
- LEASE PENDING

**NORTH PORTION**  
**COLORADO**

**LEGEND**



**LEASED LANDS**



**SPLIT ESTATES**



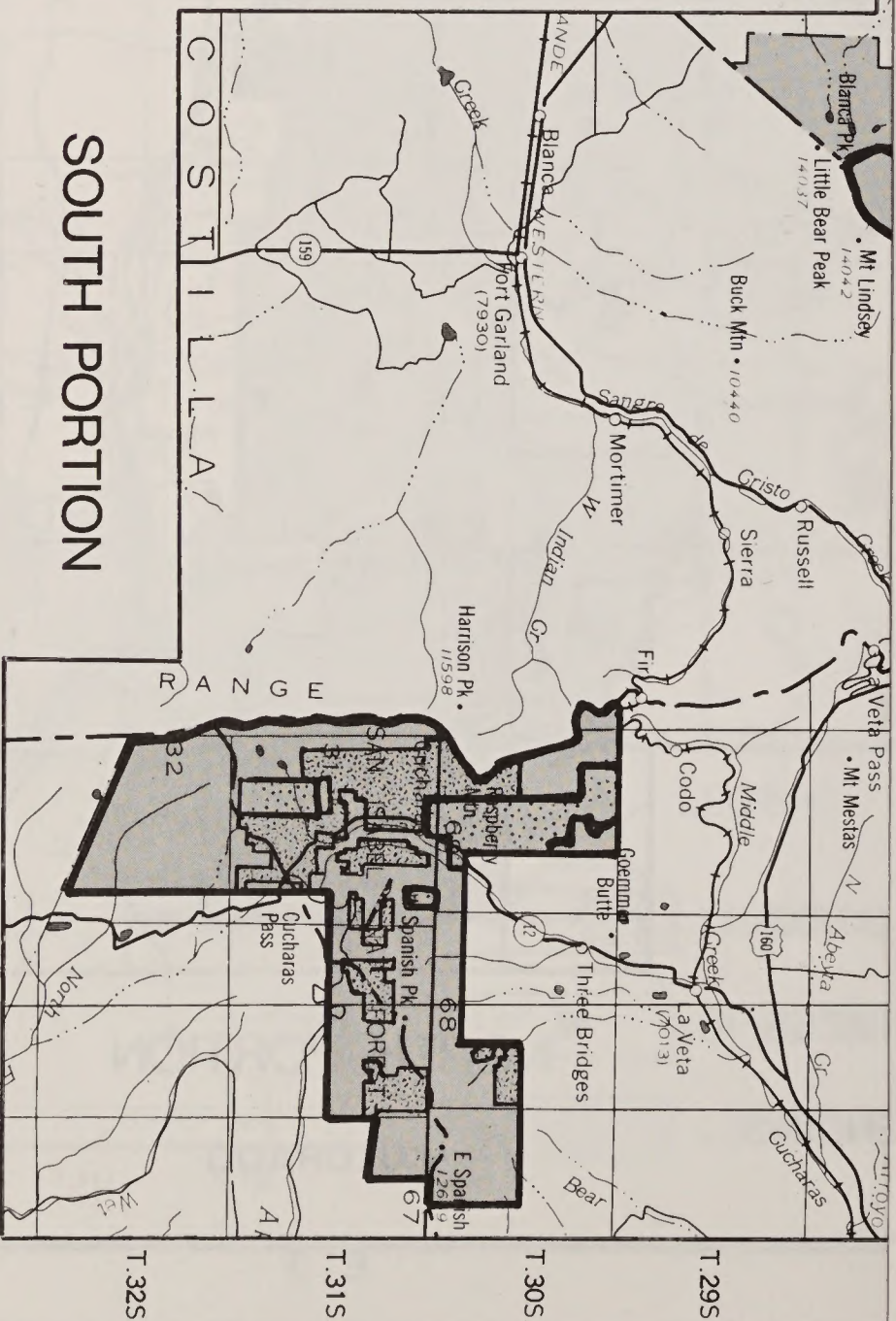
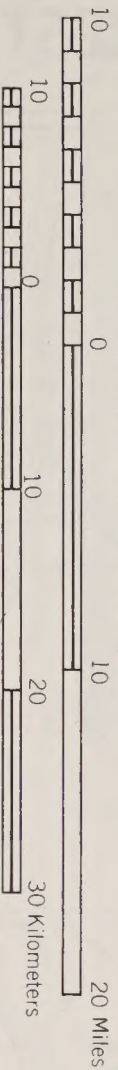
**LEASE PENDING**

**LEGEND**

- State capital
- County seat
- City, town, or village
- Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

**Scale 1:500,000**

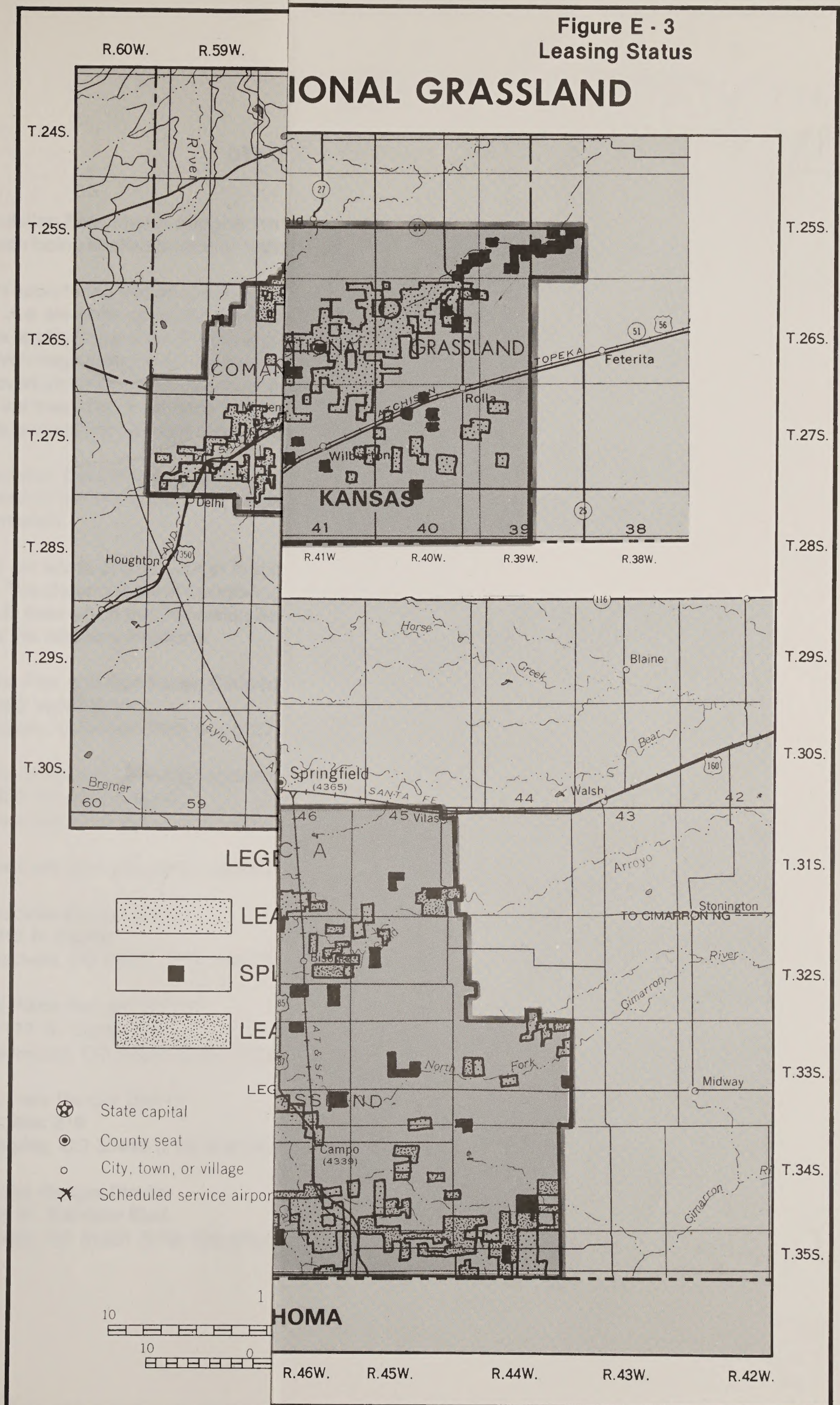
1 inch equals approximately 8 miles



**SOUTH PORTION**

**COLORADO**

Figure E - 3  
Leasing Status

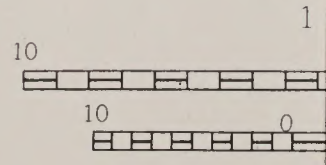


# NATIONAL GRASSLAND

## LEGEND

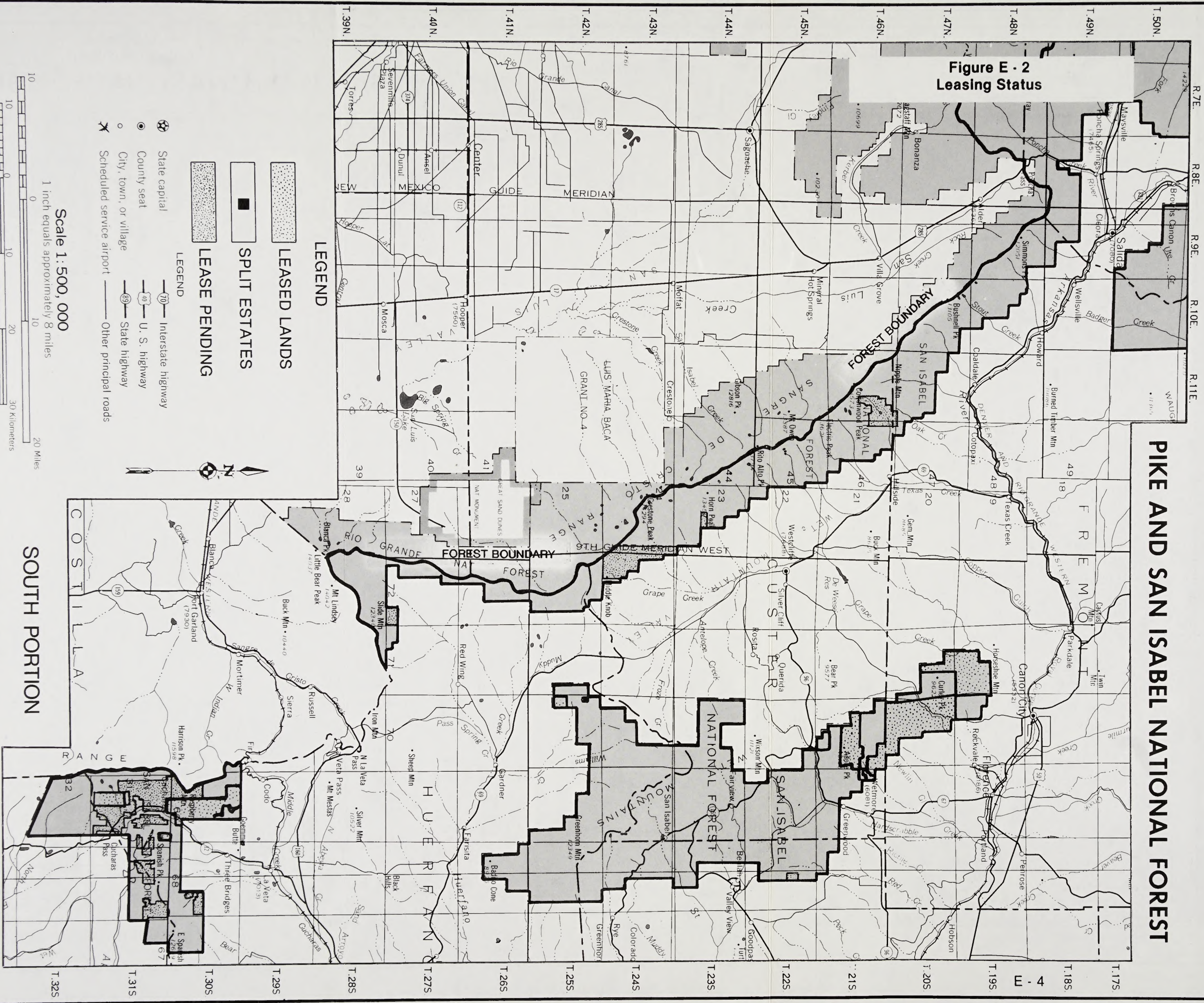
- LEASED
- SPECIAL USE
- LEASED

- ★ State capital
- County seat
- City, town, or village
- ✈ Scheduled service airport



# PIKE AND SAN ISABEL NATIONAL FOREST

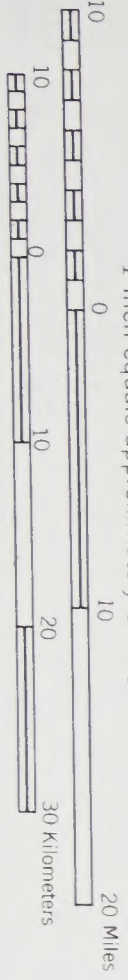
**Figure E - 2  
Leasing Status**



- LEGEND**
- LEASED LANDS
  - SPLIT ESTATES
  - LEASE PENDING
- LEGEND**
- Interstate highway
  - U. S. highway
  - State capital
  - County seat
  - City, town, or village
  - Scheduled service airport
  - Other principal roads

Scale 1: 500, 000

1 inch equals approximately 8 miles



SOUTH PORTION

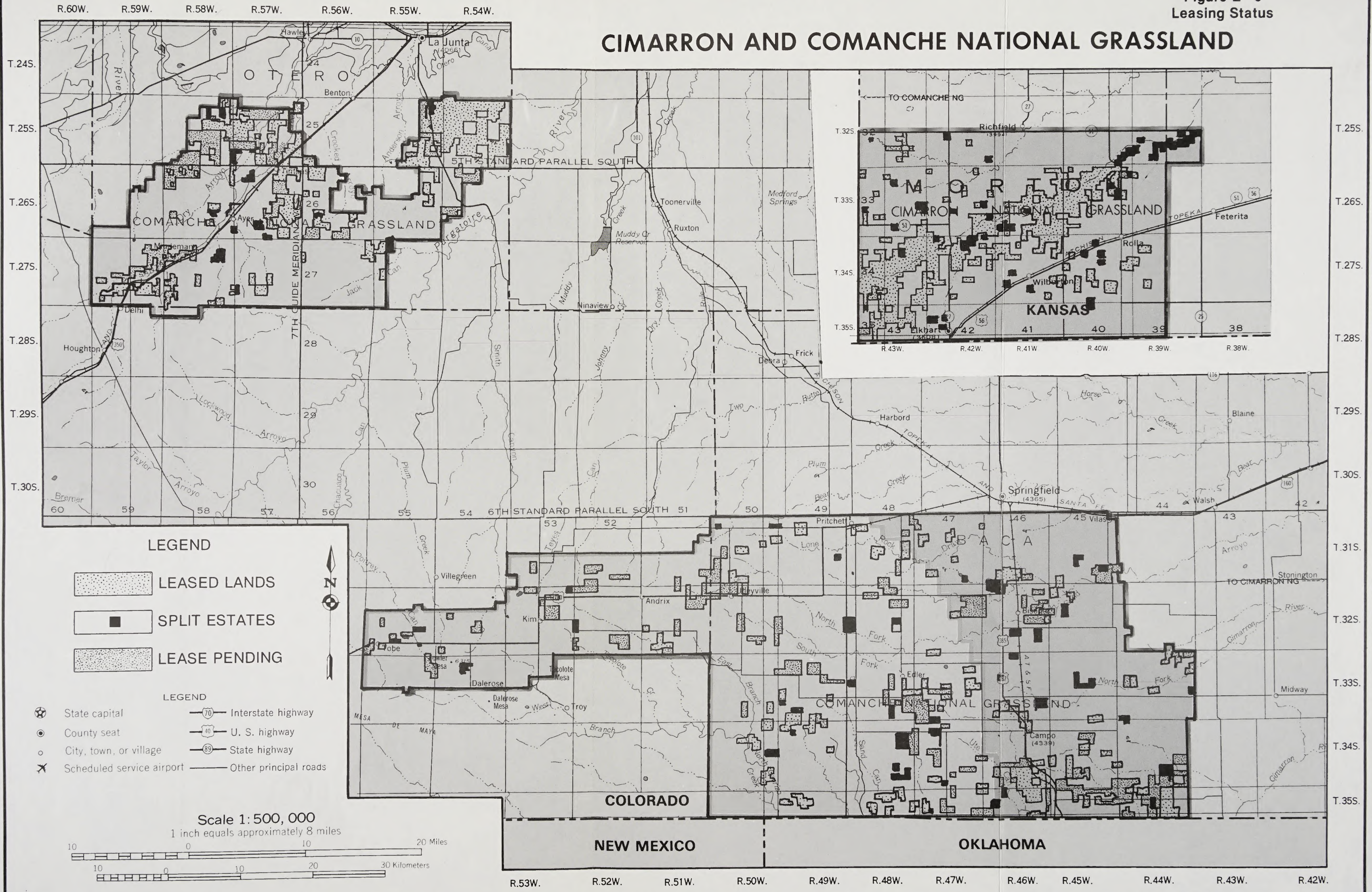
COLORADO

R. 69E. R. 68E. R. 67E.

T. 325 T. 315 T. 305 T. 295 T. 285 T. 275 T. 265 T. 255 T. 245 T. 235 T. 225 T. 215 T. 205 T. 195 T. 185 T. 175

Figure E - 3  
Leasing Status

# CIMARRON AND COMANCHE NATIONAL GRASSLAND







## APPENDIX F

### STIPULATION BASE MAP

The Stipulation Base Map is designed to display the conditions that may be applied to leases on those lands being studied based on management alternatives. This map is at a scale of 1:126,720.

Standard lease terms and stipulations, No Surface Occupancy, Timing Limitations, and Controlled Surface Use are color coded on the base map and relate to the most restrictive stipulation that would be applied to any piece of land given the most protective scenario. Areas smaller than 40 acres which may require restrictive stipulations were not mapped. Lands which may be discretionally removed for leasing for a portion or the duration of the planning period are also identified. The scale of the base map is so small that there are many areas of inclusions that were impossible to map. It is provided for general information only.

The Stipulation Base Map was developed from the working maps and Primary Base Series (PBS) quads used by the Interdisciplinary Team in their impact analysis and which will be used in project implementation.

The PBS are some 270 in number and include 6 mylar overlays displaying resource information on each. The sheer volume of the information makes it impossible to freely distribute to the public. The quads from which the Stipulation Base Map was developed will be made available for public review at the following locations:

The Pike and San Isabel, Cimarron and Comanche Forest Supervisor's Office  
1920 Valley Drive  
Pueblo, Colorado (719) 545-8737

The Bureau of Land Management, Colorado State Office  
2850 Youngfield Street  
Lakewood, CO 80215 (303) 236-1756

Quads for each sub-unit will be located at the following offices:

Leadville Ranger District  
2015 N. Poplar  
Leadville, CO 80461 (719) 486-0749

So Platte Ranger District  
11177 W. Eighth Ave.  
Lakewood, CO 80225 (303) 236-7386

So Park Ranger District  
PO Box 219  
Fairplay, CO 80440 (719) 836-2031

Salida Ranger District  
325 W. Rainbow Blvd.  
Salida, CO 81201 (719) 539-3591

San Carlos Ranger District  
326 Dozier St.  
Canon City, CO 81212 (719) 275-4119

Pikes Peak Ranger District  
601 S. Weber St.  
Colorado Springs, CO 80903

Cimarron National Grassland  
242 Hwy 50 East  
Elkhart, KS 67950 (316) 697-4621

Comanche National Grassland  
27162 Hwy 287  
Springfield, CO 81073 (719) 523-6591

## APPENDIX G

### RESOURCE MAPS

Resource maps in this appendix are small scale duplicates, in a gross sense, of the resource overlays used in the analysis. These duplicates are visual aids intended to display the location of specific resources that are related to the stipulations identified in Appendix F.

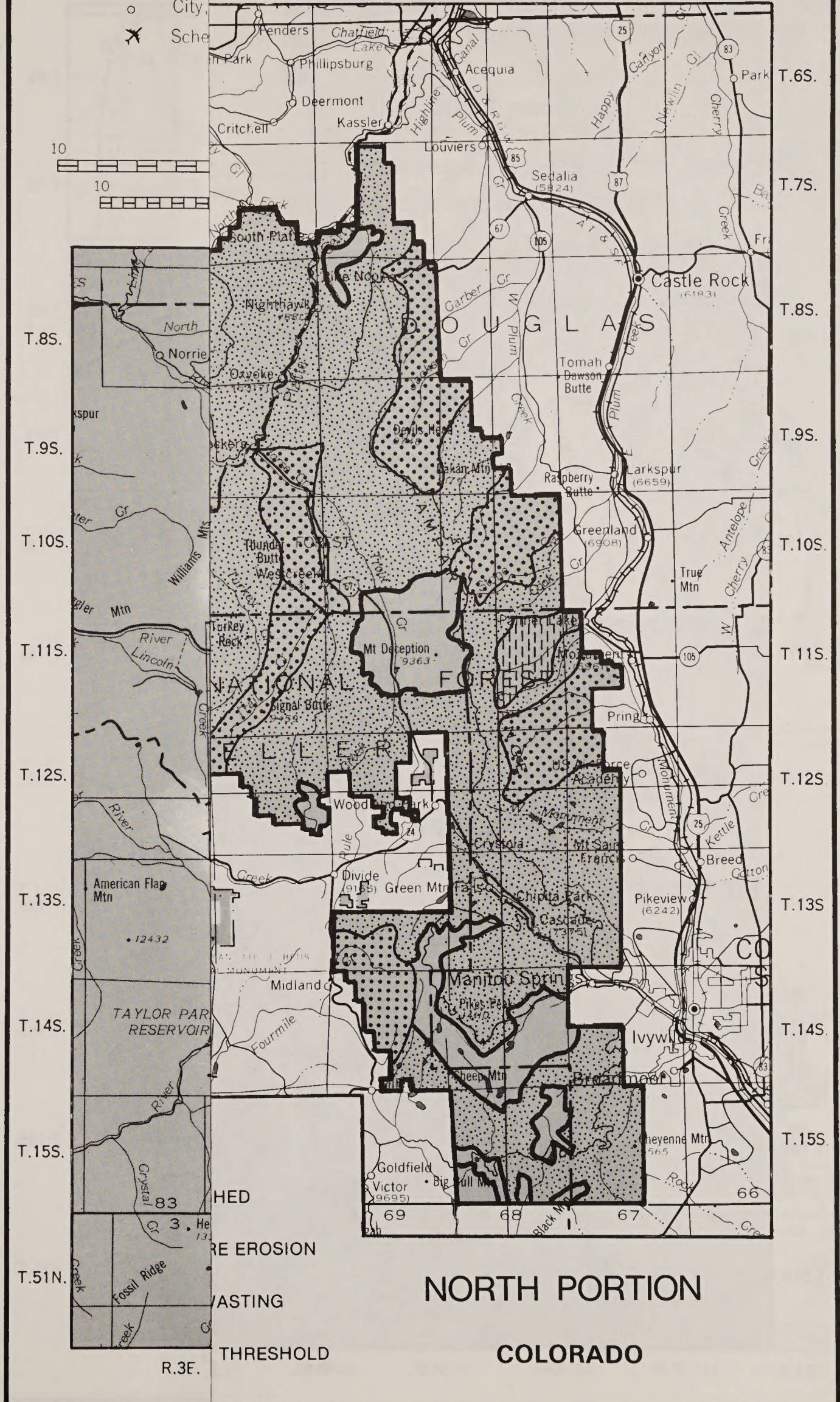
These small resource-identifying maps were developed from the working maps used by the Interdisciplinary Team. The resource maps give the reader an understanding of the resource values that were analyzed.

Faint, illegible text at the top of the page, possibly bleed-through from the reverse side.

Figure G - 1  
Resource Map

# ISABEL NATIONAL FOREST

- ⊛ State
- ⊙ Cour
- City
- ✈ Sche



SECRET  
CONFIDENTIAL

The following information is being furnished to you for your information only. It is not to be disseminated outside your organization.

This information is being furnished to you for your information only. It is not to be disseminated outside your organization.

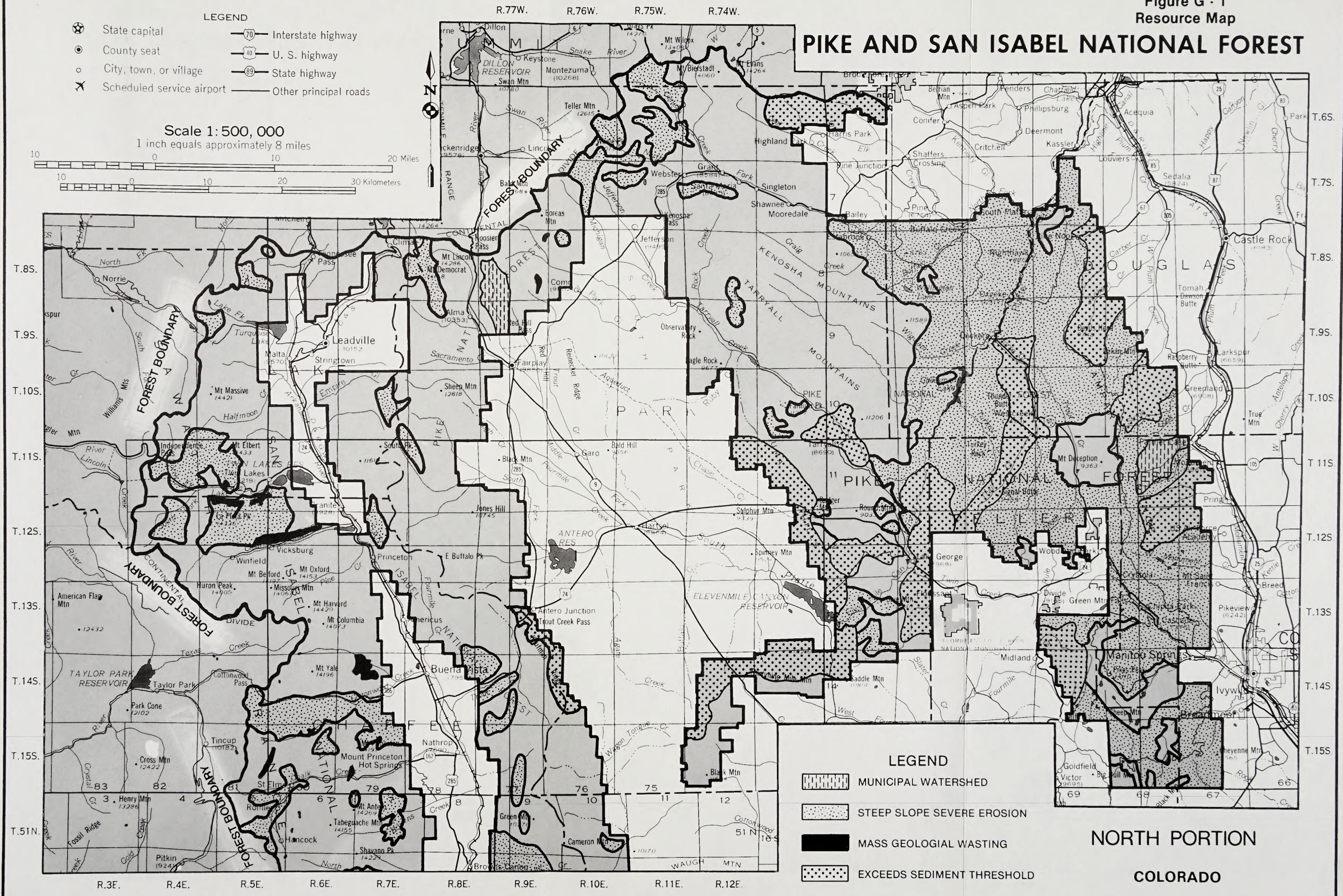
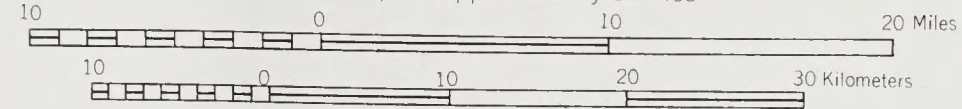
CONFIDENTIAL

Figure G - 1  
Resource Map

# PIKE AND SAN ISABEL NATIONAL FOREST

- LEGEND**
- ⊛ State capital
  - ⊙ County seat
  - City, town, or village
  - ✈ Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

Scale 1:500,000  
1 inch equals approximately 8 miles

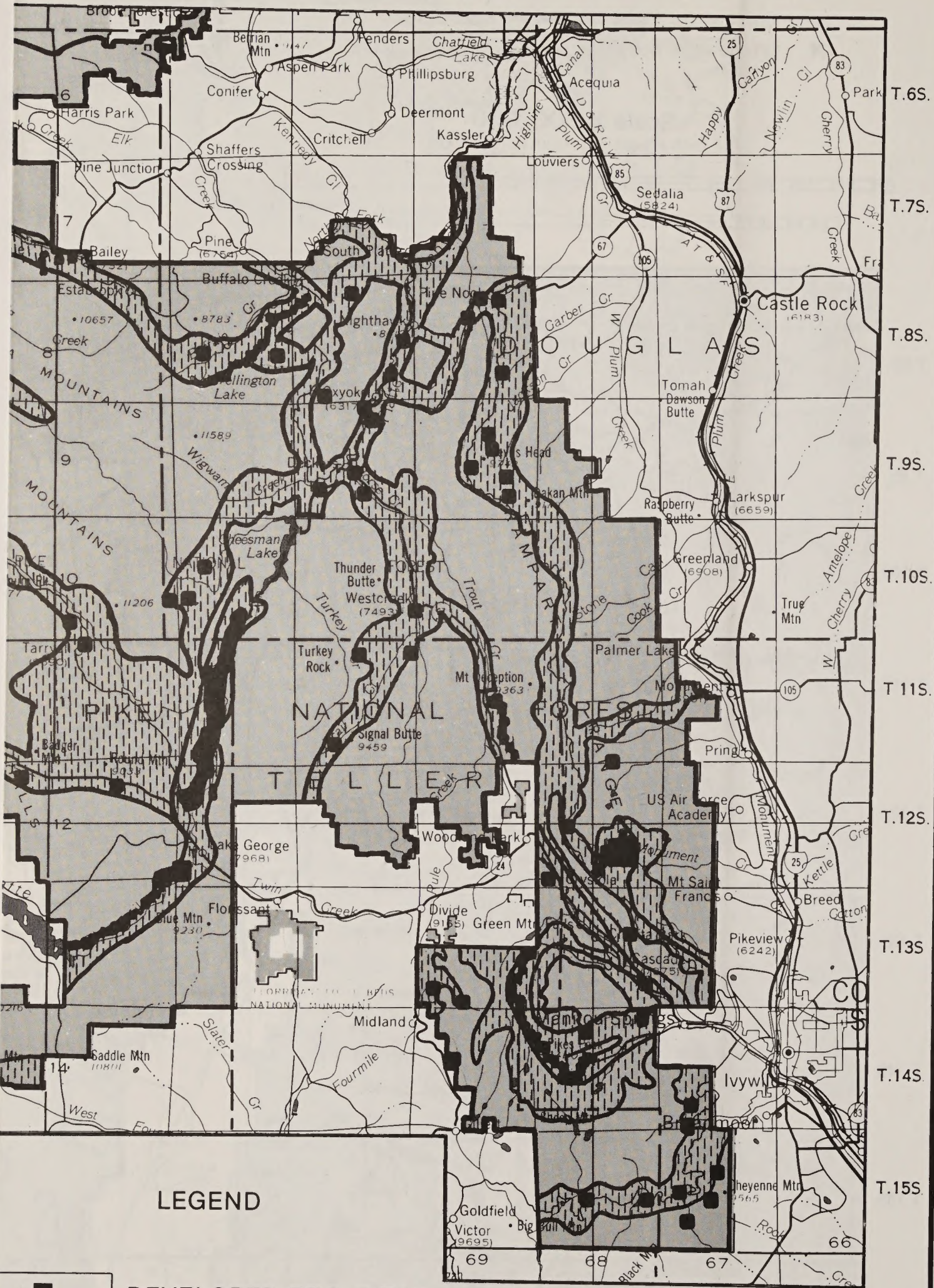


- LEGEND**
- [Hatched Box] MUNICIPAL WATERSHED
  - [Stippled Box] STEEP SLOPE SEVERE EROSION
  - [Solid Black Box] MASS GEOLOGICAL WASTING
  - [Dotted Box] EXCEEDS SEDIMENT THRESHOLD

NORTH PORTION  
COLORADO

Figure G - 2  
Resource Map

# PIKE AND SAN ISABEL NATIONAL FOREST



**LEGEND**

- DEVELOPED REC. SITES
- VISUAL CORRIDORS

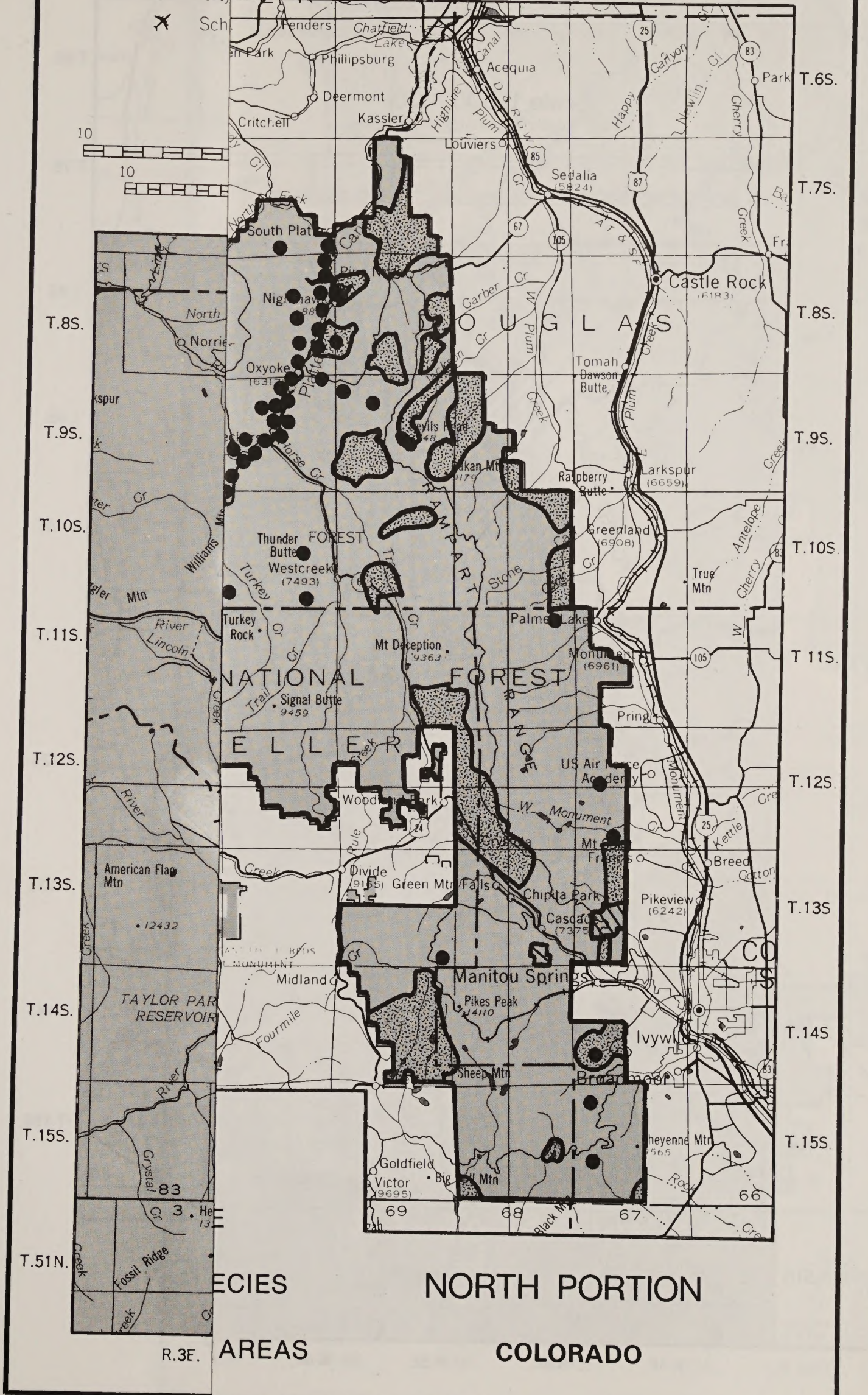
**NORTH PORTION  
COLORADO**



Figure G - 3  
Resource Map

# ISABEL NATIONAL FOREST

- ⊙ State
- County
- City
- ✕ School



ECIES NORTH PORTION  
AREAS COLORADO

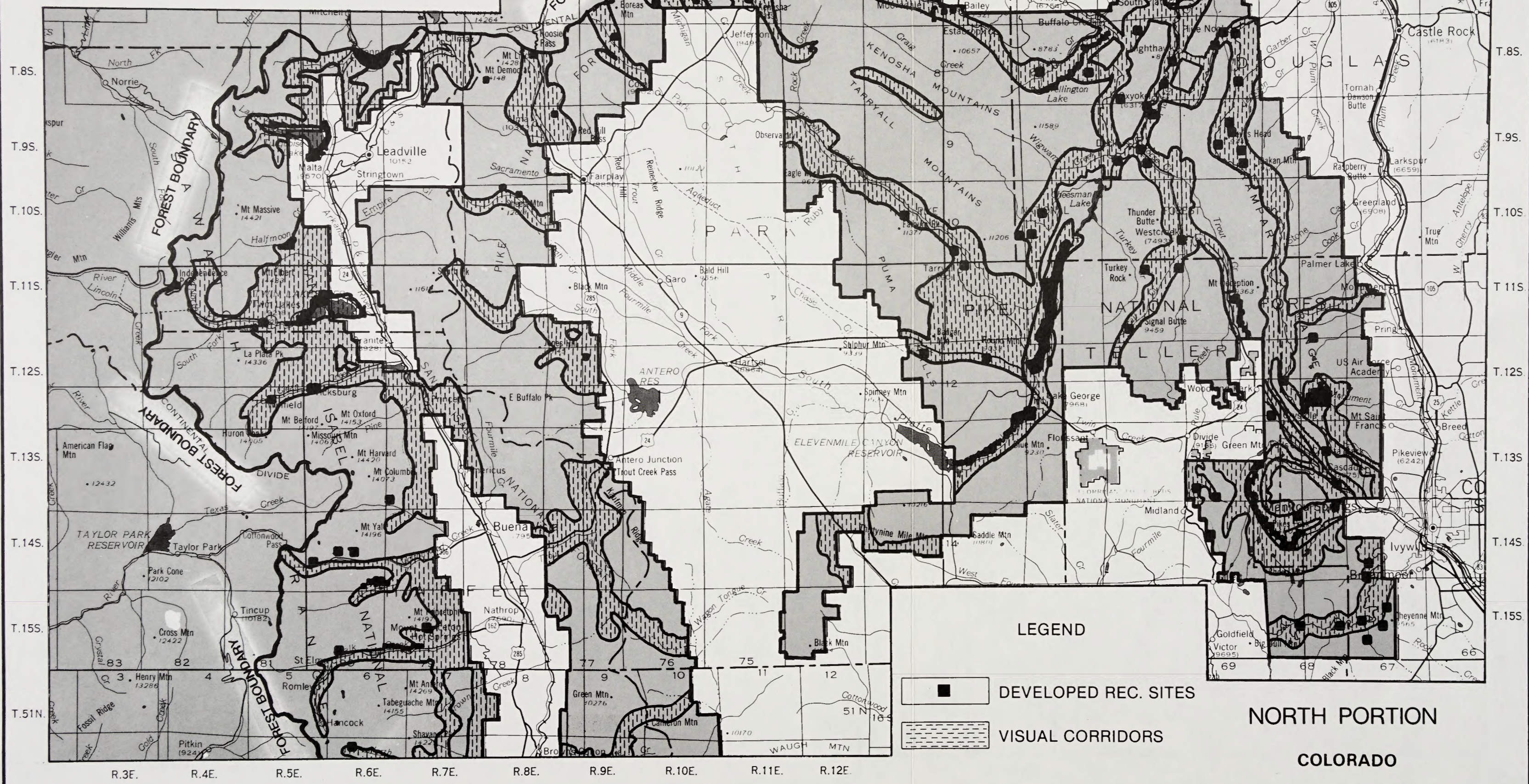
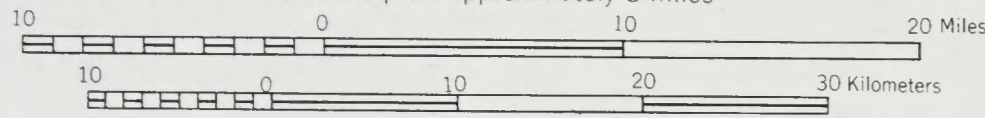
Figure G - 2  
Resource Map

# PIKE AND SAN ISABEL NATIONAL FOREST

- LEGEND**
- ⊗ State capital
  - ⊙ County seat
  - City, town, or village
  - ✈ Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

Scale 1: 500, 000

1 inch equals approximately 8 miles



- LEGEND**
- DEVELOPED REC. SITES
  - ▨ VISUAL CORRIDORS

NORTH PORTION  
COLORADO

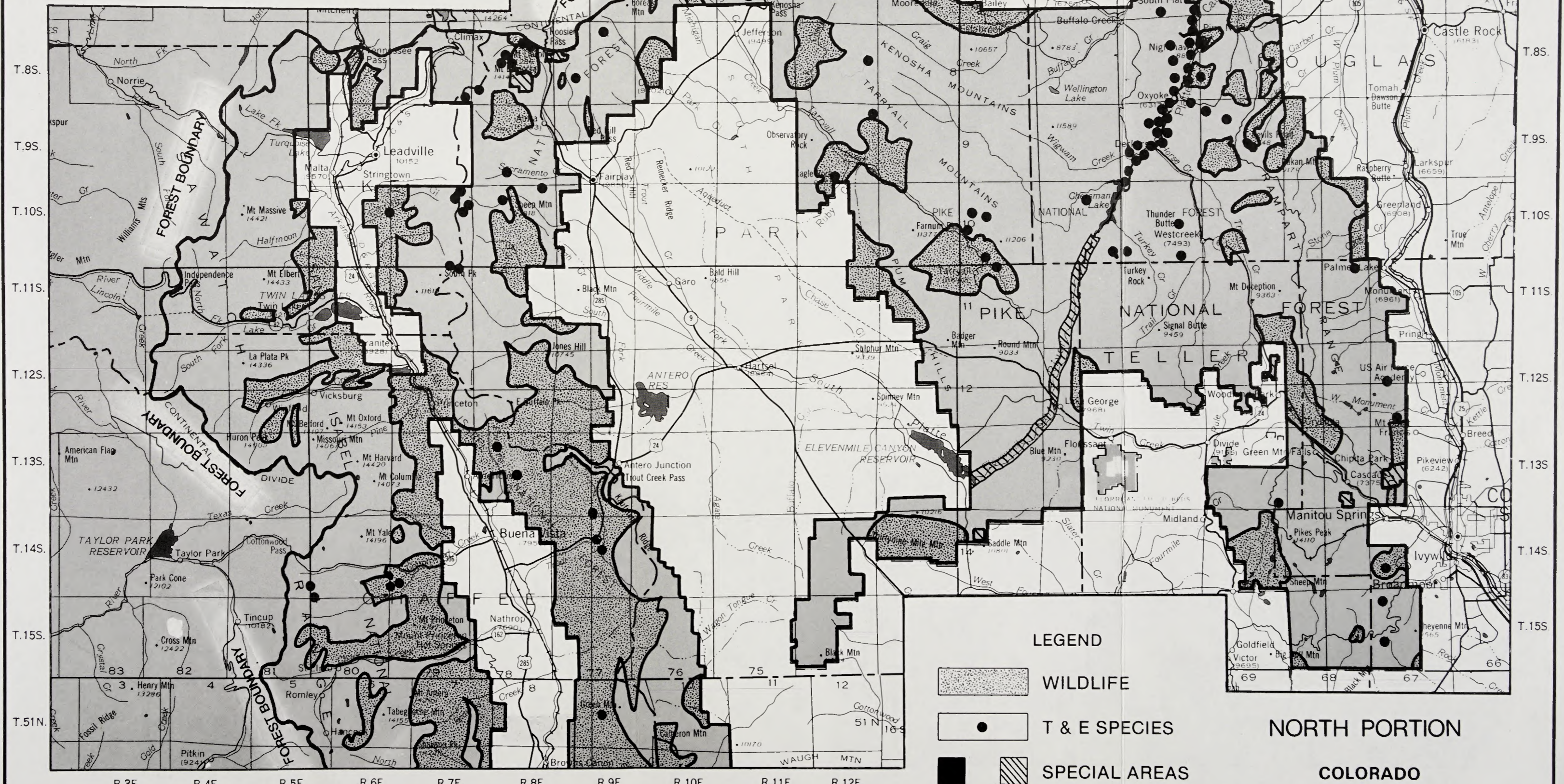
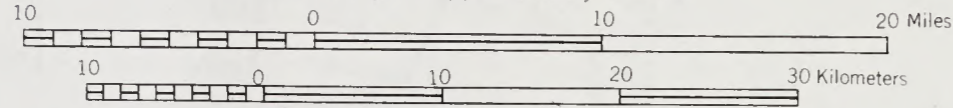
Figure G - 3  
Resource Map

PIKE AND SAN ISABEL NATIONAL FOREST

LEGEND

- ⊗ State capital
- ⊙ County seat
- City, town, or village
- ✈ Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scale 1:500,000  
1 inch equals approximately 8 miles



LEGEND

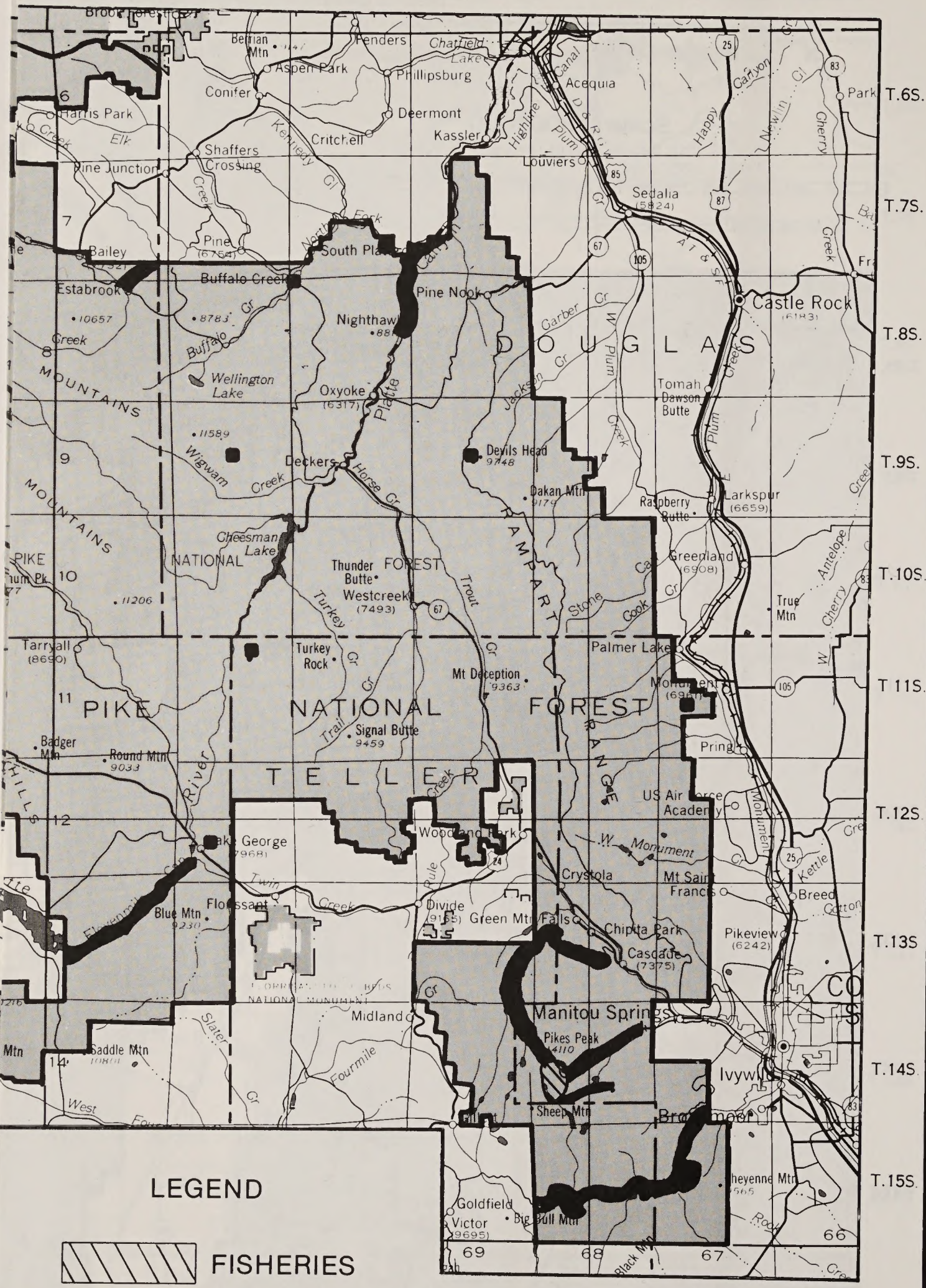
- ▨ WILDLIFE
- T & E SPECIES
- SPECIAL AREAS

NORTH PORTION

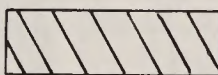

COLORADO

Figure G - 4  
Resource Map

# PIKE AND SAN ISABEL NATIONAL FOREST





**LEGEND**

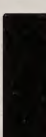
-  FISHERIES
-  CULTURAL

**NORTH PORTION  
COLORADO**









**LEGEND**

 MUNICIPAL WATERSHED

 STEEP SLOPE SEVERE EROSION

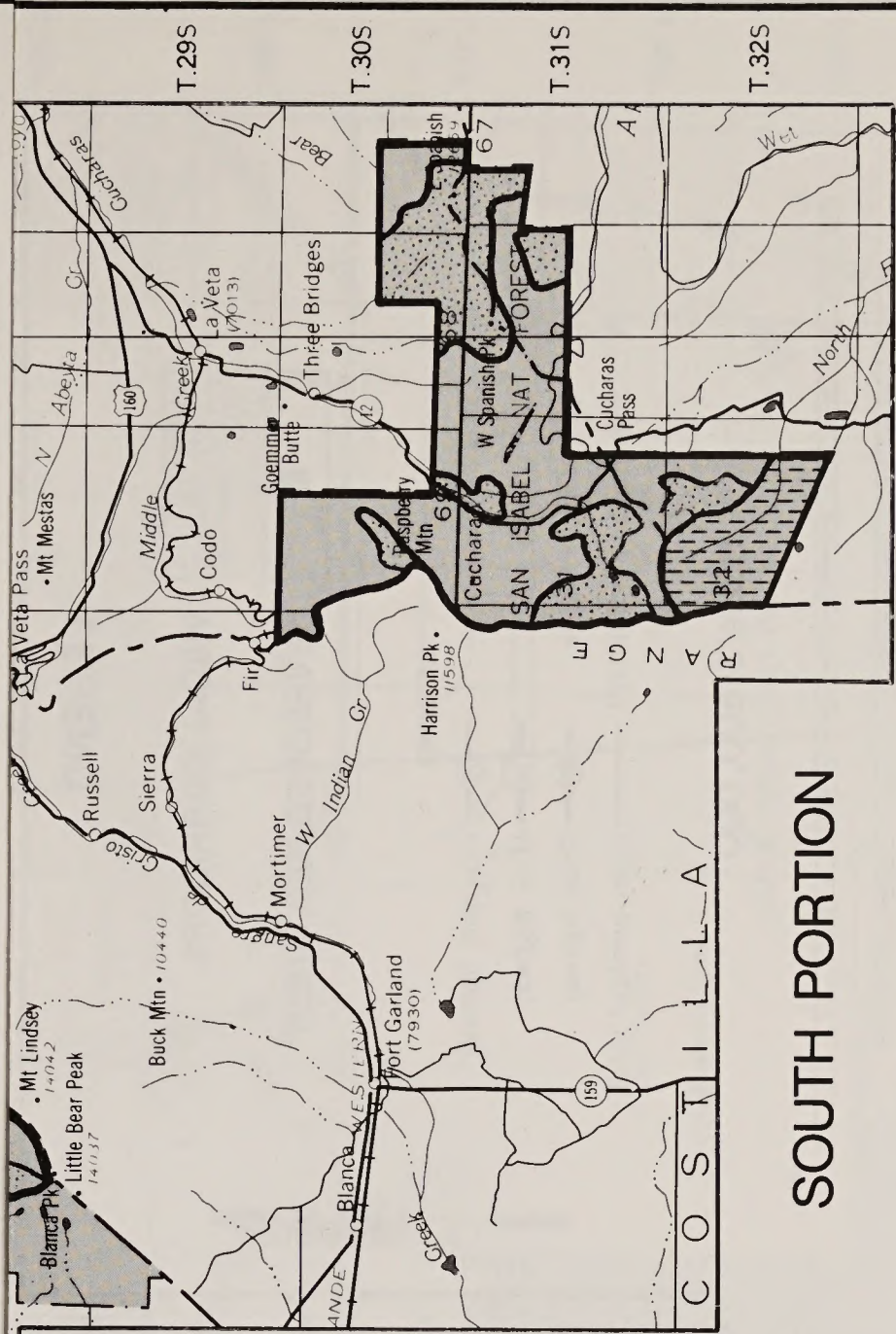
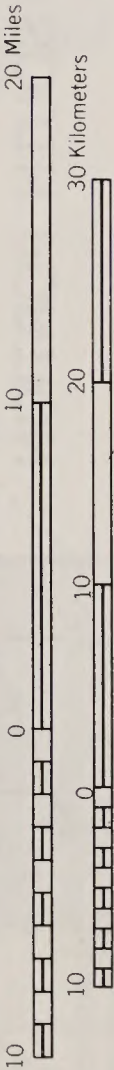
 MASS GEOLOGICAL WASTING

**LEGEND**

-  State capital
-  County seat
-  City, town, or village
-  Scheduled service airport
-  Interstate highway
-  U. S. highway
-  State highway
-  Other principal roads

**Scale 1:500,000**

1 inch equals approximately 8 miles



**SOUTH PORTION**

**COLORADO**

R.67E. R.68E. R.69E.

Figure G - 4  
Resource Map

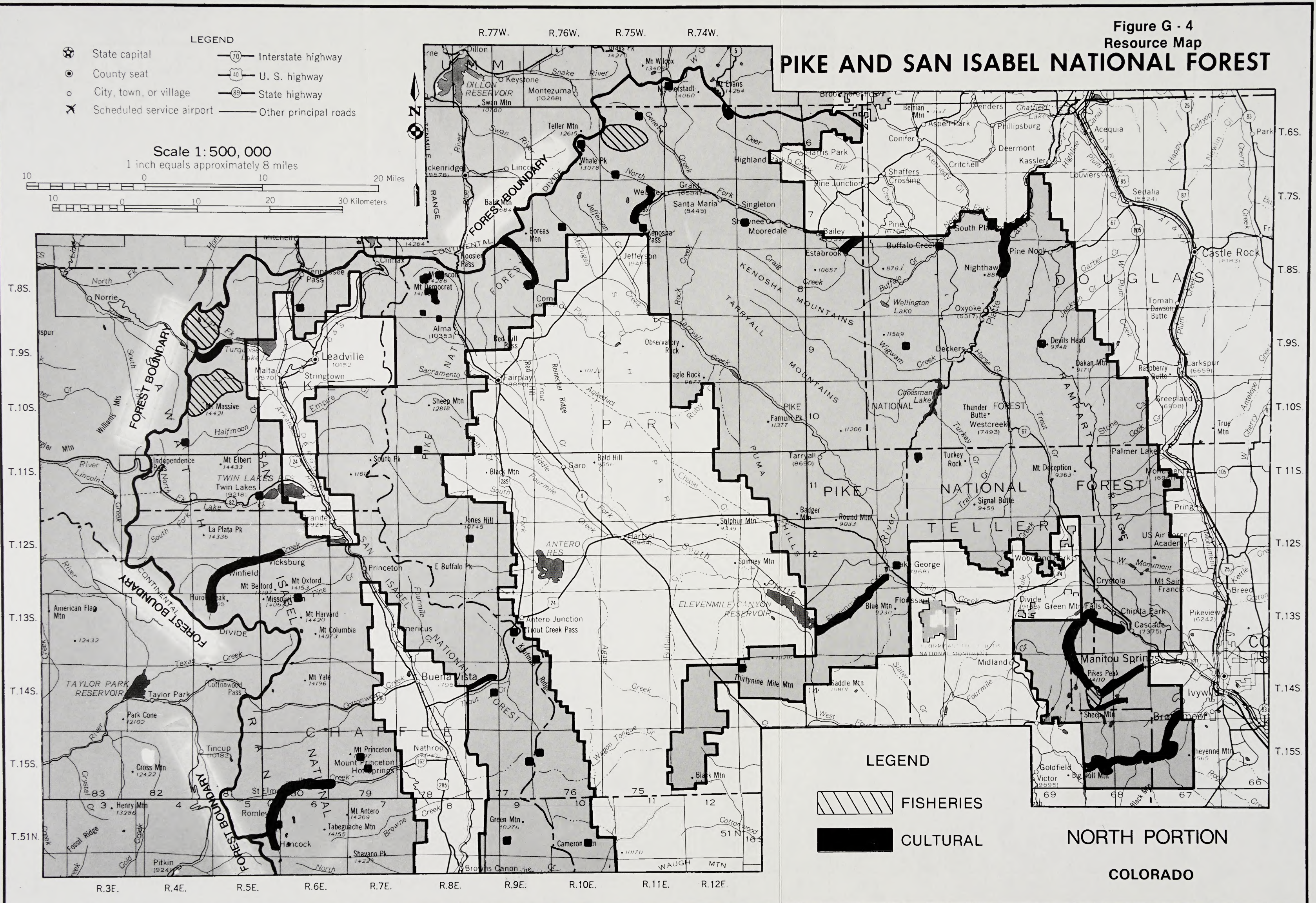
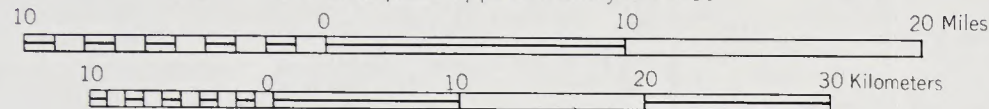
# PIKE AND SAN ISABEL NATIONAL FOREST

LEGEND

- State capital
- County seat
- City, town, or village
- Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scale 1: 500, 000

1 inch equals approximately 8 miles



LEGEND

- FISHERIES
- CULTURAL

NORTH PORTION  
COLORADO

# PIKE AND SAN ISABEL NATIONAL FOREST

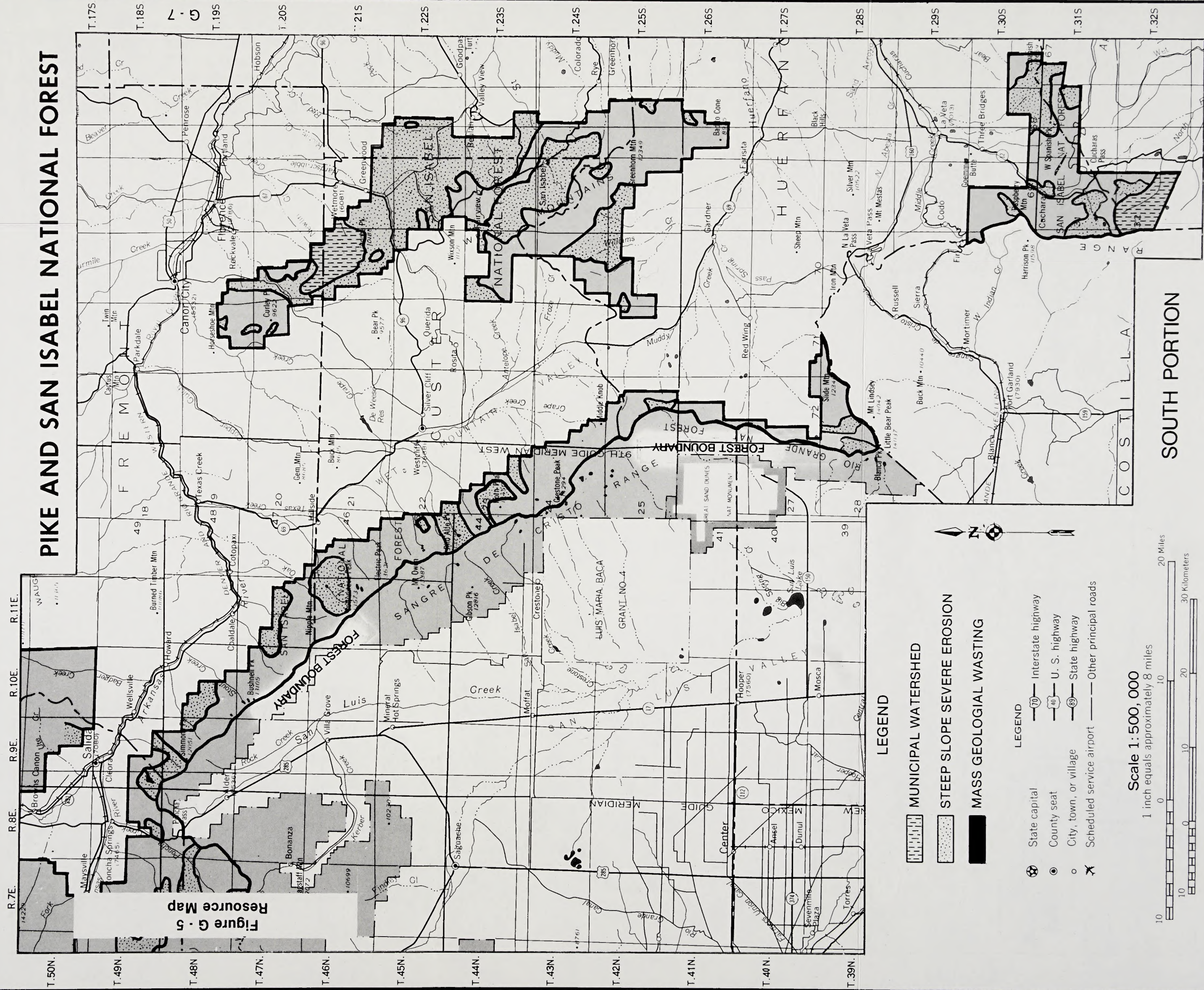


Figure G - 5  
Resource Map

## LEGEND

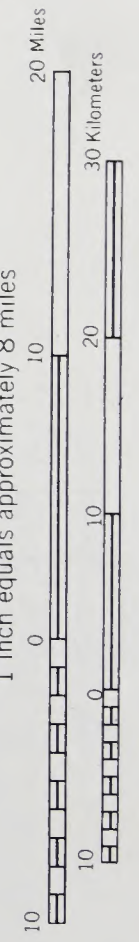
- MUNICIPAL WATERSHED
- STEEP SLOPE SEVERE EROSION
- MASS GEOLOGICAL WASTING



- ## LEGEND
- State capital
  - County seat
  - City, town, or village
  - Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

Scale 1:500,000

1 inch equals approximately 8 miles

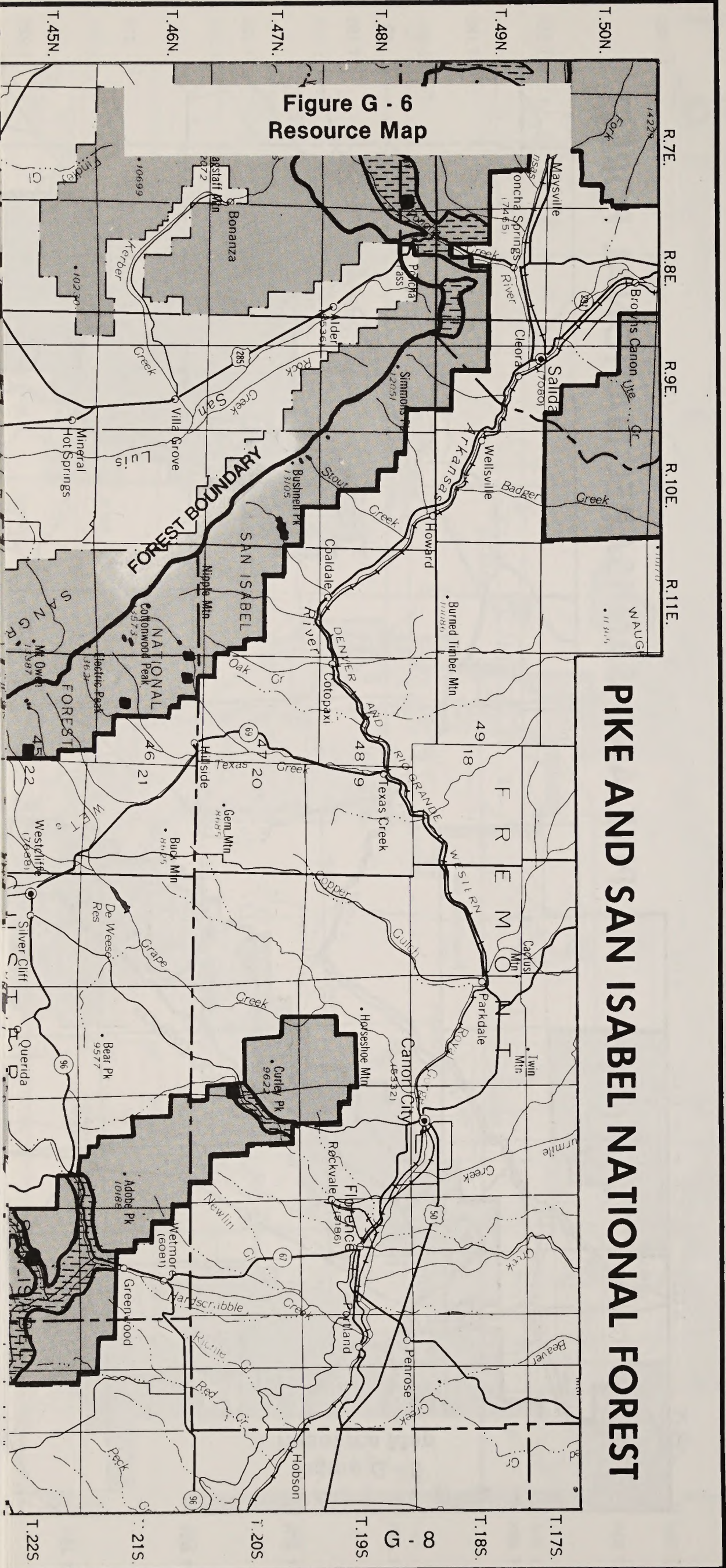


SOUTH PORTION

COLORADO

R.69E. R.68E. R.67E.

Figure G - 6  
Resource Map



**PIKE AND SAN ISABEL NATIONAL FOREST**



# T & E / WILDLIFE TIMING

## LEGEND



T&E SPECIES

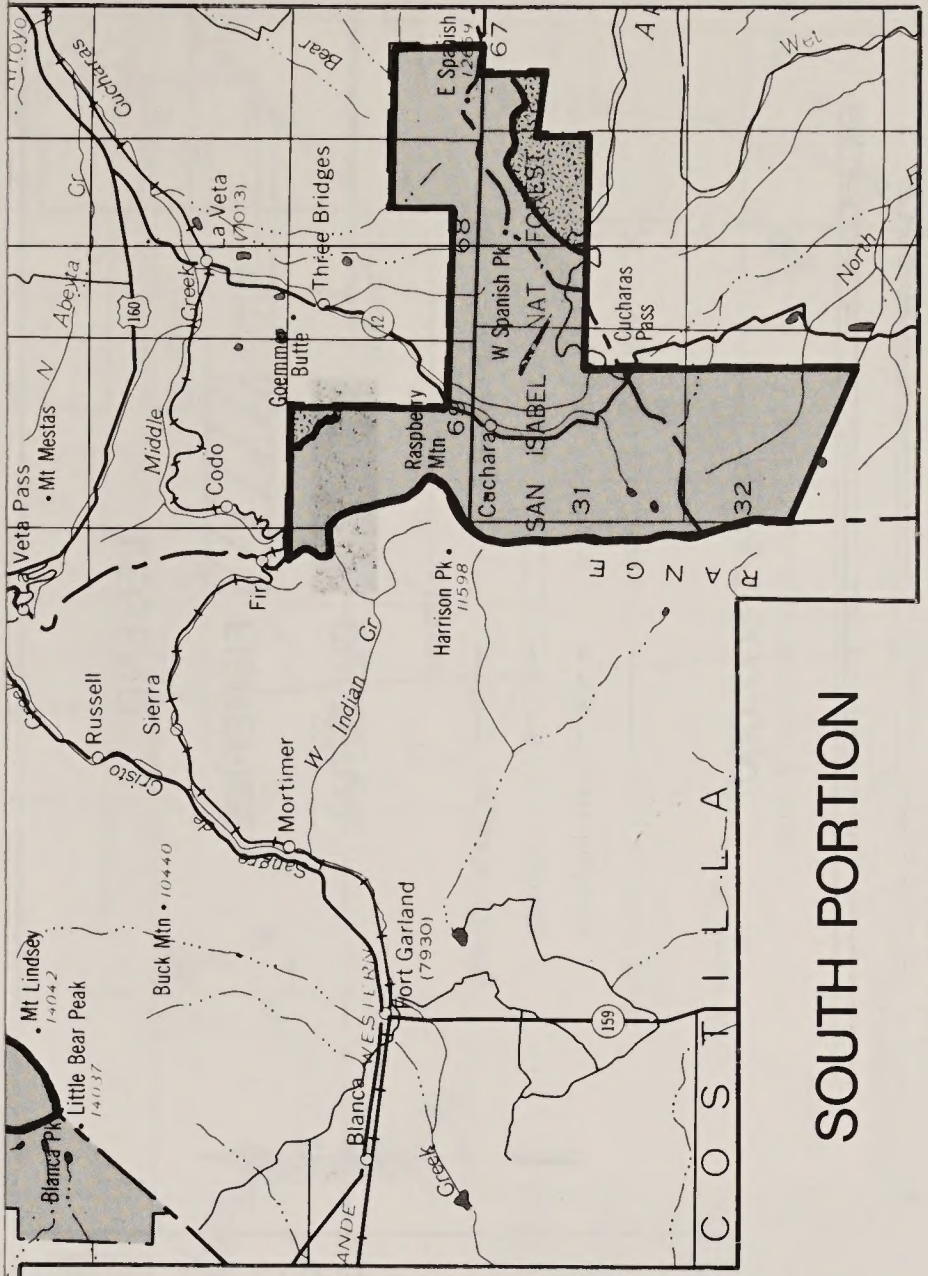
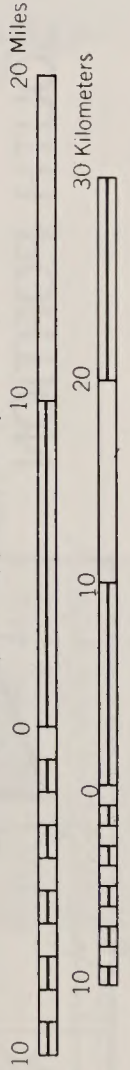


WILDLIFE

- LEGEND**
- State capital
  - County seat
  - City, town, or village
  - Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

Scale 1:500,000

1 inch equals approximately 8 miles



# SOUTH PORTION

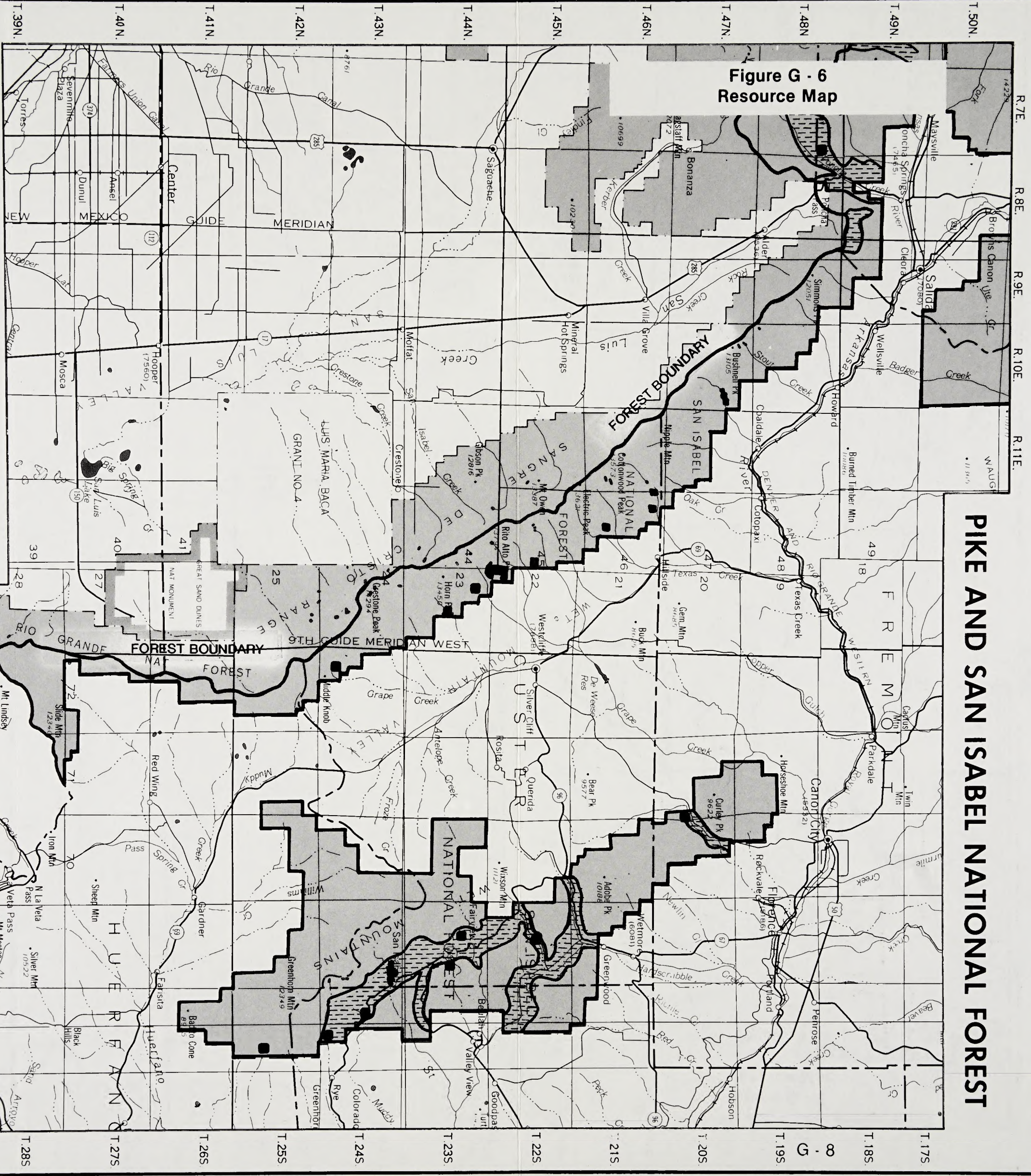
COLORADO

T.29S T.30S T.31S T.32S

R.67E R.68E R.69E

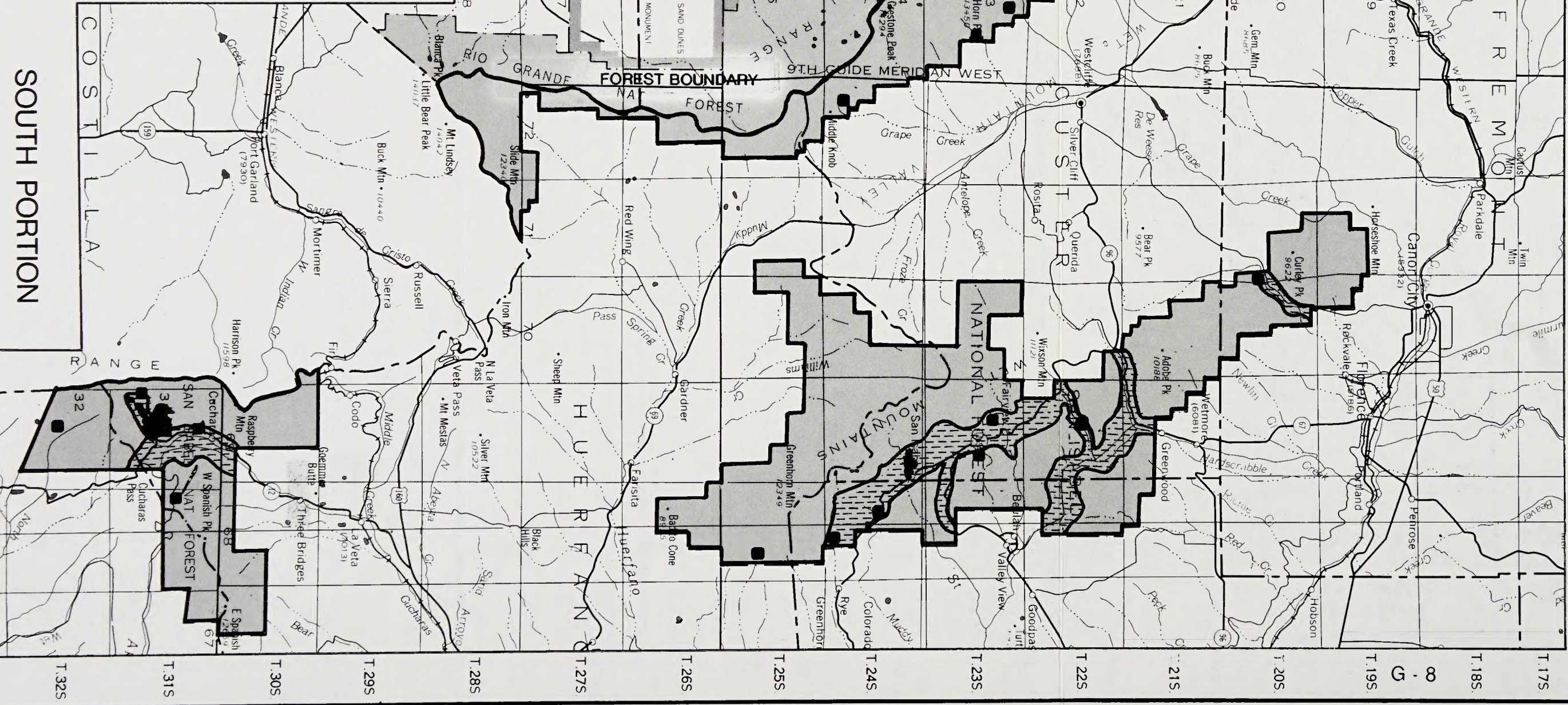
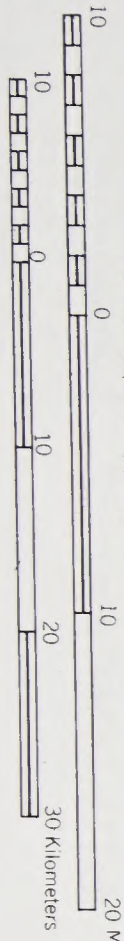
# PIKE AND SAN ISABEL NATIONAL FOREST

Figure G - 6  
Resource Map



- ### LEGEND
- State capital
  - County seat
  - City, town, or village
  - Scheduled service airport
  - Other principal roads
  - Interstate highway
  - U. S. highway
  - State highway
- ### LEGEND
- Visual corridors
  - Developed rec. sites
- ### LEGEND
- State capital
  - County seat
  - City, town, or village
  - Scheduled service airport
  - Other principal roads
  - Interstate highway
  - U. S. highway
  - State highway

Scale 1:500,000  
1 inch equals approximately 8 miles



SOUTH PORTION  
COLORADO

R. 69E. R. 68E. R. 67E.  
T. 32S. T. 31S. T. 30S. T. 29S. T. 28S. T. 27S. T. 26S. T. 25S. T. 24S. T. 23S. T. 22S. T. 21S. T. 20S. T. 19S. T. 18S. T. 17S.

# PIKE AND SAN ISABEL NATIONAL FOREST

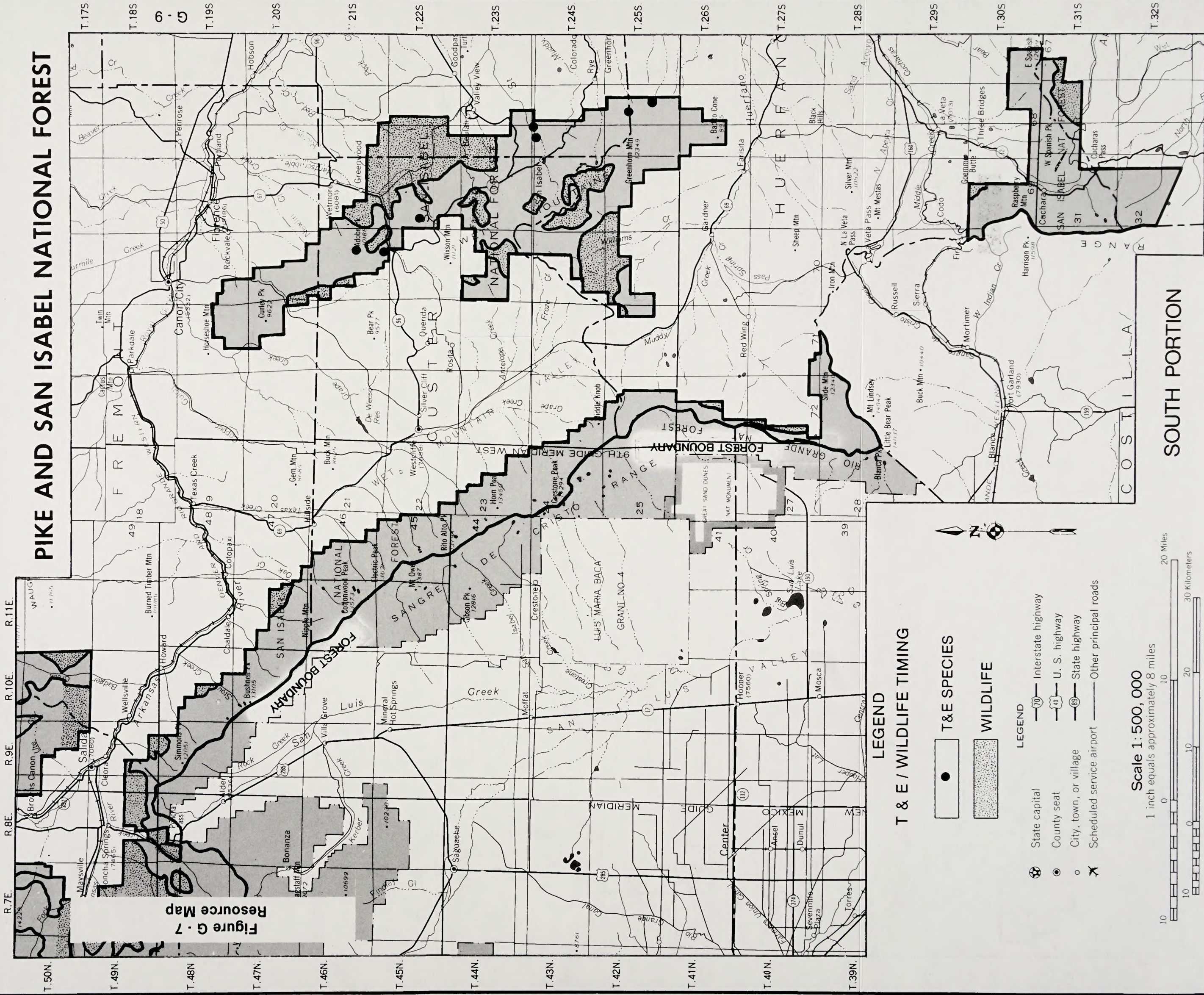
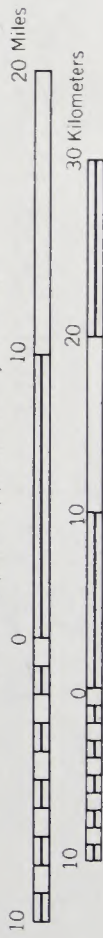


Figure G - 7  
Resource Map

### LEGEND T & E / WILDLIFE TIMING

- |  |               |
|--|---------------|
|  | T & E SPECIES |
|  | WILDLIFE      |
- 
- |               |                           |
|---------------|---------------------------|
| <b>LEGEND</b> |                           |
|               | State capital             |
|               | County seat               |
|               | City, town, or village    |
|               | Scheduled service airport |
|               | Interstate highway        |
|               | U. S. highway             |
|               | State highway             |
|               | Other principal roads     |

Scale 1:500,000  
1 inch equals approximately 8 miles

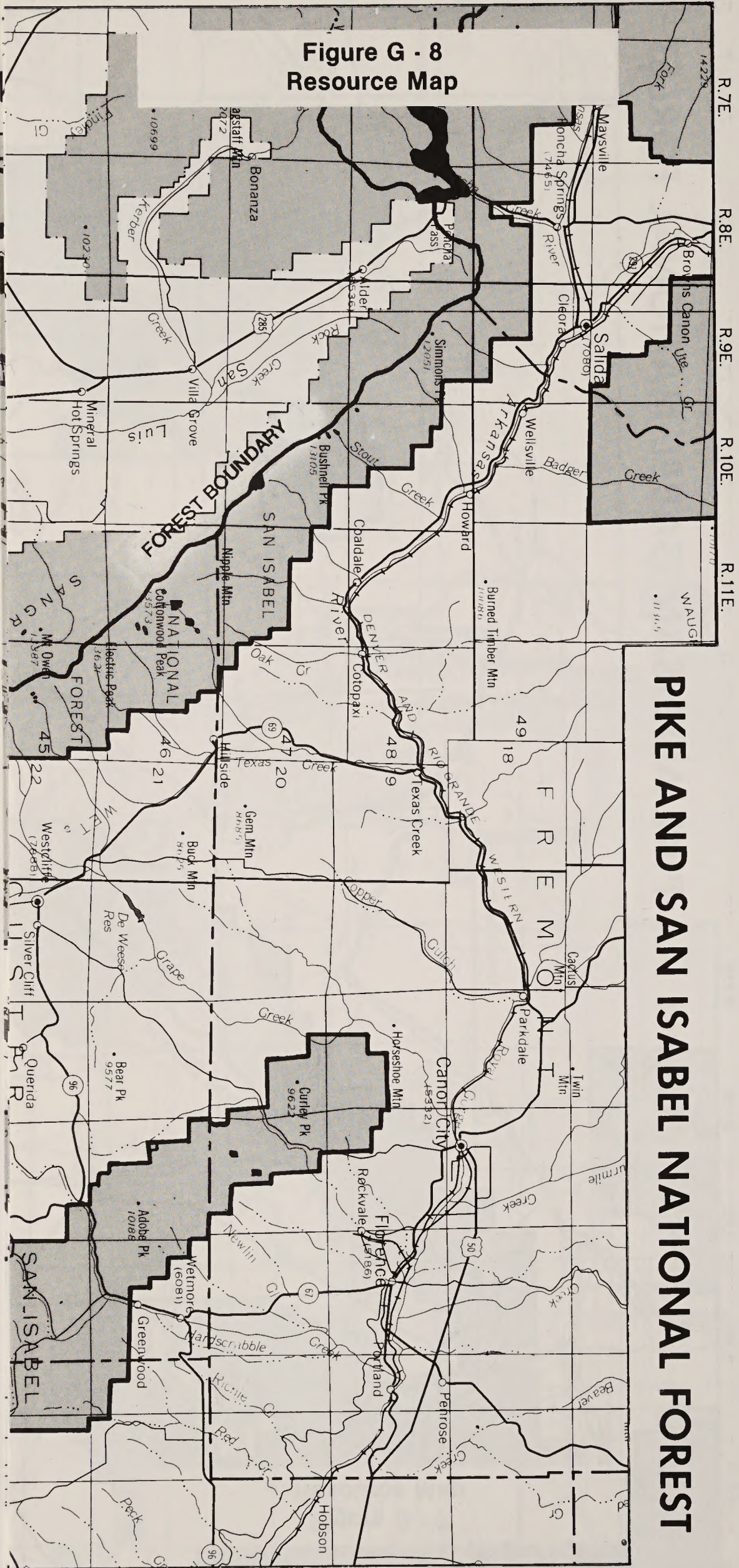


### SOUTH PORTION

COLORADO

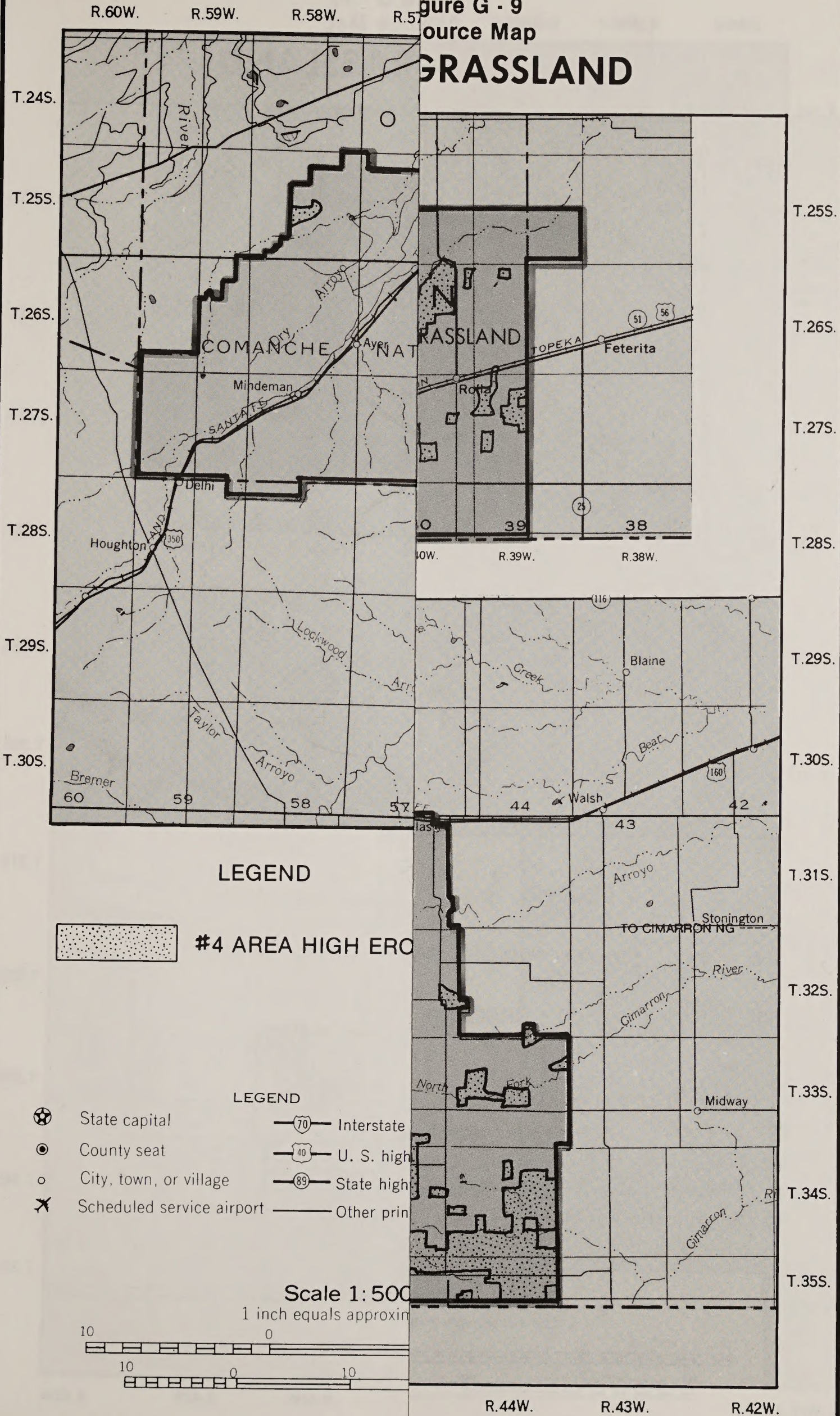
R. 68E. R. 69E. R. 70E. R. 71E.

Figure G - 8  
Resource Map




PIKE AND SAN ISABEL NATIONAL FOREST









# Figure G - 9 Source Map GRASSLAND



## LEGEND

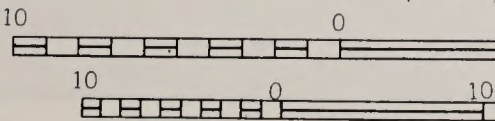
 #4 AREA HIGH EROSION

## LEGEND

-  State capital
-  County seat
-  City, town, or village
-  Scheduled service airport
-  Interstate
-  U. S. highway
-  State highway
-  Other principal road

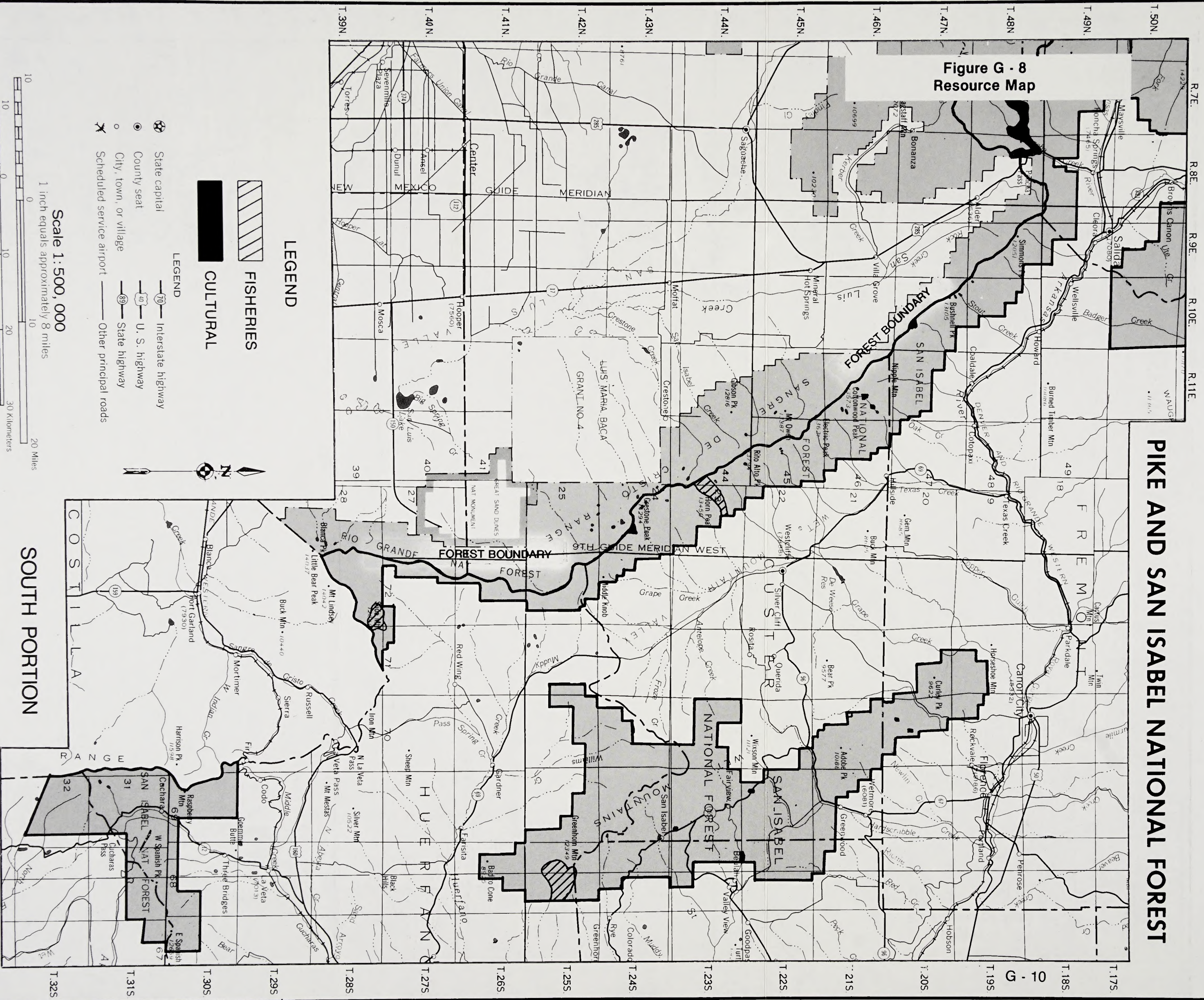
Scale 1:500,000

1 inch equals approximately 10 miles



# PIKE AND SAN ISABEL NATIONAL FOREST

**Figure G - 8  
Resource Map**



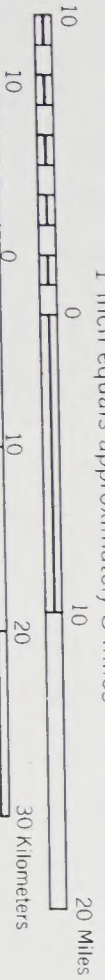
**LEGEND**

- FISHERIES
- CULTURAL

**LEGEND**

- State capital
- County seat
- City, town, or village
- Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scale 1:500,000  
1 inch equals approximately 8 miles

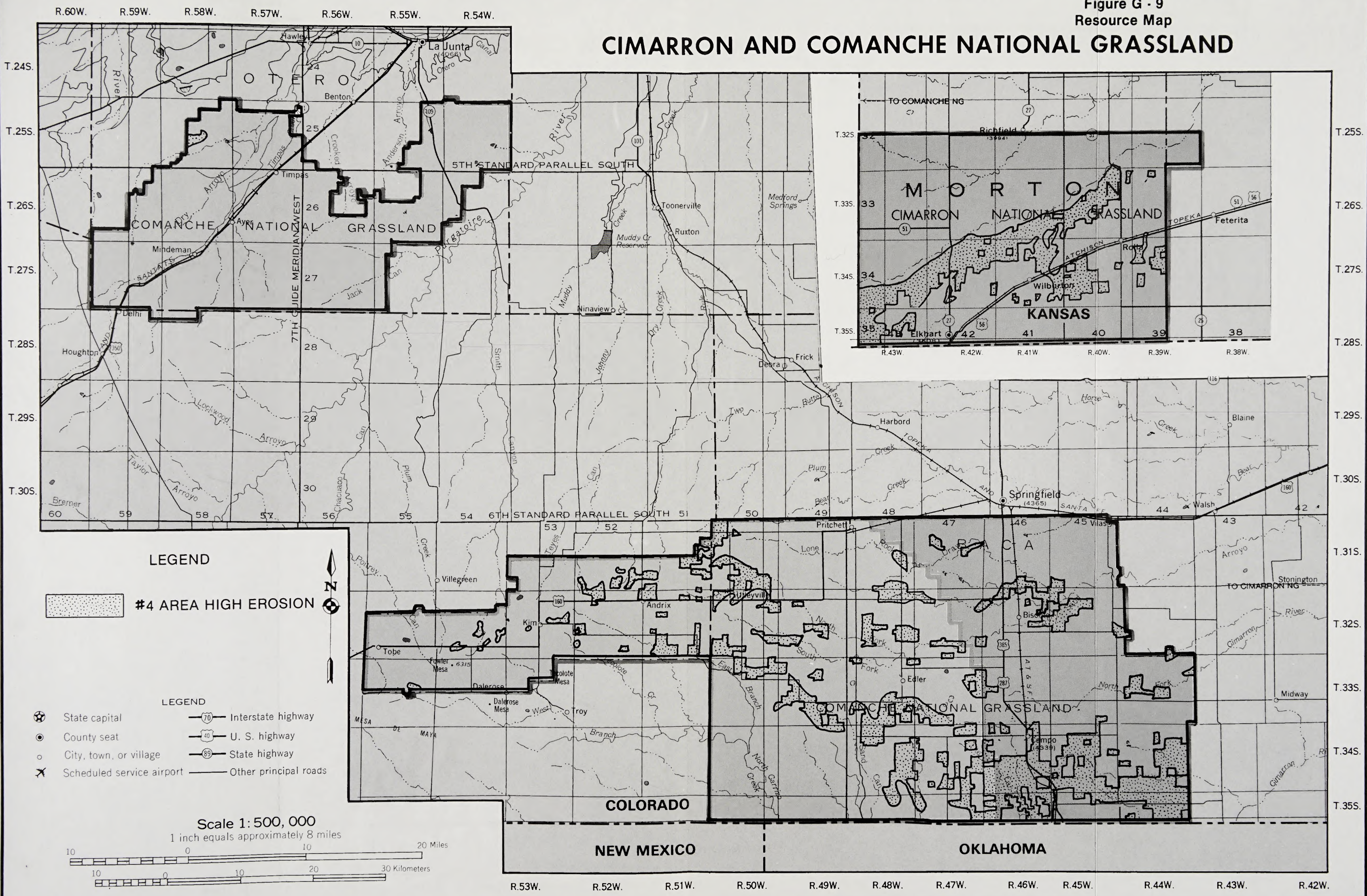


SOUTH PORTION

COLORADO

Figure G - 9  
Resource Map

# CIMARRON AND COMANCHE NATIONAL GRASSLAND



**LEGEND**

#4 AREA HIGH EROSION

**LEGEND**

- State capital
- County seat
- City, town, or village
- Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scale 1: 500, 000  
1 inch equals approximately 8 miles

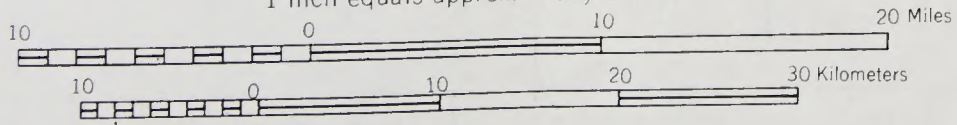


Figure G - 10  
Resource Map

# MORTON AND COMANCHE NATIONAL GRASSLAND

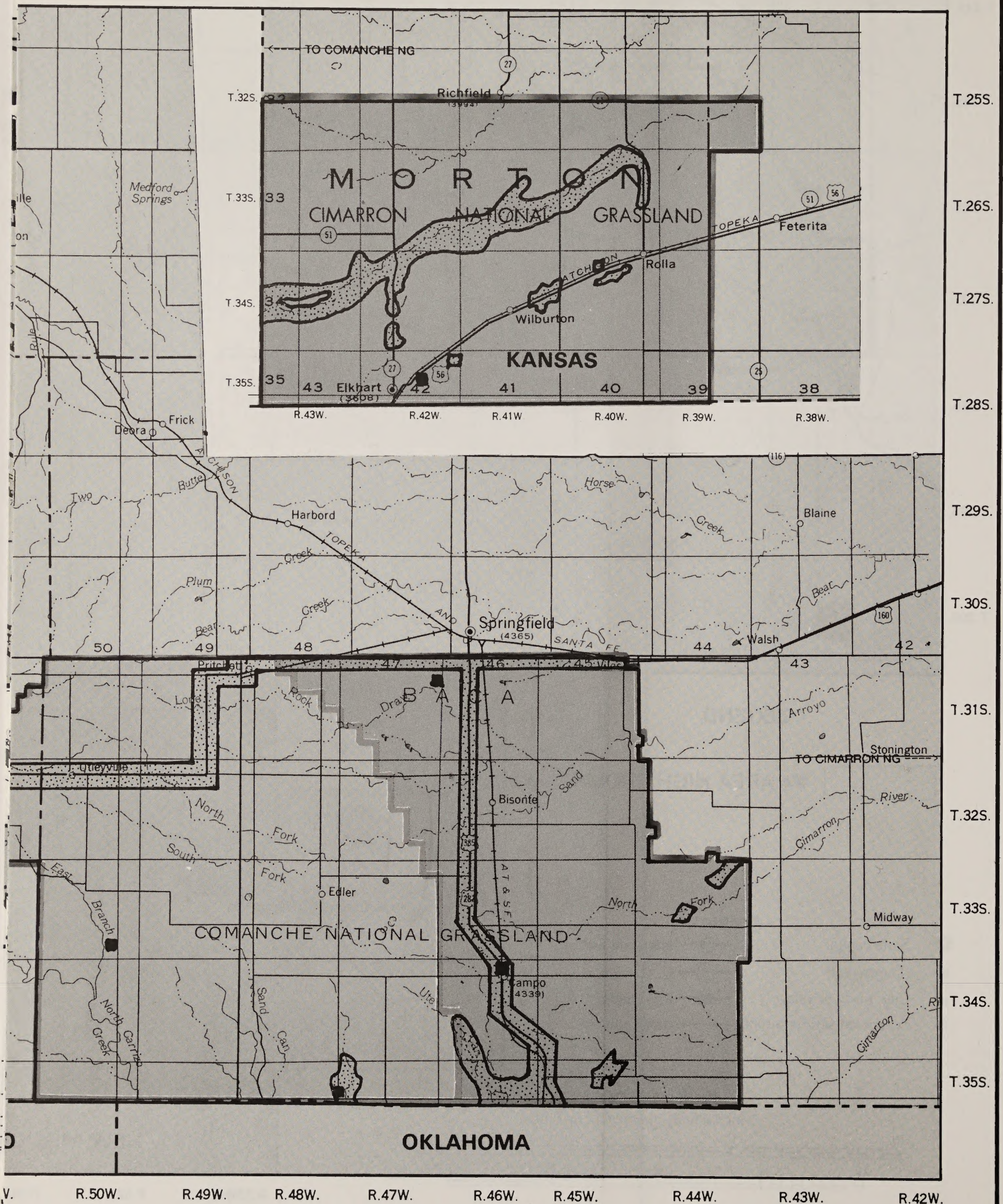
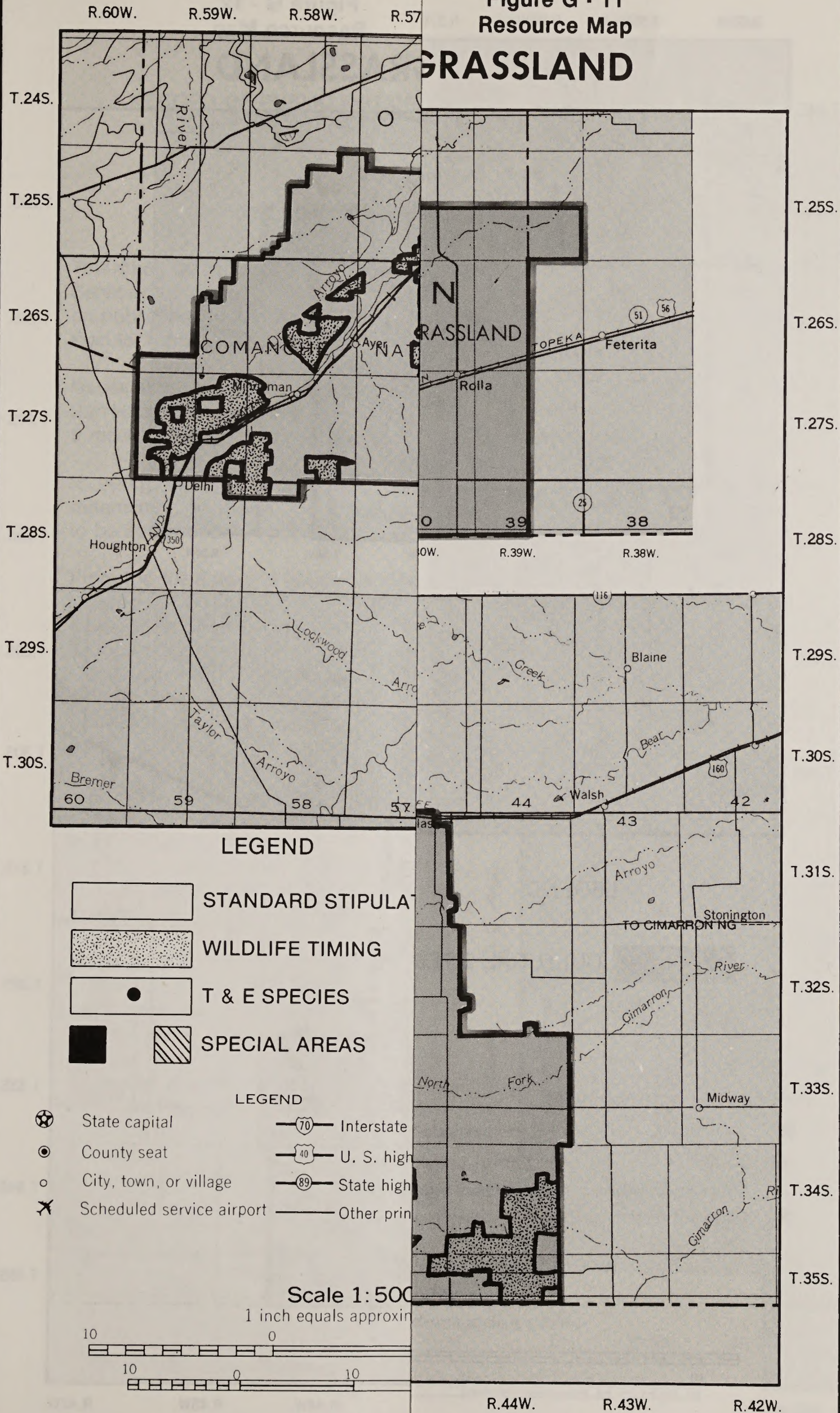


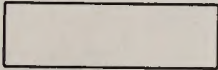

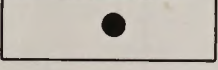
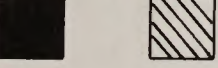


Figure G - 11  
Resource Map









**GRASSLAND**



**LEGEND**

-  STANDARD STIPULATION
-  WILDLIFE TIMING
-  T & E SPECIES
-  SPECIAL AREAS

**LEGEND**

-  State capital
-  County seat
-  City, town, or village
-  Scheduled service airport
-  Interstate
-  U. S. highway
-  State highway
-  Other primary road

Scale 1:500,000

1 inch equals approximately 12.5 miles

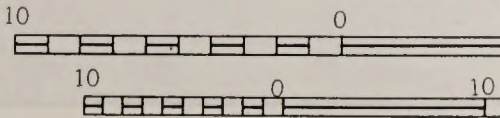
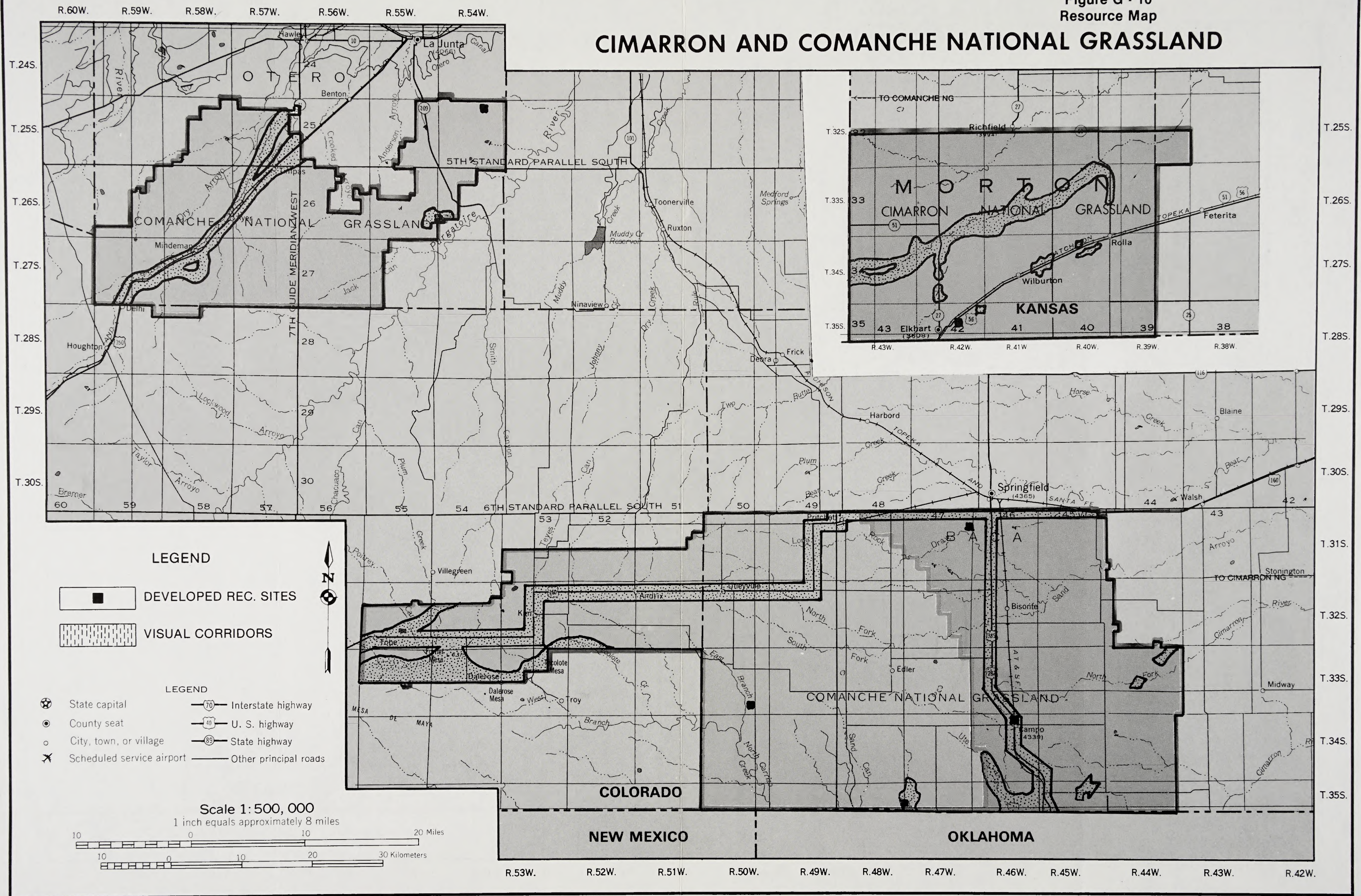


Figure G - 10  
Resource Map

# CIMARRON AND COMANCHE NATIONAL GRASSLAND



**LEGEND**

- DEVELOPED REC. SITES
- VISUAL CORRIDORS

**LEGEND**

- State capital
- County seat
- City, town, or village
- ✕ Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scale 1:500,000  
1 inch equals approximately 8 miles

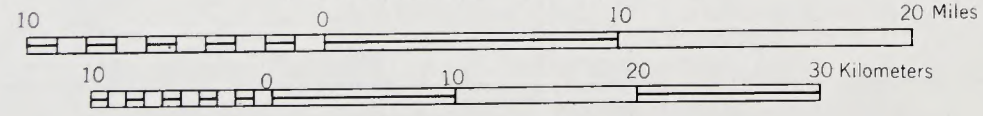


Figure G - 11  
Resource Map

# CIMARRON AND COMANCHE NATIONAL GRASSLAND

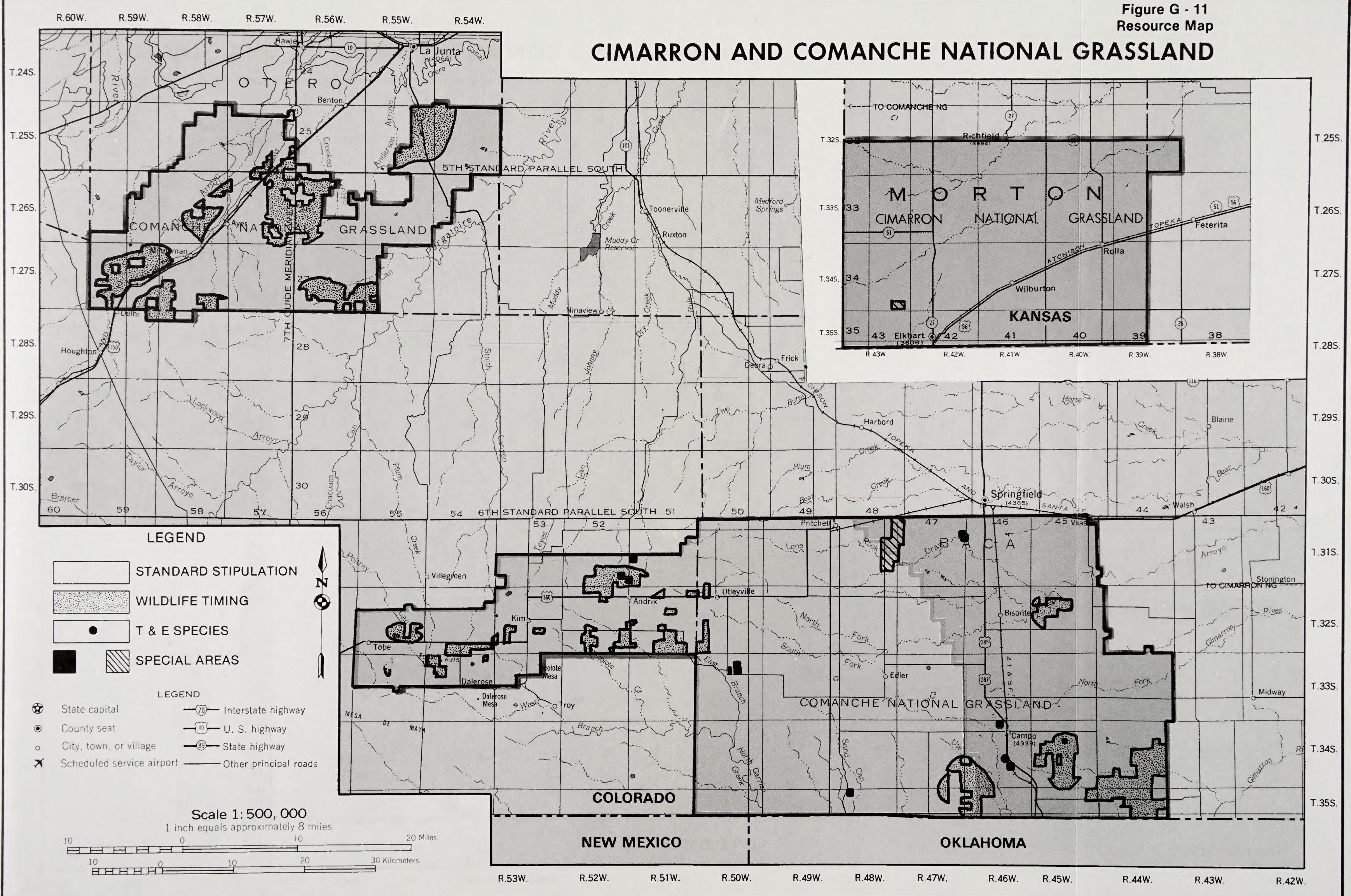
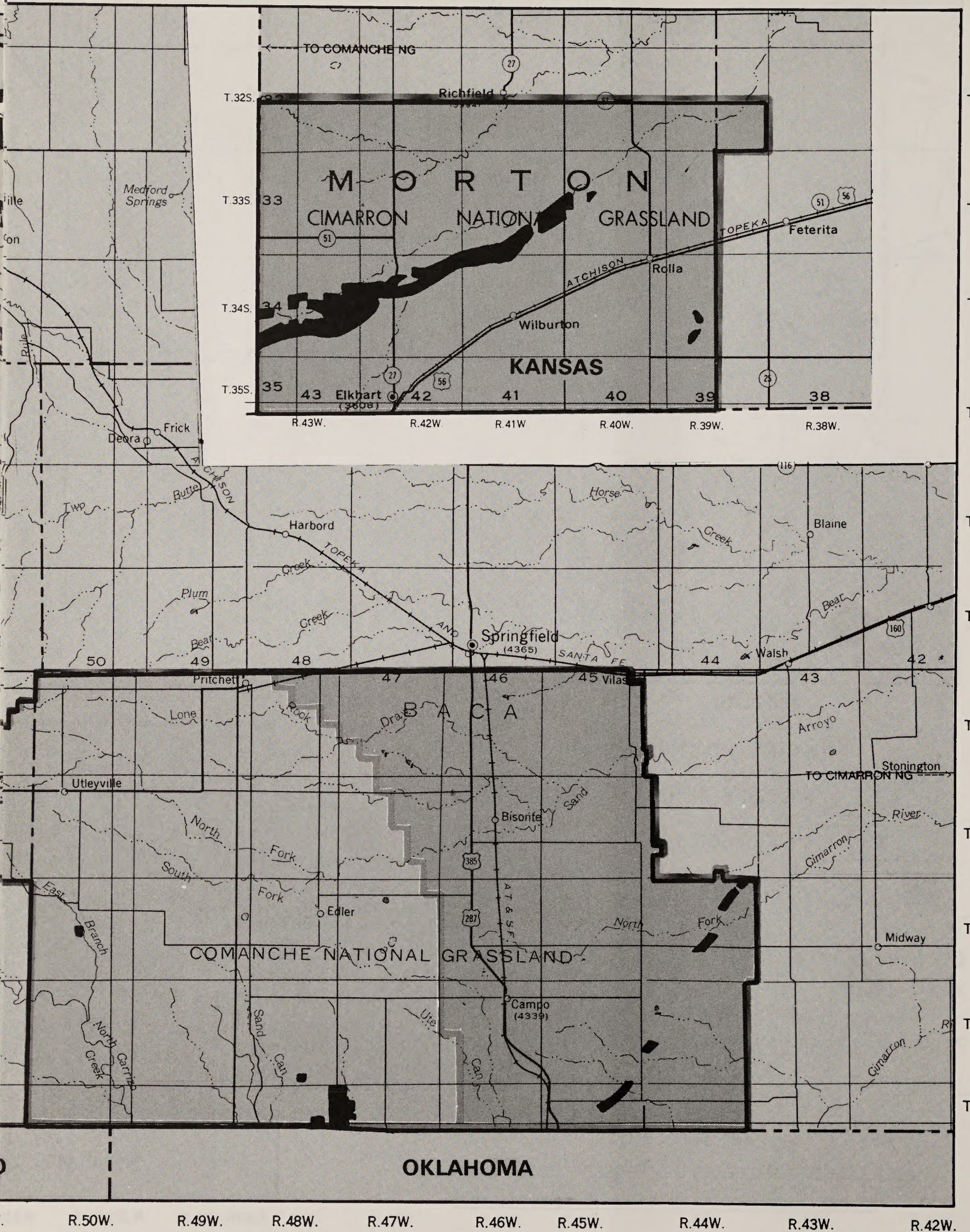


Figure G - 12  
Resource Map

# MORTON AND COMANCHE NATIONAL GRASSLAND



## APPENDIX H

### RECORD OF PUBLIC NOTICE, OTHER AGENCY AND PUBLIC PARTICIPATION AND FOREST SERVICE RESPONSE TO ISSUES

#### INTRODUCTION

This appendix contains a description of all issues identified during this EIS process and the Forest Service recommended response and action to be taken regarding each issue. Detailed information on public involvement for the original DEIS is available at the Forest Service, 1920 Valley Drive, Pueblo, Colorado.

Issues about future oil and gas leasing and subsequent development activities on the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands were identified as a result of the scoping process and public review of the first DEIS.

"Scoping" (40 CFR Part 1501.7) is a term the Forest Service uses to identify the process for determining the scope of issues related to a proposed action and for identifying significant issues to be addressed.

From the full scope of issues identified, the responsible official has determined the significant issues (40 CFR Part 1501.7 (a)(2)(3)) to be analyzed in depth in this EIS. Significant issues are identified in Chapter I. Issues covered by prior environmental review (40 CFR 1501.7 (a)(3) and 1506.3) need not be discussed in detail in this EIS. However, issues that are not significant are discussed in this appendix, or reference to their coverage elsewhere is provided (40 CFR Part 1501.7 (a)(3)). Anticipated effects of oil and gas leasing pertaining to each significant issue, including potential subsequent oil and gas field development are discussed in Chapter IV, Environmental Consequences.

The Forest Service Interdisciplinary Team has completed an analysis of issues that have been identified. Actions necessary to resolve these issues have been formulated and are discussed later in this appendix.

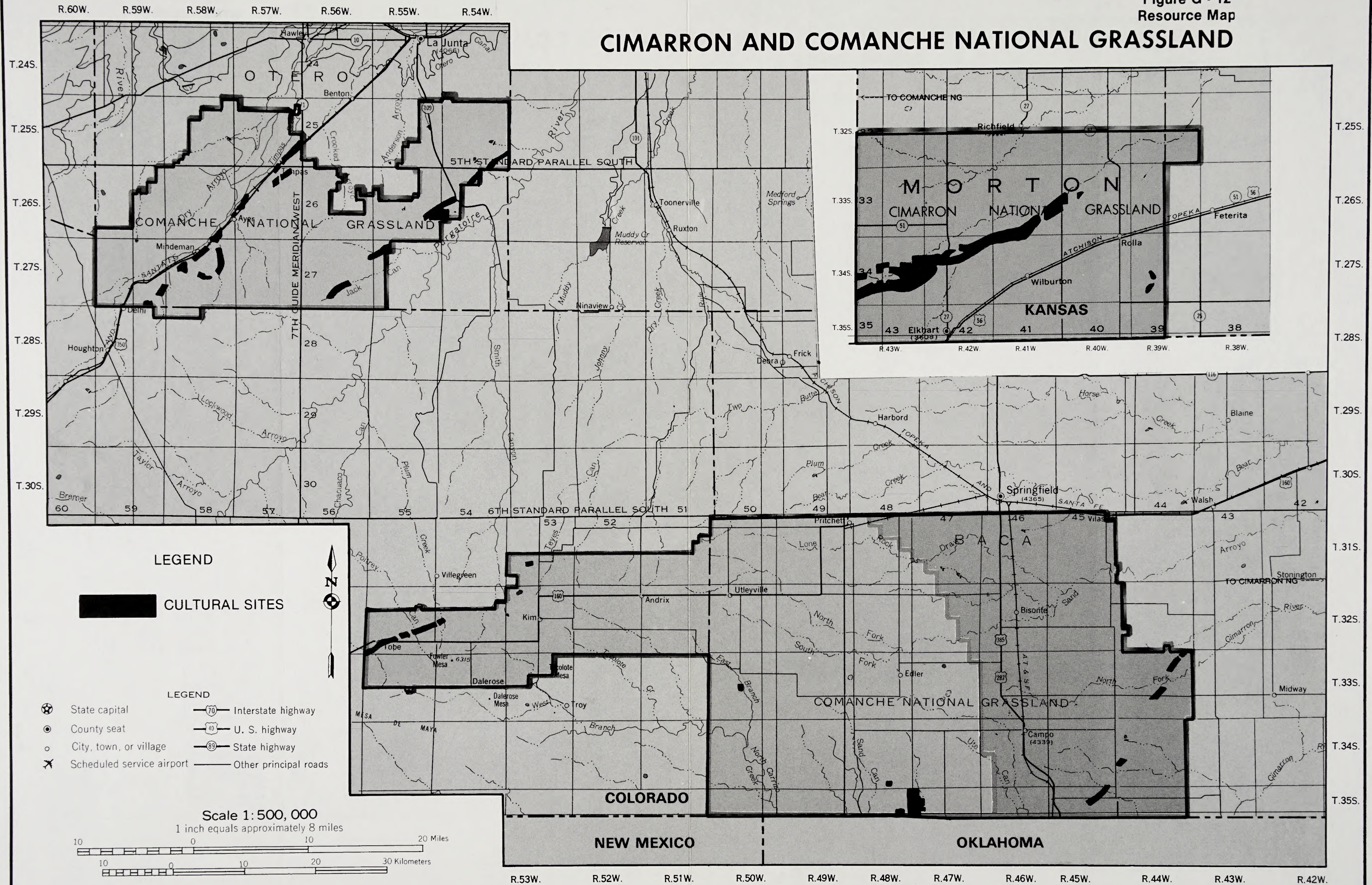
The first section of this appendix, Public Notice and Consultation With Others, summarizes public involvement activities undertaken during this EIS process.

The second section, Content Analysis Summary and Forest Service Response, contains a summarization of public, Forest Service and other agency issues extracted or paraphrased from comments received. Similar issues were grouped together. Each issue is followed by a recommended Forest Service response. The response describes the disposition of each issue, the action the Forest Service has taken, or intends to take, or how the issue is addressed in this EIS. Some of the issues identified during this EIS process were addressed during development of the Forest Plan. The Forest Plan and accompanying final EIS were approved by Regional Forester James F. Torrence (Record of Decision, signed October 18, 1984). Reference to where these issues were addressed in the Regional Guide and accompanying FEIS, the Forest Plan and accompanying FEIS and the Record of Decision approving the Forest Plan is identified here.

The third section, Commenter Name and Assigned Number, identifies Federal, State and County agencies and private citizens and interest groups who identified issues and provided comments

Figure G - 12  
Resource Map

# CIMARRON AND COMANCHE NATIONAL GRASSLAND



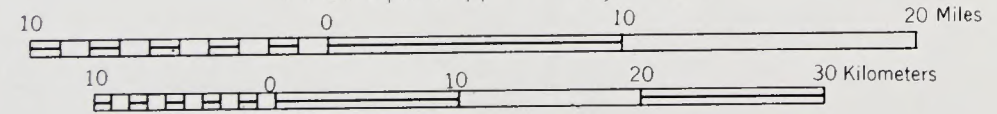
**LEGEND**

CULTURAL SITES

**LEGEND**

- State capital
- County seat
- City, town, or village
- Scheduled service airport
- Interstate highway
- U. S. highway
- State highway
- Other principal roads

Scale 1:500,000  
1 inch equals approximately 8 miles



## APPENDIX H

### RECORD OF PUBLIC NOTICE, OTHER AGENCY AND PUBLIC PARTICIPATION AND FOREST SERVICE RESPONSE TO ISSUES

#### INTRODUCTION

This appendix contains a description of all issues identified during this EIS process and the Forest Service recommended response and action to be taken regarding each issue. Detailed information on public involvement for the original DEIS is available at the Forest Service, 1920 Valley Drive, Pueblo, Colorado.

Issues about future oil and gas leasing and subsequent development activities on the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands were identified as a result of the scoping process and public review of the first DEIS.

"Scoping" (40 CFR Part 1501.7) is a term the Forest Service uses to identify the process for determining the scope of issues related to a proposed action and for identifying significant issues to be addressed.

From the full scope of issues identified, the responsible official has determined the significant issues (40 CFR Part 1501.7 (a)(2)(3)) to be analyzed in depth in this EIS. Significant issues are identified in Chapter I. Issues covered by prior environmental review (40 CFR 1501.7 (a)(3) and 1506.3) need not be discussed in detail in this EIS. However, issues that are not significant are discussed in this appendix, or reference to their coverage elsewhere is provided (40 CFR Part 1501.7 (a)(3)). Anticipated effects of oil and gas leasing pertaining to each significant issue, including potential subsequent oil and gas field development are discussed in Chapter IV, Environmental Consequences.

The Forest Service Interdisciplinary Team has completed an analysis of issues that have been identified. Actions necessary to resolve these issues have been formulated and are discussed later in this appendix.

The first section of this appendix, Public Notice and Consultation With Others, summarizes public involvement activities undertaken during this EIS process.

The second section, Content Analysis Summary and Forest Service Response, contains a summarization of public, Forest Service and other agency issues extracted or paraphrased from comments received. Similar issues were grouped together. Each issue is followed by a recommended Forest Service response. The response describes the disposition of each issue, the action the Forest Service has taken, or intends to take, or how the issue is addressed in this EIS. Some of the issues identified during this EIS process were addressed during development of the Forest Plan. The Forest Plan and accompanying final EIS were approved by Regional Forester James F. Torrence (Record of Decision, signed October 18, 1984). Reference to where these issues were addressed in the Regional Guide and accompanying FEIS, the Forest Plan and accompanying FEIS and the Record of Decision approving the Forest Plan is identified here.

The third section, Commenter Name and Assigned Number, identifies Federal, State and County agencies and private citizens and interest groups who identified issues and provided comments

(by letter or personal communication) pertaining to the scope of the analysis for this EIS. The assigned letter-number (e.g., A-1 denotes comments received from Colorado Association of 4 Wheel Drive Clubs, Inc.) ties each issue to the commenter, so that the reader or an individual commentor may easily find how each issue is addressed in the EIS.

All mailing lists are available for review, during normal working hours, at the Forest Supervisor's office, 1920 Valley Drive, Pueblo, Colorado.

### **SIGNIFICANT ENVIRONMENTAL ISSUES FROM THE FIRST DRAFT ENVIRONMENTAL IMPACT STATEMENT**

To discuss comments received, please contact the Forest Supervisor's office by calling (719) 545-8737. The record of all scoping comments can be reviewed at the Forest Supervisor's office at 1920 Valley Drive, Pueblo, CO between 7:30 AM and 4:30 AM, Monday through Friday, except on holidays.

#### **Forest Resources**

##### **ISSUE:**

*Resource Management* - The Forest Service should recognize, through Forest Plans, that some resources must be managed with priority to others where concurrent use causes conflict. Designation of these areas by prescription facilitates the avoidance of such conflicts. (EFA-12) A number of ecologically important areas are threatened with development. (EA-2, 22, 27, 42, 45, 52, 66, 74, 93, 116, 118, 130) Oil and gas exploration and development in lands should be handled with particular caution. The generally dry climate, poor soils, and at higher elevations the short growing season plus snowmelt and runoff, create conditions that are easily damaged and do not recover well. Resource management should set the limitations for oil and gas development. (EA-54, 78)

The most serious potential problems we identified involved our failure to locate evidence that all resource users are subject to the same restriction as oil and gas lessees. In Lek habitation we were unable to locate similar restrictions in the forest plan to be applied to grazing, timber harvest, recreation and other resource users. Late season hunts, snowmobile, motorcycle, ATV, firewood harvest, and others are of longer duration, more extensive and as a result have a much more long term and lasting impact. We see a potential inconsistency in many of the winter range restrictions for big game wildlife species. (EFA-6)

##### **RESPONSE AND ACTION:**

Oil and gas are among the resources within the multiple uses of the NFS lands and are managed within the multiple use spectrum as all other resources. Oil and gas development can occur on NFS lands and be compatible with other uses of the NFS lands. Consent to lease can occur only after site-specific analyses are conducted of lease application areas. The Forest Plan provides the basis for the management direction that guides the EIS for oil and gas leasing on the Forest.

A description of how the federal government manages oil and gas activities is included in Chapter I of this EIS and in the Forest Plan. The Reform Act also provides direction for surface management of NFS lands.



Forest Supervisor Jack Weissling, the responsible official, constituted an interdisciplinary team of specialists to ensure integrated use of the natural and social sciences and the environmental design arts for preparation of this EIS as required by NEPA. Interdisciplinary team members are identified and listed in Chapter V.

The disciplines (e.g., soil scientist, forester, hydrologist, wildlife biologist, etc.) of the EIS preparers are appropriate to the scope of issues identified during the scoping process as required by NEPA.

The analysis of environmental consequences from oil and gas development activities focused on adverse impacts that impacted all resources. All resource development activity on the Forest must undergo similar analysis under the NEPA requirements. Oil and gas resource activities is treated on an equal basis with other Forest resources. With few exceptions, special stipulations imposed may be waived or modified at the time of an APD with appropriate public notification.

#### Issue Tracking:

Regional Guide and FEIS References: Not applicable.

Forest Plan, FEIS and ROD References: FEIS, Chap. VI, pages 51-66.

This EIS References: Chapters I, II, III, IV, Appendix B, D, H, I.

*Wildlife Habitat.* Goals for managing wildlife habitats are displayed in the Forest Plan, Chapter III, pages 3-6. Specific standards and guidelines for wildlife management are found in the Forest Plan, Chapter III, pages 28-35 and in Management Area Prescription requirements, Chapter III, pages 86-241. Minimum standards for wildlife habitats are given in the Wildlife and Fish Resource Management section under Management Requirements in Chapter III, pages 28-35. These minimum standards were used to develop recommendations and mitigation measures common to all alternatives as well as recommendations for specialized stipulations when required.

#### Issue Tracking:

Regional Guide and FEIS References: Regional Guide, Chap. 1, page 8, Chap. 2, pages 18-21, 46, 47, Chap. 3, pages 14-16, 51, 62, 63; FEIS, Chap. 3, pages 8-10, Chap. 4, pages 5, 6, 16, 17, 22, Appendix C, pages 28-33.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 84, 85, Chap. III, pages 3-6, 28-35; FEIS, Summary, page 2, Chap. I, page 13, Chap. VI, pages 117-131; ROD, pages 4, 6, 9-11, 17, 18.

This EIS References: Chapters III, and IV, Appendix B, D, G, I.

#### ISSUE:

*Grassland Resources* - Oil and gas exploration and development will affect a fragile ecological area on the Cimarron NG's. From the history of the area, the disruption of permanent native vegetation will cause severe wind erosion. (EFA-6)

In Las Animas County, where the USFS acreage is small and of very pristine quality, there is a danger of ruining forever this last piece of sanctuary, if leasing were allowed. With almost unchecked development occurring on the surrounding private properties, we need a stable USFS

base to mitigate the wildlife habitat and watershed losses. Transform the USFS into a true multiple-use agency. (EA-129)

**RESPONSE AND ACTION:**

Any activity which removes vegetative ground cover protection on the Grasslands will accelerate natural erosion rates without appropriate mitigation. Analysis has shown that severe wind erosion is most prominent on the sandy lands. However, much has been learned about erosion-control practices since the "Dust Bowl" era, and it has been demonstrated through current management of oil and gas activities that significant impacts can be prevented through appropriate mitigation and careful application of erosion-control COS's.

**ISSUE:**

*Air Quality* - Oil and gas development has generally avoided PSD review in Colorado; therefore, BACT has not been applied. A greater-than-expected impact might occur due to the combined emissions of numerous small sources. There is no requirement that emissions, from small sources be analyzed for impacts to Class I areas. Cumulatively, oil and gas development on the Forest could impact Class I areas. (EFA-13)

**RESPONSE AND ACTION:**

The Forest Service will require compliance with national and state air quality standards for oil and gas development on NFS lands under all alternatives in this EIS. In the event that sour gas (hydrogen sulfide) is encountered in drilling or is recovered as part of the production, protective measures will be enforced immediately by the BLM. Regulatory requirements imposed by the BLM for oil and gas development make the potential hydrogen sulfide problems quite rare.

Issue Tracking:

Regional Guide and FEIS References: Regional Guide, Chap. 1, page 7, Chap. 2, pages 39, 48, Chap. 3, pages 34-36, 65, 67; FEIS, Summary, page 8, Chap. 2, pages 5, 6, Chap. 4, pages 32-34.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, page 71, Chap. III, pages 3-6, 82; FEIS, Summary, page 13; ROD, page 4.

This EIS References: Chapters III, IV, APPENDIX B.

**ISSUE:**

*Recreation* - Change towards emphasis on recreational use of our lands. Oil and gas developments in the Pike and San Isabel NF's and the Cimarron and Comanche NG's endanger popular recreation areas. (EA-28)

Oil and gas development threaten recreation areas, critical natural habitats, and upset natural ecological systems. (EA-81, 99, 105, 110, 112, 113, 115, 117, 119, 137)

## **RESPONSE AND ACTION:**

Oil and gas are among the resources (within the multiple uses) of the NFS lands and are managed within the multiple use spectrum as all other resources. Recreation is only one of the many uses of the Forest resources. Oil and gas development can occur on NFS lands and be compatible with other uses of the NFS lands.

## **ISSUE:**

*Visual Resources* - The scenic beauty of our state and the quality of natural resources, such as water, wildlife, forests and grasslands is important. O&G development can have long-lasting adverse effects. Careful consideration should be given before any public land is leased for mineral or oil development. Colorado is a popular state because of its scenic wonders and recreational opportunities. (EA-58, 72, 94)

## **RESPONSE AND ACTION:**

The Forest Plan identifies Human Resource Units for recognizing the social and economic characteristics and dependency of communities within the Forest affected environment. The analysis conducted for this EIS also identified some distinct differences between communities on the Forests and the Grasslands. The application of NSO and CSU stipulations in addition to the standard stipulations will protect the visual quality of leased NFS lands.

Standard stipulations of all leases are the minimum required to protect surface resources. Areas determined to contain highly sensitive visual resource values as a result of the analysis for this EIS were identified. Special stipulations (NSO and CSU) will be used to minimize the impacts of oil and gas developments on visual quality in these sensitive areas. The NSO stipulation will be used only where necessary to protect those areas that are most scenic or receive high recreation use. The CSU special stipulation will be used to protect visual resources on the remaining areas of the National Forests and Grasslands.

In NFS lands within Foreground visual zones with sensitivity level one viewpoints, such as scenic byways, the NSO stipulations will be applied 1/4 mile to either side of transportation routes and 1/2 mile either side of National Recreation Trails, Scenic Byways, and scenic rivers including the South Platte Wild and Scenic River Corridor.

## **Issue Tracking:**

Regional Guide and FEIS References: Regional Guide, Chap. 3, pages 1-3, 20; FEIS, Chap. 2, pages 2, 3, Chap. 4, pages 9, 14, 17, 20, 22-25.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. III, pages 3-6, 18, 19; FEIS, Chap. VI, pages 51-56, 176, 177; ROD, pages 7, 9, 11.

This EIS References: Chapters II, III, IV, and Appendix D, J.

Impacts to both recreation facilities and experiences will be minimized by the application of mitigation measures. Each developed recreation site (area) will be protected by a NSO buffer. Along trails, particularly those with special designations, the foot path and visual corridor will be protected by controls placed on leasing developments.

During drilling and operating phases of oil and gas development activities, the road associated with a particular site will be closed to public recreation use. After the project site is abandoned the area may be converted to recreation use, provided that use is compatible with management direction for that area.

Prior to leasing, impacts to potential recreation developments will be considered. If the Forest is developed to the RFD described in the analysis assumptions, density of oil and gas wells will be sparse enough that recreation user contacts will be minimal. Abandoned well sites may actually serve as wildlife openings and thereby provide opportunities for wildlife viewing.

Should oil and gas development occur that requires a temporary reserve pit, fencing will be required for the safety of the publics, other forest users, as well as animals.

#### Issue Tracking:

Regional Guide and FEIS References: Regional Guide, Chap. 2, pages 4, 9, 10-12, 46, Chap. 3, pages 1, 3-13, 51, 62; FEIS, Summary, pages 9, 10, 13, Chap. 3, pages 3-6, Chap. 4, pages 10, 11, 14, 34-45, 46, Appendix C, pages 34-41.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 90-92, Chap. III, pages 3-6, 19-24; FEIS, Summary, page 15, Chap. I, page 14, Chap. VI, pages 79-81; ROD, pages 1, 4-6, 9, 11, 13, 14.

This EIS References: Chapters III, IV, Appendix B, D, G.

#### ISSUE:

*Wildlife Resources* - Oil and gas developments in the Pike and San Isabel NF's and the Cimarron and Comanche NG's endanger critical natural habitats for wildlife. It is not necessary to create an unhealthy environment for the wildlife. (EA-88)

The Buffalo Peaks area north of Buena Vista is important for the sheep and elk population which use the area for wintering and breeding. The area is extremely fragile. (EA-43, 54)

Specific concerns relative to the Cimarron NG in Kansas: The long-billed curlew, a Federal category 2 candidate species, is primarily a bird of grassland rather than wetlands as indicated. The Arkansas darter is listed as threatened in Kansas, as well as being a Federal category 2 candidate species. The Texas horned lizard, long-billed curlew, ferruginous hawk, and swift fox are not listed in Kansas, but all are category 2 candidates. The migrant loggerhead shrike (*Lanius ludovicianus migrans*) should also be included as a category 2 species. The Arkansas River shiner is a Federal category 2 candidate species, in addition to being listed as an endangered species by Kansas. The sandhill goosefoot (*Chenopodium cycloides*) is a category 2 candidate plant species occurring in Morton County. (EFA-2, 10, 13)

The Forest Service should be aware that the Migratory Bird Treaty Act protects all species of migratory birds, in addition to those on the Indicator Species list. The Act prohibits, by any means or in any manner, the direct or indirect capture, possession, or destruction of any migratory bird, its nest, its eggs, its young, or any parts thereof. Destruction or removal of active nests or eggs of a protected bird species may be considered a taking activity under the Act. (EFA-2)

## RESPONSE AND ACTION:

*Wildlife Habitat.* Goals for managing wildlife habitats are displayed in the Forest Plan, Chapter III, pages 3-6. Specific standards and guidelines for wildlife management are found in the Forest Plan, Chapter III, pages 28-35 and in Management Area Prescription requirements, Chapter III, pages 86-241. Minimum standards for wildlife habitats are given in the Wildlife and Fish Resource Management section under Management Requirements in Chapter III, pages 28-35. These minimum standards were used to develop recommendations and mitigation measures common to all alternatives as well as recommendations for specialized stipulations when required.

The Buffalo Peaks WSA is not available for oil and gas leasing by virtue of the Reform Act until a determination is made concerning their possible designation as Wilderness.

### Issue Tracking:

Regional Guide and FEIS References: Regional Guide, Chap. 1, page 8, Chap. 2, pages 18-21, 46, 47, Chap. 3, pages 14-16, 51, 62, 63; FEIS, Chap. 3, pages 8-10, Chap. 4, pages 5, 6, 16, 17, 22, Appendix C, pages 28-33.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 84, 85, Chap. III, pages 3-6, 28-35; FEIS, Summary, page 2, Chap. I, page 13, Chap. VI, pages 117-131; ROD, pages 4, 6, 9-11, 17, 18.

This EIS References: Chapters I, II, III, and IV, Appendix B, D, G.

*Effects on Threatened and Endangered Species.* Analysis of impacts to Threatened and Endangered wildlife, fish and plant species found on the Forest includes mapping and compilation of acres of habitat impacted directly, indirectly and cumulatively from past and planned future activities. The analysis includes known and potential habitat. T&E species and their habitats are protected by law. Where there is a threat to a species or its habitat, standard lease stipulations will provide the necessary protection. The plan is currently not in compliance with the Endangered Species Act. Assessments must be completed in order for the Forest Service to adequately design the leasing program to protect all threatened and endangered species from direct, indirect and cumulative impacts. These requirements were confirmed in the case of Connor vs. Burford: A biological assessment of all threatened and endangered species occurring within the Forests and Grassland and their habitats; Analysis of the potential affects to these species from all activities involved from the lease stage through full development stages. (EA-147)

The DEIS does not contain a biological opinion concerning the potential effects on endangered and threatened species from the U.S. Fish & Wildlife Service. This deficiency must be corrected, and the biological opinion must be included in the EIS. (EA-145, 147, EFA-1)

This draft recognizes only federally listed threatened and endangered species as deserving full protection from impacts. State listed species should be given the same consideration and protection. The Division should be included in coordination projects, studies and decisions regarding threatened and endangered species. Only the U.S. Fish and Wildlife Service is stipulated for such interaction at this time. (EFA-12)

## RESPONSE AND ACTION:

Analysis of impacts to Threatened and Endangered wildlife, fish and plant species found on the Forest includes mapping and compilation of acres of habitat impacted directly, indirectly and

cumulatively from past and planned future activities. The analysis includes known and potential habitat. By law areas are protected under standard lease stipulations.

A biological assessment will be written on the preferred alternative and an opinion obtained from the U.S. Fish and Wildlife Service.

#### Issue Tracking:

Regional Guide and FEIS References: Regional Guide, Chap. 1, page 8, Chap. 2, pages 18-21, 46, 47, Chap. 3, pages 14-16, 51, 62, 63; FEIS, Chap. 3, pages 8-10, Chap. 4, pages 5, 6, 16, 17, 22, Appendix C, pages 28-33.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 84, 85, Chap. III, pages 3-6, 31-35; FEIS, Summary, page 12, Chap. I, page 13, Chap. VI, pages 117-131; ROD, 4, 5, 6, 9, 10, 11, 15, 17, 18.

This EIS References: Chapters III, IV, Appendix B, D, G.

#### ISSUE:

*Mineral Resources* - The proposed oil/gas leasing arrangement for federal lands in Southern Colorado should be used for this purpose only as a last resort during an energy crisis. There are presently more than adequate fossil fuel reserves. These lands in question can better serve our future needs as natural wildlife preservations. Additional roads, heavy equipment traffic, and spillage of hazardous materials would provide a serious and unnecessary impact on these wild environments. (EA-126)

We are concerned about the leasing or not leasing in areas based on "potential mineral" classification. We are under the impression that lands not withdrawn should be made available for lease and for the Forest Service to arbitrarily start withdrawing lands from leasing activity based on someone's opinion that an area has high, moderate or low mineral potential is absurd and a very dangerous concept to introduce into the leasing process. (EA-21, 148, 149, 154, EFA-6)

#### RESPONSE AND ACTION:

A mineral potential evaluation was conducted to determine the possible existence of leasable mineral deposits on the Forest. A set of general criteria was established which included known favorable geology and structure, known mineral occurrences and reserves (if data available), and field activity related to mineral exploration, development and production. The potential of NFS land areas indicating low, moderate, high and unknown oil and gas mineral potential was determined by J. S. Dersch, M. C. Martinez and BLM staff by utilizing existing geologic studies (please see Chapter V for biographies of IDT members).

An assessment of mineral resource potential for locatable and leasable minerals for the Pike and San Isabel National Forests and the Cimarron and Comanche National Grasslands was prepared by John S. Dersch, Geologist, Lakewood, Colorado, on April 6, 1981, and revised on May 15, 1984. The assessment was compiled from information obtained from Federal, State, and private sectors, including industry.

The Bureau of Land Management, Canon City District, Canon City, Colorado; and, Tulsa District, Tulsa, Oklahoma, provided current information to update the existing Mineral Potential Report for the Forest (Forest Plan, Appendix H). In addition, new mineral resource potential information by

the Forest Geologist included in this EIS for the Mineral Potential Report were substantiated by a map and report entitled Mountain Front Thrust, Southeastern Front Range and Northeastern Wet Mountains, Colorado, by Arthur F. Jacob, Rocky Mountain Association of Geologists, 1983.

The Rocky Mountain Oil and Gas Association was invited to participate in determining the mineral resource potential for the Forest.

#### Issue Tracking:

Regional Guide and FEIS References: Not specifically addressed during development of the Regional Guide.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 55-62, Chap. III, pages 52-68, Appendices H and I; FEIS, Chap. I, pages 13, 19, 22, Chap. III, pages 107-109, 113, 114, Chap. VI, pages 70-78, 220, 221, 223, 224, 233, 235, 236, 247, 251, 253, 260.

This EIS References: Chapter I, II, IV; Appendix C, E, K.

#### ISSUE:

*Wilderness and Wilderness Study Areas* - This is a direct contradiction to the concept of wilderness. Too many of our precious wild and scenic areas have already been destroyed by poorly controlled exploitation. The following ecologically important areas should be closed to leasing: The five proposed wilderness areas (included in the Wirth and Armstrong Wilderness Bills) Sangre de Cristo, Greenhorn Mtn., Buffalo Peaks, Lost Creek and Spanish Peaks. The highest and best use of the areas mentioned above, is as high quality watersheds and areas of public recreation and not as production units for resource extraction. (EA-4, 5, 6, 7, 8, 10, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 56, 57, 58, 59, 61, 62, 63, 64, 65, 66, 68, 69, 71, 72, 73, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94, 95, 96, 97, 98, 100, 101, 105, 108, 109, 110, 111, 112, 113, 115, 119, 124, 125, 130, 131, 133, 134, 135, 136, 137, 138, 143, 147; EFA-10)

#### RESPONSE AND ACTION:

Wilderness and Wilderness Study Areas (WSAs) are removed from leasing by congressional authority until a determination is made concerning their suitability for inclusion in the National Wilderness Preservation System. If WSAs are determined to be unsuitable they will then be available for oil and gas leasing under the same stipulations as the remainder of the National Forests and Grasslands.

With mitigation techniques applied to developments outside Wilderness there should be no short or long term physical or environmental impacts. However, visitor experiences may be affected in the short term by noise and lights associated with drilling activity. This impact is very short, generally less than six weeks.

The proposed addition to the Lost Creek Wilderness was designated as a "further planning area" in the Forest Plan. It was to be treated similar to a wilderness study area until its suitability for wilderness designation was determined. A decision was made concerning this area in the Regional Forester's Record of Decision for the Forest Plan (approved October, 1984). The area was deemed not suitable for wilderness designation and is therefore to be managed according to general forest direction and is available for oil and gas development.

The four Wilderness Study Areas (Buffalo Peaks, Greenhorn Mountain, Sangre de Cristo and Spanish Peaks) are removed from leasing until a determination is made concerning their possible designation as Wilderness. All other areas, through the Final EIS for the RARE II areas and the Colorado Wilderness Act of 1980 (P.L. 88-577), were removed from further consideration for inclusion in the Wilderness Preservation System. This includes Aspen Ridge, Tanner Peak and the Kenosha Range. These lands will be managed according to Forest Plan Management Area Prescription requirements for their area.

All NFS lands legally available for oil and gas leasing were analyzed for environmental impacts from oil and gas activities. As indicated by the impact analysis, specific lands may be removed from leasing to protect the surface resources.

#### Issue Tracking:

Regional Guide and FEIS References: Regional Guide, Chap. 2, pages 12-18, 33, 46, Chap. 3, pages 13-14; FEIS, Chap. 3, pages 6, 7, Chap. 4, page 33, Appendix C, pages 41-43, 49-51.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 83, 84, Chap. III, pages 3-6, 24-27; FEIS, Summary, pages 11, 12, Chap. I, page 12, Chap. VI, pages 137-172, Appendix C (340 pages); ROD, pages 1, 3, 4, 5, 6, 12, 17, 20.

This EIS References: Chapters I, II, IV; Appendix D.

#### Issue Tracking:

Regional Guide and FEIS References: Not specifically addressed during development of the Regional Guide.

Forest Plan, FEIS and ROD References: Forest Plan, Preface, pages xii, xiii, Chap. II, pages 58-60, 85, 86, Chap. III, pages 52-68; FEIS, Summary, page 4, Chap. II, pages 6, 13, Chap. VI, pages 71-79; ROD, pages 3, 4.

This EIS References: Chapters II, III, IV, Appendix VI, IX, X.

Forest Service Roadless areas - Little Fountain Creek Canyon, Aspen Ridge and Tanner Peak - all adjacent to the BLM WSAs which are being considered for wilderness designations. (EA-4, 5, 6, 7, 8, 10, 13, 15, 16, 17, 19, 20, 22, 24, 25, 26, 28, 29, 30, 31, 32, 33, 35, 38, 40, 41, 42, 44, 45, 46, 47, 52, 53, 57, 59, 61, 62, 63, 64, 65, 66, 67, 71, 73, 75, 76, 77, 78, 82, 84, 85, 86, 87, 89, 90, 92, 95, 96, 108, 111, 121, 122, 124, 125, 131, 133, 135, 138, 147)

#### **RESPONSE AND ACTION:**

Forest Service roadless areas, BLM --- ??  
"To complete later"

#### **ISSUE:**

*Wild and Scenic River System Candidates* - The Badger Creek, Huerfano, Cimarron and Arkansas Rivers are all potential additions to the Wild & Scenic Rivers System; oil and gas development would destroy their eligibility. If these possess outstandingly remarkable value and are eligible for inclusion in the national rivers system, the DEIS should be amended at p. IV - 8, 9 to reflect the



requirements of interim protection for such rivers. (EA-4, 5, 6, 7, 8, 10, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 25, 26, 27, 28, 30, 31, 32, 33, 35, 38, 42, 45, 46, 47, 52, 53, 56, 57, 58, 59, 61, 62, 63, 64, 65, 66, 67, 68, 71, 72, 73, 75, 76, 77, 78, 80, 82, 85, 86, 87, 89, 90, 92, 95, 96, 97, 100, 101, 102, 105, 108, 110, 111, 112, 113, 115, 119, 121, 123, 124, 125, 131, 135, 138, 147)

The South Platte River from Cheesman Reservoir downstream to the confluence of the north and south forks of the South Platte River is potentially eligible as a recreational component to the National Wild and Scenic River System. This segment should be afforded the same protection in the FEIS as that segment on the South Platte between Elevenmile Canyon Reservoir and Cheesman Reservoir. Waterton and Cheesman Canyons and North Fork of the South Platte areas receive heavy recreational use and are critical habitat for one of Colorado's last low-elevation herds of bighorn sheep. The one-half mile protection corridor should be a *minimum* width and additional protection measures should be employed on a case-by-case basis. (EA-4, 5, 7, 8, 10, 13, 15, 16, 17, 18, 20, 22, 23, 24, 25, 26, 27, 29, 32, 33, 35, 38, 40, 42, 45, 46, 47, 51, 52, 53, 56, 57, 58, 59, 61, 62, 63, 64, 65, 66, 67, 68, 71, 72, 73, 75, 76, 77, 78, 80, 82, 85, 86, 87, 89, 90, 92, 95, 96, 97, 100, 101, 102, 105, 108, 110, 111, 112, 113, 115, 119, 121, 123, 124, 125, 131, 135, 138, 147) (EFA-9)

#### **RESPONSE AND ACTION:**

Because of the interest in the South Platte River as a potential for W&S classification, additional segment of the river will be removed from leasing until further studies determine the eligibility of the river for designation. The South Platte River from Elevenmile Dam and Cheesman Reservoir has been determined to be eligible designation and awaits suitability study. From Cheesman Reservoir to Waterton will be withdrawn from leasing until an eligibility study can be completed. Badger Creek was administratively removed from oil and gas leasing until a suitability determination can be done.

#### **ISSUE:**

*Special Areas* - 39 Mile Mountain in South Park is an island of naturalness and should not be open to oil and gas leasing. Oil and gas development would seriously endanger the abundant wildlife habitat and pristine beauty. (EA-4, 5, 6, 7, 8, 10, 13, 16, 17, 18, 20, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 38, 40, 42, 45, 46, 47, 51, 52, 53, 54, 57, 58, 61, 62, 63, 65, 66, 67, 68, 71, 73, 75, 76, 77, 78, 82, 84, 85, 87, 89, 90, 92, 95, 96, 111, 121, 122, 124, 125, 131)

#### **RESPONSE AND ACTION:**

The roadless area was determined not suitable for Wilderness designation in the first environmental statement for RARE II areas, January, 1979. This area will be protected as indicated by impact analysis with standard lease terms, COA's and supplemental stipulations as appropriate.

#### **ISSUE:**

*Bureau of Reclamation (BR) Projects* - The BR has project reservoirs located on lands identified in the low potential for mineral development (Twin Lakes Reservoir and Turquoise Lake). Should any proposals to lease or drill be received by the Forest Service, BR should be consulted on the leasing stipulations and/or drilling plan so that they can evaluate the activity in relation to protection of BR structures, water quality, water operations, and protection of terrestrial and aquatic life. (EFA-9)

**RESPONSE AND ACTION:**

The Bureau of Reclamation will be notified in the event that any future leasing activity is located near their projects. They will have the opportunity to review existing mitigation requirements for adequacy in protecting their operations.

**ISSUE:**

*Adjacent National Park Service Lands* - Several units administered by the National Park Service (NPS) may be impacted by project actions on NFS lands. Oil and gas activities on the ridgeline of the Sangre de Cristo Mtns., located near the eastern boundary of the Great Sand Dunes National Monument, could adversely impact scenic views from the Monument and affect Monument wildlife populations. In addition to possible impacts to scenic views from the Florissant Fossil Beds National Monument, NPS is concerned about impacts to Monument visitors' perceptions and experiences from oil and gas activities. These monuments should be identified in the FEIS "Affected Environment" chapter and possible impacts to them addressed in the "Environmental Impacts" chapter. Any oil and gas development activities proposed in the vicinity of the Santa Fe National Historic Trail should be fully evaluated in the FEIS to assess impacts to this trail and its users, and adequate mitigation measures should be identified. Two National Natural Landmarks (NNL), Spanish Peaks and Lost Creek Scenic Area, are located in the San Isabel and Pike NF's. There is no reference to these NNLs in the DEIS. Careful consideration of the values of these significant resources should be included in the FEIS. (EFA-9)

**RESPONSE AND ACTION:**

Upon receipt of an APD for leasing activities, coordination with NPS representative will be done. The Santa Fe NHT, the Spanish Peaks NNL and other areas are protected under standard lease terms and supplemental stipulations as appropriate.

**ISSUE:**

*Water Resources* - Avoid damage to precious stream and river areas. (EA-26)

We are opposed to the proposed plans for oil and gas development in areas that may impact valuable water resources. Specifically, Waterton Canyon, Cheesman Canyon, and the North Fork of the South Platte have apparently been saved from the Two Forks Dam as a result of adverse environmental impacts only to be threatened by the Forest Service efforts. (EA-102)

With respect to water quality, we recommend that surface disturbance should not be allowed in areas where sediment yield thresholds are already exceeded. We would like the EIS to demonstrate that impacts - even those associated with NSO activity - can be mitigated. In areas where sediment yield approaches the threshold, we recommend that adequate monitoring occur before and after lease decisions. (EFA-13)

**RESPONSE AND ACTION:**

Effects of short and long term oil and gas leasing and drilling activities on surface and groundwater supplies are discussed in Chapter IV.

Watersheds that are at or within 10 percent of exceeding sediment limits will have the Controlled Surface Use stipulation attached to them for protection of those areas. In addition, a No Surface

Occupancy stipulation will prohibit oil and gas drill sites from occupying riparian areas, wetlands and floodplains. Existing mitigation measures are designed to revegetate exposed soil in a timely manner and prevent sediment from moving off-site. Standard mitigating measures or regulatory practices for casing and capping wells, rehabilitating dry or unproductive holes, etc., are sufficient to prevent cross-contamination of aquifers if applied appropriately and inspected routinely. Implementation of the Underground Injection Control provisions of the Safe Drinking Water Act will be required.

Geophysical drill holes 2 1/2 inches or larger in diameter will be filled with subsurface material or like material to prevent migration of water, gas, oil, or other substances from one strata to another. Holes will be plugged at the surface and randomly checked by the Forest Service.

In the event spills occur the proponent will be required to immediately remove all contaminated material and replace it with fresh material and revegetate it. Proponents will be required to post a reclamation bond and have an approved emergency spill plan. The Forest Service will monitor for such accidental spill.

On rivers designated for Wild and Scenic River studies, no leasing will occur within a quarter mile on either side of the river.

#### Issue Tracking:

Regional Guide and FEIS References: Regional Guide, Chap. 1, pages 2, 8, Chap. 2, pages 2, 28-31, 45, 47, 48, Chap. 3, pages 26, 28-30, 51, 64; FEIS, Summary, page 6, Chap. 3, pages 16, 17, Chap. 4, pages 6, 7, 14, 16, 17, 19, 22-24, 43, 46, 47, Appendix C, pages 55-57.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 82, 83, 85, 86, Chap. III, pages 3-6, 50-52; FEIS, Summary, pages 10, 13, Chap. I, pages 11, 12, Chap. VI, pages 110-117; ROD, pages 1, 4, 5.

This EIS References: Chapters I, II, III, IV; Appendix B, E.

### **Social and Economic Environments**

#### **ISSUE:**

*Social and Economic Future* - Colorado's economic future will be grounded in the success of its two largest industries, manufacturing and tourism. Manufacturing will increase its share of the state's gross product as we attract more business to Colorado. To do that we must protect the primary asset that brings people here - our great quality of life as manifested by Colorado's natural beauty. To increase tourism, we must set aside our last remaining natural lands for protection, and we must manage them to maintain their ecology. If you deem oil and gas development necessary in these areas, please make it clear to the developers what they can and cannot do. Enforce all environmental stipulations on leases stringently. (EA-10, 60, 108, 114, 120, 128)

#### **RESPONSE AND ACTION:**

On developed recreation sites, the NSO stipulation will protect the recreation resource opportunities. There will be short term impacts to grazing. The fiscal return of leasing and production will generate revenues accruing to the Federal Treasury from lease bonus bids, annual rentals, and royalties based on annual production.

Impacts on economic investments in property near the Forest were not addressed in this EIS.

Oil and gas resources are one of the multiple resources managed on NFS lands. Lands are available for oil and gas leasing unless formally withdrawn from oil and gas leasing. Oil and gas resource development when conducted properly can be compatible with several other uses of the NFS lands. Application and enforcement of special NSO, CSU, Timing, and Lease Notices provide protection of sensitive resources as necessary and will minimize impacts.

All operators are required to post a pre-determined bond to reclaim areas should the operator default or declare bankruptcy.

Positive impacts to the social-economic environment will be noticed under alternatives I, II, and III where oil and gas development may occur and create jobs and other indirect influences on the economy. This is particularly most noticeable in the two grasslands which already have significant oil and gas resource development ongoing. A loss of leasing through denial would severely affect the social economic environment of some areas creating serious unemployment and loss of economic base.

**Issue Tracking:**

Regional Guide and FEIS References: Regional Guide, Chap. 2, pages 2-9; FEIS, Chap. 3, pages 2, 3, Chap. 4, pages 10, 11, 17, 18, 22, 27, 30, 33.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 1-15, 93, 94, Chap. III, pages 3-6; FEIS, Chap. II, pages 10-11, Chap. III, pages 15-53, Chap. VI, pages 45-51; ROD, pages 15-17.

This EIS References: Chapters IV; Appendix J.

**ISSUE:**

*Adjacent Private Lands* - Oil and gas leasing is of concern to me because of private land very near possible exploration area(s). Summer homes are adjacent to the upper Goat Creek drainage and just off the Rainbow Trail about ten miles northwest of Westcliffe, at the end of Verdumont Road in Custer County. (EA-139)

**RESPONSE AND ACTION:**

Protection to the adjacent lands and the human environment is required under standard lease terms, all notices to lessees, as well as local ordinances and regulations.

**Split-Estate Lands**

**ISSUE:**

*Location of Split-estate Minerals* - Where specifically are the split-estate lands? (EA-143, EFA-7)

**RESPONSE AND ACTION:**

A map of the split-estate lands within the boundaries of the Forest is located in Appendix F of this DEIS.

**ISSUE:**

*Decision to Lease on Split-Estate Lands* - Has the decision to lease on Forest non split-estate lands already been made in the Forest Plan? The process involved also is not clear. (EA-143)

**RESPONSE AND ACTION:**

This EIS analyzes and discloses the expected environmental impacts including the possible cumulative impacts on split estate lands where minerals are federally owned and the surface estate is owned or managed by parties other than the Forest Service, where such lands are within the administrative boundaries of the Pike and San Isabel National Forests and Comanche National Grassland, Colorado, or within the administrative boundary of the Cimarron National Grassland, Kansas.

The BLM has the authority to lease split-estate land minerals located within the Forest.

## Issue Tracking:

Regional Guide and FEIS References: Not specifically addressed during development of the Regional Guide.

Forest Plan, FEIS and ROD References: Not specifically addressed during development of the Forest Plan.

This EIS References: Chapters I, II, III, IV; Appendix B.

**Oil and Gas Leasing****ISSUE:**

*Forest Service Oil and Gas Regulations* - The Forest Service's new oil and gas regulations will govern oil and gas leasing decisions for all national forests. The new regulations provide for notice to the public of Forest Service decisions on what lands are administratively available for leasing, and what lands may be offered by the Department of the Interior for lease sale. They confirm that these decisions are appealable. The Forest Service must also provide public notice of receipt of an Application for Permit to Drill (APD). A decision to approve an APD is also subject to appeal. The Forest Service must comply with the National Environmental Policy Act (NEPA), 42 U.S.C. Section 4321 *et seq.*, throughout the process of evaluating and offering lands for lease sale. The adequacy of the agency's environmental documents is a matter of public concern. The public has a right to challenge the Forest Service's failure to fulfill its NEPA duties. It is not clear to me what process the Pike-San Isabel Forest is following to overcome the current deficiencies in the discussion of oil and gas leasing in its Forest Plan and EIS. (EA-153)

**RESPONSE AND ACTION:**

As directed by the FS Oil and Gas Regulations that implemented the Reform Act, this EIS will analyze and disclose environmental impacts as a result of a projected RFD and post-leasing activities.

## ISSUE:

*Leasing Process* - Where does the EA and where does granting the lease fit into the process described in the DEIS? Does the EA come before or after the lease is issued. Where does receipt of a special use permit fit in the process described? Does additional site-specific analysis mean an EA? Appendix IV, pg. 36 states "Site-specific environmental analysis of tracts under oil and gas lease applications will be conducted by the Forest Service for all NFS lands". Does this mean an EA will be done for leases already granted? Or, an EA will be done for proposed leases? Will the EA be before the lease is granted? The summary and the introduction of the EIS should clearly explain: 1) Why the Forest believes that site-specific impacts do not need to be analyzed before the lease is granted? 2) At what point in the process will site-specific impacts be analyzed in a NEPA document? Will the analysis be an EA and Decision Notice? 3) How does that NEPA document relate to this EIS? 4) At what point can the public have input regarding site-specific effects? Is this input before or after the lease is granted? The document uses as the basis for the alternatives and the analysis lands with high, moderate and low potential for oil and gas leasing and industry interest. This establishes a bias in the document towards leasing. (EA-143)

The Forest should determine which lands, from an ecological, as well as administrative, point of view should not be leased, then analyze which remaining lands have high, moderate and low potential. User needs should be secondary to ecological protection. The list of criteria used to deny leases should contain the following additions: tundra and timberline areas; dispersed recreational areas and recreational access corridors such as roads leading up to the crest and roads crossing the crest of the Sangres (Colony Lakes, Hayden Pass, Music Pass, Venable Pass, Medano Pass, Hermit Pass, Cloverdale Basin); the Huerfano Valley road; areas around popular dispersed recreation (Blanca Pk., Iron Nipple, east of the Buffalo Pk. WSA). (EA-143)

It is not clear after review of this document, what procedure if any, will be taken to conduct an environmental evaluation on a case by case lease application. Will an EIS or EA be required for each specific lease, or is this document intended to blanket all oil and gas leasing activities? EPA recommends that an individual environmental evaluation be conducted on each leasing activity. This is especially significant considering the wide range of area the DEIS covers. (EFA-11)

## RESPONSE AND ACTION:

A complete discussion of the leasing process is found in Chapter I of this EIS. Alternatives pertaining to mineral potential were removed from further consideration in this EIS.

A number of sensitive lands could be removed as a result of the decisions contained in the Record of Decision for this EIS. All other sensitive lands subject to leasing are protected by standard lease terms and supplemental stipulations.

As a result of this EIS and as required by the FS Oil and Gas Regulations, full disclosures of environmental impacts from a projected RFD is the basis for leasing decisions. Authority to BLM to lease specific lands is subject to verification of stipulations identified in this EIS for such lands. If conditions warrant, a new NEPA process will be undertaken before a consent decision is granted.

## ISSUE:

*Discretionary Authority* - It is stated that the Forest Service would continue current management with some lands removed from leasing available through discretionary authority. What is meant by discretionary authority? Can expansion of land available for leasing also occur on a discretionary basis? If the answer is yes, what circumstances would warrant discretionary authority? It is not

sufficient to state that the Agency will use discretion, without adequately defining the term. (EFA-11)

**RESPONSE AND ACTION:**

The Reform Act conveyed all authority for leasing decisions to the Secretary, U.S. Dept. of Agriculture. Certain lands identified as highly sensitive because of pending legislative processes or resource sensitivity may be removed as a result of this analysis. The Forest Service will exercise the "DNL" authority as appropriate when conditions warrant.

The total acres of lands which are legally available for leasing on this Forest will not increase unless Congress denies the designation of specific suitable lands recommended for Wilderness or revokes an existing withdrawal.

**ISSUE:**

*Discretionary No-Lease Areas for Wildlife* - None of your proposed alternatives consider the possibility of not leasing areas of the Forest based on high wildlife habitat values. The areas you consider for excluding leases are several municipal watersheds, roadless areas and other special-use sites. This reflects an assumption of the Forest Service that every square inch of wildlife habitat on the Pike/San Isabel -- no matter how sensitive or crucial to the species involved, no matter how rare or endangered the species affected -- is less important than oil and gas leasing. (EA-3, 145)

**RESPONSE AND ACTION:**

*Wildlife Habitat.* Goals for managing wildlife habitats are displayed in the Forest Plan, Chapter III, pages 3-6. Specific standards and guidelines for wildlife management are found in the Forest Plan, Chapter III, pages 28-35 and in Management Area Prescription requirements, Chapter III, pages 86-241. Minimum standards for wildlife habitats are given in the Wildlife and Fish Resource Management section under Management Requirements in Chapter III, pages 28-35. These minimum standards were used to develop recommendations and mitigation measures common to all alternatives as well as recommendations for specialized stipulations when required.

Analysis of impacts to Threatened and Endangered wildlife, fish and plant species found on the Forest includes mapping and compilation of acres of habitat impacted directly, indirectly and cumulatively from past and planned future activities. The analysis includes known and potential habitat. These areas are protected by using the standard stipulations in oil and gas lease agreements.

**Issue Tracking:**

Regional Guide and FEIS References: Regional Guide, Chap. 1, page 8, Chap. 2, pages 18-21, 46, 47, Chap. 3, pages 14-16, 51, 62, 63; FEIS, Chap. 3, pages 8-10, Chap. 4, pages 5, 6, 16, 17, 22, Appendix C, pages 28-33.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 84, 85, Chap. III, pages 3-6, 28-35; FEIS, Summary, page 2, Chap. I, page 13, Chap. VI, pages 117-131; ROD, pages 4, 6, 9-11, 17, 18.

This EIS References: Chapters III, and IV; Appendix B, D, I.

**ISSUE:**

*Manitou Experimental Forest* - We object to the decision not to issue leases in the Manitou Experimental Forest. (EA-149)

I vigorously appealed the Forest Service's decision to lease much of the Manitou Experimental Forest for oil and gas exploration in January 1988 because of our concerns for our daughter's health. Those concerns remain unchanged. You are proposing to lease 2880 acres of the Manitou Experimental Forest for experimental oil and gas research. This means there will be extensive drilling in this area regardless of the likelihood of finding oil. With over two million acres available for leasing, why do you have to choose this property only 1-1/2 miles from our house? (EA-132)

**RESPONSE AND ACTION:**

The Manitou Experimental Forest was removed from leasing by the Chief, USDA, Forest Service, on October 26, 1988.

Issue Tracking:

This EIS References:

**Planning Process**

**ISSUE:**

*Conformity with Existing Management Plan* - The Oil and Gas DEIS does an inadequate job at protecting the management goals of the Forest, as stated in the Pike/San Isabel Land and Resource Management Plan. The DEIS must set certain limits or prohibit oil and gas development on certain parcels of the Forest to fulfill the goals of the Pike/San Isabel Management Plan. (EA-150)

**RESPONSE AND ACTION:**

The FS Oil and Gas Regulations require compliance of oil and gas leasing with existing Land and Resource Management Plans. As appropriate, the Forest Plan will be amended to reflect necessary changes resulting from this EIS.

**ISSUE:**

*Public Involvement* - Allowing oil and gas development in the Pike and San Isabel NF's, as well as the Cimarron and Comanche NG's inevitably results in detrimental effects to the environment. Anything the Forest Service decides on this matter should be introduced to the general public. (EA-107)



## **RESPONSE AND ACTION:**

The NEPA process requires public involvement of all planning actions on NFS lands. This EIS process is subject to public reviews during the draft phase.

## **ISSUE:**

*DEIS Purpose and Need* - The purpose of this EIS is not clear. The reader is confused as to whether the purpose is to simply disclose expected effects from the issuance of oil and gas leases or whether this EIS establishes criteria and contains an analysis so the Forest can "consent or not consent to issuances of....leases" as stated in the Federal Register Notice. It is not clear if the Forest Plan has already made the decision for lands on which the Forest Service manages both the surface and the minerals. The Final EIS must clarify the following: 1) What, specifically is the purpose of this EIS? 2) How does this EIS relate to the Forest Plan? (EA-143)

*Proposed Action Unclear* - The public cannot understand and comment intelligently without knowing what it is the Forest Service intends to do. A new Draft EIS should clearly identify the proposed action of the Forest Service. (EA-145)

## **RESPONSE AND ACTION:**

This is a new draft EIS for oil and gas leasing on the Forest. Chapter I provides the reader with information on the purpose and need and the proposed action.

## **ISSUE:**

*Forest Plan Amendment* - Nowhere in the draft EIS do we see a proposed amendment to the Pike-San Isabel Forest Plan. (EA-33)

## **RESPONSE AND ACTION:**

Chapter I, II, and Appendix A of this EIS discusses the need to prepare a Forest Plan amendment.

## **ISSUE:**

*Maps* - The maps are in violation of 40 CFR section 1502.8, which states that graphics need to be readily understandable by the public. The maps fail to show overlapping between timing and control surface use stipulations. The public is unable to tell if all resources are being protected and if the Forest Service is in compliance with the plan when leases are issued in the future. The maps fail to show where the different types of stipulations and controlled surface use stipulations are to be used. The public is provided with only a general map grouping the various timing, NSO, and controlled surface use stipulations into single categories. If the Forest Service is unable to provide adequate maps of some of the leasing stipulation areas such as wetlands, floodplains and steep slopes, then it should be stated in the amendment that these stipulations will be added to all leases issued on the Forest and if these features exist in the lease area, they will be protected. (EA-33)

**RESPONSE AND ACTION:**

A complete set of quadrangles maps at a scale of 1:24,000 is available for public review at the Forest Supervisor's Office, 1920 Valley Drive, Pueblo, Colorado. A discussion of the series of maps used, is found in the Summary, Chapter I and Appendies E, F, and G of this EIS.

**ISSUE:**

*Redraft of the EIS* - We recommend that the document be redrafted in order to analyze alternatives which address resource concerns that the Forest Service has the expertise and knowledge to address and manage. (EA-149)

We strongly recommend that the Pike/San Isabel National Forest Oil and GAs Leasing EIS be redrafted with a new, more reasonable set of alternatives. The redraft should include reasonable development assumptions and eliminate analytical inaccuracies and oversights. It is critical that the document be redrafted to a high standard since it will be used as a guide by other forests in the Region when they begin their oil and gas analyses. (EA-145, 149)

**RESPONSE AND ACTION:**

The new EIS discusses alternatives in Chapter II. Alternative considered and analyzed are in compliance with the FS Oil and Gas Regulations. The development of reasonable foreseeable activities is discussed in Appendix C of this EIS.

**ISSUE:**

*Consent to Lease Decision* - We strongly urge the Forest Service to make specific decisions in the Record of Decision on the Leasing EIS indicating where leases will be issued and with what types of stipulations. The point at which an appeal may be filed must be limited to the step at which the planning documents are formally adopted by the Forest Service, rather than when parcels are forwarded to the BLM accompanied by a decision notice to object or not object to lease issuance. It is crucial that the decision to lease or not to lease be made in the planning documents, before recommendations are formally submitted to the BLM. (EA-149)

**RESPONSE AND ACTION:**

Leasing decisions for available NFS lands on this Forest will be made in the Record of Decision. Authority to BLM to issue leases to specific lands is subject to a verification of stipulation process discussed in Chapter I.

**Alternatives****ISSUE:**

*Range of Alternatives* - The Forest Service fails to provide an adequate range of alternatives. Each alternative is based on a certain level of leasing and development, regardless of the status of other resources and the direction of the forest plan. This approach assumes that oil and gas is a superior resource use to the other forest resources, with management of fish, wildlife, recreation and other resources secondary to that of oil and gas. The assumption that one resource has priority over others forest-wide violates the principle of multiple use forest management. A proper range of

alternatives would be based on the forest plan and the need to protect and manage the full array of forest resources. Oil and gas leasing should be managed to conform to the management priorities and prescriptions of the forest plan rather than vice versa. The consideration of oil and gas in isolation from other resources results in a lack of site-specific analysis. Suitability for leasing and development must be based on all resources and values for a specific area, not just the level of mineral potential. Areas with environmental sensitivity, roadless character, and recreation potential should be closed to leasing regardless of mineral potential. All critical winter range, birthing areas, riparian areas, and potential Wild and Scenic Rivers and wilderness areas should be excluded from all leasing activities. (EA-147, 150)

Other alternatives should make forest uses other than oil and gas a priority use. Making oil and gas development on the forest top priority and attempting to protect all other forest resources with stipulations is not adequate. (EA-150)

## **RESPONSE AND ACTION:**

A range of reasonable alternatives is required by the NEPA to assess direct, indirect, and cumulative impacts from oil and gas leasing development on the affected environment. This EIS contains that range of alternatives. Oil and gas mineral resources are one of the natural resources within the multiple use spectrum of resources on National Forest System lands. The Multiple Use-Sustained Yield Act of 1960 and the National Forest Management Act of 1976 direct the Forest Service to manage National Forest System lands for multiple uses. Development of oil and gas mineral resources provides significant benefits to the economic base for the Cimarron National Grassland area.

Identification of supplemental stipulations for oil and gas leasing development will be applied in areas where leasing with surface activity will be allowed subject to conditions. Surface activities will be prohibited in sensitive areas, such as watersheds not currently withdrawn from mineral leasing on the Forest, where the conditions for protection of the resources cannot be met to Forest Service satisfaction.

The BLM is responsible for subsurface inspection and compliance of development activities for leasing such as drilling. Stringent rules and regulations are imposed by BLM to ensure that no leakage or contamination into groundwater aquifers occurs from oil and gas drilling.

All NFS lands, regardless of identified mineral resource or geologic potential, within the Forest will be made available for leasing and future exploration and development, unless specifically precluded by Acts of Congress or other form of formal withdrawal, including administrative withdrawals. As the surface resource management agency, the Forest Service has a responsibility and obligation in conjunction with the BLM to ensure that mineral activities on NFS lands are conducted to minimize conflicts with other uses and prevent damage to surface resources, and that where necessary, affected areas are rehabilitated after mineral operations are completed. Appropriate terms, conditions or stipulations will be added as necessary to all permits or leases to provide adequate protection and rehabilitation for surface resources of NFS lands.

### **Issue Tracking:**

Regional Guide and FEIS References: Not specifically addressed during development of the Regional Guide.

Forest Plan, FEIS and ROD References: FEIS, Chap. II, pages 1-59, Chap. VI, pages 42-45; ROD, 1-14.

**ISSUE:**

*Mineral Potential Alternatives* - Another area of extreme concern relates to the ill-conceived decision to develop leasing alternatives based upon mineral potential. Moreover, federal laws and policies dictate that all lands not withdrawn are to be made available to oil and gas leasing subject, of course, to specific resource concerns. To make leasing decisions based upon potential is contrary to current policy and law. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA) specifies which federal lands are unsuitable for leasing: wilderness and WSAs. Nothing in the law indicates that oil and gas leasing should be prohibited in areas considered to have low or moderate potential. These alternatives set a dangerous precedent. It is conceivable that another forest may believe the adoption of such onerous alternatives is justifiable because they were included in the "model" analysis. (EA-148, 149)

Using mineral potential creates problems because of its dynamic nature. What may be considered low potential today, may not be in coming years when mineral economic conditions change. Using mineral potential could make the document obsolete if market conditions for oil and gas changed. The alternative used in the analysis should be revised to reflect those values for which the Forest Service has authority; that is surface resources. The most significant concern with using mineral potential is the leasing decisions which would result from the alternatives. Depending on the alternative, certain lands would not be leased if low to moderate potential existed. A reasonable range of alternatives should be analyzed which addresses surface resources and forest objectives. (EA-152)

**RESPONSE AND ACTION:**

Two leasing alternatives based upon mineral potential were considered but eliminated from further study in the EIS. Regardless of mineral potential, all NFS lands legally available for oil and gas leasing were analyzed in the impact analysis for the EIS.

A range of reasonable alternatives is required by the NEPA to assess direct, indirect, and cumulative impacts from oil and gas leasing development on the affected environment. This EIS contains that range of alternatives. Oil and gas mineral resources are one of the natural resources within the multiple use spectrum of resources on National Forest System lands. The Multiple Use-Sustained Yield Act of 1960 and the National Forest Management Act of 1976 direct the Forest Service to manage National Forest System lands for multiple uses. Development of oil and gas mineral resources provides significant benefits to the economic base for the Cimarron National Grassland area.

Identification of supplemental stipulations for oil and gas leasing development will be applied in areas where leasing with surface activity will be allowed subject to conditions. Surface activities will be prohibited in sensitive areas, such as watersheds not currently withdrawn from mineral leasing on the Forest, where the conditions for protection of the resources cannot be met to Forest Service satisfaction.

The BLM is responsible for subsurface inspection and compliance of development activities for leasing such as drilling. Stringent rules and regulations are imposed by BLM to ensure that no leakage or contamination into groundwater aquifers occurs from oil and gas drilling.

All NFS lands, regardless of identified mineral resource or geologic potential, within the Forest will be made available for leasing and future exploration and development, unless specifically preclud-

ed by Acts of Congress or other form of formal withdrawal, including administrative withdrawals. As the surface resource management agency, the Forest Service has a responsibility and obligation in conjunction with the BLM to ensure that mineral activities on NFS lands are conducted to minimize conflicts with other uses and prevent damage to surface resources, and that where necessary, affected areas are rehabilitated after mineral operations are completed. Appropriate terms, conditions or stipulations will be added as necessary to all permits or leases to provide adequate protection and rehabilitation for surface resources of NFS lands.

Issue Tracking:

Regional Guide and FEIS References: Not specifically addressed during development of the Regional Guide.

Forest Plan, FEIS and ROD References: FEIS, Chap. II, pages 1-59, Chap. VI, pages 42-45; ROD, 1-14.

This EIS References: Chapters II; Appendix H.

**ISSUE:**

*Preferred Alternative* - The preferred alternative doesn't best protect the environment! The DEIS does not estimate negative impacts on recreation, water quality, and fish & wildlife of the substantial impacts identified. (EFA-10)

**RESPONSE AND ACTION:**

In the Record of Decision, the preferred alternative was in part based on the protection of recreation, water quality, and fish and wildlife resources.

**ISSUE:**

*Alternatives Fail to Consider Surface Impacts* - EIS presents wildlife advocates with no meaningful choice of alternatives. All of your alternatives in this EIS are structured to identify only the geological costs of not leasing portions of the forest. EIS tells us what the cost to the oil and gas industry will be if we arbitrarily limit oil and gas leasing - but not what the cost and benefits will be if we limit oil and gas leasing for the protection of our important biological and ecological areas. The Forest Service should develop a new set of alternatives that consider impacts of different development scenarios on the surface resources of the forest, including fish and wildlife. Alternatives should consider making areas unavailable for leasing, and requiring non-waivable no surface occupancy stipulations, for areas of the Forest based on the presence of surface resources that may indicate a conflict with oil and gas development, including threatened and endangered species habitat, big game winter range, nesting and calving areas, and other sensitive wildlife habitats. (EA-145)

The EIS asserts that NSO and other stipulations will offer needed protection, but, there is not enough information to substantiate that conclusion. We recommend that the protection of special interest resources, including areas of old growth forest and roadless areas, be considered in each alternative. (EFA-13)

In the production phase, air pollutants such as carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide and hydrogen sulfide can be produced from a variety of processes and sources. Accidental explosions, fire, blowouts, oil spills and leaks can occur causing potentially severe short

term problems. These "severe short term problems" can take our daughter's life--even if they occur 15 to 20 miles away depending upon the wind drift at the time. I was unable to find where you addressed the impact of the refineries--the worst air pollution source of all. You are proposing to lease 2880 acres of the Manitou Experimental Forest for experimental oil and gas research. This means there will be extensive drilling in this area regardless of the likelihood of finding oil. With over two million acres available for leasing, why do you have to choose this property only 1-1/2 miles from our house? (EA-132)

#### **RESPONSE AND ACTION:**

A range of reasonable alternatives is required by the NEPA to assess direct, indirect, and cumulative impacts from oil and gas leasing development on the affected environment. This EIS contains that range of alternatives. Oil and gas mineral resources are one of the natural resources within the multiple use spectrum of resources on National Forest System lands. The Multiple Use-Sustained Yield Act of 1960 and the National Forest Management Act of 1976 direct the Forest Service to manage National Forest System lands for multiple uses. Development of oil and gas mineral resources provides significant benefits to the economic base for the Cimarron National Grassland area.

Identification of supplemental stipulations for oil and gas leasing development will be applied in areas where leasing with surface activity will be allowed subject to conditions. Surface activities will be prohibited in sensitive areas, such as watersheds not currently withdrawn from mineral leasing on the Forest, where the conditions for protection of the resources cannot be met to Forest Service satisfaction.

The BLM is responsible for subsurface inspection and compliance of development activities for leasing such as drilling. Stringent rules and regulations are imposed by BLM to ensure that no leakage or contamination into groundwater aquifers occurs from oil and gas drilling.

All NFS lands, regardless of identified mineral resource or geologic potential, within the Forest will be made available for leasing and future exploration and development, unless specifically precluded by Acts of Congress or other form of formal withdrawal, including administrative withdrawals. As the surface resource management agency, the Forest Service has a responsibility and obligation in conjunction with the BLM to ensure that mineral activities on NFS lands are conducted to minimize conflicts with other uses and prevent damage to surface resources, and that where necessary, affected areas are rehabilitated after mineral operations are completed. Appropriate terms, conditions or stipulations will be added as necessary to all permits or leases to provide adequate protection and rehabilitation for surface resources of NFS lands.

A number of sensitive lands may be removed from leasing availability as justified by the impact analysis. Sensitive lands such as T&E habitats, riparian and wetlands, WSA's and Wild and Scenic Rivers are discussed elsewhere in this appendix.

#### **Issue Tracking:**

Regional Guide and FEIS References: Not specifically addressed during development of the Regional Guide.

Forest Plan, FEIS and ROD References: FEIS, Chap. II, pages 1-59, Chap. VI, pages 42-45; ROD, 1-14.

### **Reasonably Foreseeable Development Scenarios**

#### **ISSUE:**

*Development Assumptions* - The Forest Service needs to develop scenarios that fit the different types of terrain found in the two Forests and two Grasslands being studied. The Forest Service also needs to develop criteria on what areas should be offered for lease and not just accept the BLM's submissions of areas to be leased on the Forests and Grasslands. Criteria based on four concerns when determining which areas are to be offered for lease: 1) Is the area in a known geological structure? 2) Is drainage occurring to the federal mineral estate? 3) Is there interest from industry? 4) Are there public concerns regarding to maintaining the existing qualities of the area? (EA-33)

The site disturbance assumptions used are inaccurate and grossly distort the effects of oil and gas activities. It is highly improbable that one mile of new road construction and three miles of road reconstruction would be required for every well drilled. One mile of new access would be more reasonable. The basic assumption that access roads would need to be in excess of 30 to 35 feet wide is extraordinary and implausible. We recommend the Forest Service revise its calculations to reflect the standards adopted by the Forest Service and BLM in the "Gold Book". The assumption that wellpads would require 7.5 acres is groundless. The size of a wellpad normally requires from 2.5 to 4.0 acres. A wellpad of 300 by 400 feet is average. This would amount to 2.8 acres of surface disturbance, not 7.5 acres. This is the average figure the Forest Service should use in its assumptions. Assumptions for activities on the NG's are equally flawed. The Forest Service is contending that leaks and spills will occur with each well at the drilling stage. If immediate reclamation is required, leaks and spills cannot be considered to have long-term effects. Pipeline leaks and spills should be addressed as a separate concern and must not be included in wellsite disturbance assumptions. (EA-149, 152)

Another major defect relates to the projection of reasonable foreseeable development on forest lands. There is currently no activity on the forest, and only one well--a stratigraphic test well--has been drilled since 1955. We firmly believe the BLM's projection of one wildcat well every four years is much more accurate, but would accept a maximum of one wildcat per year. If future activity exceeds that analyzed in the EIS, an amendment can be done. The Forest Service must include verification that the reasonably foreseeable development scenarios for the NG's are accurate. According to the BLM, 2 wells per year were forecast. The Forest Service must have some valid reason for increasing the projection to 30 wells per year. This deviation must be justified in the DEIS. (EA-149, 150)

#### **RESPONSE AND ACTION:**

The access distance to wells has been reanalyzed in conjunction with the issuance of the revised draft. The distances not shown are based on assumed well locations and thus are as realistic as possible.

The issue of the area of disturbance is based on the assumption that all area disturbed in construction which is not actually in use as pad or road surface can be rehabilitated and thus should not be considered as disturbed area. This is not born out of actual experience in the field. In most instances, the entire area within the road or pad prism continues to produce sediment over and above the natural level until the land is put back to natural contour; thus the area continues to be disturbed for that period of time.

## Direct, Indirect and Cumulative Environmental Effects

### ISSUE:

*EPA Evaluation of EIS* - The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment. (EFA-11)

### RESPONSE AND ACTION:

A new draft EIS was prepared for oil and gas leasing on the Forest. Additional information on environmental impacts which could result from the projected RFD is available for EPA review.

### ISSUE:

*Positive Effects* - There was little or no mention of the possible positive impacts to the surface resources from oil and gas exploration and development. With the use of appropriate controls during exploration and development and innovative reclamation, net beneficial impacts can be obtained for certain resources in certain areas (i.e., stabilization of natural erosion conditions, improvements in wildlife habitat and habitat diversity, access for recreation and other resource uses. The FEIS should include a discussion and analysis of these points. (EFA-10)

### RESPONSE AND ACTION:

Existing roads and disturbed areas not fully recovered from past activities which are utilized by potential operators would be upgraded by more erosion-control measures. Therefore, current rates of soil erosion and sedimentation would be reduced.

### ISSUE:

*Site-Specific Effects* - The DEIS completely fails to address the impacts from oil and gas development on site specific areas of the Forest. This lack of information, coupled with maps that accompany the DEIS that fail to show what specific stipulations are in place for a forest parcel, makes public involvement, as well as well-informed decisions by land managers, nearly impossible. Without site specific analysis into the impacts created by oil and gas development, this document is virtually useless and fails to comply with NEPA. No leasing on the Forest should take place until the site specific and cumulative impacts in a particular area are documented and adequate protection measures against impacts are in place. (EA-150, EFA-11)

### RESPONSE AND ACTION:

Oil and gas exploration and development activities progress through five phases that are, in part, sequential and may overlap in time: preliminary exploration; exploration drilling; development; production; and abandonment. Leases are obtained before the second phase (exploratory drilling). A description of oil and gas exploration and development activities is found in Appendix III of this EIS.

Future development is contingent on potential exploration and production of oil and gas resources based on a reasonable foreseeable development (RFD) scenario within the Forest within the next 15 years. Assumptions developed for the RFD were derived from a statistical analysis of historical



production since the 1930's and 1940's on the Grasslands in southwestern Kansas, and other nearby areas in the Comanche and mountain districts in conjunction with the Forest Service and oil and gas industry's assessments of geologic potential for oil and gas mineral resources. The market demand for oil and gas resources will determine the rate at which projected development will occur.

The Bureau of Land Management assisted by preparing a drilling activity evaluation and projection for development for the northern and southern mountain areas of the Forest. Cumulative environmental impacts of reasonably foreseeable fluid mineral development were assessed for each of the EIS alternatives analyzed in detail. Projections of what is reasonably foreseeable varies depending on areas of low, moderate, and high mineral resource potentials. Projections made for analysis assumptions identified to assess environmental impacts from the RFD are expressed in terms of the number of wells and fields by mountain and grassland areas.

The transportation section discusses the impacts of opening up new areas for roads. It concludes that the actual number of miles constructed is less than that projected in and approved by the Forest Plan (due to reduced timber program) and that therefore there are no impacts over the level analyzed in and approved by the Forest Plan. Since the Forest Plan direction to close such roads at the close of use, there will be no long term impacts. Also discussed in the Transportation section is the fact that there will be essentially no impact upon the transportation system of either the Federal, State, County, or Forest Service road systems.

A discussion on cumulative impacts is found in Chapter IV of this EIS; Appendix VI identifies measures available to mitigate adverse effects which may result from oil and gas leasing exploration and development activities.

#### Issue Tracking:

Regional Guide and FEIS References: Regional Guide FEIS, Chap. 4, pages 45-48.

Forest Plan, FEIS and ROD References: Not specifically addressed during development of the Forest Plan.

This EIS References: Chapters I, III, IV; Appendix B, C, D, I.

#### ISSUE:

*Site-specific analysis* - We do not believe this EIS adequately addresses these areas on a site-specific basis. What is needed is a site-specific EA for any lease proposed in these areas. We believe that site-specific leases can not be issued before a site-specific analysis is done. Oil and gas leasing should be treated the way the timber program is treated: do a site-specific EA before the lease is granted. The Forest Service is required to adopt a two-tier approach to leasing decisions (36 CFR Sec. 228.102). **Both tiers must come before a lease is issued.** (EA-143, 150)

The use of NSO and CSU stipulations appears to protect many resources of special value where these resources are known to exist. There is no assurance that important values will be fully protected from activity on adjacent land. An adequate inventory of all forest and grassland resources, along with a site specific analysis, should be done before lease stipulations are finalized. The use of NSOs and CSUs should be summarized in a table which displays sites, resource values and acreages. (EFA-13)

## **RESPONSE AND ACTION:**

A number of analysis assumptions based on a reasonably foreseeable level of development for oil and gas were identified to assess impacts throughout the Mountain Districts and Grasslands. These assumptions addressed various scenarios within the low, moderate and high mineral resource potential areas and areas where minerals are currently under production. The Forest Plan was used as the basic framework and foundation to delineate areas of sensitivity such as soils, water, riparian, floodplains, and visual resources.

Management direction in the Forest Plan directed the identification and delineation of sensitive areas on planning record maps. Appropriate supplemental stipulations were also identified in addition to standard lease terms which will be used to provide for the protection of the resource values in the affected environment. Site-specific environmental analysis of tracts under oil and gas lease applications will be conducted by the Forest Service for all NFS lands. The Bureau of Land Management, in coordination with the Forest Service, will conduct further analysis of leased lands on a site-specific basis upon receipt of an Application for Permit to Drill and/or an operating plan.

Additional scoping and environmental analyses under the National Environmental Policy Act will be carried out for any proposed oil and gas leasing development activities that fall outside the scope of this EIS.

### **Issue Tracking:**

Regional Guide and FEIS References: Not specifically addressed during development of the Regional Guide.

Forest Plan, FEIS and ROD References: FEIS, Summary, page 3, Chap. I, pages 5, 6, 7; ROD, pages 21, 22.

This EIS References: Summary; Chapters I, II, III, IV; Appendix A, B, C, D

## **ISSUE:**

*Environmental Effects from Other Resource Management* - Oil and gas exploration and production activities have been conducted within the Cimarron NG's from before the creation of the NG until today, without significant impacts to the environment. We believe that other activities such as ranching and the application of chemicals in agricultural operations can have far greater impacts on the environment than those from the development and production of oil and gas. (EA-144)

## **RESPONSE AND ACTION:**

Any activity which removes vegetative ground-cover protection on the Grasslands will accelerate natural erosion rates without appropriate mitigation. Management differences exist between site-specific mitigation of localized disturbances from oil and gas activities, and proper range management of random reduction of vegetation from grazing. Specific laws and regulations govern the use of chemicals on NFS lands, but it is difficult to account for cumulative effects from chemical applications from other non-point sources.

## **ISSUE:**

*Worst Case Scenario* - We are concerned that the document has failed to specifically justify the need for special lease stipulations and other mitigation measures, particularly in conjunction with forest plan management area resource goals and objectives. The DEIS studies a "worst case scenario" that has no basis in fact. It appears that the Forest Service has tried to escalate the level of impacts associated with oil and gas activities in order to justify the application of excessive restrictions on the forest and its units. The DEIS does not acknowledge standard requirements. The impact analyses are predicated upon what could happen if no restrictions at all were placed on activities. Only potential effects that are not covered by standard terms and conditions should be addressed, as well as effects which could not be mitigated through the use of special stipulations and operating standards. (EA-148, 149)

## **RESPONSE AND ACTION:**

A "worst case" scenario analysis was not considered to be appropriate for this EIS. This EIS's purpose is to bring the Forest Plan and accompanying FEIS into compliance with the 1987 Reform Act and to meet requirements of BLM SPG. It is considered to be the basis for environmentally sound oil and gas leasing decisions on NFS lands for the Forest. As such, it is a programmatic supplement to the FEIS accompanying the Forest Plan.

A worst case analysis may be more appropriate, depending on circumstances, in an environmental document for a project, activity, or resource which is being proposed for development under the Forest Plan framework. Since the Forest Plan and FEIS are not proposals for mineral development, a worst case scenario will not be prepared. (National Wildlife Federation Appeal of the Black Hills N.F. (Apr. 9, 1984).

### Issue Tracking:

Regional Guide and FEIS References: Not specifically addressed during development of the Regional Guide.

Forest Plan, FEIS and ROD References: Not specifically addressed during development of the Forest Plan.

This EIS References: Chapters I, II, III, IV, Appendix C.

## **ISSUE:**

*Cumulative Impacts* - The analysis regarding the cumulative impacts of oil and gas leasing is grossly inadequate. The plan fails to look at the impacts that opening of new roads, pipelines, and wells could have on the Forests and Grasslands. It also fails to examine secondary impacts caused by opening additional areas to motorized use. The plan fails to consider the impacts of full-scale development features i.e. pipelines, roads, wells that would occur. The secondary impacts to wildlife, non-motorized recreation, water, and cultural resources from opening areas to motorized use are not considered. This could have considerable effects on wildlife, cultural resources, and nonmotorized recreation. (EA-33, 147)

The DEIS fails to examine the cumulative effects that timber cutting, grazing, as well as oil and gas development would have on recreation, wildlife, and fisheries. Simply adding stipulations to leases that would affect a particular critical wildlife habitat, recreation area, or riparian area is not enough to protect these resources from degradation and destruction as the plan states. (EA-150)

A much more thorough analysis is needed in the DEIS to adequately address the cumulative impacts of the extractive industries on other forest resources. Where serious impacts are likely to occur, areas should be closed to oil and gas development. The lack of pre-lease planning and discussion of the cumulative impacts of oil and gas leasing in the DEIS violates National Environmental Policy Act (NEPA) mandates and needs to be corrected in a supplement to the DEIS. (EA-150)

#### **RESPONSE AND ACTION:**

Oil and gas exploration and development activities progress through five phases that are, in part, sequential and may overlap in time: preliminary exploration; exploration drilling; development; production; and abandonment. Leases are obtained before the second phase (exploratory drilling). A description of oil and gas exploration and development activities is found in Appendix III of this EIS.

Future development is contingent on potential exploration and production of oil and gas resources based on a reasonable foreseeable development (RFD) scenario within the Forest within the next 15 years. Assumptions developed for the RFD were derived from a statistical analysis of historical production since the 1930's and 1940's on the Grasslands in southwestern Kansas, and other nearby areas in the Comanche and mountain districts in conjunction with the Forest Service and oil and gas industry's assessments of geologic potential for oil and gas mineral resources. The market demand for oil and gas resources will determine the rate at which projected development will occur.

The Bureau of Land Management assisted by preparing a drilling activity evaluation and projection for development for the northern and southern mountain areas of the Forest. Cumulative environmental impacts of reasonably foreseeable fluid mineral development were assessed for each of the EIS alternatives analyzed in detail. Projections of what is reasonably foreseeable varies depending on areas of low, moderate, and high mineral resource potentials. Projections made for analysis assumptions identified to assess environmental impacts from the RFD are expressed in terms of the number of wells and fields by mountain and grassland areas.

A discussion on cumulative impacts is found in Chapter IV of this EIS; Appendix VI identifies measures available to mitigate adverse effects which may result from oil and gas leasing exploration and development activities.

#### **Issue Tracking:**

Regional Guide and FEIS References: Regional Guide FEIS, Chap. 4, pages 45-48.

Forest Plan, FEIS and ROD References: Not specifically addressed during development of the Forest Plan.

This EIS References: Chapters I, IV, Appendix B,C.

#### **ISSUE:**

*Visual Resource Effects* - One would assume that the only way to provide new viewing opportunities is through new road construction. It appears the Forest Service intends to allow new road construction as long as it is not the result of oil and gas activities. It seems incongruous to apply more restrictive stipulations on leases in areas where new roads are built. The Forest Service is requiring a 1/4 mile NSO buffer on both sides of transportation routes and 1/2 mile buffers on both sides

of trails and scenic rivers. These restrictions exceed those successfully utilized in the past. Activities adjacent to a designated wild or scenic river are normally subject to a 1/4 mile restriction on both sides of the river; activity is usually only restricted within 200 feet of a trail. There is no justification for exceeding restrictions which have proven adequate. (EA-149)

Why does USDA-FS say lease denial should be after visual resources cannot be restored - what happens when *immediate* short term violations of the LMP happens? What is *long-term* v. *short-term* to USDA-FS? (EFA-10)

#### **RESPONSE AND ACTION:**

New viewing opportunities are created not only through road construction, but also construction of campgrounds, picnic areas, trails and scenic overlooks along existing roads. Changes in management prescriptions and special designations (i.e., Wilderness, Scenic Byways, Wild & Scenic Rivers) also require amending of visual quality mapping.

The 1/4 and 1/2 mile distances would be the extremes along their respective routes. Distance will be used to protect the foreground viewing areas, which may vary from 0-1/2 mile based on topographic features. The NSO stipulation will be applied to routes with national or state level importance. A buffer greater than 200 feet is necessary in order to meet adopted visual quality objectives.

Direction from:

FSM - 2380  
NEPA  
Visual Resource Management Handbook  
Forest Plan, pages III-18 & 19

#### **ISSUE:**

*Soil and Water Resources* - Please indicate in a chart or table in the DEIS the locations and condition and trend of each watershed. Since the soils are "generally low in productivity" (p.III-50) development should be explored. Provide a current backlog of acres needing reforestation, and reforested areas v. successfully reforested areas by year since 1980. (EFA-10)

Why would soil erosion of *undisturbed* sites deliver "little if any" material to streams? Why risk *any* activity in areas steeper than 60%? Per the Region 2 guide, *timbering* is usually not allowed anywhere there is a 40% or greater slope. Why should any other surface disturbing operation be allowed on such steep slopes? The DEIS indicates "areas designated as NSO have a high potential for mass movement", yet P/SI claims sediment on slopes steeper than 60% will be leased only with a NSO stipulation! (EFA-10)

The DEIS shows that *all* acres, *even with mitigation* exceed tolerable limits! You will allow the destruction of the critical watersheds in violation of NFMA and the Clean Water Act! How do you mitigate when you propose (P.V-3) that roads will be constructed or reconstructed to the *lowest* standards! (EFA-10)

What are the effects of brine spills on the soils? Does the Forest Service have money budgeted to monitor accidental spills? How are costs figured for the reclamation of the lands? The costs in 2005 will be more than the cost in 1995, how is the difference made up? Are abandoned pipelines filled with any thing to prevent collapse at a future date? Why are there only two berms around a

reserve pit? Garbage, recycling of materials should be placed first before burning or burying. (EA-151)

**RESPONSE AND ACTION:**

Watersheds that are exceeding sediment threshold or are within 10 percent of exceeding sediment thresholds are included on the Controlled Surface Use stipulation addressing these areas. Natural erosion occurs at low levels which streams can easily transport. It is only when the erosion rates become accelerated and streams are unable to transport the added sediment that channel instability begins to occur.

Resource protection on slopes steeper than 60 percent is provided in supplemental stipulations whereby activities are relocated to suitable soil types and/or stable slope conditions or no surface occupancy is allowed. Areas identified with High Geologic Hazard (mass movement) and slopes greater than 60 percent are designated as NSO which adequately protects surface resources from any ground-disturbing activities.

The previous draft EIS has been revised, and the soils section of Environmental Consequences displays new information.

Lowest standards for road construction refers to dimensions of disturbed area and minimum requirements for construction purposes. Soil and water conservation practices include all mitigation for road stabilization and drainage for adequate protection of watershed resources.

Brine spills on soils cause serious alterations of soil chemical properties and impacts severely damage vegetation and soil productivity. Specific mitigation is contained in the COA's which contain a "spill prevention control and counter-measure plan" (SPCC Plan). With implementation of preventative and site-specific mitigation measures, the chemical, point-source pollution of both surface and groundwater will be negligible for all alternatives. Many of the cost issues are incurred by the operator.

**ISSUE:**

Access - Leasing would be very detrimental to our forests. The access to a site would really mess up forests, watersheds, etc., and what do they do with all that drilling slurry and mud, etc.? With the low cost (presently) of oil, it doesn't seem economically feasible to extract oil or gas from forest areas. The areas of land, usually mountainous, steep, rocky and not very accessible, that usually makeup NF's, at least in Colorado, seem especially unsuitable for drilling and very vulnerable to unsightly damage due to access, as well as to damage to water and watersheds. (EA-70)

**RESPONSE AND ACTION:**

The analysis has examined the potential for coordination of transportation system development for oil and gas and other resource activities. Because of the nature of most exploration activities, there is no potential for coordination of exploration roads. However, when development takes place, coordination of roading activities will be required.

The impacts of road and transportation developments on other resources such as soils, livestock, and wildlife are discussed in their respective sections.

The impacts of oil and gas generated traffic is discussed in the transportation section. No significant impacts are expected.

## Issue Tracking:

Regional Guide and FEIS References: Regional Guide, Chap. 2, pages 10, 42-44, 45, Chap. 3, pages 41, 43, 46; FEIS, Chap. 2, pages 4, 5, Chap. 3, pages 3-5, 25-27, Chap. 4, pages 30-32, Appendix C, pages 44-47.

Forest Plan, FEIS and ROD References: Forest Plan, Chap. II, pages 85, 86, 92, 93, Chap. III, pages 3-6, 74-80; FEIS, Summary, page 17, Chap. I, pages 14, 15, Chap. VI, pages 105-110; ROD, pages 11, 12.

This EIS References: Chapters II, III, IV, Appendix VI.

### ISSUE:

*Global Weather System* - The effect of fossil fuels on our global weather system must be taken into consideration in order for your actions to be in compliance with the NEPA. It is ridiculous to allow the possibility of large scale development of additional hydrocarbon-fossil fuels which will lead to CO<sup>2</sup> releases, increasing potential global warming. (EA-70, EFA-10)

### RESPONSE AND ACTION:

The Forest Service does not feel that it has the information or expertise needed to address global effects.

### ISSUE:

*Public Safety* - The statement that there would be one percent probability of flows detrimental to human safety washing through areas of stored hazardous materials or solid waste for facilities located within the 100-year floodplain is misleading. During the 15 years covered by the Forest Management Plan there is about a 14 percent probability that at least one flood of the 100-year magnitude will occur. These data should be considered when evaluating waivers, exceptions, or modification of lease stipulations. (EFA-9)

In the production phase, air pollutants such as carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide and hydrogen sulfide can be produced from a variety of processes and sources. Accidental explosions, fire, blowouts, oil spills and leaks can occur causing potentially severe short term problems. These "severe short term problems" can take our daughter's life--even if they occur 15 to 20 miles away depending upon the wind drift at the time. I was unable to find where you addressed the impact of the refineries--the worst air pollution source of all. (EA-132)

### RESPONSE AND ACTION:

The Forest Service will not permit establishment of any hazardous waste dumps on the Forests or Grasslands.

Hazardous waste issues are addressed in Chapter IV in the Range, Wildlife, Air Quality, and Water Quality resource sections. Mitigation and safety measures have been discussed and recommended for both lease stipulations and operations plan documents to insure appropriate precautions are taken into consideration at all phases of oil and gas activities.

All construction and work will be performed under Occupational Safety and Health Administration (OSHA) standards and guidelines. All restricted pesticide application will require prior approval and requires a State certified applicator. Disposal of toxic chemicals will be in accordance with US Environmental Protection Agency and State Health Department (Colorado and Kansas) regulations.

**Issue Tracking:**

Regional Guide and FEIS References: Not specifically addressed during development of the Regional Guide.

Forest Plan, FEIS and ROD References: Not specifically addressed during development of the Forest Plan.

This EIS References: Chapter III, IV. Appendix B.

### **Cost-Benefit Analysis**

**ISSUE:**

*Cost-Benefit Analysis* - The following costs need to be detailed and included in the cost side of the cost/benefit analysis: the cost of building the road - who pays for the road?; the cost of additional monitoring of the lease conditions; new and improved roads could greatly increase recreational traffic which could lead to increased costs for trash removal and patrolling by the Forest Service. (EA-143)

**RESPONSE AND ACTION:**

These costs are included in the cost figures developed for the EIS. It is not practical to separately display the individual cost figures used to assemble the cost benefit analysis.

### **Mitigation**

**ISSUE:**

*Specific Resource Mitigation* - A statement is made that a requirement of a 1/4 mile NSO buffer on both sides of a transportation route and a 1/2 mile buffer on both sides of trails and scenic rivers would be implemented. These restrictions exceed those being utilized currently. Activities adjacent to a designated wild or scenic river are normally subject to a total of 1/4 mile restriction on both sides of the river. For trails, it is usually restricted to within 200 feet of a trail. It is recommended that current guidelines being utilized as buffers and be incorporated into the FEIS. (EA-152)

**RESPONSE AND ACTION:**

New viewing opportunities are created not only through road construction, but also construction of campgrounds, picnic areas, trails and scenic overlooks along existing roads. Changes in management prescriptions and special designations (i.e., Wilderness, Scenic Byways, Wild & Scenic Rivers) also require amending of visual quality mapping.

The 1/4 and 1/2 mile distances would be the extremes along their respective routes. Distance will be used to protect the foreground viewing areas, which may vary from 0-1/2 mile based on



topographic features. The NSO stipulation will be applied to routes with national or state level importance. A buffer greater than 200 feet is necessary in order to meet adopted visual quality objectives.

Direction from:

FSM - 2380  
NEPA  
Visual Resource Management Handbook  
Forest Plan, pages III-18 & 19

**ISSUE:**

*Travel Management* - We recommend the Forest Service limit access to each oil or gas well to one access road whenever possible. As wells are abandoned, roads and well sites should be rehabilitated with grasses and forbs native to the area. Some feeder roads should also be looked at for possible closure if they do not serve as the only means of getting to various locations. (EFA-8)

**RESPONSE AND ACTION:**

As a result of the leasing analysis, special stipulations do limit access by the general public on most newly constructed roads developed for oil and gas exploration and development. This is in compliance with the Forest Plan direction.

**ISSUE:**

*Monitoring and Evaluation* - We are concerned that the Forest Service intends to initiate further evaluation or corrective action based upon relatively minor factors which are subject to limited precision and reliability. The Forest Service must fully analyze the situation and demonstrate that perceived downward trends in wildlife populations are directly tied to oil and gas activities and not a result of natural occurrences. We believe that the threshold limits included in the monitoring program are too low and could be reached as a result of natural causes, yet industry could be penalized. (EA-149)

**RESPONSE AND ACTION:**

As far as water quality is concerning, monitoring will be required to determine if the Best Management Practices to be identified in the Erosion Control Plan are in place and are effective.

Monitoring and evaluation of post-leasing activities is required by the FS Oil and Gas Leasing Regulations and is discussed in Appendix ? of this EIS.

**Oil and Gas Lease Stipulations**

**ISSUE:**

*Waiver of Stipulations* - The Forest Service opens the door for making waivers without properly amending the forest plan or involving the public with the provision as the bottom of most stipulations: "any changes to this stipulation will be made in accordance with the land use plan and/or

the regulatory provisions for such changes". This statement would allow district level waivers without public involvement or amendment of the plan. (EA-33, 147)

The Forest Service will also allow for waiver of stipulations without properly amending the Forest Plan. The following phrase is at the bottom of most lease stipulations: "Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes...". By including the word "or" in the phrase, the Forest Service is basically allowing district rangers to override decisions made in the Forest Plan without amending the plan and without providing the public with the opportunity to comment on the waiver of the stipulation. (EA-33)

Past history has shown that the Forest Service, when confronted with pressure from industry, routinely grants waivers to the stipulations. There is nothing to indicate that these waivers will not continue in the future. (EA-150)

**RESPONSE AND ACTION:**

A new NEPA process for APD is required as discussed in Chapter I. Waiver of stipulations will have a 30-day public review period before changes are made.

Several stipulations were prepared to address critical fish and wildlife issues, including floodplain/riparian stipulations and threatened and endangered species stipulations.

**ISSUE:**

*Watersheds* - Various places in this draft document state that marginal conditions of several watersheds is due to grazing, developed and dispersed recreation use. These resource uses have brought the watershed to near or over the acceptable threshold and the apparent preferred solution is to restrict oil and gas development. The NSO and CSU stipulations can only be justified where all resource uses are similarly restricted. (EFA-6)

**RESPONSE AND ACTION:**

Any soil-disturbing activity is restricted in watersheds where sediment threshold limits are exceeded.

**ISSUE:**

*Grassland Stipulations* - None of the canyon areas have CSU/NSO designation. These areas have scenic, cultural and biological values that make them the primary destination of many visitors to the Comanche NG. I appreciate the economic impact that oil and gas development has had on the area. Recreation also brings dollars into the community and its contribution will likely grow in importance. Surface occupancy for oil and gas in the canyons would drastically alter their special character and diminish their appeal to tourists and locals alike. Some of the effects of development would also likely be long-term (e.g. landscape scars). This, along with other factors make sight-seeing and oil and gas development somewhat incompatible; and it would seem ill-advised to take the short-term benefits offered by the latter, over the long-term benefits of recreation. I would like to see the canyon bottoms and an area back from the rims (min. of 1/4 mile) withheld from oil and gas development in Pastures 2A, 2C, 3A, 15A and 15B. (EA-142)

We are specifically concerned with the proposed classification of regions within the NG's as "NSO". We would hope that this NSO classification would *not* apply to oil and gas wells or tank batteries. We agree that natural gas processing plants or natural gas pipeline compressor stations should be sited where environmental impacts can be minimized. Oil and gas well installations are often limited to specific locations due to subsurface geological structures. The prohibited siting of an oil or gas well in a lease area may prevent the recovery of hydrocarbon resources beneath the subject lease. We recommend that the NSO classification exempt the location of individual oil and gas well installations in these designated areas. (EA-142)

We are concerned with the extensive areas within the Comanche NG's which have been designated as "seasonal control". All of these type requirements can be administered through the drilling permit process. This type classification appears to be applied to all areas within the southwest portion of the Comanche Grasslands when only certain specific areas may actually justify such controls. Therefore, this type requirement can best be administered through a site specific review. (EA-144)

Present federal environmental legislation, along with present BLM and Forest Service Regulations allow for a review and regulation of oil and gas activities within the Grasslands and other areas. Proper coordination in the siting of oil and gas installations will allow for the protection of our environment with the recovery of our Nation's Resources. Continued development of hydrocarbon resources has successfully been conducted without environmental harm in numerous national wildlife refuges. Oil and gas activities can be conducted in a manner for preventing harm to the environment and in a manner which poses no threat to wildlife. Please consider our request for an oil and gas exemption to the "NSO" restrictions proposed for the Cimarron and Comanche NG's. (EA-144)

#### **RESPONSE AND ACTION:**

For cultural resources, Vogel Canyon, Picture Canyon and some portions of Carrizo Creek, Holt Canyon and Sand Canyon are proposed for protection through no surface occupancy and controlled surface use stipulation.

The soil resource is protected on the escarpment slopes of the canyonland CSU stipulation which relocates activities to suitable soil types and/or stable slope conditions. Canyon bottoms identified as riparian are protected with an NSO stipulation.

#### **ISSUE:**

*Cultural and Paleontological Resources* - The Forest Service intends to apply a NSO stipulation on areas with known cultural and paleontological resources. The Forest Service does not make a distinction between "known" and "significant" resources. These requirements must be further defined to specify that only resources deemed "significant" will be protected with no surface occupancy. (EA-149)

#### **RESPONSE AND ACTION:**

This is now adequately addressed in the new version of the EIS and the Cultural Resource specialist's report. Significant cultural resources versus cultural resources is discussed.



## APPENDIX I

### MONITORING AND EVALUATION

Impacts of implementation of the selected alternative will be evaluated on a periodic basis. The purposes of monitoring and evaluation will be:

- To determine if approved operations for oil and gas exploration or development activities fulfill the purpose and need for which they were designed, or if there is a need for modification or termination of specific activities;
- To determine if the implemented alternative is responsive to public issues;
- To discover unanticipated and/or unpredictable effects from approved oil and gas activities and require necessary corrective actions;
- To determine if mitigation measures are effective;
- To ensure that leasing decisions are being implemented as scheduled;
- To provide continuing evaluation of consistency with state and local plans and programs.

Oil and gas resource exploration and development activities will be allowed on NFS lands only under the authority of a surface management plan which has been approved by the Forest Service. A review of detailed plans for operation is conducted by a Forest Service employee in conjunction with a BLM Minerals Specialist on the site location. A thorough review of proposed activities and the potential for impacts on existing resources is conducted. Monitoring of operations for impacts to surface resources is carried out by Forest Service staff to ensure compliance of approved activities in accordance with the plan of operations. Infractions of non-compliance are brought to the attention of the operator and the BLM. Corrective action is required within a reasonable time-frame.

Monitoring plans will be required and prepared for specific surface resources in the analysis area described in this EIS. These monitoring plans will be used to monitor implementation of management activities which impact surface resources and the human environment.

#### Air

Federal and state regulations require air quality monitoring for all activities that could impact existing air quality. Detailed monitoring and mitigation plans are required at the APD level.

## **Vegetation**

Monitoring oil and gas lease applications and post-leasing activities will determine:

- Whether acres suitable for timber production are affected by oil and gas development.
- Whether the reclamation plan specifies appropriate site-specific reforestation, when tree planting is a requirement on suitable acres.
- Whether 5 year reforestation (after non-use) is occurring on cleared acres suitable for timber production.
- Whether lease proposals will occur in alpine areas.

Monitoring of 5-year ground cover vegetation recovery will be addressed in the Soil Scientist's specialist report.

### ***Acres Suitable for Timber Production (Mountains Only)***

At the APD phase, the District Minerals Staff will provide the District R2RIS Coordinator with site-specific information about forested lands potentially affected by oil and gas development. The District R2RIS Coordinator will then query the data base to determine which sites on the leasehold are suitable for timber production, per the current Forest Supplement to section 42 (Timber Component) of FSH 6609.21 (Total Resource Information Handbook). The Forest Minerals Specialist or the BLM will inform the lessee about which forested sites are suitable for timber production and therefore subject to the 5-year reforestation standard. Conditions of Approval at the APD phase will include site-specific tree planting specifications.

### ***Reclamation Plan***

At the APD phase, the District Forester, Forest Silviculturist or Forest Ecologist will review the tree planting specifications of the reclamation plan and make recommendations for approval or specify modifications.

### ***Five Year Reforestation***

Monitoring will be carried out in accordance with Page IV-6 of Chapter IV of the Forest Plan, and Chapter 70 (Reforestation Examinations) of FSH 2409.26b, with the following exceptions applicable to oil and gas activities:

- The 5-year reforestation period will begin immediately after non-use, not immediately after final harvest. The 5-year reforestation standard will be applied on acres suitable for timber production.
- Reliance on natural regeneration within 5 years will not be emphasized. Scalping and conifer planting will often be required to adequately re-stock abandoned clearings within 5 years. Oil and gas clearings will be seeded for erosion control and ground cover vegetation might out-compete newly germinated natural conifer seedlings for moisture and nutrients.

Aspen transplanting and portable irrigation may be required on localized areas which have experienced enough root damage to inhibit aspen suckering. Ripping may be required on localized areas which have experienced soil compaction, as this could promote aspen

suckering.<sup>1</sup> If aspen regeneration fails in localized areas, conifer seedlings adapted to the sites will be planted.

### ***Lease Applications in Alpine Areas***

The District Ranger or Forest Minerals Staff shall notify the Forest Supervisor if a lease proposal occurs in a mapped alpine area. A qualified botanist/ecologist or soil scientist, as approved by the Forest Service authorizing official, will conduct field review of the alpine lease proposal and make site-specific recommendations regarding the potential for irreversible and irretrievable damages to surface resources and the potential for reclamation. These recommendations will determine if site-specific NEPA analysis is necessary before the Forest Service authorizing official makes the decision to consent to leasing or deny consent to leasing.

### **Fishery, TE&S Fish and Riparian Resources**

There are basically three types of monitoring that should be considered, when addressing oil and gas development and riparian and fishery resources. Listed below are the types of monitoring strategies, and use for each of the resources described.

#### ***Pre-Project Monitoring***

Prior to any project implementation, monitoring must be conducted in order to determine potential impacts to critical resources. This monitoring is probably the most "cost-effective" strategy, mainly because avoidance and pre-project planning can resolve issues that could result in expensive mitigation following project implementation. All personnel involved in a particular project should be involved in this monitoring.

#### **Riparian Resources**

Pre-project monitoring for riparian resources, may include site-specific analysis to determine riparian boundaries and potential design changes. Additional map reviews would also be advised, as this information is currently available for the majority of the study areas. To comply with the appropriate laws and stipulations concerning this resource, this form of monitoring will be critical in avoiding impacts to this sensitive resource. Coordination with proper governmental and public personnel should be an important part of this analysis.

#### **Fishery Resources**

Pre-project monitoring for fishery resources will determine potential impacts from previously discussed sediment and chemical impacts, as well as possible barrier problems. Analysis of existing populations of fish that would be impacted by development related activities should be conducted to determine potential activities. Physical habitat and water quality analysis should be conducted where these potential limiting factors would impact fishery resources. Appropriate mitigation techniques would then be developed to minimize or alleviate impacts. Coordination with proper governmental and public personnel should be an important part of this analysis.

#### **Threatened, Endangered and Sensitive Fishery Resources**

Pre-project monitoring will determine the presence or absence of potentially impacted fish species. Information as to the distribution of these species should be coordinated with the US Fish & Wildlife Service, US Forest Service and appropriate State and local agencies. In the presence of a species

which is within the jurisdiction of Federal and/or State laws concerning TE&S species appropriate stipulations will be enforced [see Appendix B].

### ***Implementation Monitoring***

Implementation monitoring answers the question "did we accomplish what we said we would accomplish?" This type of monitoring determines if changes are needed after we have initiated the project. It also answers the question "Are we following our standards and guidelines?" This type of monitoring should be conducted while the project is being implemented, with changes in operation made when standards and guidelines are not met.

#### **Riparian Resources**

Standard stipulations indicate that there will be no surface occupancy in riparian areas or floodplains [see Appendix B]. Implementation monitoring would evaluate whether unforeseen impacts related to a specific project were occurring. Steps could be made at that time to determine if mitigative measures would be needed to correct the problem. Direct impacts due to road and pad construction, as well as sedimentation and chemical impacts would be addressed in this monitoring scheme. Coordination with proper governmental and public personnel should be an important part of this analysis.

#### **Fishery Resources**

Implementation monitoring would evaluate whether unforeseen impacts related to a specific project were occurring. Steps could be made at that time to determine if mitigative measures would be needed to correct the problem. Direct impacts due to road and pad construction, as well as sedimentation and chemical impacts would be addressed in this monitoring scheme. Coordination with proper governmental and public personnel should be an important part of this analysis. Biological sampling may be necessary to quantify impacts to the fishery resource.

#### **Threatened, Endangered and Sensitive Fishery Resources**

Adequate pre-project monitoring and planning should preclude the need for this type of monitoring, in terms of this resource. However, if there is any indication that this resource could be impacted by a particular project once it is initiated, a monitoring plan would be implemented. Coordination with proper governmental and public personnel should be an important part of this analysis.

### ***Effectiveness Monitoring***

Effectiveness monitoring addressing the question "did the project or mitigation accomplish what we told what we told the public it would?" This type of monitoring will be conducted during and definitely after a specific oil and gas development project to determine if the mitigation enacted was sufficient to protect the resource, in terms of stipulations and regulations. Additional steps may be needed to ensure that the specific resource is properly protected from current and future impacts. Ground and/or surface water quality and biological monitoring may be necessary on a long term basis to ensure proper resource protection.

#### **Riparian Resources**

Standard stipulations indicate that there will be no surface occupancy in riparian areas or floodplains [see Appendix B]. Effectiveness monitoring would evaluate whether adequate measures



were taken to ensure the protection of riparian areas. Steps could be made at that time to determine if mitigative measures would be needed to correct the problem. Direct impacts due to road and pad construction, as well as sedimentation and chemical impacts would be addressed in this monitoring scheme. Ground and/or surface water quality and biological monitoring may be necessary on a long term basis to ensure proper resource protection. Coordination with proper governmental and public personnel should be an important part of this analysis.

### **Fishery Resources**

Effectiveness monitoring would evaluate whether adequate measures were taken to ensure the protection of fishery resources. Steps could be made at that time to determine if mitigative measures would be needed to correct the problem. Direct impacts due to road and pad construction, as well as sedimentation and chemical impacts would be addressed in this monitoring scheme. Ground and/or surface water quality and biological monitoring may be necessary on a long term basis to ensure proper resource protection. Coordination with proper governmental and public personnel should be an important part of this analysis. Biological sampling may be necessary to quantify impacts to the fishery resource.

### **Threatened, Endangered and Sensitive Fishery Resources**

Adequate pre-project monitoring and planning should preclude the need for this type of monitoring, in terms of this resource. However, if there is any indication that this resource could be impacted by a particular project once it is initiated, a monitoring plan would be implemented. Coordination with proper governmental and public personnel should be an important part of this analysis.

### **Recreation**

The Forest Service will monitor implementation of the preferred alternative to maintain the recreational quality available on public lands and to ensure that the opportunities for various recreation experiences are not adversely impacted as a result of oil and gas exploration and development activities. Application and requirement of the no surface occupancy and controlled surface use stipulations and other mitigation measures in sensitive areas will minimize potential impacts to recreation users. Monitoring and evaluation of oil and gas leasing activities will assist in achieving the goals, objectives and requirements of the Forest Plan and the direction outlined in this EIS as well as responding to the issues and needs of the recreation users. The effectiveness of the 1/4 mile buffer around all developed sites needs to be monitored to determine the adequacy of the distance. If the reasons for establishing the 1/4 mile distance are not being achieved, then the distance should be adjusted accordingly.

### **Visual Resource**

Monitoring of oil and gas development impacts on visual resources will be conducted to ensure compliance with Forest Plan direction (Forest Plan, Chapter IV, pages 4, 5) and the Visual Management System.<sup>2</sup><sup>3</sup> Monitoring will be conducted to prevent loss of visual quality and resulting loss of recreation opportunities; to make recommendations on new or refined mitigation techniques; and to evaluate validity of visual quality mapping and recommend any necessary changes.

Monitoring conducted by the Forest Landscape Architect and District staff will include road designs, terrain modifications, clearing shapes and the introduction of structures and reclamation techniques. Monitoring will be handled in several stages:

- (1) Each site will be evaluated prior to development to establish a baseline inventory;
- (2) Site-specific recommendations at the APD level to incorporate mitigation techniques into the operating plan.
- (3) During development and reclamation and bi-yearly afterwards to examine the success of prescribed mitigation methods. Mitigation techniques will then be modified as necessary.
- (4) General Forest/Grassland environment to note changes in the characteristic landscape or a decline in visual quality. This level of monitoring will be used to ensure prescribed VQOs are met.

Monitoring will be considered complete when the disturbance is reclaimed and restoration meets Forest Plan requirement.

The tools used to monitor visual resource impacts will be photographic inventories and existing visual inventory mapping.

### **Cultural Resources**

Monitoring of cultural and paleontological resources in areas under oil and gas leasing development or exploration will be carried out before, during, and after the construction phase. Standard lease terms as well as supplemental stipulations will be evaluated as needed to ensure protection of such resources on the Forest.

### **Experimental Forests, Research Natural Areas and Special Areas**

Monitoring will help determine whether T&E wildlife habitat is being maintained and plant associations are being properly protected from surface disturbance within these areas. Special stipulations required for lease issuance include No Surface Occupancy and/or Timing Limitation and the Lease Notice. Samples of these special stipulations which will require monitoring are in Appendix B, Monitoring. Monitoring will evaluate the effectiveness of prescribed mitigating measures and whether to adjust the measures to the extent possible under lease regulations.

### **Wildlife**

Monitoring oil and gas leasing exploration and development activities will determine:

- Whether optimum wildlife habitat, as determined by optimum structural stage diversity, is being maintained for all vegetative types over time.
- Whether wildlife population goals, as represented by goals for indicator and special emphasis species, are being achieved and maintained over time.

Monitoring will be carried out in accordance with the FLMP (Chapter IV, pages 5-6).

### **Threatened and Endangered Plants and Animals**

Monitoring will determine if the selected alternative is achieving its objectives and whether T&E wildlife habitat is being maintained and plant associations are being properly protected from surface disturbance, also whether T&E Recovery Plans and goals are being achieved and maintained over time.

Monitoring will be done in accordance with the FLMP (Chapter IV, pages 1-9).

### **Range Resource**

Oil and gas leasing exploration and development activities will be monitored for impacts to grazing resources. Monitoring will focus on vegetation trends, forage utilization and amount of actual use (livestock numbers, periods of grazing and range condition).

### **Watershed Resource**

The Forest Service will monitor or may require the operator to monitor for potential impacts from lease development and exploration through one or more of the following methods: measuring ground cover to assess erosion and sedimentation potential; measuring runoff, sediment production, water quality and water quantity; studying runoff plots; monitoring streambank stability and riparian communities at selected sites; and monitoring observation wells for groundwater level and quality.

The type of monitoring is dependent upon the type and location of the activity. Monitoring parameters, levels, and frequency will be determined at the APD stage.

Implementation monitoring will be done at every new well site to ensure that *all* required mitigation measures are correctly designed and are in place.

Effectiveness monitoring will be done at fewer of the well sites. The purpose of this type of monitoring will be to assess the effectiveness of the mitigation measures in controlling sediment movement and preventing water pollution from the other waste materials associated with oil and gas exploration activities. If the required mitigation measures are found to be inadequate, different measures will be required. If all else fails, the activities will be stopped until the problem can be corrected.

Monitoring of the ground water quality may be required where large production facilities occur. Where these facilities occur in Kansas, the Forest Service will work cooperatively with the ground-water management district and the U. S. Geological Survey to incorporate the monitoring into their ongoing programs. Monitoring of the groundwater in Colorado will be done in conjunction with the Colorado State Health Department and U. S. Geological Survey. The operator will be required to pay for the monitoring costs.

## **Soils**

Soil properties and responses to different management activities vary by many site-specific conditions. Monitoring provides a means of measuring threshold values for management induced changes in soil properties that may significantly lower potential productivity. Therefore, short-term monitoring will be carried out before, during, and after ground disturbing activities to assess potential changes and the effectiveness of prescribed mitigation. Primary impacts which could significantly change soil properties include accelerated erosion and detrimental compaction and/or rutting caused by equipment. The minimum amount of ground cover necessary to protect the soil from accelerated erosion must be determined locally. Current or natural soil loss rates will be compared with increased soil loss amounts on soils physically disturbed.

A monitoring plan of operation will be required as part of the site-specific plan. The Forest Service will monitor to ensure compliance of the approved operating plan. The plan will specify the sampling locations, the type of data that will be collected, sampling frequency, the type of analysis needed, and who will conduct the activities.

## **Transportation System**

Unanticipated impacts might include increases in traffic or in the number of miles of roads constructed or left open.

### **Roads (Long Term Maintenance)**

Ensure reduction and elimination of environmental impacts over time by monitoring maintenance of roads and facilities constructed as part of any oil and gas development.

## *Oil and Gas Resources*

The Forest Service will monitor the exploration and development of oil and gas operations on NFS lands for compliance of lease terms and stipulations for all leases and permits to ensure that the lessee does not violate the Forest Plan direction or conditions of approval outlined in this EIS. On-site inspections will be conducted as necessary for assessment of compliance with lease terms, including road use of leases or permits, or unauthorized uses of NFS lands.

The Forest Service will notify the appropriate BLM official requesting corrective action in cases of misuse, unauthorized use, or any other breach of lease or permit terms affecting NFS land management. If the violation or improper use is one which is eminently likely to endanger public health or safety, life or property, or to cause irreparable damage to resources, the Forest Service will directly contact the responsible lessee and also the BLM.

The Forest Service will monitor to ensure that hazardous waste dumping does not occur on NFS lands, and hazardous materials produced or brought onto the Forest are properly disposed.

## NOTES

<sup>1</sup> Personal communication with Wayne Shepperd, Silviculturist, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. February, 1991.

<sup>2</sup> USDA Forest Service, National Forest Landscape Management, Volume 1; Agriculture Handbook No. 434, 1973, 76 pp. (A.R. Vol. III, pp. 1-79).

<sup>3</sup> USDA Forest Service National Forest Landscape Management, Volume 2, Agriculture Handbook No. 462, 1974, 45 pp. (A.R. Vol. III, pp. 80-127).



## APPENDIX J

### SOCIO-ECONOMIC AND COST EFFICIENCY ANALYSIS<sup>1</sup>

#### SOCIAL RESOURCE UNITS

Social Resource Units (SRU's) were delineated and used as a framework for assessing the social and cultural relationships that people have with the land environment. Social Resource Units were defined by natural topographic boundaries such as drainage basins, mountain valleys and by settlement patterns and cultural and social lifestyles. The Forest lies within three SRU's: the Front Range, Arkansas, and Southern Plains [Figure J-1].

The Forest was further subdivided into Human Resource Units (HRU). A HRU is defined as a geographic area of land characterized by particular patterns of cultural lifestyles, economic conditions and topography. This concept is used in order to characterize the unique relationship that residents of a distinctive area have with each other and with the land on or near the National Forests and Grasslands. From the HRU's, the dependency of local and adjacent communities on the Forest and Grassland natural resources can be determined.

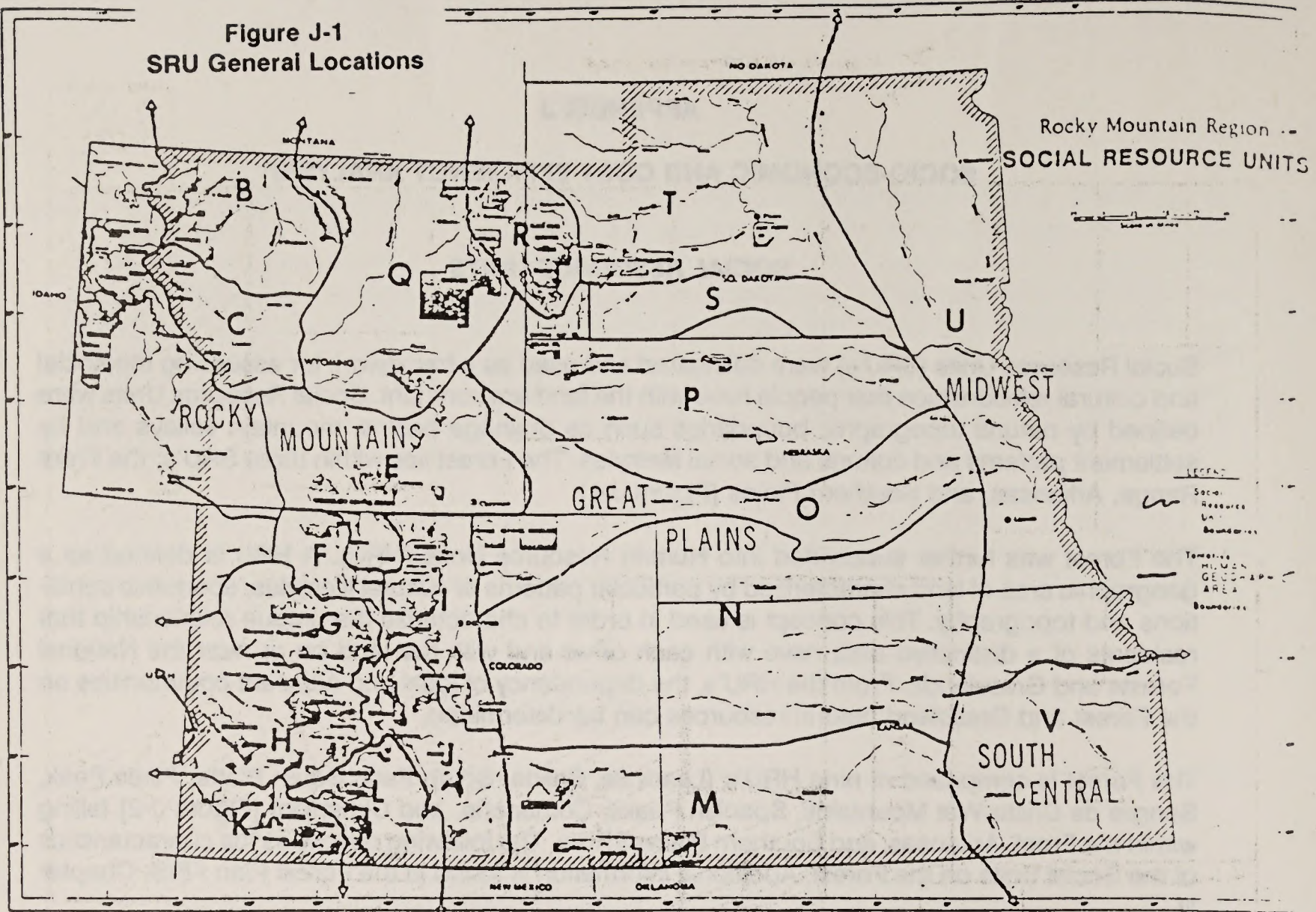
The Forest is comprised of nine HRU's (Leadville, Salida, South Park, South Platte, Pikes Peak, Sangre de Cristo-Wet Mountains, Spanish Peaks, Comanche, and Cimarron) [Figure J-2] falling within the Front, Arkansas, and Southern Plains SRU's. The following describes the characteristics of the Social Units on the Forest. Additional information is found in the Forest Plan FEIS, Chapter III.

#### Front Range Social Resource Unit

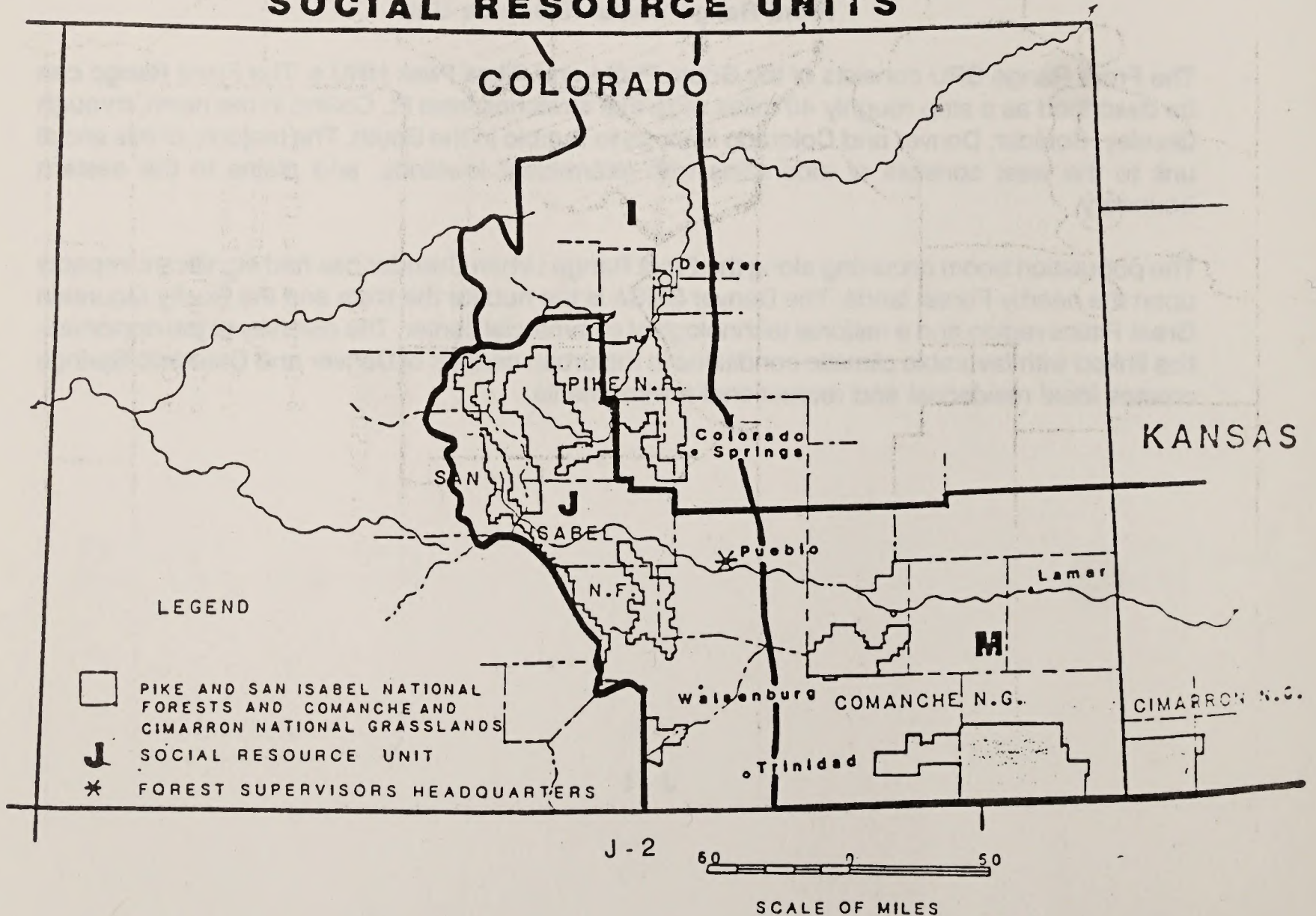
The Front Range SRU consists of the South Platte and Pikes Peak HRU's. The Front Range can be described as a strip roughly 40 miles wide that stretches from Ft. Collins in the north, through Greeley, Boulder, Denver and Colorado Springs to Pueblo in the South. The majority of this social unit to the west consists of mountains with intermittent lowlands, and plains to the eastern boundary.

The population boom occurring along the Front Range Urban Corridor has had significant impacts upon the nearby Forest lands. The Denver SMSA is the hub for the state and the Rocky Mountain Great Plains region and a national technological commercial center. The diversity of job opportunities linked with favorable climatic conditions in the urban centers of Denver and Colorado Springs creates ideal residential and recreational environments.

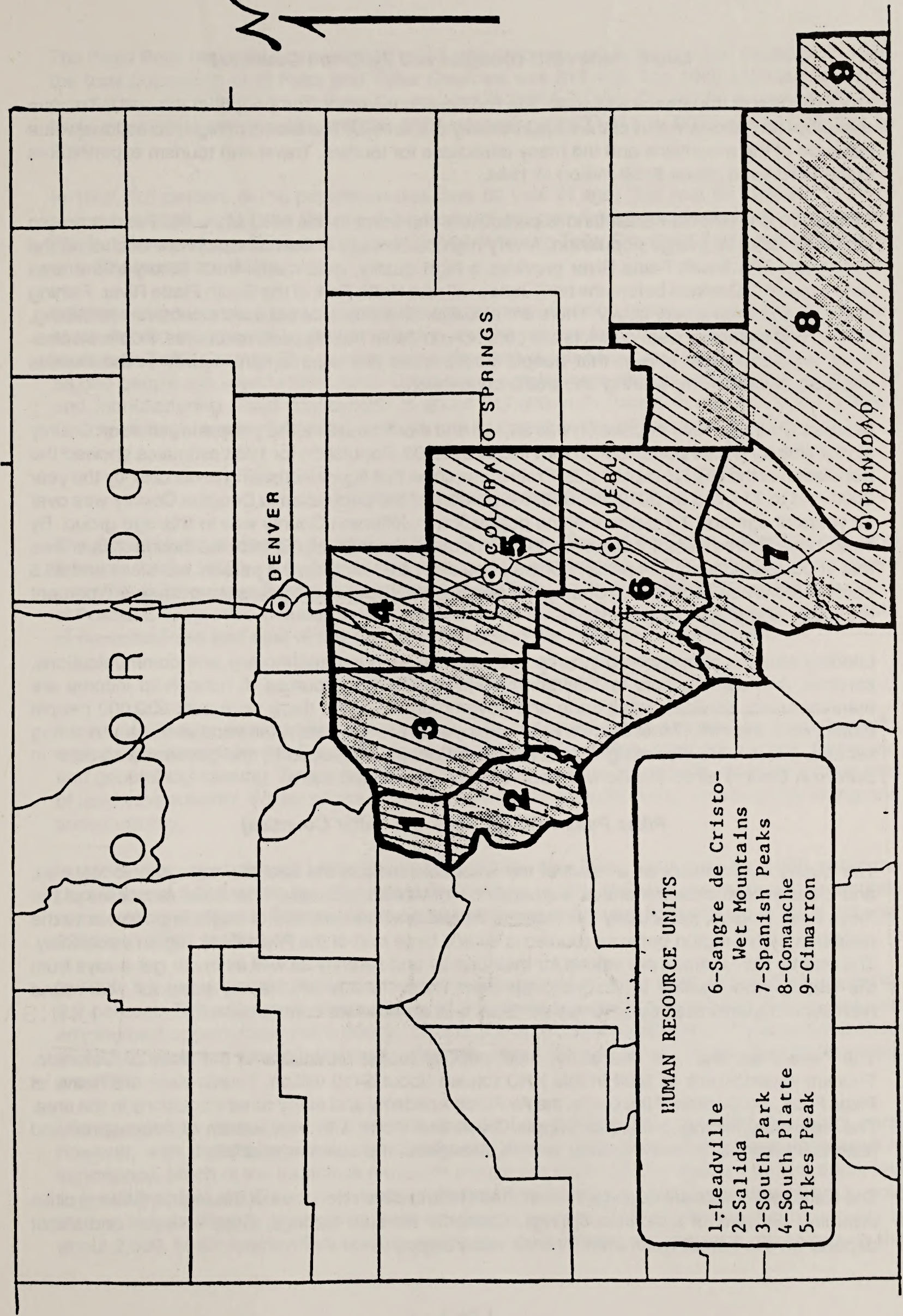
Figure J-1  
SRU General Locations



GENERAL LOCATION MAP  
SOCIAL RESOURCE UNITS







- HUMAN RESOURCE UNITS**
- 1-Leadville
  - 2-Salida
  - 3-South Park
  - 4-South Platte
  - 5-Pikes Peak
  - 6-Sangre de Cristo-  
Wet Mountains
  - 7-Spanish Peaks
  - 8-Comanche
  - 9-Cimarron

### ***South Platte HRU (Douglas and Jefferson Counties)***

The esthetics of the area are important to the Forest users and the people in the HRU. Tourism also plays an important part of the local economy of this HRU. The area is of high recreational value because of the mountains and the many attractions for tourists. Travel and tourism expenditures in the HRU were about \$150 million in 1984.

Recreation on National Forest land is particularly important in this HRU since the Forests are so very accessible to a large population. A very high percentage of the recreation use occurs on the weekends. The South Platte River provides a high quality, gold-medal trout fishery in the area downstream of Deckers before the confluence with the North Fork of the South Platte River. Fishing activity in this area is very heavy. There are also river stretches that are used extensively for tubing, rafting, and kayaking. User conflicts are common on these heavily used resources. Public involvement programs have shown that people desire more law enforcement activity in the Forests because of vandalism, littering and traffic congestion.

Douglas County's 1980 population was 25,153 and there were 371,753 people in Jefferson County at that time for a total population in the HRU of 396,906. Population for 1988 estimates showed the population of the HRU to be 469,223. Projections show that figure increasing to 605,257 by the year 2000 and to 711,735 by 2010. In 1980, 6.2 percent of the population in Douglas County was over 62 years of age and 7.7 percent of the population in Jefferson County was in this age group. By 1988 those figures were 5.7 percent and 10.2 percent, respectively. Ethnic distribution data shows that in Douglas County, 2.4 percent of the population are Hispanic, 0.4 percent are Black and 96.5 percent are White. In Jefferson County, 5.2 percent are Hispanic, 0.5 percent are Black, 1.0 percent are Asian and 93 percent are White.

Leading sources of household income in Douglas County are technology and communications, services, and construction. In Jefferson County, the leading sources of household income are manufacturing, services, retail trade and government. In 1986, there were over 230,000 people employed in this HRU. Most of them were employed in the services, retail trade and manufacturing sectors. There were also a significant number of people employed by the government sector in Jefferson County since the Denver Federal Center is located there.

### ***Pikes Peak HRU (El Paso and Teller Counties)***

The quality environment as a result of the amenable climate, the beautiful topographic features, and pleasant esthetics generates a steady flow of tourists annually. The visual resources of the Pikes Peak Region, particularly the National Forest environment, are of major importance to the residents of this region because tourism is such a large part of the Pikes Peak region's economy. The nearby Forest areas are valued for their beauty and serenity as well as major get-aways from the weekly work routine in Colorado Springs. Thus, Forests are heavily used for year-round recreation opportunities by HRU residents as well as adjacent communities.

The Pikes Peak region is one of the most popular tourist attractions in the state of Colorado. Tourism expenditures in 1984 in this HRU totaled about \$410 million. Tourist visits are heavy at Pikes Peak, the Garden of the Gods, the Air Force Academy and many other attractions in the area. The legendary mining centers of Cripple Creek and Victor with their wealth of educational and historical information receive many visitors throughout the summer and fall.

The National Forests are important watersheds for the developed area of the region. Several cities including portions of Colorado Springs, Cascade, Manitou Springs, Cripple Creek and Victor depend on the Forest watershed for their water supply.

The Pikes Peak region has experienced rapid population growth in the last two decades. In 1980, the total population of El Paso and Teller Counties was 317,458. The 1988 estimate of county population was 396,200 for El Paso County and 11,349 for Teller County for a total of 407,549. Projections show the population of this HRU increasing to 523,917 by 2000 and to 626, 281 by 2010.

In 1988, 9.5 percent of the population was over 62 year of age. This was an increase from 8.6 percent in 1980. In El Paso County, 7.7 percent of the population are Hispanic, 6.2 percent are Black, 1.6 percent are Asian and 83.9 percent are White. In Teller County, 1.5 percent are Hispanic and 98 percent are White.

Military and government jobs dominate the employment situation in this region. Leading sources of household income are high-tech industry and the military in El Paso County and mining and tourism in Teller County. The government is the largest job sector in El Paso County with over 58,000 people employed (1986 data). Other major employment sectors are services, retail trade and manufacturing. Total employment is about 217,000 in El Paso County and 4,000 in Teller County. A large number of military retirees make up part of the civilian labor force.

### **Arkansas Social Resource Unit**

This Social Unit includes the Leadville, Salida, South Park, Sangre de Cristo - Wet Mountain, and Spanish Peaks HRU's. It begins in the west at the headwaters of the Arkansas River above Leadville, at Tennessee Pass. It follows the Arkansas River south and east to the eastern boundary of Pueblo County. Also included in this Social Unit are the South Park valley area which lies south of Kenosha Pass and east of the Arkansas River, and the Spanish Peaks Region.

### ***Leadville HRU (Lake County)***

Recreation is also very important in this region. The National Forests are used by local residents and many visitors from the Front Range and out-of-state for hiking, camping, fishing, picnicking and general sightseeing. Turquoise Lake, about four miles west of Leadville, receives a great deal of use in the summer. Winter sports in the county include downhill skiing, cross-county skiing and snowmobiling.

In 1980, the population of Lake County was 8,830. Population estimates for 1988 show the population of 6,012 which is a 32 percent decline since 1980. This was largely due to reductions in the mining workforce. Projections show the population continuing to decline to 4,321 in the year 2000 and 2,591 in 2010.

In 1980, 5.3 percent of the population was over 62 years of age. By 1988, that had increased by 9.9 percent. This change is due to many of the younger age groups leaving due to reduced employment opportunities in the county. Data on the ethnic characteristics of the population show that 23.5 percent of the population are Hispanic, about 0.7 percent are Indian and 75.3 percent are White.

Mining activities have been and are still important to this region's economy. In recent ears, however, with the scaling back of molybdenum mining operations, tourism has increased in importance. Much of the tourism is related to the mining history of the region. Tourism and travel expenditures in Lake County were about \$4.8 million in 1984. Leading sources of household income in Lake County are mining, government and tourism. Total employment in the county is about 2,600. Major employment sectors are mining, government, services and retail trade. In the

last few years, due to the housing shortages in communities around ski areas, many people live in Leadville and commute to work in the ski areas in Summit and Eagle counties.

#### ***Salida HRU (Chaffee County)***

With 68 percent of the land in the county in National Forest, there are many opportunities for outdoor recreational activities. There are jeep roads, ghost towns, campgrounds, river rafting, kayaking, cross-country skiing, downhill skiing at Monarch Ski area, hiking trails, fishing and natural hot springs. The scenic quality of the area, enhanced by the Collegiate Peaks, attracts a large number of tourists and generates a significant portion of the economy in the area. Tourism and travel expenditures in Chaffee County in 1984 were \$24.9 million. Many of the tourists to this area are from the Front Range.

Generally, local residents feel that mineral development is important for jobs and production of energy, but that those activities should only be allowed with controls that would ensure protection of the area's aesthetic qualities. The National Forests are also used by local residents for fuelwood gathering and for grazing of domestic livestock.

The county's 1988 population was estimated at 12,276. This was a 7.2 percent decrease from the 1980 census county of 13,227. Projections show a population of 14,144 by 2000 and 15,486 by 2010. In 1980, 14.1 percent of the population was over 62 years of age. That figure had increased to 17.6 percent by 1988. The scenic quality, good climate and abundant recreational opportunities have been the reasons for increased migration of elderly population into the area. In Chaffee County, 9.7 percent of the population are Hispanics, 0.7 percent are Black and 89 percent are White.

Services, retail trade and government provide the majority of employment opportunities in Chaffee County. Leading sources of household income in the county are recreation, tourism, mining and agriculture. The majority of the employment in the county is in services, retail trade and government. Total 1986 employment was 6,044. Many of the government workers are employed at the Buena Vista Correctional Facility.

#### ***South Park HRU (Park County)***

Agriculture and ranching have been of major importance to the South Park area with the production of hay, cattle and sheep. However, the amount of land devoted to those activities continues to decline. These losses have been fueled by the loss of agricultural water rights because of residential developments and increased domestic use of water.

Approximately 60 percent of the land in Park County is government-owned. Of the total public land in the County, 47 percent is NFS land. This large public land base provides many outdoor recreational opportunities. Land uses on public land include wildlife management, grazing, timber harvesting, mining, watershed conservation and recreation. Land uses on private lands include seasonal home development, mining, recreation, grazing and agricultural operations.

Tourism is an important element of the economy in South Park. In 1984, tourism and travel expenditures amounted to \$9.4 million in Park County. This region offers a wide variety of outdoor recreation opportunities to residents and tourists. Large lakes and reservoirs attract sportsmen for boating, fishing, swimming, camping and water skiing. Forest visitors who are camping, picnicking, sightseeing and experiencing other outdoor recreation activities create jobs in government and in small businesses. The local economy of communities near the National Forests area also affected by direct purchasing of goods and services.

There are three large water supply reservoirs located in Park County that provide water to the metro Denver area. These are Spinney Mountain, Antero, and Eleven Mile Canyon reservoirs. In addition, there are several smaller reservoirs including Tarryall, Jefferson and Montgomery reservoirs. All of these reservoirs are popular for fishing and other water-based outdoor recreation. State recreation areas are developed at Antero, Eleven Mile and Tarryall reservoirs.

Park County is quite sparsely populated with a 1988 estimated population of 6,058. This figure is up from the 1980 census of 5,333 and the 1970 census county of 2,185. The Bailey/Platte Canyon area has experienced accelerated population growth due to its proximity to the Denver metropolitan area. Population projections for the county show a year 2000 population of 8,578 and a year 2010 population of 10,901. Currently about 8.8 percent of the population is at least 62 years of age. That figure is up from 8.0 percent in 1980. Data on ethnic characteristics of the county shows 2.3 percent are Hispanic and 96.5 percent are White.

Government, services, retail trade and construction are the sectors that provide the most employment in Park County. Total 1986 employment was 2,090 people. The peak period of employment is in the summer because of the seasonal nature of agriculture, construction and tourism.

### ***Sangre de Cristo-Wet Mountain HRU (Custer, Fremont and Pueblo Counties)***

Management of NFS lands for recreation uses and watershed is very important to this HRU. Several communities near the Forest depend on relatively small drainages within the forest for all or part of their water supply for domestic or irrigation purposes. Recreation use of the Forest areas is very high in portions of this HRU. Fishing pressure on some lakes, such as Lake Isabel, is, on a per acre basis, some of the heaviest in Colorado.

Tourism is important throughout the region. Total 1984 travel and tourism expenditures in the HRU were about \$50 million. The Pueblo Reservoir is a very large recreation area in the HRU with facilities for boating, fishing, camping and picnicking. It has 5,700 acres of water surface and 60 miles of shoreline.

Custer County is a quite sparsely populated rural, agricultural and tourist oriented county. About one-third of the county's population lives in the two communities of Westcliffe and Silver Cliff. Hay and cattle ranches are the predominant occupations of the long time residents. Tourism provides most of the non-farm employment. Leading sources of household income in Custer County are agriculture, tourism, real estate and retirement. Tourism and travel expenditures in the county were about \$1.6 million in 1984.

Pueblo County has a varied economic base. Colorado Fuel and Iron Corporation (CF&I) still has some employment in the area. Agriculture is important in the county as are government and services. Leading sources of household income in Pueblo County are from manufacturing and public administration.

The 1980 population of the HRU was 156, 176: 1,528 in Custer County, 28,676 in Fremont County, and 125,972 in Pueblo County. As of July 1988, the estimated population of the HRU was 164,600. Projections for the year 2000 and 2010 show slight population increases to 170,656 and 171,581, respectively.

In 1980, 15.9 percent of the total population in Custer County was over 62 years of age. Corresponding figures for Fremont County are 20.7 percent and 14.3 percent for Pueblo County. By 1988, these figures were 13.9 percent for Custer County, 22.4 percent for Fremont County and 16.3 percent for Pueblo County. These figures are very high ranging to almost twice as high as averages seen in the more populated portions of the state.

The ethnic characteristics for the HRU show that 27.9 percent of the population of the HRU are Hispanic, 1.7 percent are Black, 0.5 percent are Indian and 69.6 percent are White.

Farming is the major occupation in Custer County. Services and government are the main employment sectors in the rest of the HRU. Many of the service jobs in Custer and Fremont Counties are related to tourism. A large portion of the government jobs in the Fremont County are with the Colorado Department of Corrections. Government jobs in Pueblo include those at the Colorado State Hospital and those at the Pueblo Army Depot. In addition to services and government, retail trade is a strong employment sector in Pueblo County.

Total 1986 employment for the HRU was 62,584; 755 for Custer County, 11,940 for Fremont County, and 49,889 for Pueblo County.

### ***Spanish Peaks HRU (Huerfano and Part of Las Animas County)***

Tourism has been steadily growing over the years and significant numbers of elderly have moved into the area to enjoy its scenic qualities and reasonable cost-of-living. There are many lakes and reservoirs that provide opportunities for fishing, camping, swimming and boating. Horseback riding is also a popular activity in the Unit. Tourism/travel expenditures in this HRU were about \$24.8 million in 1984.

In 1980, there were 6,440 people in Huerfano County. By July 1988, that had increased to 6,964. In 1980, there were 14,897 people in Las Animas County. The 1988 population estimate for Las Animas County was 14,319. It is assumed that 90 percent of the population of Las Animas County is included in this HRU, even though only about 37 percent of the land area in the county is included in the HRU. In 1980, Spanish Americans made-up 44 percent of the total population of the Unit. Less than 1 percent were Blacks and other races and 55 percent were White.

Population projections show the population in Huerfano County dropping to 6,513 in the year 2000 and to 6,110 by 2010. Las Animas County projects a drop in population of 12,243 for the year 2000 to 10,148 by 2010. The 1980 population of the unit was 19,928. Population projections for the Unit are for 17,532 people in the year 2000 and for 15,243 by 2010. Population decreases in the HRU are due to the lack of employment opportunities.

In 1980, persons 62 years old and over accounted for 22 percent of the population in Huerfano County and for 21.2 percent of the population in Las Animas County. In 1988, those figures were 20.6 percent for Huerfano County and 21.7 percent for Las Animas County. These figures support the trend that this area has been very popular for in-migration of elderly.

Ranching, livestock and hay production are the primary agricultural activities in the HRU. Leading sources of household income in Huerfano County are government, services and retail trade. Leading sources of household income in Las Animas County are railroads, government, mining and agriculture.

In 1986, there were over 2,600 people employed in Huerfano County. The largest employment sectors were services, retail trade and government. At the same time, there were over 5,000 people employed in Las Animas County. The majority of those people worked in the government and services sectors. There were also a sizeable number of people working in farming and ranching throughout the Unit.

## **Southern Plains Social Resource Unit**

The Southern Plains Social Unit consists of the Comanche and Cimarron National Grasslands in southeastern Colorado and southwestern Kansas, respectively. The Cimarron Grassland is the largest block of public land in Kansas.

### ***Comanche HRU (Baca, Otero, and Part of Las Animas County)***

Federal agricultural programs in the area provide an economic base on which the area depends. Agriculture and livestock raising is the main way of life and the leading source of household income in this HRU. The agriculture depends on water and the water yield in the Unit is very unpredictable. Precipitation varies from 6 to 17 inches. Many livestock operations are dependent on grazing on the National Grasslands. Fruits and vegetables are grown along the lower Arkansas River and other areas. The region produces the famous Rocky Ford cantaloupe.

The Grasslands provide good wildlife habitat and hunting and birdwatching are popular activities. The area receives hunting for big and small game, waterfowl and upland game birds. Tourism and travel expenditures in this HRU were about \$16 million in 1984.

Population in Baca County was 5,419 in 1980. Although this HRU contains about 63 percent of the total land in Las Animas County, it is estimated that it only includes about 10 percent of the county's population. The portion of the Las Animas population in this HRU in 1980 was 1,499. The 1980 population of Otero County was 22,567 and the total 1980 population of this HRU was 29,485. In 1988, the HRU had a population of 27,635. Population projections show these figures decreasing to 23,454 in the year 2000 and to 19,218 by 2010.

The percentage of the population over 62 years of age in 1980 was 17 percent for Baca County, 21.2 percent for Las Animas County and 17.5 percent for Otero County. By 1988, those figures increased to 21.8 percent, 21.7 percent and 18.6 percent, respectively. There is a significantly higher proportion of senior citizens in this region than in many of the other more highly populated areas of the state.

In Baca County, six percent of the population are Hispanic, one percent are Indian and 92.9 percent are White. In Las Animas County, 43.4 percent are Hispanic, 0.5 percent are Indian and 55.5 percent are White. In Otero County, 32.9 percent are Hispanic, 0.5 are Asian and 65.9 percent are White.

There were 2,361 people employed in Baca County in 1986. Farming was the occupation for over 900 people. Other main employment sectors were government, retail trade and services. Farming is also the main occupation for the eastern portion of Las Animas county. The largest employment sector in Otero County is the services sector followed by government, retail trade, and agriculture. Total 1986 employment in Otero County was 10,224. Total employment for the HRU is about 13,100.

### ***Cimarron HRU (Morton & a Small Part of Stevens County)***

The area is principally a ranching and farming region characterized by large farms. Most of the wheat and grain sorghum produced in the HRU are marketed locally. Agriculture, along with oil and gas production industries, are the main activities in the HRU. Agriculture and livestock raising which are the principal occupations of the region are affected by several climatic factors. Unpredictable and low amounts of precipitation are the main limiting factors in crop production in the HRU. This affects the forage which is a key resource on the Cimarron Grasslands and which influences the local economy. Oil and gas development has been a significant economic factor in

the region by providing local employment. Protection and management of the Grasslands for sustained cattle grazing are important to the residents of the HRU.

Recreation is an important activity on the Grasslands. The Grasslands are used for bird-watching, picnicking, and small game hunting for quail, pheasant, cottontail rabbits and waterfowl. For sightseeing, the Grasslands include evidence of the Santa Fe Trail and various Indian artifacts. Local residents are the heaviest recreation users of the Grasslands.

The 1980 population of Morton County was 3,454 people. The July 1988 population estimate showed the population increasing slightly to 3,500 people. Projections show continued slow growth to 3,542 in the year 2000 and 3,730 in 2010.

Total employment in Morton County in 1987 was 1970 people. The largest employment was in government followed by employment in farming, retail trade, and services.

## **ECONOMIC IMPACTS**

### **IMPLAN Analysis**

IMPLAN models the economic effects of monetary expenditures within a defined economic community. Inputs or expenditures are entered as dollar values and are allocated to, or originate from sectors which are generally the same as the Standard Industrial Codes (SIC) of the U.S. Commerce Department. Each sector number is tied to a unique industrial activity or function allowing for detailed computer modeling. The model then applies a set of mathematical functions to the input, simulating the economic process, and generates output. The output for this study represents the total income and total number of employed persons created by expenditures due to oil and gas leasing within the area.

To facilitate this analysis the study area was divided into three primary geographic areas which have similar oil and gas development potential and will experience similar impacts from oil and gas activities. The three areas are Urban, Rural, and Grasslands. The Rural area is comprised of the mountainous lands within the Pike and San Isabel National Forests, and includes Lake, Park, Chaffee, and part of Fremont counties within Colorado. The Urban area is made up of the Denver Metro area and the Front Range areas within the Pike and San Isabel National Forests. Huerfano, Custer, Pueblo, Jefferson, Douglas, Teller, El Paso, and part of Fremont counties make up this area. All lands within the Comanche and Cimarron National Grasslands are included in the Grasslands area and include Morton County, Kansas, and Baca, Las Animas, and Otero Counties in Colorado.

The Rural area is sparsely populated and has seen very little oil and gas activity. The primary geologic basin where most future oil and gas activity probably would occur would be the South Park Basin, in Park County, Colorado. The oil and gas service industry is nearly non-existent in this area and most services would, therefore, come from the Denver Metro area and Wyoming.

The Urban area supports a number of large cities and urban areas. The Denver Metro area is home to many large and small oil companies and to oil service companies including seismic and drilling contractors. It is assumed that all necessary services would be provided from within this area.

The Grasslands area, especially that part within Morton County, Kansas, is heavily developed in terms of the oil and gas industry. Thousands of wells have been drilled in this area, from the early nineteenth hundreds to the present. Service centers are well established in this area and would



adequately service the oil and gas activities proposed. Drilling and seismic contractors would probably come from within the area and Oklahoma and Texas. Lands within the Comanche Grasslands in Colorado are less developed than those on the Cimarron Grasslands in Kansas, with well densities decreasing as you go west.

The oil and gas activities which could impact the local economies have been further subdivided into three phases: exploration, drilling and production. The lands within this EIS study area, if leased to oil and gas companies, would be developed by a number of different companies with a variety of operational strategies. This development would begin at different times and would occur at different intensities depending on the area of the lease and the lessee. A specific lease or lease area will generally be impacted by the three phases of activities identified above. These activities would typically occur in the order they are listed in. However, because of the number of different leases and companies involved in the study area, each of the geographic areas would at any one time, be impacted by activities from all three categories. Therefore, expenditures in the exploration and drilling categories were applied uniformly, on an annual basis, throughout the 15-year study period. Production expenditures increase each year, and are cumulative because each year new producing wells would be found, yet none would be abandoned.

### ***COST EFFICIENCY***

The main criterion used in assessing efficiency is Present Net Value (PNV) analysis, which is defined as the value of discounted benefits less discounted costs. In the preparation of the Forest Management Plan and FEIS, the PNV analysis included all outputs, such as timber, grazing and recreation, to which monetary values were assigned. That analysis demonstrated the relative efficiency of the Forest Management Plan which in turn guides the current analysis of alternative oil and gas leasing programs on the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands.

Given that the efficiency of the Forest Management Plan has already been addressed, a more limited analysis, termed a cost efficiency analysis, is undertaken for the assessment of the oil and gas leasing alternatives. The focus of this analysis is an evaluation of the costs and revenues to the Federal government for each of the four alternatives. Only costs and revenues directly linked to oil and gas leasing are considered in this analysis. For instance, estimates of additional administration costs associated with issuing exploration permits, annual lease rentals and royalties paid on production are included, whereas Federal income taxes to be paid on employee earnings in the oil and gas industry are not included. Furthermore, proponent costs such as field exploration costs are also ignored. To the extent that they are identified and quantified, changes in Federal costs or revenues resulting from impacts on other outputs on the National Forests or Grasslands, termed "opportunity costs", are also considered.

The current analysis consists of two measures of efficiency: (1) a PNV analysis (discounted revenues less discounted costs) and (2) revenue-cost ratios (discounted revenues divided by discounted costs). As all monetary values are expressed in constant 1989 dollar terms, with no allowance for either real change or inflation, a four (4.0) percent discount rate is used throughout this analysis. Furthermore, producing wells are assumed to have a 15-year productive life. Since the alternatives assume that new wells will begin production throughout the 15-year analysis period, some of future revenue stream, as well as associated Forest Service administrative costs, will extend beyond the year 2004. Consequently, their analysis also examines the cost efficiency of leasing over a 30-year time period extending to 2019. The resulting PNV and revenue-cost ratio analysis are then ranked in terms of the alternative which would yield the highest returns.

## Revenues Accruing to the Treasury

Revenues accruing to the Federal Treasury that could potentially be affected by the oil and gas leasing alternatives include: lease bonus bids, annual rentals, royalties based on annual production, grazing fees, timber sale revenues and user fees at developed recreation facilities.

### Lease Bonus Bids

Lease bonus bids are one-time premiums paid to the Federal government for the right to explore and develop a given lease being offered for such purposes. The premium is established by competitive bid. The bonus generally reflects the industry's appraisal of the mineral potential of a given lease, as well as the outlook for energy prices. The more well-defined a tracts' mineral potential, as established by a higher than average success rate for wells in the surrounding region or other indicators, the higher the likely bonus payments. Bonus bids vary greatly, even within a relatively limited geographic area.

For this analysis, bonus bid revenues are estimated as a function of bonus bids received per acre in 1988 and 1989 plus the assumed frequency, number and size of leases expected to be offered on the Cimarron and Comanche National Grasslands and the National Forests. The rates reflect differences in mineral development potentials throughout the region, and uncertainty arising from the relative lack of exploration history on the Comanche National Grassland and the Forests. The bonus bid values in 1989 dollars, are: \$400/acre for the Cimarron National Grassland; \$25/acre for the Comanche National Grassland; and \$10/acre for the National Forests.

The following assumptions are used with respect to the other factors that affect the timing and amount of bonus bid revenues:

- Average tract size for leased parcels is 160 acres on the Grasslands and 900 acres on the National Forests;
- Leasing is assumed to occur at a uniform rate over the period of analysis; and
- All lands available for leasing are to be leased during the course of that period.

Table J-1 summarizes the leasing profile resulting from these assumptions. These assumptions imply annual rates of leasing comparable to or exceeding recent activity levels in these areas under all but Alternative IV. For instance, during calendar year 1988, 41 tracts on the Cimarron National Grassland and four tracts on the Pike and San Isabel National Forests were leased using the competitive bid process.

**Table J-1  
Comparison of Leasing Profiles by Alternative**

|                                   | Alt. I    | Alt. II   | Alt. III  | Alt. IV |
|-----------------------------------|-----------|-----------|-----------|---------|
| Total Acres Leased                | 2,245,421 | 2,245,421 | 2,125,938 | 0       |
| Ave. Acres Leased Per Year        | 112,271   | 112,271   | 106,297   | 0       |
| Ave. # of Tracts Leased Per Year: |           |           |           |         |
| Grasslands                        | 123       | 123       | 123       | 0       |
| Forests                           | 103       | 103       | 96        | 0       |
| Total Tracts Leased               | 3,382     | 3,382     | 3,282     | 0       |

Due to the variability of the bonus bids, the competitive nature in which they are established, and uncertainties associated with both the success rate and the future price on energy resources, these values are established solely for the current analysis and are thought to be reasonably conservative. They should not be interpreted as an indication of what actual bonus bids may be in the future nor should they be used as the basis for developing any bid for a future offering.

#### Annual Rentals

Annual rentals are the annual payments to the Federal Government for an active lease. Oil and gas leases are generally for five-year terms, although a lease can be held indefinitely by a producing well. The current annual rental rate is \$1.50 per acre. This value is used and held constant over the entire analysis period. Revenues are estimated as a function of the number of wells drilled, the success rate and abandonment assumptions under each alternative.

#### Royalties

Royalties are a direct function of the royalty rate and value of production achieved from a producing well. The current royalty rate for Federal oil and gas leases is 12 percent of the value of production. This rate is maintained over the entire analysis period.

Energy prices are extremely volatile and future prices uncertain. Values established for this analysis are based on average wellhead prices received over the three-year period 1986, 1987 and 1988. Adjusted to 1989 dollar terms, the values are: \$16.27 per barrel of crude oil and \$2.10 per 1,000 cubic feet of natural gas. Because real energy prices have been near historic lows during that period, the results derived using these values are probably conservative.

Average per well oil and gas production is the other primary determinant of royalties to be received. Production characteristics vary by field and individual well. Average production assumptions based on statistics for annual production volume and the number of producing wells in selected counties in Colorado and Kansas are used in this analysis. The average annual production assumptions used in this analysis are:

- 30,000 Mcf of gas and 800 barrels of crude for wells on the National Forests
- 45,000 Mcf and 5,000 barrels of crude on "high" mineral potential portions of the Grasslands
- 25,000 Mcf and 1,500 barrels of crude on "moderate" mineral potential portions of the Grasslands

Since the mix of wells between these areas varies by alternative, some variation occurs in the average production per well across the alternatives.

Producing wells typically experience diminishing production over time. Thus, it is assumed that a well will produce approximately one-half of its eventual cumulative life-of-well production within the first three years. After that time, production is assumed to remain constant over the 12-year residual productive life.

### **Grazing Fees**

Grazing fees are paid by farmers and ranchers who have seasonal grazing allotments on Federal lands. Each grazing allotment entitles the lease holder to graze a specified number of cattle or sheep for a defined time period, which varies based on the ranges productive capacity. Combining the number of animals and the duration yield a measure termed animal-unit-months (AUM's), which is the standardized basis for the fees. The current fee (1989) is \$2.10 per AUM. This value is maintained for this analysis.

### **Timber Sale Revenues**

Timber sale revenues are payments made to the Federal government for the right to harvest timber on public lands. As with the bonus payments, the payments are competitively established at auction for specific advertised tracts. However, unlike the oil and gas leases, minimum bids are established for timber sales.

The potential impact on the timber sale revenues from oil and gas leasing would arise in a situation where the latter would reduce or impede a future timber sale, which in turn would reduce revenues to the Federal Treasury; an opportunity cost. However, as discussed in other sections, no impacts on timber harvest are projected as a result of the alternatives. Therefore, there would be no impact on timber sale revenues to the Federal Treasury.

### **Recreation User Fees**

Recreation user fees are collected by the Forest Service from users of many developed campgrounds. In fiscal year 1988, such fees were charged at 59 of the 93 developed campgrounds managed by the Forest Service in the study area. In some instances, the Forest Service also collects recreation fees from downhill ski areas that are operating some or all of their facilities on public lands under a special use permit. As is true for grazing and timber sales, the proposed oil and gas leasing alternatives could impose an opportunity cost to the Federal Treasury, if such activities interfered with revenue-producing recreational pursuits on the National Grasslands or Forests. Some potential for adverse impact relative to the enjoyment or quality of experience and possibly the level of recreation use of a particular developed recreation area is acknowledged. However, the net impact on use and resulting fees cannot be quantified. In many instances the

impact is likely to be in the form of re-directing the recreation use to another location, not an actual loss or reduction of use. Therefore, the revenue projections include no allowances for changes in recreation user fee receipts.

### **Incremental Costs to the Forest Service**

Three categories of costs are addressed in the cost efficiency analysis; operation and maintenance, general administration, and capital investments. As with the revenues, the emphasis is on those costs that are directly linked to the oil and gas leasing program.

#### **Operation and Maintenance**

Operation and Maintenance (O & M) costs are the recurring labor and non-labor costs required to implement and administer the program on-site and at the local district level. In other words, the O & M costs are directly associated with the industry's exploration, development, production and reclamation activities. For example, the Forest Service is required to conduct an on-site inspection of all wells to insure compliance with various stipulations and regulations. The staff time and associated costs fall under the heading of operation and maintenance costs. For this analysis, the projected O & M costs reflect recent experience and budgets of the Forest Service associated with oil and gas leasing programs in the study area.

The major component of O & M costs are payroll and staff-related expenses. O & M costs are less sensitive to the number of producing wells than are revenues. Costs respond more in an incremental fashion to major changes in the levels of leasing, exploration, development and reclamation activity. Also, as the Forest Service's budget is Congressionally established, increased staffing does not necessarily result from increased demand. For this analysis, the following incremental staffing needs and costs are assumed. The staffing estimates are in addition to the current staffs assigned to Minerals and Leasing activities. The estimated annual cost per full-time employee (FTE) includes allowances to cover associated expenses, such as motor vehicles. In addition to the above expenses, a second allowance of 13.2 percent of the subtotal is included for overhead and other Forest-level administrative expenses. Finally, annual expenditures of \$106,300 which represent the average project budget for Minerals and Leasing on the Pike and San Isabel National Forests and the Comanche and Cimarron National Grasslands are also included.

#### **General Administration**

General Administration (GA) costs also encompass recurring labor and non-labor costs associated with the development and administration of the program. However, the GA costs are not specifically linked with on-the-ground activities, but rather are tied to the administration of the overall program. Most of these costs occur at the Forest and Regional level. Among the functions considered to be GA in nature are the collection, reporting and disbursing of royalty receipts; coordination of leasing programs and output targets among the Forests and staff; and budget formulation for the district operations. These costs are not easily attributable to discrete activities and programs of a particular Forest. For this analysis, they are assumed to be equal to the projected O & M costs.

## **Capital Investments**

Capital investments are expenditures associated with improvements or items which have an expected life of more than one year. Examples of such expenditures include construction costs for new roads, Forest Service vehicles, or additional data processing capacity. No specific requirements for major capital investments from Federal sources resulting from oil and gas leasing have been identified. However, as some capital investment is required on a periodic basis, such as replacement of motor vehicles, an allowance for such costs is factored into the O & M cost components for this analysis.

## **Other Costs**

Payments to State and Local Governments are made to help finance public education and road maintenance in the counties where the National Forest lands are located. By law, 25 percent of the revenues collected by the Forest Service are returned to state and/or local governments for these purposes. These "revenue-sharing"-type disbursements do not represent costs in the same manner that outlays for motor vehicles are costs, but they do reduce the effective net revenue to the Federal Treasury. At the same time, they can be viewed as providing a benefit at the local level, that may not be captured in an analysis that considers only the net effects on the Federal Treasury. The PNV and revenue-cost ratios presented in this analysis have the payments subtracted from the estimated revenues.

## ***PRESENT NET VALUE AND DISCOUNTED REVENUE-COST RATIOS***

Annual estimates of the incremental revenues and costs associated with each of the alternatives are derived based on the factors and assumptions outlined above. Annual revenues are projected to increase over time, primarily as a function of the number of producing wells. Figure J-3 provides a simplified illustration of this pattern, showing the increasing level and changing composition of the revenue stream over time.

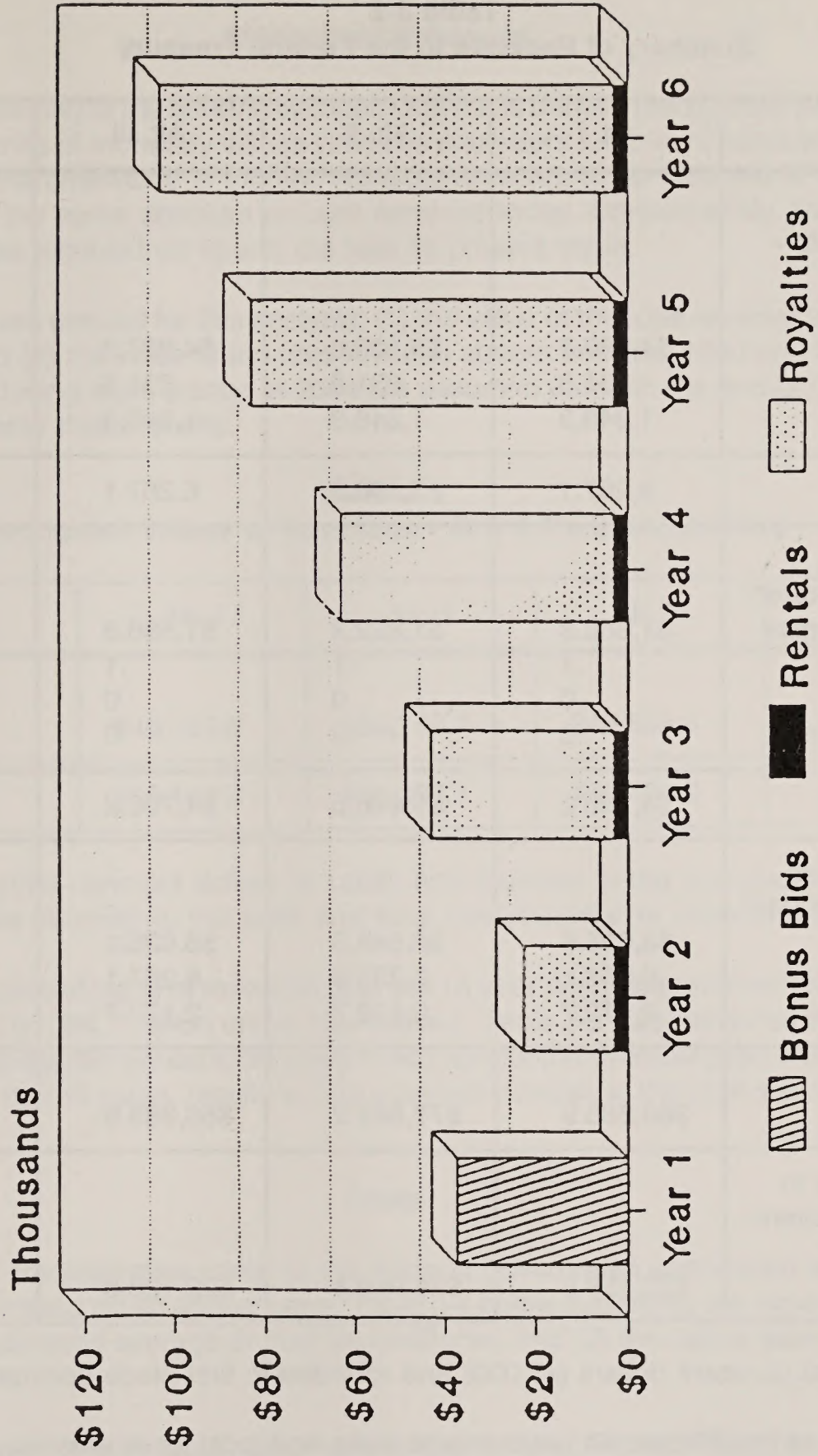
As shown, the typical revenue stream combines one-time and recurrent revenues. This results in a revenue stream punctuated by periodic receipts coinciding with the bonus bids received from the initial leasing. Subsequently, the Treasury would receive annual rentals based on the land area leased. Finally, royalty payments would accrue as new wells come into production, resulting in a cumulative increase over time.

Conversely, Forest Service costs are significantly less sensitive to the number of wells or even minor changes in the rate of leasing on a given Forest. Rather, the management costs are relatively fixed and adjust in a more discrete or incremental fashion.

## **Revenues**

Revenues to accrue to the Federal Treasury are estimated on an annual basis. The generalized pattern parallels that shown in Figure J-3 although there is a substantial variation over time and between alternatives. Table J-2 compares the alternatives from three different perspectives: (1) the estimated revenue, by major source, for the year 2000; (2) total revenues for the years 1995, 2000 and 2004; and, (3) the combined revenues summed over the period 1990 to 2004. The total payments to be made to state and/or local governments, representing 25 percent of the Forest Service's receipts, are also shown.

Figure J-3  
Generic Yearly Revenue Stream



**Table J-2  
Summary of Receipts to the Federal Treasury**

|   | Alt. I            | Alt. II           | Alt. III          | Alt. IV        |
|---|-------------------|-------------------|-------------------|----------------|
| <b>A. Federal Receipts -<br/>Year 2000</b>  |                   |                   |                   |                |
| Add:  |                   |                   |                   |                |
| Bonus Bids  | \$4,087.2         | \$5,109.0         | \$4,087.2         | 0              |
| Rentals   | 831.6             | 831.6             | 831.6             | 0              |
| Royalties   | 1,348.3           | 1,348.3           | 1,348.3           | 7.3            |
| <b>Subtotal</b>   | <b>6,267.1</b>    | <b>7,288.9</b>    | <b>6,267.1</b>    | <b>7.3</b>     |
| Less:   |                   |                   |                   |                |
| Payments to State* <sup>1</sup>   |                   |                   |                   |                |
| Local Government  | \$1,566.8         | \$1,822.2         | \$1,566.8         | \$1.8          |
| Grazing Fees  | .1                | .1                | .1                | 0              |
| Timber Sales  | 0                 | 0                 | 0                 |                |
| Recreation Fees   | 0                 | 0                 | 0                 |                |
| <b>TOTAL REVENUE</b>  | <b>\$4,700.2</b>  | <b>\$5,466.6</b>  | <b>\$4,700.2</b>  | <b>5.5</b>     |
| <b>B. Annual Revenues -<br/>1995, 2000, and 2004*<sup>2</sup></b>                   |                   |                   |                   |                |
| 1995  | \$5,826.5         | \$6,848.3         | \$5,826.5         | \$27.3         |
| 2000  | 6,267.1           | 7,288.9           | 6,267.1           | 7.3            |
| 2005  | 2,172.7           | 2,172.7           | 2,172.7           | 14.6           |
| <b>C. Total Revenue:<br/>1990 to 2004*<sup>2</sup></b>                              | <b>\$66,385.9</b> | <b>\$77,881.2</b> | <b>\$66,385.9</b> | <b>\$166.9</b> |
| <b>D. Total Payments to<br/>State and Local Govern-<br/>ments:<br/>1990 to 2004</b> | <b>\$22,128.6</b> | <b>\$25,960.4</b> | <b>\$22,128.6</b> | <b>\$55.6</b>  |

\*1 All values in 1989 constant dollars (x1,000) and rounded to first-place decimal.

\*2 All revenues net of the 25 percent payments to state and local governments.

Alternative II has the largest revenue because it has no special stipulations applied to new leases. Alternatives I and III have comparable revenue streams because they both use special stipulations to protect the environment. Alternative IV has the lowest revenue since no new leases are sold. Over the 15-year period, the total revenue accruing to the Federal Treasury, net the payments



made to the local governments, range from \$77.9 million under Alternative II to \$166,900 under the Alternative IV.

### **Discounted Revenues**

The discounted value (DV) of the annual revenues streams is derived using a four percent discount rate. The DV of a series of monetary values yields its equivalent lump-sum value in today's (1989) terms. Because of the time-value of money, absolute amounts to be received in the future have a lower value than the same absolute amount received today. Consequently, the further in the future a sum is to be received (or spent) the less its present value.

Two separate DV's are derived for this analysis: (1) the value of the total revenue stream between 1990 and 2004, and (2) the value of the total revenue stream between 1990 and 2019, when the last of the new producing wells started in 2004 are assumed to reach the end of their productive life. Table J-3 presents these results.

**Table J-3  
Discounted Values of Revenues - At a 4.0% Discount Rate**

|                | Alt. I     | Alt. II    | Alt. III   | Alt. IV |
|----------------|------------|------------|------------|---------|
| A. 1990-2004   | \$46,553.8 | \$54,746.7 | \$46,553.8 | \$106.6 |
| B. 1990 - 2019 | \$50,194.2 | \$58,387.1 | \$50,194.2 | \$112.4 |

Note: All values in 1989 constant dollars (x 1,000) and rounded to the first-place decimal. Net of the 25% of revenues returned to the state and local governments for schools and roads.

As shown, the discounted value of revenues over the 15-year analysis period varies from \$106,600 under Alternative IV to \$54.7 million under Alternative II. Table J-3 also demonstrates the effect of discounting, as doubling the period to 30 years to account for the eventual production from all wells started during the initial 15 years, results in only a limited increase in the total discounted revenue.

### **Costs**

Future O & M and administrative costs to the Federal government associated with the leasing alternatives are estimated on an annual basis. Table J-4 below compares the alternatives from two perspectives: (1) estimated average annual expenditures, and (2) the total expenditures over the period 1990 to 2004.

Similar projected expenditures would occur under Alternatives I, II and III because they are based on comparable levels of activity. Alternative IV would require the lowest outlays. Over the course of the 15-year period, the total expenditure required by the Forest Service to implement and administer the oil and gas leasing program, not including the transfer payments made to local governments, range from \$4.17 million under Alternative I to \$1.59 million under Alternative IV. The transfer payments are not considered a direct cost to the Forest Service associated with the management program.

**Table J-4  
Summary of Federal Expenditures**

|  | Alt. I    | Alt. II   | Alt. III  | Alt. IV   |
|--|-----------|-----------|-----------|-----------|
| A. Average Annual Federal Expenditures | \$278.2   | \$278.2   | \$278.2   | \$106.3   |
| B. Total Expenditures: 1990 to 2004    | \$4,172.4 | \$4,172.4 | \$4,172.4 | \$1,593.8 |

Note: All values in 1989 constant dollars (x 1,000) and rounded to first-place decimal.

**Discounted Costs**

As with the revenues, the discounted value of the projected expenditures is derived using a four percent discount rate. Two sets of discounted costs are derived for this analysis; (1) for expenditures between 1990 and 2004 and (2) the value of the total expenditures between 1990 and 2019, when the last of the new producing wells started in 2004 are assumed to reach the end of the life-of-well. Table J-5 below presents these results.

**Table J-5  
Discounted Value of Costs - At a 4.0% Discount Rate**

|                | Alt. I    | Alt. II   | Alt. III  | Alt. IV   |
|----------------|-----------|-----------|-----------|-----------|
| A. 1990-2004   | \$3,092.7 | \$3,092.7 | \$3,092.7 | \$1,181.3 |
| B. 1990 - 2019 | \$4,312.3 | \$4,312.3 | \$4,312.3 | \$1,647.2 |

Note: All values in 1989 constant dollars (x 1,000) and rounded to the first-place decimal.

Less variation occurs in the discounted value of expenditures, compared to that of revenues. For the initial 15-year period, 1990 to 2004, the discounted value of expenditures range from a high of \$3.09 million for Alternatives I, II and III to a low of \$1.18 million under Alternative IV. Extending the period of consideration to 30 years, increased the discounted costs by about 40 percent over the initial costs.

Table J-6 below combines the discounted revenues and costs to yield measures of the overall cost efficiency of the alternatives. Two different measures are presented; (1) the Present Net Value, defined as the difference between discounted revenues and costs, and (2) the ratio of discounted revenues and costs.

**Table J-6  
Present Net Value and Net Revenue/Cost Ratio**

|                       | Alt. I     | Alt. II    | Alt. III   | Alt. IV    |
|-----------------------|------------|------------|------------|------------|
| A. Present Net Value  |            |            |            |            |
| Revenue               | \$46,553.8 | \$54,746.7 | \$46,553.8 | \$106.6    |
| Cost                  | 3,092.7    | 3,092.7    | 3,092.7    | 1,181.3    |
| NET                   | \$43,461.1 | \$51,654.0 | \$43,553.1 | -\$1,074.7 |
| B. Revenue/Cost Ratio |            |            |            |            |
| 15.1                  | 17.7       | 15.1       | .09        |            |

Note: All values in 1989 constant dollars (x 1,000) and rounded to first-place decimal. Revenues are net of the payments made to state and local governments. Discounted revenues and costs are for the period 1990 to 2004.

Alternatives I, II and III would yield positive present net values and revenue/cost ratios greater than 1.0. Alternative IV has a PNV less than 1 and a revenue/cost ratio less than 1. Any of the alternatives is supportable from a cost efficiency perspective. However, if the objective is to maximize the benefits from oil and gas leasing, then Alternative II would yield the most favorable results.

**Cost Efficiency Ranks**

Table J-7 displays the rankings of the alternatives, based on the results in Table J-6. Rankings are from 1 to 4 in descending order, with 1 representing the most favorable alternative from a cost efficiency perspective. The ranking for PNV is based on the highest absolute net return to the Federal Treasury. The revenue/cost ratio ranking reflects the most favorable percentage margin of revenues to costs. Again, the ranking shows Alternative II to be the most favorable.

**Table J-7  
Cost Efficiency Ranking of Alternatives**

|            | Alt. I | Alt. II | Alt. III | Alt. IV |
|------------|--------|---------|----------|---------|
| Rank Order | 3      | 1       | 2        | 4       |

## NOTES

1

Greystone Development Consultants, Inc.; Socioeconomic and Cost Efficiency Analysis to Support the Oil and Gas Leasing EIS for the Pike/San Isabel National Forests and the Cimarron/Comanche National Grasslands. Englewood, CO November 1989.

**APPENDIX K**  
**MINERAL POTENTIAL MAPS**

**APPENDIX K**  
**MINERAL POTENTIAL MAPS**

This Appendix discloses the mineral potential for all lands on the Unit. This potential was jointly developed by the Forest Service and Bureau of Land Management. It is based on the probability of undiscovered mineral resources, the anticipated type of mineral, and extent of the expected deposit. The indicies are high, moderate and low potential. Their definitions are as follows:

**High Potential** - Describes geologic environment that is highly favorable for discovering oil and gas resources. The area is on or near a producing field and evidence exists that the geologic conditions of reservoir, source, and trap necessary for the accumulation of oil and gas are present.

**Moderate Potential** - Refers to environment that is favorable for the occurrence of undiscovered oil and gas resources, however one of the geologic conditions necessary for the accumulation of oil or gas may be absent.

**Low Potential** - Refers to an environment that is not favorable for the accumulation of oil and gas as indicated by geologic, geochemical, and geophysical characteristics. Evidence exists that one of the geologic conditions necessary for the accumulation of oil or gas is absent.

INVESTMENT REPORT

The purpose of this report is to provide a comprehensive overview of the investment opportunities available in the current market. The analysis is based on a thorough review of the available data and is intended to assist investors in making informed decisions.

The following table provides a summary of the key findings of the analysis. The data indicates that the market is currently in a state of relative stability, with a number of attractive investment opportunities available. The most promising areas for investment are in the technology and healthcare sectors.

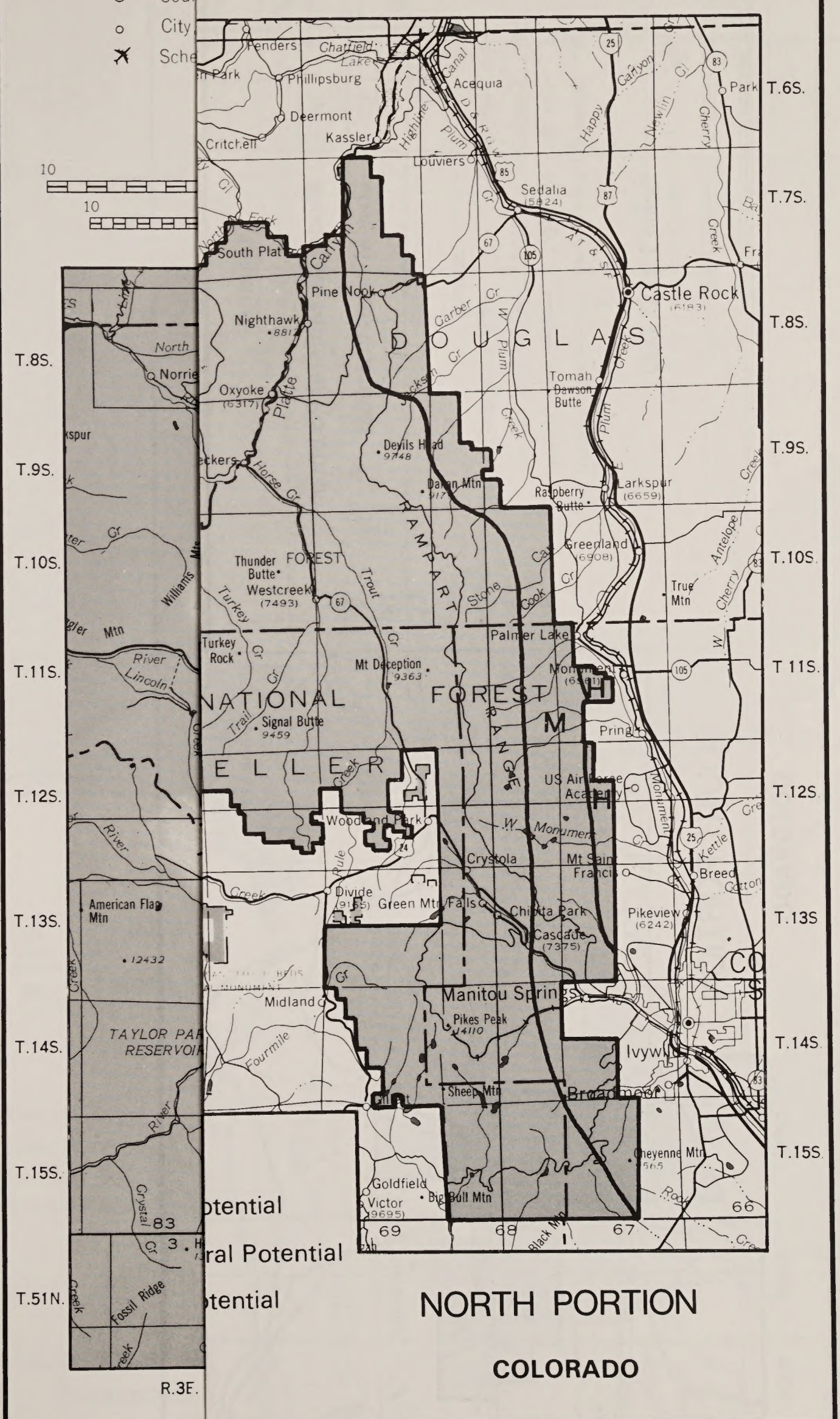
It is important to note that the market is subject to a number of risks, including changes in interest rates and inflation. Investors should therefore exercise caution and diversify their portfolios to minimize risk.

For further information, please contact the author of this report. The author is available for consultation and can provide more detailed information on the investment opportunities discussed in this report.

Figure K - 1  
Mineral Potential

# ISABEL NATIONAL FOREST

- ⊗ State
- ⊙ County
- City
- ✕ Scheme



NORTH PORTION  
COLORADO

LABORATORY POTENTIAL

PART I

POTENTIAL

The purpose of this section is to provide a comprehensive overview of the laboratory's capabilities and the various tests performed. This section is divided into several sub-sections, each detailing a specific area of the laboratory's work.

The first sub-section discusses the laboratory's general information, including its location, hours of operation, and contact information. This information is essential for patients and healthcare providers who need to schedule tests or seek advice.

The second sub-section provides a detailed description of the laboratory's services. This includes a list of the various tests offered, such as blood chemistry, hematology, and microbiology, along with the equipment and techniques used for each test.

The final sub-section discusses the laboratory's quality control and accreditation. This section highlights the laboratory's commitment to providing accurate and reliable test results, and the various measures taken to ensure the highest quality of care.

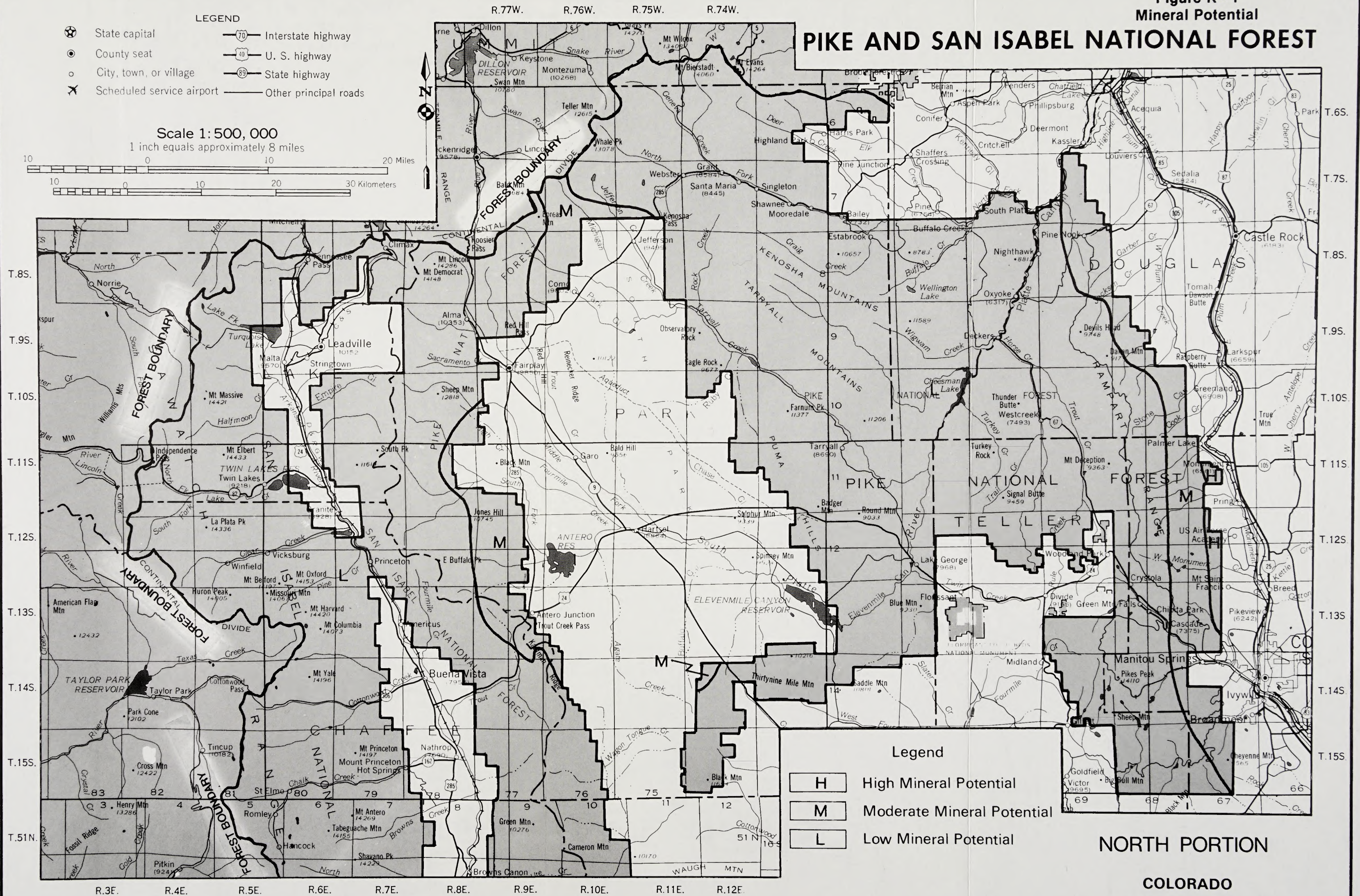
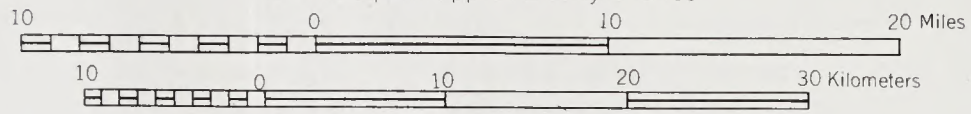


**Figure K - 1  
Mineral Potential**

**PIKE AND SAN ISABEL NATIONAL FOREST**

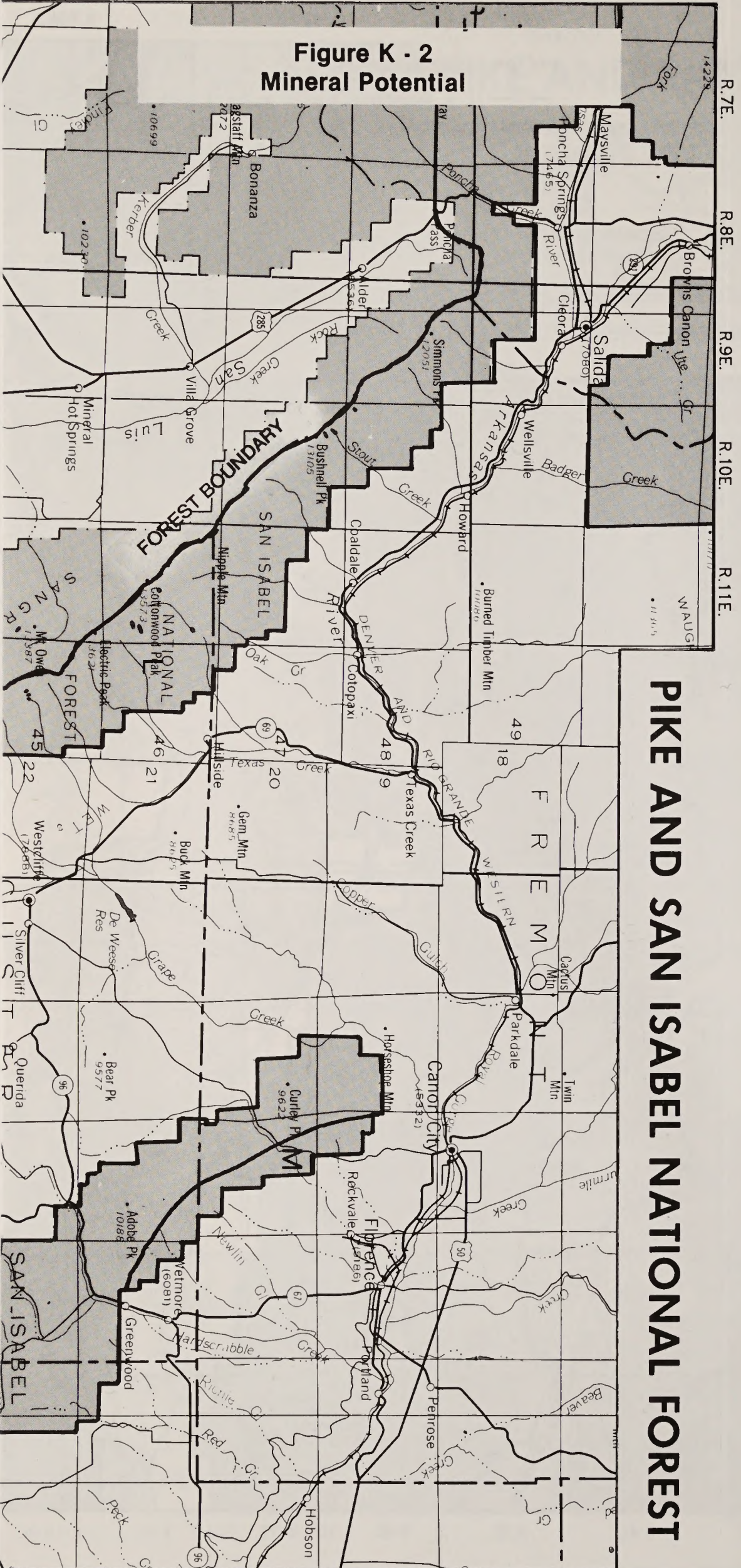
- LEGEND**
- ⊗ State capital
  - ⊙ County seat
  - City, town, or village
  - ✈ Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

Scale 1:500,000  
1 inch equals approximately 8 miles



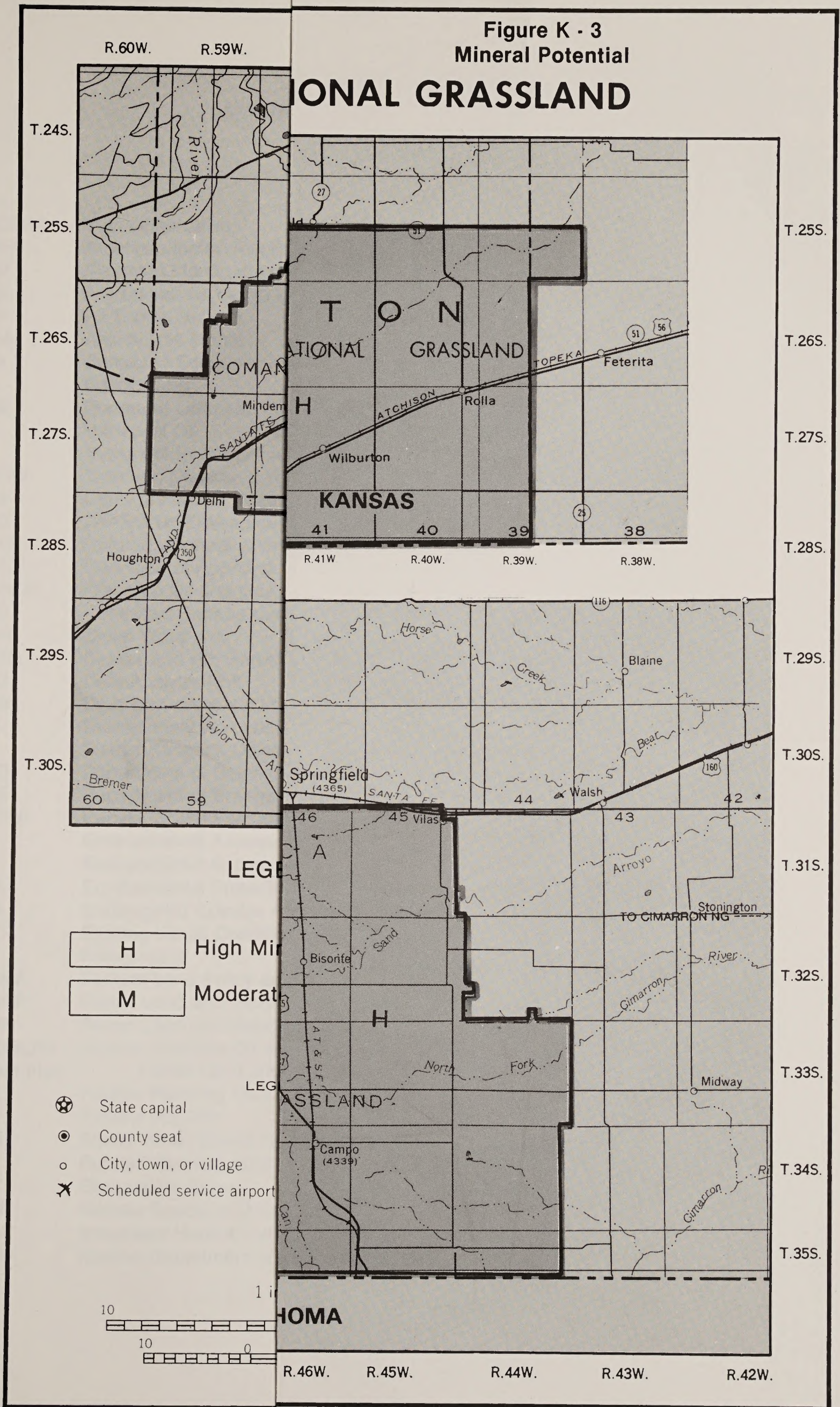
**NORTH PORTION  
COLORADO**

**Figure K - 2  
Mineral Potential**



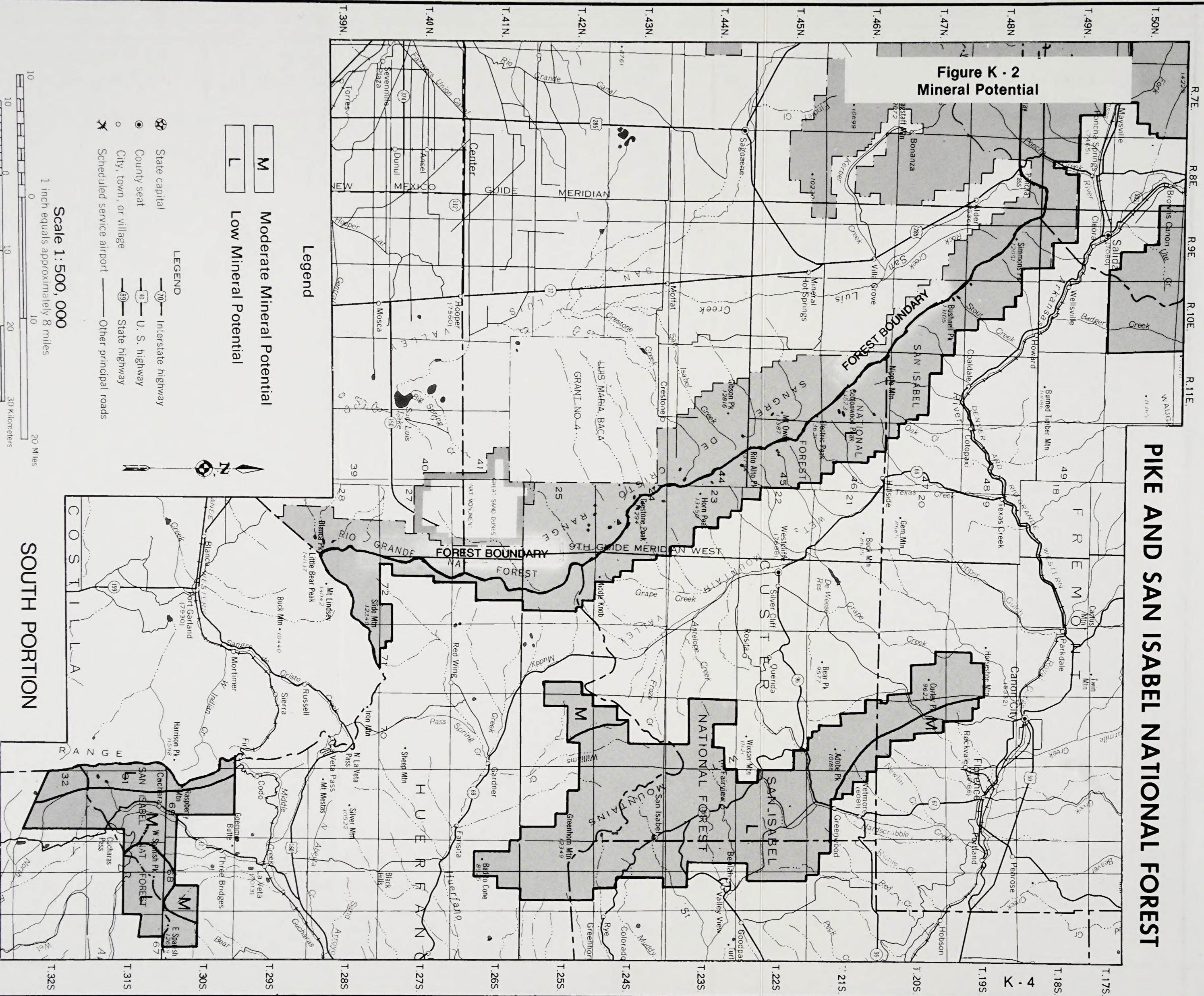
**PIKE AND SAN ISABEL NATIONAL FOREST**

**Figure K - 3  
Mineral Potential**



# PIKE AND SAN ISABEL NATIONAL FOREST

**Figure K - 2  
Mineral Potential**

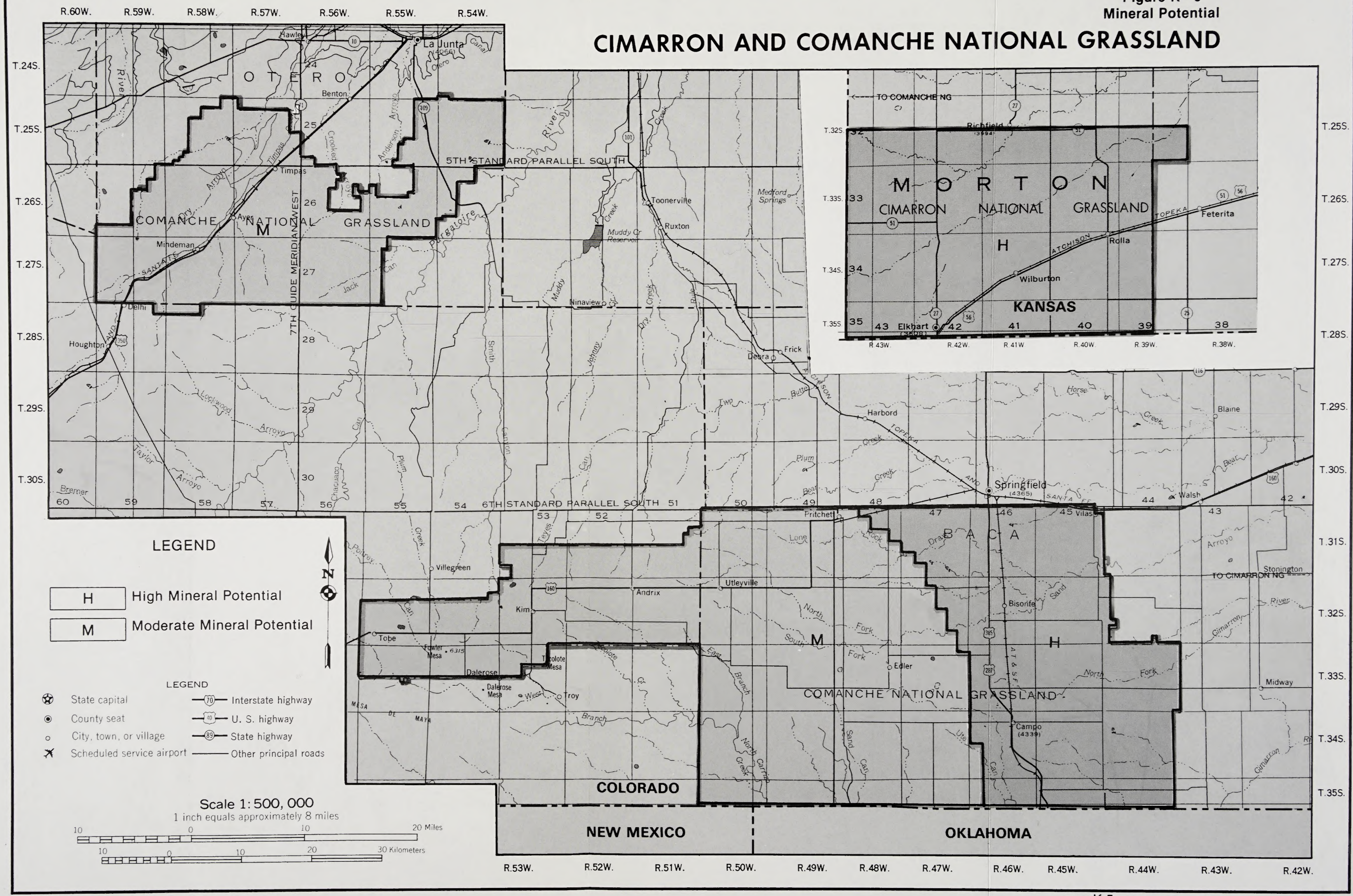


**SOUTH PORTION**

**COLORADO**

Figure K - 3  
Mineral Potential

# CIMARRON AND COMANCHE NATIONAL GRASSLAND

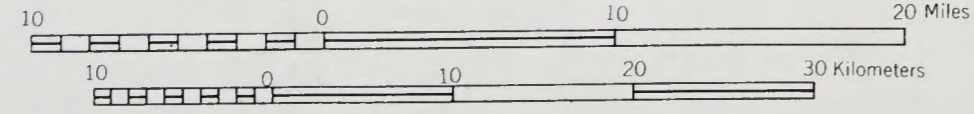


**LEGEND**

- H High Mineral Potential
- M Moderate Mineral Potential

- LEGEND**
- State capital
  - County seat
  - City, town, or village
  - Scheduled service airport
  - Interstate highway
  - U. S. highway
  - State highway
  - Other principal roads

Scale 1: 500, 000  
1 inch equals approximately 8 miles



CHART



1927  
1926  
1925  
1924  
1923  
1922  
1921

|      |      |
|------|------|
| 1927 | 1926 |
| 1925 | 1924 |

1927  
1926  
1925  
1924  
1923  
1922  
1921

## ACRONYMS/GLOSSARY OF TERMS

### ACRONYMS

|             |  |
|-------------|--|
| 4WD/4x4     | Four-wheel Drive                                       |
| AIRFA       | American Indian Religious Freedom Act                  |
| AMP         | Allotment Management Plan                              |
| APD         | Application for Permit to Drill                        |
| ATV         | All Terrain Vehicle                                    |
| AUM         | Animal Unit Month                                      |
| BEA         | Bureau of Economic Analysis                            |
| Bg          | Background   |
| BLM         | Bureau of Land Management                              |
| BO          | Barrels of Oil   |
| BR          | Bureau of Reclamation                                  |
| CDOW        | Colorado Division of Wildlife                          |
| CFR         | Code of Federal Regulations                            |
| CEQ         | Council on Environmental Quality                       |
| CNAP        | Colorado Natural Areas Program                         |
| COA         | Condition of Approval                                  |
| COGCC       | Colorado Oil and Gas Conservation Commission           |
| CSU         | Controlled Surface Use                                 |
| CWA         | Clean Water Act  |
| D&RG        | Denver and Rio Grand (Railroad)                        |
| DAU         | Data Analysis Unit                                     |
| DEIS        | Draft Environmental Impact Statement                   |
| DNL         | Discretionary No Lease                                 |
| DO          | District Ranger's Office, USFS                         |
| DOD         | Department of Defense                                  |
| DOE         | Department of Energy                                   |
| DSP&P       | Denver, South Park and Pacific (Railroad)              |
| EA          | Environmental Assessment                               |
| EIS         | Environmental Impact Statement                         |
| EPA         | Environmental Protection Agency                        |
| ESA         | Endangered Species Act                                 |
| EVC         | Existing Visual Condition                              |
| Fg          | Foreground   |
| FLPMA       | Federal Land Policy and Management Act                 |
| FLRMP       | Forest Land and Resource Management Plan               |
| FLUR        | Forest Land Use Report                                 |
| FOOGLRA     | Federal Onshore Oil and Gas Leasing Reform Act of 1987 |
| Forest Plan | Forest Land and Resource Management Plan               |
| FPA         | Further Planning Area                                  |
| FR          | Federal Register                                       |
| FDR         | Forest Development Road                                |
| FPA         | Further Planning Area                                  |
| GZ          | Geographic Zone  |
| HRU         | Human Resource Units                                   |
| IHICS       | Integrated Habitat Inventory and Classification System |
| KDGP        | Kansas Department of Game and Parks                    |

|            |   |
|------------|---|
| KDWP       | Kansas Department of Wildlife and Parks             |
| Kg/ha      | Kilograms per hectare                               |
| LRMP       | Land and Resource Management Plan                   |
| Mcf        | Thousand Cubic Feet                                 |
| Mg         | Middleground  |
| MM         | Maximum Modification                                |
| NEPA       | National Environmental Policy Act                   |
| NF         | National Forest                                     |
| NFMA       | National Forest Management Act                      |
| NFS        | National Forest System                              |
| NG         | National Grassland                                  |
| NNL        | Natural National Landmark                           |
| NOI        | Notice of Intent                                    |
| NRHP       | National Register of Historic Places                |
| NSO        | No Surface Occupancy                                |
| NTL        | Notice to Lessee(s)                                 |
| NWI        | National Wetlands Inventory                         |
| NWPS       | National Wilderness Preservation System             |
| O&G        | Oil and Gas   |
| OHV        | Off-highway Vehicles                                |
| ORA        | Oklahoma Resource Area                              |
| P          | Primitive; Preservation                             |
| PA         | Plan Amendment                                      |
| PAOT       | People At One Time                                  |
| PL         | Public Law  |
| POD        | Potential of Development                            |
| R          | Rural; Retention                                    |
| R2RIS      | Region 2 Resource Information System                |
| Reform Act | same as FOOGLRA                                     |
| RFD        | Reasonably Foreseeable Development                  |
| RMP        | Resource Management Plan                            |
| RN         | Roaded Natural                                      |
| RNA        | Research Natural Area                               |
| RO         | Regional Office, USFS                               |
| ROD        | Record of Decision                                  |
| ROS        | Recreation Opportunity Spectrum                     |
| ROW        | Right of Way  |
| RVD        | Recreation Visitor Day                              |
| SAOT       | Skiers at One Time                                  |
| SCS        | Soil Conservation Service                           |
| SMSA       | (Denver) Standard Metropolitan Statistical Area     |
| SO         | Supervisor's Office, USFS                           |
| SPCC       | Spill Prevention Control and Countermeasures (Plan) |
| SPM        | Semiprimitive Motorized                             |
| SPN        | Semiprimitive Nonmotorized                          |
| spp.       | Species   |
| SRMA       | Special Recreation Management Area                  |
| SRU        | Social Resource Units                               |
| SSF        | Soil Surface Factor                                 |
| SUPO       | Surface Use Plan of Operation                       |
| T&E        | Threatened and Endangered                           |
| TDS        | Total Dissolved Solids                              |
| TE&S       | Threatened, Endangered and Sensitive (Species)      |



|       |                                      |
|-------|--------------------------------------|
| TSP   | Total Suspended Particulates         |
| USC   | United States Code                   |
| USFS  | U.S. Forest Service                  |
| USFWS | U.S. Fish and Wildlife Service       |
| USGS  | U.S. Geological Survey               |
| USLE  | Universal Soil Loss Equation         |
| VAC   | Visual Absorption Capability         |
| VQO   | Visual Quality Objective             |
| VRM   | Visual Resource Management           |
| WRIS  | Wildlife Resource Information System |
| WSA   | Wilderness Study Area                |

## GLOSSARY

A complete and definitive glossary of terminology used in this EIS is found in the Wildland Planning Glossary, C.F. Schwarz, E.C. Thor, and G.H. Elsner, a publication of the USDA Forest Service, Gen. Tech. Report PSW, 13/1979. Forest Plan FEIS Appendix B contains a glossary of terms that is also useful for further definition of information in this EIS.

### - A -

**Abandonment.** Termination of operations for production from a well. Permanent abandonment involves plugging the well and removal of installations. Conclusively abandoned unpatented oil placer mining claims are subject to conversion into a noncompetitive oil and gas lease pursuant to the Federal Oil and Gas Royalty Management Act of 1982 (30 U.S.C. 188(f)).

**Acre Foot.** The amount of water it would take to cover an acre of land to a depth of one foot.

**Affected Environment.** Surface or subsurface resources (including social and economic elements) within or adjacent to a geographic area which could potentially be affected by oil and gas activities. The environment of the area to be affected or created by the alternatives under consideration. (40 CFR 1502.15)

**Air Quality Classes.** Classifications established under the Prevention of Significant Deterioration portion of the Clean Air Act which limit the amount of air pollution considered significant within an area. Class I applies to areas where almost any change in air quality would be significant; Class II applies to areas where the deterioration normally accompanying moderate well-controlled growth would be permitted; and Class III applies to areas where industrial deterioration would generally be allowed.

**Allotment Management Plan (AMP).** The plan for long-term use and development of a range allotment.

**Alluvial Soil.** A soil developing from recently deposited alluvium and exhibiting essentially no horizon development or modification of the recently deposited materials.

**Alluvium.** Clay, silt, sand, gravel, or other rock materials transported by flowing water. Deposited in comparatively recent geologic time as sorted or semi-sorted sediment in riverbeds, estuaries, floodplains, lakes and shores, and in fans at the base of mountain slopes.

**Analysis Area.** A delineated area of land subject to analysis of (1) responses to proposed management practices in the production, enhancement, or maintenance of forest and rangeland outputs and environmental quality objectives, and (2) economic and social impacts.

**Animal Unit Month (AUM).** The amount of forage necessary to sustain one cow and one calf or its equivalent for one month.

**Anticline.** A fold, generally convex upward, whose core contains the stratigraphically older rocks.

**Application.** A written request, petition, or offer to lease lands for the purpose of oil and gas exploration and/or the right of extraction.

**Application for Permit to Drill (APD).** An application to drill a well submitted by a lessee or operator to the BLM. The APD consists of a Drilling Plan that discusses downhole specifications and procedures (reviewed by the BLM) and a Surface Use Plan of Operations (SUPO) that examines surface uses, including access roads, wellsite layout, cut/fill diagrams, reclamation procedures, production facility locations, etc. (reviewed by the FS). The approved APD is a contract between the operator and the federal government and cannot be changed or modified unless authorized by the BLM and FS.

**Aquatic Ecosystem.** All organisms in a water based community plus the associated environmental factors.

**Area of Critical Environmental Concern (ACEC).** An area established through the planning process as provided in FLPMA where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values; or to fish and wildlife resources or other natural systems or processes; or to protect life and afford safety from natural hazards.

**Authorized Forest Officer.** The Forest Service employee delegated the authority to perform a duty described in these rules. Generally, a Regional Forester, Forest Supervisor, District Ranger, or Minerals Staff Officer, depending on the scope and level of the duty to be performed.

**Available Lands.** Any lands subject to oil and gas leasing under the Mineral Leasing Act.

**Availability for Oil and Gas Leasing.** Availability of NFS lands for oil and gas leasing refers to lands which have not been formally withdrawn from oil and gas leasing activities. The existing Forest Land and Resource Management Plan provided the primary basis for the identification of NFS lands available for consideration for oil and gas leasing. All NFS lands will be subject to determination of compatibility of oil and gas leasing activities with the affected resources as well as the human environment before the Forest Service consents to leasing.

- B -

**Background.** One of the distance zones of a landscape being viewed. Extends from middleground to infinity. Texture is seen as groups or patterns of trees.

**Basin.** (a) A depressed area with no surface outlet. (b) A low in the Earth's crust of tectonic origin in which sediments have accumulated.

**Basal Area.** The cross-sectional area of a stand of trees measured at breast height. The area is expressed in square feet per acre.

**Benthos.** All animals and plants living on or in the bottom of standing or running water environments.

**Big Game.** Larger species of wildlife that are hunted, such as elk, deer, bighorn sheep, and pronghorn antelope.

**Big Game Winter Range.** The area available to and used by big game (large mammals normally managed for sport hunting) through the winter season.

**Browse.** That part of the current leaf and twig growth of shrubs, woody vines and trees available for animal consumption.

**Candidate Species.** Any species not yet officially listed but which are undergoing a status review or are proposed for listing according to Federal Register notices published by the Secretary of the Interior or the Secretary of Commerce.

**Carrying Capacity.**

**In Range Management** - The maximum stocking rate possible without inducing damage to vegetation or related resources.

**In Wildlife Management** - The maximum number of individual animals that can survive the greatest period of stress each year on a given land area.

**In Recreation** - The maximum human use an area can sustain on a long-term basis without unacceptable physical (ecological) deterioration or psychological crowding.

**Cirque (geology).** Semicircular, concave, bowl-like areas that have steep faces primarily resulting from glacial ice and snow abrasion.

**Clearcutting.** The harvest of all trees in a localized area, generally to encourage regeneration of a new, even-aged stand or to meet other specified non-timber resource objectives.

**Climatic (Weather) Conditions.** Fog, clouds, or precipitation which may affect visibility and contrast.

**Color.** Color enables a viewer to differentiate between similar objects. Colors may change as distance increases from the viewed object

**Commercial Thinning.** Cutting in immature stands to improve the quality and growth of the remaining stand. Trees removed in the thinning are used for sawtimber or products (poles, posts, props, fuelwood, etc.)

**Compliance Officer.** The Deputy Chief, or the Associate Deputy Chiefs, National Forest System or the line officer designated to act in the absence of the Deputy Chief.

**Condition of Approval (COA).** Conditions or provisions (requirements) under which an Application for a Permit to Drill or a Sundry Notice is approved.

**Consent for Oil and Gas Leasing.** A consent by the Forest Service for oil and gas leasing on a specified parcel of NFS land. Grants the right to explore, develop, extract, and dispose of a specific mineral or minerals in lands covered by the lease, subject to various terms and conditions.

**Contrast.** Diversity of adjacent parts. The closer the position of two dissimilar objects the more powerful the appeal to attention.

**Controlled Surface Use (CSU).** Allowed use and occupancy (unless restricted by another stipulation) with identified resource values requiring special operational constraints that may modify the lease rights. CSU is used as an operating guideline, not as a substitute for NSO or Timing stipulations.

**Cover, Hiding.** Vegetation capable of hiding 90 percent of a standing adult deer or elk from the view of a human at a distance of 200 feet or less.

**Cover, Thermal.** Cover used by animals for protection against adverse effects of weather.

**Crucial Habitat.** A biological feature, that if lost, would adversely affect the species.

**Cultural Resources.** Those fragile and non-renewable remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were of importance in human events.

**Cultural Resources Inventory Classes.**

**CLASS I.** An existing data survey. This is an inventory of a study area to (1) provide a narrative overview of cultural resources by using existing information, and (2) compile existing cultural resources site record data on which to base the development of the Forest's site record system.

**CLASS II.** A sampling field inventory designated to locate, from surface and exposed profile indications, all cultural resource sites within a portion of an area so that an estimate can be made of the cultural resources for the entire area.

**CLASS III.** An intensive field inventory designed to locate, from surface and exposed profile indications, all cultural resource sites in an area. Upon its completion, no further cultural resources inventory work is normally needed.

**Cumulative Impact.** The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

- D -

**Developed Recreation.** Recreation which occurs at man-made developments, such as campgrounds, picnic grounds, resorts, ski areas, trailheads, etc.

**Development and Full-Field Development.**

**Development well** - well drilled in proven territory in a field to complete a pattern of production.

**Full field development** - the drilling of the necessary development wells and associated field facilities, including roads, production facilities, pipelines, injection wells, power lines, etc.

**Diastrophism.** A general term for all movement of the crust produced by tectonic processes, including the formation of ocean basins, continents, plateaus, and mountain ranges.

**Directional Drilling.** Drilling borehole with course of hole planned before drilling. Such holes are usually drilled with rotary equipment at an angle to the vertical and are useful in avoiding obstacles, or in reaching side areas or mineral estate beneath restricted surface.

**Discovery Well.** A well that yields commercial quantities of oil or gas.

**Discretionary "No Lease".** Forest Service discretionary authority to remove sensitive resource lands from oil and gas leasing. Authority must be based on sound management justification. The

Federal Onshore Oil and Gas Leasing Reform Act of 1987 expanded the Forest Service authority to include a "discretion" to consent or deny consent on all NFS lands with leasable minerals. Formerly, the BLM had authority to issue oil and gas leases on public domain lands without Forest Service consent. According to the Reform Act, the BLM may not issue an oil and gas lease on NFS lands without consent from the Forest Service.

**Dispersed Recreation.** That type of outdoor recreation which tends to be spread out over the land such as hunting, fishing, snowmobiling, hiking, driving for pleasure, cross-country skiing, motor-biking, and mountain climbing.

**Distance Zone.** The divisions of a landscape being viewed. Three zones are used to describe a landscape: foreground, middleground, background.

**Diversity.** (1) The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area. (2) The distribution and abundance of different plant and animal communities and species within the area covered by a Land and Resource Management Plan (36 CFR Part 219.3(g)).

**Duration.** As pertains to visual evaluation criteria: the length of time the management activity and its impacts will be taking place.

- E -

**Easement.** Right afforded a person or agency to make limited use of another's real property for access or other purposes.

**Ecosystem.** All organisms in a community plus the associated environmental factors.

**Effects.**

**Direct Effects** - Caused by the action and occur at the same time and place.

**Indirect Effects** - Caused by the action later in time or farther removed in distance, but still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.

**Endangered Species.** Any species which is in danger of extinction throughout all or a significant portion of its range.

**Enhancement.** A short-term visual resource management objective aimed at increasing positive visual variety where little variety now exists.

**Environmental Assessment (EA).** A concise public document prepared to provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact. It includes a brief discussion of the need for the proposal,

alternatives considered, environmental impact of the proposed action and alternatives, and a list of agencies and individuals consulted.

**Environmental Impact Statement (EIS).** A formal public document prepared to analyze the impacts on the environment of a proposed project or action and released for comment and review. An EIS must meet the requirements of NEPA, CEQ guidelines, and directives of the agency responsible for the proposed project or action.

**Erosion.** 1. The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. 2. Detachment and movement of soil or rock fragments by water, wind, ice, or gravity. The following terms are used to describe different types of erosion:

**Accelerated Erosion** - Erosion much more rapid than normal, natural, or geologic erosion, primarily as a result of the activities of man or animals or natural catastrophes such as fire that expose base surfaces.

**Geological Erosion** - The normal or natural erosion caused by geological processes acting over long geologic periods and resulting in the wearing away of mountains, the building up of floodplains, coastal plains, etc. Also called natural erosion.

**Gully Erosion** - The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 1 to 2 feet to as much as 75 to 100 feet.

**Rill Erosion** - An erosion process in which numerous small channels only several inches deep are formed: occurs mainly on recently cultivated soils.

**Sheet Erosion** - The removal of a fairly uniform layer of soil from the land surface by runoff water.

**Erosion Hazard.** The probability of soil loss resulting from complete removal of vegetation and litter. It is an interpretation based on potential soil loss in relation to tolerance values. Soil loss tolerance rate: An estimate of the amount of erosion which could occur over a short period of time (one year) without causing irreparable damage to the long-term productivity of the soil.

**Ratings:**

**Slight** - Potential soil loss rates do not exceed tolerance soil loss. Loss in soil production potential from erosion is of low probability.

**Moderate** - Potential soil loss rates exceed tolerance soil loss. Loss in soil production potential from erosion is probable and significant if unmitigated. On-site investigation by watershed specialists may be needed for activities on such areas.

**Severe** - Potential soil loss rates exceed tolerance soil loss. Loss in soil production potential from erosion is inevitable and irreversible if unmitigated. These soils may require expensive measures to control erosion and sedimentation when activities are planned for such areas. On-site investigation by watershed specialists is highly recommended.

**Even-aged Management.** The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short

period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

**Exception.** Case by case exemption from a lease stipulation. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria applies.

**Existing Visual Condition (EVC).** An inventory of the present state of visual alteration. The existence, size and location of alterations are identified through the use of six categories; category one having the least alterations and category six the most.

**Exploration and Wildcat Wells .** Wells drilled to test for the presence of oil or gas in a previously undeveloped area. Nine out of ten wildcats are dry holes.

- F -

**Facies.** The aspect, appearance, and characteristics of a rock unit, usually reflecting the conditions of its origin; especially as differentiating the unit from adjacent or associated units.

**Fault.** A fracture or zone of fractures along which there has been displacement of the sides relative to one another parallel to the fracture.

**Federal Land Policy and Management Act of 1976 (FLPMA).** Public Law 94-579 signed by the President on October 21, 1976. Established public land policy for management of lands administered by the Bureau of Land Management. FLPMA specifies several key directions for the Bureau, notably (1) management on the basis of multiple-use and sustained yield, (2) land use plans prepared to guide management actions, (3) public lands for the protection, development, and enhancement of resources, (4) public lands retained in federal ownership, and (5) public participation utilized in reaching management decisions.

**Fold.** A curve or bend of a planar structure such as rock strata, bedding planes, foliation, or cleavage. A fold is usually a product of deformation, although its definition is descriptive and not genetic and may include primary structures.

**Forage.** All browse and herbaceous foods that are available to grazing animals.

**Foreground.** One of the distance zones of a landscape being viewed. Distance at which details can be perceived, normally within 1/4 to 1/2 mile of the viewer. Must be determined on a case by case basis.

**Forest Management.** The application of business methods and technical forestry principles to the operation of a forest property.

**Form.** The mass of an object or objects that appear unified.

**Formally Withdrawn From Oil and Gas Leasing.** A Formal Withdrawal of lands is segregation of public lands from specific management activities by Acts of Congress or other types of administrative regulations subject to valid existing rights. A number of National Forest System lands have been removed from oil and gas leasing as well as other mineral development as a result of Congressional Acts or other forms of withdrawal such as by the Department of Interior. Such lands include designated wilderness areas, wilderness study area lands which were found to be suitable by the surface management agency for wilderness designation as identified by the Federal Onshore Oil and Gas Leasing Reform Act, as well as other specially classified lands.



**Formation.** A body of rock identified by lithic characteristics and stratigraphic position; it is prevailing but not necessarily tabular, and is mappable at the earth's surface or traceable in the subsurface (NACSN, 1983, Art. 24).

**Fossil.** The remains or traces of an organism or assemblage of organisms which have been preserved by natural processes in the earth's crust exclusive of organisms which have been buried since the beginning of historical time. Minerals, such as oil and gas, coal, oil shale, bitumen, lignite, asphaltum, and tar sands, phosphate, limestone, diatomaceous earth, uranium and vanadium, while they may be of biologic origin, are not here considered "fossils." Fossils of scientific value may occur within or in association with such materials.

**Fragile Soil.** A soil that is especially vulnerable to erosion or deterioration due to its physical characteristics and/or location. Disturbance to the surface or the vegetative cover can initiate a rapid cycle of loss and destruction of the soil material, structure, and ability to sustain a biotic community.

- G -

**Geophysics.** Study of the earth by quantitative physical methods.

**Glacial Outwash (geology).** Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

**Glacial Till (geology).** Unsorted, nonstratified glacial drift consisting of soil material and boulders transported and deposited by glacial ice.

**Granite Wash Trap.** Granite wash is a sandstone formed by weathered granite basement rock. Granite is composed of coarse, sand-sized crystals that weather to form a sandstone covering the flanks of buried granite mountains and hills. Source rocks occur deeper, along the flanks.

**Grazing Association.** Organization set up by the permittees to manage grazing resources on the National Grasslands. They are also responsible for collecting all applicable fees.

**Grazing System.** Scheduled grazing use and nonuse of an allotment to reach identified goals or objectives by improving the quality and quantity of vegetation.

**Groundcover.** The area of ground surface occupied by the stem(s) of a range plant, as contrasted with the full spread of its herbage or foliage, generally measured at one inch above soil level.

**Growing Season.** Generally, the period of the year during which the temperature of vegetation remains sufficiently high to allow plant growth.

- H -

**Habitat.** A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

**Habitat Capability.** The estimated ability of an area, given existing or predicted habitat conditions to support a wildlife, fish or plant population. It is measured in terms of potential population numbers.

**Habitat Effectiveness.** The degree to which a physical wildlife habitat (food, water, shelter) is free from disturbances, and therefore attractive for wildlife occupancy.

**Horizontal Diversity.** The vegetative diversity resulting from several stands of different plant communities or successional stages or both.

**Hydrocarbon.** Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

- I -

**Igneous.** Type of rock or mineral that solidified from molten or partly molten material.

**Impact.** The effect, influence, alteration, or imprint caused by an action.

**Intensive Grazing.** Management designed to increase the carrying capacity through structural and nonstructural practices. Complex livestock management systems are employed. Management seeks to maximize livestock forage production.

**Intermontaine.** Situated between or surrounded by mountains, mountain ranges, or mountainous regions.

**Invertebrate.** An animal lacking a spinal column.

- K -

**Known Geologic Structures (KGS).** A trap in which an accumulation of oil and gas has been discovered by drilling and which is determined to be productive. Its limits include all acreage that is presumptively productive (43 CFR 3100.0-5(a)).

- L -

**Land Treatment.** All methods of artificial range improvement and soil stabilization such as reseeding, brush control (chemical and mechanical), pitting, furrowing, water spreading, etc.

**Leasable Mineral(s).** Those minerals or materials designated as leasable under the Mineral Leasing Act of 1920. They include coal, phosphate, asphalt, sulphur, potassium, sodium minerals, and oil and gas. Geothermal resources are also leasable under the Geothermal Stream Act of 1970.

**Lease.** A legal contract that provides for the right to develop and produce oil and gas resources for a specific period of time under certain agreed-upon terms and conditions.

**Lease Modification.** Fundamental change to the provisions of a lease stipulation, either temporarily or for the term of the lease. A modification may include an exemption from or alteration to a stipulated requirement. Depending on the specific modification, the stipulation may or may not apply to all other sites within the leasehold to which the restrictive criteria applied.

**Lease Notice.** Provides more detailed information concerning limitations that already exist in law, lease terms, regulations, or operational orders. A Lease Notice also addresses special items the

lessee would need to consider when planning operations, but does not impose new or additional restrictions. Lease Notices that are attached to leases should not be confused with formal Information Notices or Notices to Lessees (43 CFR Part 3160.0-5).

**Lease Stipulations.** Additional specific terms and conditions that change the manner in which operation may be conducted on a lease, or modify the lease rights granted.

**Leasehold.** The area described in a Federal oil and gas lease, communitized, or unitized area.

**Lessee.** A person or entity holding record title in a lease issued by the United States.

**Line.** An extended point, or anything that is arranged in a row. Can be found in ridgelines, timberlines, tree trunks, or vegetative boundaries.

**Locatable Minerals.** Minerals or materials subject to claim and development under the Mining Law of 1872, as amended. Generally includes metallic minerals such as gold and silver, and other materials not subject to lease or sale (some bentonites, limestone, talc, some zeolites, etc.).

**Location.** Perfecting the right to a mining claim by discovery of a valuable mineral, monumenting the corners, completing discovery work, posting a notice of location, and recording the claim.

**Long-Term.** Describes impacts which would occur over a 20-year period.

- M -

**Magnitude.** The number of different viewpoints a site can be seen from, or the length of time a site is visible (as along a trail or road).

**Management Area.** An area with similar management objectives and a common management prescription.

**Management Concern.** An issue, problem, or condition which constrains the range of management practices identified by the Forest Service in the planning process (36 CFR Part 219.3).

**Management Direction.** A statement of multiple use, other goals, and objectives; and associated management prescriptions, standards, and guidelines for attaining them (36 CFR Part 219.3).

**Management Indicator Species.** Those wildlife species selected in the planning process to monitor the effects of planned management activities of viable populations of all wildlife and fish species including those species that are socially or economically important.

**Mass Wasting (geologic hazard).** A general term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another. (American Geological Institute, 1974, p.308) Slow displacements include slumping and soil creep. Rapid movements include slope failures, landslides, debris flows, and rock slides.

**Ratings:**

**Slight** - Management practices are not limited by special precautions to maintain slope stability. Slope gradients are under 40 percent.

**Moderate** - Management practices which disturb the land surface will be limited by precautionary measures to maintain slope stability. Slope gradients are usually in the 40 to 60 percent range. However, there is no evidence of past slope failures.

**Severe** - Management practices are severely limited. Slope gradients are over 60 percent, and evidence of past mass wasting usually exists. Special on-site investigations are required prior to ground disturbing activities, and higher costs for design and construction can be anticipated to achieve adequate resource protection.

**Maximum Modification (MM)**. A visual resource management objective in which management activities may dominate the landscape characteristic. When viewed as background they should appear natural. In middleground or foreground they may not completely blend in. Introduced structures should remain subordinate. Contrast reduction should be completed within five years.

**Middleground**. One of the distance zones of a landscape being viewed. This zone extends from the foreground to 3 to 5 miles from the observer. Texture is characterized by masses of trees.

**Mineral Entry**. Claiming public lands (administered by the Forest Service) under the Mining Law of 1872 for the purpose of exploiting minerals. May also refer to mineral exploration and development under the mineral leasing laws and the Material Sale Act of 1947.

**Mineral Estate (Mineral Rights)**. The ownership of minerals, including rights necessary for access, exploration, development, mining, ore dressing, and transportation operations.

**Mineral Materials**. Common varieties of sand, building stone, gravel, clay, moss rock, etc., obtainable under the Minerals Act of 1947, as amended.

**Mineral Potential**. The classification of lands according to the probability of undiscovered mineral resources, delineated as to the type of mineral, the extent of the expected deposit, and the likelihood of its occurrence. The likelihood of occurrence for oil and gas is classified as follows:

**High Potential** - Describes geologic environment that is highly favorable for discovering oil and gas resources. The area is on or near a producing field and evidence exists that the geologic conditions of reservoir, source, and trap necessary for the accumulation of oil and gas are present.

**Moderate Potential** - Refers to environment that is favorable for the occurrence of undiscovered oil and gas resources, however one of the geologic conditions necessary for the accumulation of oil or gas may be absent.

**Low Potential** - Refers to an environment that is not favorable for the accumulation of oil and gas as indicated by geologic, geochemical, and geophysical characteristics. Evidence exists that one of the geologic conditions necessary for the accumulation of oil or gas is absent.

**Unknown Potential** - Refers to a region for which geologic information is insufficient to otherwise categorize potential. This category should be limited to specific areas for which there is a true lack of data and should not be used as a substitute for performing the interpretation.

**Mining Law of 1872**. Provides for claiming and gaining title to locatable minerals on public lands. Also referred to as the "General Mining Laws" or "Mining Laws."

**Mitigation.** Includes:

- (a) Avoiding the impact altogether by not taking a certain action or parts of an action.
- (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- (e) Compensating for the impact by replacing or providing substitute resources or environments.

**Modification (M)(VQO).** A visual resource management objective in which the characteristic landscape may be dominated by management activities. Vegetative and landform disturbances must borrow from existing line, form, color and texture patterns. Introduction of structures should also borrow from existing patterns to be compatible with surroundings. Reduction in contrast should be completed within one year.

**Monitoring and Evaluation.** Analyzing on a sample basis Forest Plan implementation to determine how well objectives have been met, and how closely management standards and guidelines have been applied.

**Monocline.** A geologic structure in which the strata are all inclined in the same direction at a uniform angle of dip.

**Multiple-use.** Management of surface and subsurface resources so that they are jointly utilized in the manner that will best meet the present and future needs of the public without permanent impairment of the productivity of the land or the quality of the environment.

- N -

**National Environmental Policy Act of 1969 (NEPA).** Public Law 91-190. Establishes environmental policy for the nation. Among other items, NEPA requires federal agencies to consider environmental values in decision-making processes.

**National Forest System (NFS).** All National Forest lands reserved or withdrawn from the public domain of the United States; all National Forest lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1010 et seq.); and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system (16 U.S.C. 1609).

**National Register of Historic Places (National Register, NRHP).** A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance, established by the Historic Preservation Act of 1966 and maintained by the National Park Service.

**No Surface Disturbance.** Defined on a case by case basis when the activity plan for an area is developed. In general, an activity would be allowed if it would not interfere with the management objectives of the area.

**No Surface Occupancy (NSO).** A fluid mineral leasing stipulation that prohibits occupancy or disturbance on all or part of the land surface to protect special values or uses. The NSO stipulation includes stipulations which may have been worded as "No Surface Use/Occupancy," "No Surface

Disturbance," "Conditional NSO," and "Surface Disturbance or Surface Occupancy Restriction by location)." Lessees may exploit the oil and gas or geothermal resources under leases restricted by this stipulation through use of directional drilling from sites outside the no surface occupancy area.

**Notice to Lessees, Transferees, and Operators.** Written notice issued by an authorized Forest officer. Notices To Lessees, Transferees, and Operators implement regulations and serve as instructions on specific item(s) of importance within a Forest Service Region, National Forest, or Ranger District.

- 0 -

**Off-Highway Vehicle (OHV).** Any motorized vehicle capable of or designed for travel on or immediately over land, water, or other natural terrain.

**Off-Road Vehicle (ORV).** Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, snow, ice, marsh, swampland or other natural terrain. It includes, but is not limited to, four-wheel drive or low-pressure-tire vehicles, motorcycles and related two-wheel vehicles, amphibious machines, ground-effect or air-cushion vehicles.

**Off-Road Vehicle Designations.**

**Closed.** Designated areas and trails where the use of off-road vehicles is permanently or temporarily prohibited. Emergency use of vehicles is allowed.

**Limited.** Designated areas and trails where the use of off-road vehicles is subject to restrictions such as limiting the number or types of vehicles allowed, dates and times of use (seasonal restrictions), limiting use to existing roads and trails, or limiting use to designated roads and trails. Under the designated roads and trails designation, use would be allowed only on roads and trails that are signed for use. Combinations of restrictions, such as limiting use to certain types of vehicles during certain times of the year, are possible.

**Open.** Designated areas and trails where off-road vehicles may be operated (subject to operating regulations and vehicle standards).

**Oil and Gas Lease.** An oil and gas lease grants the right to explore, develop, extract, and dispose of a specific mineral or minerals in lands covered by the lease, subject to various terms and conditions. Oil and gas leases are issued by the Bureau of Land Management, Department of the Interior.

**Onlap.** An "overlap" characterized by the regular and progressive pinching out, toward the margins or shores of a depositional basin of the sedimentary units within a conformable sequence of rocks. The boundary of each unit is exceeded by the next overlying unit and each unit in turn terminates farther from the point of reference.

**Onlap Sands Trap.** Beach sands that were deposited on an unconformable surface as sea level rose. Numerous buttress sand can occur along a single unconformity and each can form a pool.

**Onshore Oil and Gas Order.** A formal numbered order issued by or signed by the Chief of the Forest Service that implements and supplements the regulations in this subpart.

**Operating Right.** The interest created out of a lease that authorizes the holder of that interest to enter upon the leased lands to conduct drilling and related operations, including production of oil and gas from such lands in accordance with lease terms.

**Operating Rights Owner.** A person holding operating rights in a lease issued by the United States. This may be the lessee if the operating rights in a lease or portion thereof have not been conveyed to another person.

**Operations.** Surface disturbing activities that are conducted on a leasehold on National Forest System lands pursuant to a current approved surface use plan of operations, including but not limited to, exploration, development, and production of oil and gas resources and reclamation of surface resources.

**Operator.** Any person or entity, including, but not limited to, the lessee or operating rights owner, who has stated in writing to the authorized Forest officer the intent to be responsible under the terms of the lease for the operations conducted on the leased lands or a portion thereof.

**Overstory.** That portion of a plant community consisting of the taller plants on the site; the forest or woodland canopy.

- P -

**Paleontological Resource.** A site containing evidence of non-human life of past geological periods, usually in the form of fossil remains.

**Partial Retention (PR).** A visual resource management objective in which management activities remaining visually subordinate to the surrounding landscape. Repetition of line, form, color, and texture is allowed, but changes in qualities, size, amount, intensity, direction, pattern should remain subordinate. New contrast may be introduced but should remain subordinate as well. Reduction in contrast should be accomplished within one year of project completion.

**Patent.** A grant made to an individual or group conveying fee simple title to selected public lands.

**Patented Claim.** A claim for which title has passed from the federal government to the mining claimant under the Mining Law of 1872.

**People At One Time (PAOT).** Used to define recreation capacity which is equal to five persons per family unit for camp and picnic grounds. Other sites vary.

**Person.** An individual, partnership, corporation, association or other legal entity.

**Planning Area.** A geographical area for which land use and resource management plans are developed and maintained.

**Plant Community.** A group of individual plants of one or more species growing in a specific area in association with one another and with a complex of other plants and animals (Spurr & Barnes, 1980).

**Preservation (P).** A visual resource management objective in which only ecological changes are allowed. Management activities, except low impact recreation facilities are prohibited. This objective applies mainly to wilderness, primitive areas and areas with special classifications.

**Primitive (P).** A recreation opportunity classification term for describing a land area that is almost completely free of management controls. Essentially unmodified natural environment where evidence of other users is low, usually three miles or more from roads. Visitors enjoy hiking, horseback riding, nature study and other nonmotorized uses. Visitors experience isolation, independence, closeness to nature, and self-reliance in an environment offering a high degree of challenge and risk.

- R -

**Range Allotment.** A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under an allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System lands administered by the Forest Service.

**Raptors.** Birds of prey with sharp talons and strongly curved beaks, e.g., hawks, owls, vultures, eagles.

**Reasonably Foreseeable Development (RFD).** A projection of likely exploration, development, and production within a study area based on existing and credible geologic data, technology, economics, and activity trends.

**Reclamation.** Returning disturbed lands to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

**Recreation and Public Purposes Act (R&PP).** This Act authorizes the Secretary of the Interior to lease or convey public lands for recreational and public purposes under specified conditions to states or their political subdivisions, and to nonprofit corporations and associations.

**Recreation Opportunity Spectrum (ROS).** Land delineations which identify a variety of recreation experience opportunities in six classes along a continuum from primitive to urban. Each class is defined in terms of natural resource settings, activities and experience opportunities. The six classes are: Urban, Rural, Roaded Natural, Semiprimitive Motorized, Semiprimitive Nonmotorized and Primitive.

**Recreation Visitor Day (RVD).** An RVD is 12 hours of recreation for one person or one hour of recreation for 12 persons or any combination thereof.

**Rehabilitation.** A short-term visual resource management objective used to restore landscapes containing undesirable visual or other resource impacts to the desired visual or other acceptable quality level.

**Research Natural Area.** Designated areas of land established by the Chief of the Forest Service under 36 CFR Part 251.23 for research and educational purposes and to typify important forest and range types of the Forest as well as other plant communities that have special or unique characteristics of scientific interest and importance.

**Resource Area.** The smallest administrative subdivision of an area of public lands administered by the Bureau of Land Management.

**Resource Management Plan (RMP).** A land use plan that establishes land use allocations, multiple-use guidelines, and management objectives for a given planning area.



**Retention (R).** A visual resource management objective allowing for management activities which are not visually evident. Activities may only repeat line, form color and textures found in the characteristic landscape. Reductions in form, line, color, and texture contrasts should be completed either during or after project completion

**Revegetation Potential.** The probable success and ease in establishment of native grass and shrub species. This rating is influenced by climate, topography, and soil type. Stratification by climate yields limitations that are not normally economical to mitigate. Ratings relate to use of a rangeland drill, broadcast seeding, and aerial seeding with no consideration for site preparation (removal of trees, etc.)

**Ratings:**

**Slight** - Potential is not restricted by properties in the rating, and sites offer optimum conditions for establishment of plants.

**Moderate** - Potential is restricted by properties in the rating that can be reasonable or economically mitigated.

**Severe** - Potential is restricted by properties in the rating that severely restrict reasonable or economical means of mitigation.

**Riparian.** Riparian areas consist of terrestrial and aquatic ecosystems. These areas may be associated with lakes, reservoirs, estuaries, hotholes, marshes, streams, bogs, wet meadows, and intermittent or permanent streams where free and unbound water is available.

**Roaded Natural (RN).** A recreation opportunity classification term for describing a land area that has predominately a natural appearing environment with moderate evidence of sights and sounds of humans. Concentration of users is moderate to low. Roads of better than primitive class are usually within 1/2 mile. A broad range of motorized and nonmotorized activity opportunities are available. Management activities including timber harvest are present and harmonize with the natural environment.

**Roadless.** Refers to the absence of roads that have been constructed and maintained by mechanical means to ensure regular and continuous use.

**Roads.** Vehicle routes which have been improved and maintained by mechanical means to ensure relatively regular and continuous use. (A way maintained strictly by the passage of vehicles does not constitute a road.)

**Rural (R).** A recreation opportunity classification term for describing land areas that are substantially modified. Sights and sounds of others are readily evident. Interactions between users is moderate to high. Numerous facilities are usually present. Challenge and risks are unimportant. Motorized use and facilities are common. Resource management activities may be common and obvious.

- S -

**Salinity.** Refers to the solids such as sodium chloride (table salt) and alkali metals that are dissolved in water. Often in non-saltwater areas, total dissolved solids is used as an equivalent.

**Scoping Process.** An early and open public participation process for determining particular issues to be addressed and for identifying the significant issues related to a proposed action.

**Sediment Yield.** The amount of sediment produced in a watershed, expressed as tons, acre-feet, or cubic yards of sediment per unit of drainage area per year.

**Semiprimitive.** A recreation opportunity classification term for describing land areas that have very few management controls lying between half a mile and three miles from the nearest point of motor vehicle access, excepting four-wheel drive roads and trails, with mostly natural landscapes and some evidence of other people.

**Semiprimitive Motorized (SPM).** A land area classified as semiprimitive that may have primitive roads present and where motorized use is permitted. Settings, activities and opportunities are affected accordingly though there is still a moderate probability of experiencing isolation from sights and sounds of humans.

**Semiprimitive Nonmotorized (SPN).** A land area classified as semiprimitive that has a natural environment and motorized use is not permitted. Nonmotorized status increases the probability of experiencing isolation, independence, and closeness to nature. Challenge and risk is generally high. Resource management activities may be present; however, natural appearance is still maintained.

**Sensitivity Levels.** A measure of people's concern for the scenic quality of the Forest. Sensitivity levels are developed for visitors viewing the Forest as a result of traveling by car, hiking, camping, fishing or boating. Some degree of sensitivity is established for all National Forest System lands. Three levels of sensitivity are used, with one being most sensitive and three the least.

**Sheet Erosion.** The removal of a fairly uniform layer of soil from the land surface by runoff water.

**Shelterwood Method.** An even-aged method in which a new stand is established under the protection of a partial canopy of trees. The old stand is removed in a series of two or three harvest cuts, the last of which removes the shelterwood when the new even-aged stand is well established.

**Short-Time.** In this document, refers to the 10- to 12-year life of the Forest Plan. Short-term impacts would occur within that time period.

**Shut-in.** An oil or gas well that is capable of production but is temporarily not producing.

**Significant.** An effect that is analyzed in the context of the proposed action to determine the importance of the effect, either beneficial or adverse. The degree of significance is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment and when the effects on the quality of the human environment are likely to be highly controversial.

**Silviculture.** The science and art of cultivating (i.e., growing and tending) forest stands.

**Silvicultural System.** A management process whereby forests are tended, harvested, and replaced, resulting in forests of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop and provide for regeneration and according to the type of forest thereby produced (36 CFR Part 219.3).

**Slope.** The amount or degree of deviation from the horizontal or vertical. Landscape is categorized into three slope classes: 0-15%, 16-40% and greater than 40%. Concerning visual resources, as slope increases, views into a site and the size of the disturbance increase. Generally, the steeper slopes are more visible due to their location in the landscape.

**Soil Depth.** Depth classes:

**Shallow** - Bedrock at less than 20 inches

**Moderately Deep** - Bedrock at 20 to 40 inches

**Deep** - Bedrock at below 40 inches

**Soil Drainage.** Refers to the frequency and duration of periods when the soil is free of saturation.

**Classes:**

**Excessively Drained** - These soils have very high hydraulic conductivity and low water holding capacity.

**Somewhat Excessively Drained** - These soils have high hydraulic conductivity and low water holding capacity.

**Well-Drained** - These soils have intermediate water holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

**Moderately Well-Drained** - These soils are wet close enough to the surface for long enough that planting or harvesting operations or yields of some field crops are adversely affected unless artificial drainage is provided. Moderately well-drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

**Somewhat poorly drained** - These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless artificial drainage is provided. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

**Poorly drained** - These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

**Very poorly drained** - These soils are wet to the surface most of the time. These soils are wet enough to prevent the growth of important crops unless artificially drained.

**Soil Fertility.** The quality of a soil that enables it to provide nutrients in adequate amounts and in proper balance for the growth of specified plants when other growth factors are favorable.

**Soil Texture.** The relative proportions of sand, silt, and clay particles in a mass of soil. Basic textural classes, in order of increasing proportion of fine particles, are: sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay.

**Special Recreation Management Area (SRMA).** An area that possesses outstanding recreation resources or where recreation use causes significant user conflicts, visitor safety problems, or resource damage.

**Split-Estate Lands.** Lands which do not have both the mineral rights and the surface owned by one party. The most common split estate is federal ownership of mineral rights on lands to which someone else holds ownership. In such instances the Federal Government can lease the oil and gas rights without surface owner consent. Other split estate lands may be federally owned but with

the mineral rights owned by a private party; or, federal ownership of the land with some percentage of the mineral rights owned by a private party.

**Stand.** An aggregation of forested vegetation occupying a specific area and sufficiently uniform in species composition, age arrangement and condition as to be distinguishable from adjoining stands.

**Stipulation.** A provision that modifies standard lease rights and is attached to and made a part of the lease.

**Stream Bank (and Channel) Erosion.** The removal, transport, deposition, recutting, and bed load movement of material in streams by concentrated water flows.

**Study Area.** Refers to all the Resource Areas and Planning Areas covered in this EIS collectively.

**Structural (successional) Stage.** "A stage or recognizable condition of a plant community which occurs during its development from bare ground to climax" (Thomas 1979:491). Although successional stages may be defined in any ecosystem, structural stages are usually defined only in coniferous or other forested ecosystems in which five stages can be seen: grass/forb, shrub/seedling, sapling, pole/mature, and old growth.

**Substantial Modification.** A change in lease terms or a modification, waiver, or exception to a lease stipulation that would require an environmental assessment or environmental impact statement pursuant to the National Environmental Policy Act of 1969.

**Suitability.** As used in the Wilderness Act and in the Federal Land Policy and Management Act refers to a recommendation by the Secretary of the Interior or the Secretary of Agriculture that certain federal lands satisfying the definition of wilderness in the Wilderness Act have been found appropriate for designation as wilderness on the basis of an analysis of the existing and potential uses of the land.

**Sundry Notice.** Standard form to notify of or approve well operations subsequent to Application for Permit to Drill in accordance with Forest Service regulations.

**Supplemental Values.** Resources associated with wilderness which contribute to the quality of wilderness areas.

**Surface Management Agency.** Any agency outside the Department of the Interior with jurisdiction over the surface overlying federally owned minerals.

**Surface Use Plan of Operations (SUPO).** A plan for surface use, disturbance, and reclamation.

**Sustained Yield.** The achievement and maintenance in perpetuity of a high-level annual or regular period output of the various renewable resources of the public lands consistent with multiple-use.

**Syncline.** A fold with a core that contains the stratigraphically younger rocks; it is generally concave upward.

**Tectonics.** A branch of geology dealing with the broad architecture of the outer part of the earth; that is the regional assembling of structural or deformational features and a study of their mutual relations, origin, and historical evolution.

**Terrestrial.** Living or growing in or on the land.

**Terrestrial Ecosystem.** All organisms in a land-based community plus the associated environmental factors.

**Texture.** Detail of landscape that varies with distance.

**Thinning.** Cutting made in an immature stand to accelerate the diameter increment (annual growth) and improve the average form of the remaining trees.

**Threatened Species.** Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of Interior as a threatened species.

**Thrust Fault.** A fault with a dip of 45 degrees or less over much of its extent, on which the hanging wall (overlying side) appears to have moved upward relative to the footwall (underlying side).

**Timber Production.** The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For planning purposes, the term "timber production" does not include production of fuelwood (36 CFR Part 219.3).

**Timing Limitation (Seasonal Restriction).** Prohibits surface use during specified time periods to protect identified resource values. The stipulation does not apply to the operation and maintenance of production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.

**Total Dissolved Solids (TDS).** Salt, or an aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts.

**Trailhead.** Developed recreation sites with parking, signing, and other facilities designated to provide a take-off point for trail users at a major access point and terminus of a trail.

**Transfer.** Any conveyance of an interest in a lease by assignment, sublease or otherwise. This definition includes the terms: "Assignment" which means a conveyance of all or a portion of the lessee's record title interest in a lease; and "sublease" which means a conveyance of a non-record interest in a lease, i.e., a conveyance of operating rights. A sublease also is a subsidiary arrangement between the lessee (sublessor) and the sublessee, but a sublease does not include a transfer of a purely financial interest, such as overriding royalty interest or payment out of production, nor does it affect the relationship imposed by a lease between the lessee(s) and the United States.

**Transferee.** A person to whom an interest in a lease issued by the United States has been transferred.

**Trap.** Any barrier to the upward movement of oil or gas, allowing either or both to accumulate. A trap includes a reservoir rock and an overlying or updip impermeable roof rock; the contact between these is concave as viewed from below.

**Trespass.** Any unauthorized use of public land.

- U -

**Unacceptable Modification.** A landscape management term for describing visual impacts that contrast excessively in form, line, color, or texture.

**Unconformity.** A substantial break or gap in the geologic record in which a rock unit is overlain by another that is not next in stratigraphic succession, such as an interruption in the continuity of a depositional sequence of sedimentary rocks or a break between eroded igneous rocks and younger sedimentary strata.

**Understory.** That portion of a plant community growing underneath the taller plants on the site.

**Uneven-Aged Management.** Application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain with each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection (36 CFR Part 219.3).

**Universal Soil Loss Equation (USLE).** A formula for predicting soil loss resulting from sheet and rill erosion caused by rainfall.

**Updip Pinch Out of Sandstone Trap.** An updip pinch or wedge out of a sandstone in shale forms a trap. These are common in coastal plains where updip is landward. They tend to be small traps. If uplift caused dip, the trap type is combination.

**Urban.** A recreation opportunity classification term for describing a land area that is usually highly modified and contains numerous improvements and large concentrations of humans. Experiencing the natural environment is unimportant.

**User Activity.** Any activity a Forest visitor is involved in, i.e., camping, hiking, fishing, scenic driving, etc.

**Utilization.** The proportion of current year's forage production that was consumed or destroyed by grazing animals; usually expressed as a percentage.

- V -

**Valid Existing Rights.** Legal interests that attach to a land or mineral estate that cannot be divested from the estate until that interest expires or is relinquished.

**Vandalism.** Willful or malicious destruction or defacement of public property; specifically cultural or paleontological resources.

**Variety Class.** Determined by classifying different degrees of variety in a landscape. A determination is made on a landscape's importance based on scenic quality. Those landscapes with the most diversity have the greatest potential for scenic value. In order of importance the classes are:

- Class A** Those areas that have outstanding or unusual landforms, vegetation, water features or rock formations.
- Class B** Areas that have a variety of features but tend to be common and are not outstanding.
- Class C** Features that have little change in line, form, color or texture.

**Vegetation Manipulation.** Planned alteration of vegetation communities through use of prescribed fire, plowing, herbicide spraying, or other means to gain desired changes in forage availability, wildlife cover, species composition, etc.

**Vegetation Type.** A plant community with immediately distinguishable characteristics based upon and named after the current dominant plant species.

**Vertebrate.** An animal having a spinal column.

**Viewer Position.** The relationship of the viewer to a specific site or structure, i.e., whether a person is looking up at, down at, or across. Viewer position is classified as superior, normal, or inferior.

**Visual Absorption Capability (VAC).** The relative ability of a landscape to accept management practices without affecting its visual characteristic. The capability to absorb visual change. A prediction of how difficult it will be for a landscape to meet recommended VQO's.

**Visual Quality Objectives (VQO's).** Based upon variety class, sensitivity level and distance zone determinations. Each objective describes a different level of acceptable alteration based on aesthetic importance. The degree of alteration is based on contrast with the surrounding landscape.

**Visual Resource.** The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal of the unit.

**Visual Resource Management (VRM).** Inventory and planning to identify visual resource values and establish objectives for managing those values, and the management actions taken to achieve those objectives.

- W -

**Waiver.** Permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

**Wetlands.** Lands where saturation with water is the primary factor determining the nature of soil development and the kinds of animal and plant communities living under or on its surface.

**Wild and Scenic River System.** A system of selected rivers as provided in the Wild and Scenic Rivers Act of October 2, 1968, as amended, that are authorized by Act of Congress or Act of the State Legislature and designated as Wild, Scenic or Recreational Rivers. They are free flowing streams free of impoundments with varying degrees of accessibility and shoreline development with outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural or other similar values, to be preserved for the benefit of present and future generations.

**Wildcat Well.** A well drilled in unproved territory.

**Wilderness.** An area of undeveloped Federal land designated Wilderness by Congress, retaining its primeval character and influence, without permanent improvements or human habitation, protected and managed to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or primitive and unconfined recreation; (3) has at least 5,000 acres or is of sufficient size to make practical its preservation and use in an unimpaired condition; and (4) may also contain features that are of ecological, geological, scientific, educational, scenic, or historical value. These characteristics were identified by Congress in the Wilderness Act of 1964.

**Wilderness Inventory.** An evaluation conducted by the Bureau of Land Management of the public land in the form of a written description and a map showing those lands that meet the wilderness criteria as established under Section 2(c) of the Wilderness Act.

**Wilderness Management Policy.** Policy document prescribing the general objectives, policies, and specific activity guidance applicable to all designated Forest wilderness areas. Specific management objectives, requirements, and decisions implementing administrative practices and visitor activities in individual wilderness areas are developed and described in the wilderness management plan for each unit.

**Wilderness Study Area (WSA).** An area included in Section 105(a) of Public Law 96-560 (Colorado Wilderness Bill) which the Secretary of Agriculture shall review. Following review he will report his recommendations on suitability or unsuitability of the lands for inclusion in the National Wilderness Preservation System.

**Withdrawal.** An action which restricts the use of public land and segregates the land from the operation of some or all of the public land and mineral laws. Withdrawals are also used to transfer jurisdiction of management of public lands to other federal agencies.



## INDEX

### A

|  |                         |
|--|-------------------------|
| Abandonment                              | I-6,13                  |
| Administrative Unit                      | I-29,34                 |
| Air                                      | I-34,44                 |
| environmental consequences               | IV-8,9                  |
| Alternatives                             | I-25,34,42, II-1        |
| comparison of                            | II-33-36, IV-4,40       |
| acreage allocations                      | II-36                   |
| considerations common to all             | II-2, IV-8              |
| considered in detail                     | II-1,4                  |
| Proposed Action                          | II-37                   |
| development of                           | II-1                    |
| eliminated from detailed study           | II-3                    |
| Applicable Laws                          | I-32-35                 |
| Application for Permit to Drill          | I-6,8,15-18,20,23,27,36 |
|  | II-5,17,27,36           |
| Authority, BLM                           | I-1,16,20,21,22,35      |
| Authority, Forest Service                | I-16,31                 |
| <br>                                     |                         |
| <i>B</i>                                 |                         |
| BLM Royal Gorge Resource Management Plan | I-31                    |
| <br>                                     |                         |
| <i>C</i>                                 |                         |
| Campo Research Natural Area              |                         |
| Canyon lands                             | II-7,25,34              |
| Carrizo Unit                             | I-6                     |
| Caves                                    |                         |
| affected resources                       | III-15                  |
| environmental consequences               | IV-25,26,35,36          |
| Commentors                               |                         |
| Comment, public                          | Appendix H              |
| summary of analysis of comments          | I-46-52                 |
| Comments and responses                   | Appendix H              |
| air quality                              | I-47,52                 |
| alternatives                             | I-51                    |
| cumulative effects                       | I-48                    |
| full field development                   | I-47,51                 |
| economics                                | I-47,49,50              |
| groundwater                              | I-47                    |
| hazardous waste                          | I-47                    |
| lease stipulations                       | I-48,49,52              |
| NEPA                                     | I-52                    |
| maps                                     | I-50                    |
| mitigation                               | I-48                    |

|                                   |  |
|-----------------------------------|--|
| recreation                        | I-38,39,40,41,43                       |
| social impacts                    | I-39,41,                               |
| solid waste disposal              | I-47                                   |
| surface occupancy                 | I-40                                   |
| threatened and endangered species | I-38, III-12,27,28                     |
| transportation                    | IV-39                                  |
| visual resources                  | I-43,51                                |
| water quality                     | I-47                                   |
| wetlands and floodplains          | I-47                                   |
| wilderness                        | I-47,48,49                             |
| wilderness study areas            | I-47,48,49                             |
| wildlife and fish                 | I-46,52                                |
| Construction Activities           | I-8,15                                 |
| Consultation With Others          | VI                                     |
| Controlled Surface Use (CSU)      | I-42, II-36, Appendix B                |
| Cultural Resources                |  |
| affected environment              | III-12-15                              |
| environmental consequences        | IV-25,26,35,36                         |
| identified for protection         | Appendix B                             |
| Cumulative Impacts                | I-51, IV-28-39                         |
| <br><i>D</i>                      |  |
| Decisions to be made              | I-1,17-20, II-1                        |
| Forest-wide Availability          | I-1,17,19,20,23,25,27,29,31<br>II-1    |
| Specific Lands (Consent)          | I-1,17-19,21-23,27<br>II-1             |
| Discretionary No Lease            | II-4,17,26,27,33,35, IV-4              |
| <br><i>E</i>                      |  |
| Economic Impacts                  | Appendix J                             |
| Environmental Issues              | I-37,42                                |
| Experimental Forests              | I-4,29,39,52                           |
| affected environment              | III-19                                 |
| cumulative impacts                | IV-38                                  |
| Exploration, oil and gas          | I-6-9,17<br>II-3,4,17,26,34            |
| <br><i>F</i>                      |  |
| Fire                              | App C, VI-28                           |
| Fish and Riparian Habitat         | III-10, 27                             |
| affected environment              | III-                                   |
| Forest Plan                       | I-1,4,18,30,31<br>II-1,2,4,17,26,34,37 |
| Forest Plan Amendment             | I-1,28,31,App. A<br>II-1,2,4,17,26,34  |
| Full Field Development            | I-39,                                  |
| <br><i>G</i>                      |  |

|  |                                 |
|--|---------------------------------|
| Geographic Zones                       | App D                           |
| Global Warming                         | I-51                            |
| Glossary of Terms                      | VII-1                           |
| <i>H</i>                               |                                 |
| Hard lands                             | II-7,25,34                      |
| Historical Program                     | I-6                             |
| Hugoton Known Geologic Structure       | I-6                             |
| Human and Community Development        | III-                            |
| Hurricane Canyon Research Natural Area | III-                            |
| <i>I</i>                               |                                 |
| Implementing Regulations               | I-16-23,27<br>II-1,2,5,17,26,34 |
| <i>L</i>                               |                                 |
| Lands Excluded from Analysis           | I-4                             |
| Lease, Competitive                     | I-13-14                         |
| Lease, Noncompetitive                  | I-14-15                         |
| Lease Notice                           | I-14, II-15                     |
| Lease Requests                         | I-27,28                         |
| Lease Rights                           | I-13                            |
| Leasing Analysis                       | I-17-22<br>II-1,17,26,36        |
| Leasing Implementation                 | I-35                            |
| Leasing Reform Act                     | I-14,16,23,27,29<br>II-2        |
| <i>M</i>                               |                                 |
| Minerals                               |                                 |
| affected environment                   | III-                            |
| environmental consequences             | IV-                             |
| Mitigation                             | I-34, II-2,4,17,26,38<br>App B  |
| Monitoring and Evaluation              | App I                           |
| Mountain districts                     | I-6                             |
| <i>N</i>                               |                                 |
| National Park Service Lands            | I-49                            |
| No Surface Occupancy (NSO)             | I-10,48                         |
| Non-federal Minerals                   | I-4                             |
| <i>O</i>                               |                                 |
| Operations, oil and gas                | I-6-14                          |
| <i>P</i>                               |                                 |

|   |  |
|---|--|
| Paleontological resources               |  |
| affected environment                    | III-15, 29   |
| cumulative impacts                      | IV-35, 36  |
| environmental consequences              | IV-25, 26  |
| Physical and Biological Setting         | III-6  |
| Plants, Threatened & Endangered         | III-12   |
| Production, oil and gas                 | I-6-13   |
| Public, notification and involvement    | I-6,38-45  |
| Pumpjack                                | I-11,13  |
| <br>                                    |  |
| <i>R</i>                                |  |
| Range                                   |  |
| affected environment                    | III-11   |
| environmental consequences              | IV-23  |
| Reasonable Forseeable Development (RFD) | II-2,4,17,26,35                                    |
| BLM RFD                                 | II-2   |
| Concentrated RFD                        | II-3   |
| Reclamation                             | I-16, II-37  |
| Record of Decision                      | II-27,38   |
| Recreation                              | I-26   |
| affected environment                    | III-15-18, 32                                      |
| cumulative impacts                      | IV-36, 37  |
| environmental consequences              | IV-26, 27  |
| References                              |  |
| Research Facilities, natural areas      | II-36  |
| affected environment                    | III-19, 34   |
| cumulative impacts                      | IV-38  |
| Riparian                                | II-7,25,34   |
| affected environment                    | III-9, 10, 50                                      |
| <br>                                    |  |
| <i>S</i>                                |  |
| Sandy lands                             | II-7,25,34, III-50                                 |
| Site-specific Analysis                  | I-4,29, II-2,3,4,26                                |
| Social Impacts                          | III-5  |
| Social Resource Units                   | App J-1-9  |
| Special Uses                            | I-4,28, II-26, III-18-21, 23, 32,<br>IV-27, 37, 38 |
| Split-Estate Lands                      | II-3,4,17,26,34,35                                 |
| Standard lease terms                    | I-15,27, II-1,2,17,26,33,34                        |
| Stipulations                            | I-1,2,15,16,27, II-1,4,6,16,17,26,33,34            |
| Stipulation justification App D         |  |
| Soils                                   | II-37,   |
| affected environment                    | III-5, 6   |
| cumulative impacts                      | IV-29-31   |
| environmental consequences              | IV-12-15   |
| State and Private Forestry              |  |
| Surface Use Plan of Operations          | I-36, II-17  |
| <br>                                    |  |
| <i>T</i>                                |  |
| Threatened and Endangered Species       |  |
| affected environment                    | III-10   |

|                            |                      |
|----------------------------|----------------------|
| environmental consequences | IV 19, 20            |
| Timber                     |                      |
| active and planned sales   |                      |
| Timing Limitation          | II-36                |
| Transportation             |                      |
| affected environment       | III-22, 35           |
| cumulative impacts         | IV-39                |
| V                          |                      |
| Vegetation                 |                      |
| affected environment       | III-5                |
| environmental consequences | IV-10,11,28,29       |
| Visual Resource            |                      |
| affected environment       | III-11               |
| environmental consequences | IV-24,25,34,35       |
| W                          |                      |
| Water and Aquatic          |                      |
| affected environment       | III-7,8,24,25        |
| environmental consequences | IV-15-18,20-23,31-34 |
| Wild and Scenic Rivers     | I-4,29, II-26        |
| affected environment       | III-18,33            |
| environmental consequences | IV-38                |
| Wilderness                 | I-4,29, II-26        |
| Wildlife and Fish          |                      |
| affected environment       | III-8,9,25,26        |
| environmental consequences | IV-18                |



BLM LIBRARY  
BLDG 50, ST-150A  
DENVER FEDERAL CENTER

**STIPULATIONS ON AVAILABLE LANDS  
FOR OIL AND GAS LEASING**

**PIKE AND SAN ISABEL  
NATIONAL FORESTS**

**ITEM HAS BEEN DIGITIZED**

BLM Library  
Denver Federal Center  
Bldg. 50, OC-521  
P.O. Box 25047  
Denver, CO 80225

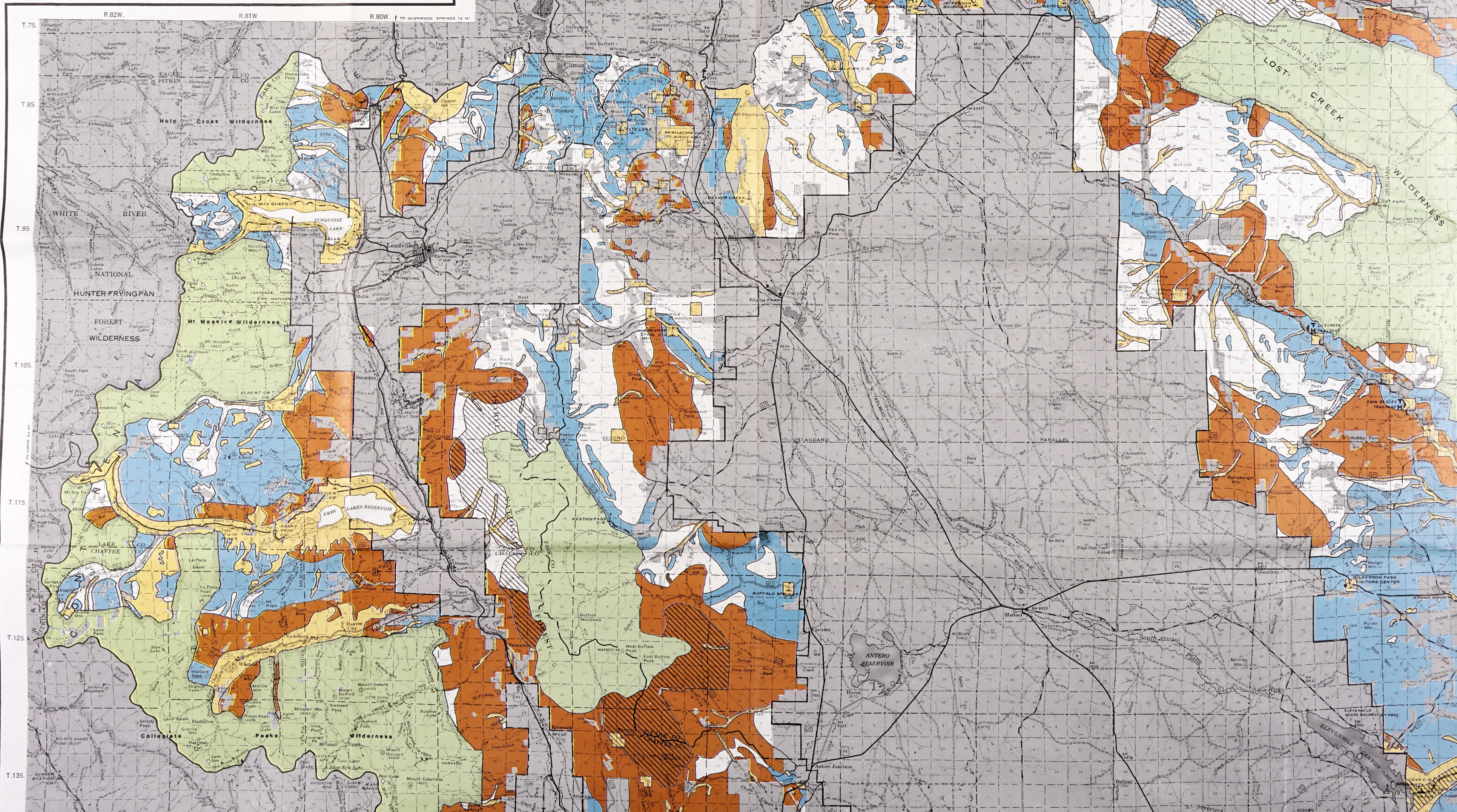
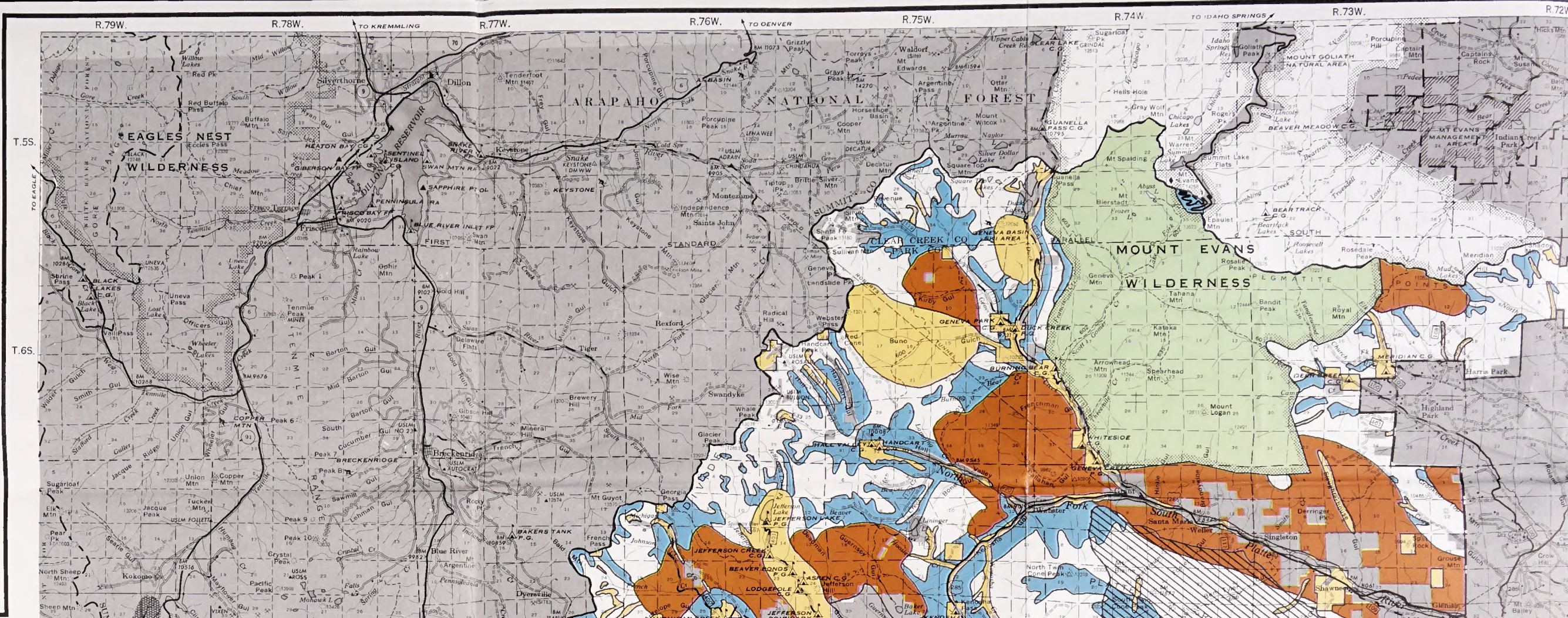
**APPENDIX F  
NORTH PORTION**

ID: 88067768

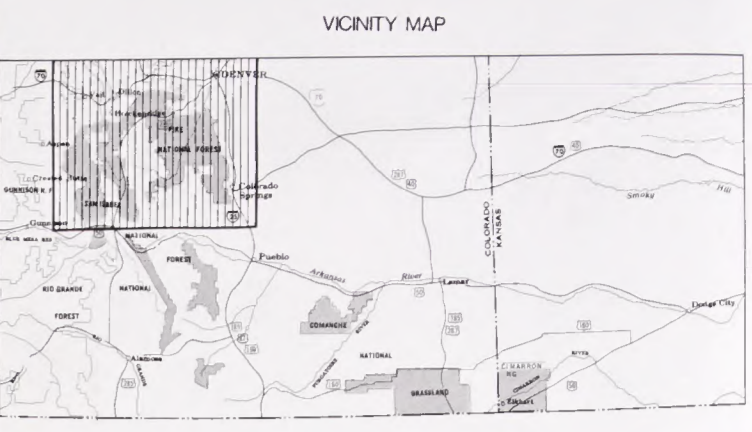
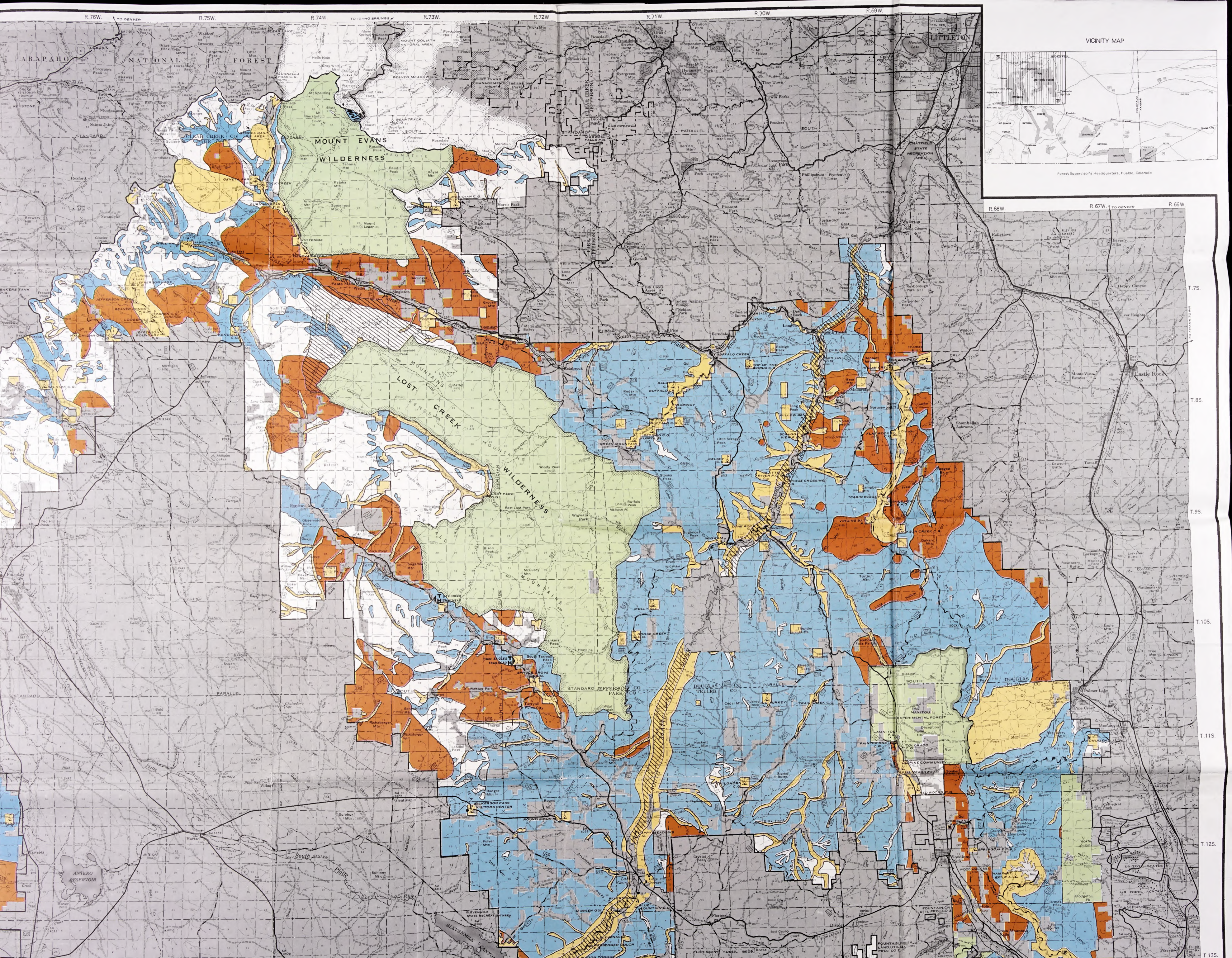
HD  
243  
C6  
P554  
1990

S  
marsh  
shoe  
Mtn  
7724  
sh  
19  
ulch  
G  
R  
ce G  
Gran

PRELIMINARY DRAFT - SUBJECT TO CORRECTION







R.68W R.67W TO DENVER R.66W

T.75S

T.85S

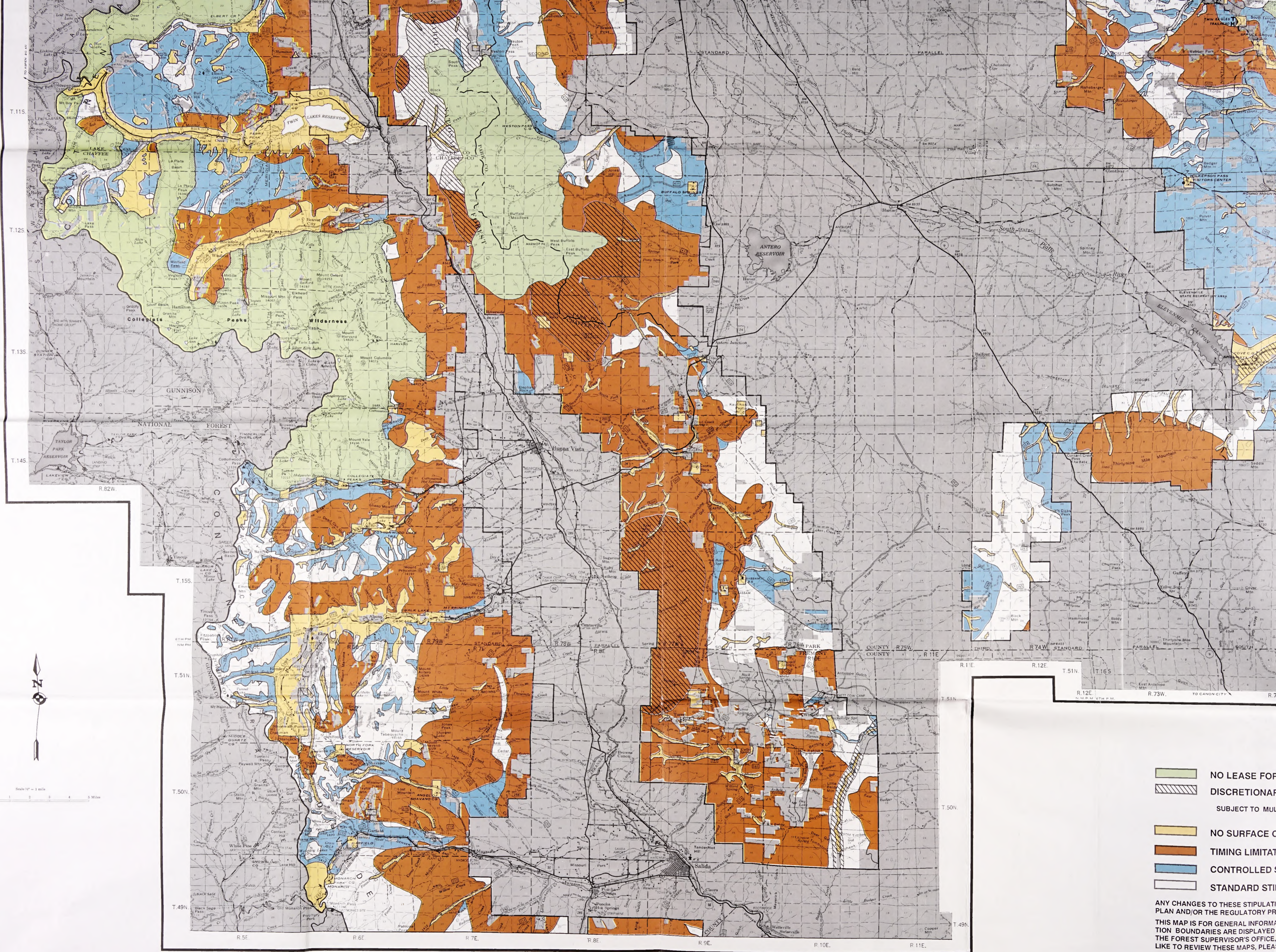
T.95S

T.105S

T.115S

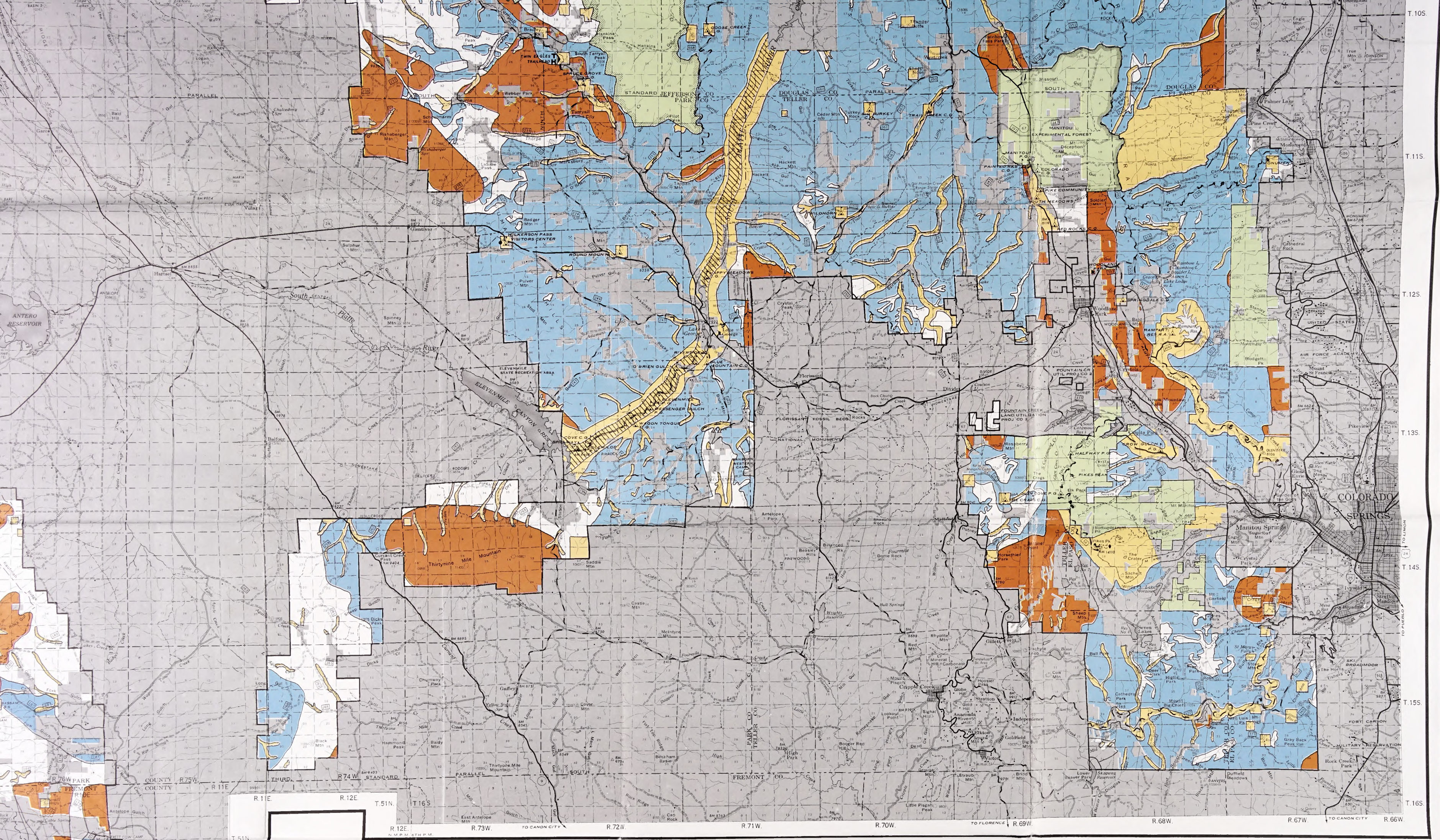
T.125S

T.135S



- NO LEASE FOR
- DISCRETIONARY
- SUBJECT TO MULTIPLE
- NO SURFACE CO
- TIMING LIMITAT
- CONTROLLED S
- STANDARD STIP

ANY CHANGES TO THESE STIPULATIONS SHALL BE MADE BY THE FOREST SUPERVISOR'S OFFICE. THIS MAP IS FOR GENERAL INFORMATION ONLY. BOUNDARIES ARE DISPLAYED AS OF THE DATE OF THE FOREST SUPERVISOR'S OFFICE. PLEASE LIKE TO REVIEW THESE MAPS, PLEASE



**LEGEND**

- NO LEASE FORMALLY WITHDRAWN FROM LEASING
- DISCRETIONARY NO LEASE  
SUBJECT TO MULTIPLE USE MGMT. PENDING SUITABILITY DETERMINATION.
- NO SURFACE OCCUPANCY (NSO)
- TIMING LIMITATION (SEASONAL)
- CONTROLLED SURFACE USE (CSU)
- STANDARD STIPULATIONS

ANY CHANGES TO THESE STIPULATIONS WILL BE MADE IN ACCORDANCE WITH THE LAND USE PLAN AND/OR THE REGULATORY PROVISIONS FOR SUCH CHANGES.

THIS MAP IS FOR GENERAL INFORMATIONAL PURPOSES. SPECIFIC RESOURCE AND STIPULATION BOUNDARIES ARE DISPLAYED ON LARGER SCALE MAPS PERMANENTLY AVAILABLE AT THE FOREST SUPERVISOR'S OFFICE, 1920 VALLEY DRIVE, PUEBLO, COLORADO. IF YOU WOULD LIKE TO REVIEW THESE MAPS, PLEASE CALL (719) 545-3550.

**STIPULATIONS ON AVAILABLE LANDS FOR OIL AND GAS LEASING**

**PIKE AND SAN ISABEL NATIONAL FORESTS**

ITEM HAS BEEN DIGITIZED

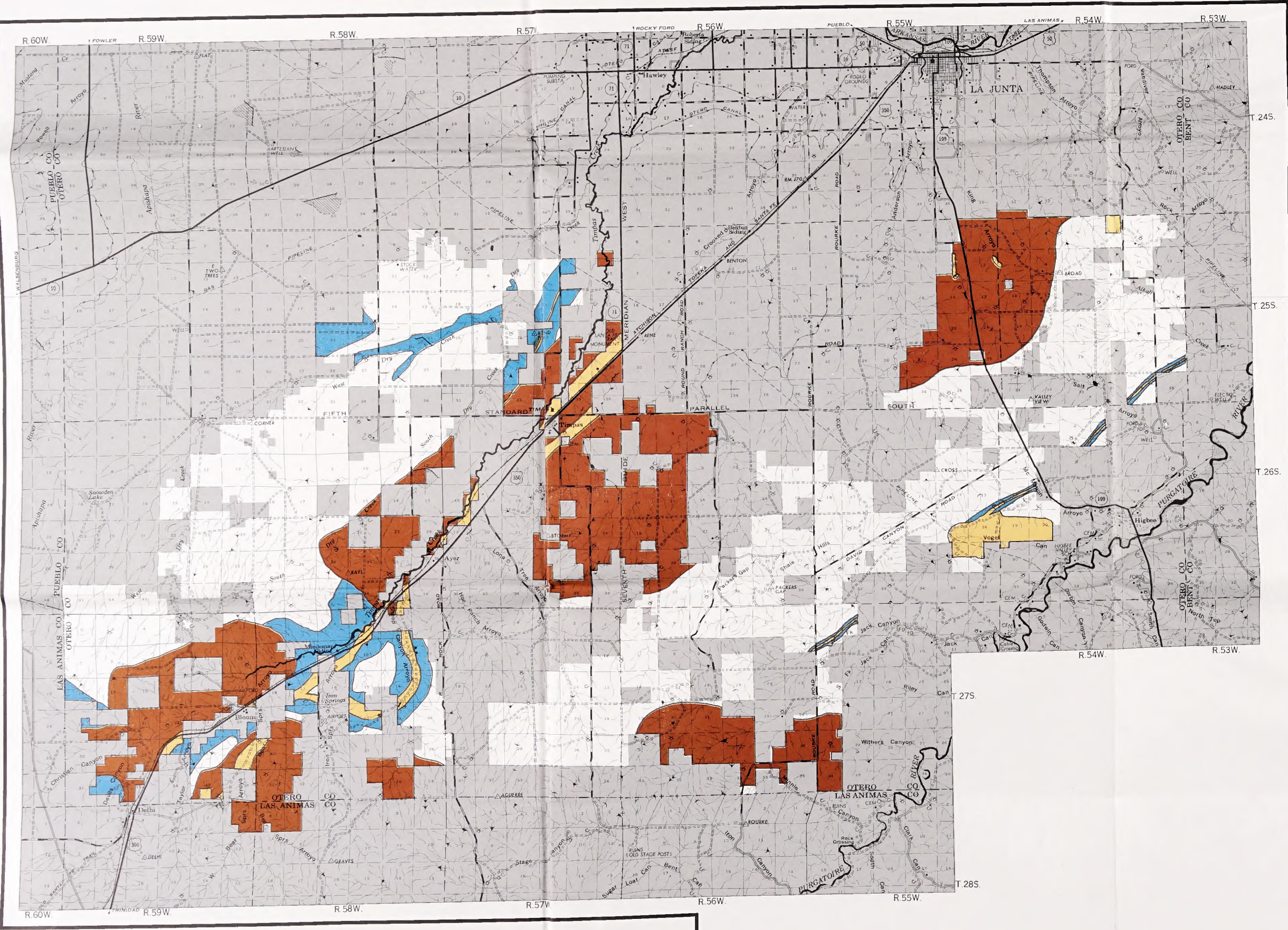
PLM Library  
Denver Federal Center  
Bldg. 50, OC-521  
P.O. Box 25047  
Denver, CO 80225

**APPENDIX F**  
**NORTH PORTION**

ID: 88067268

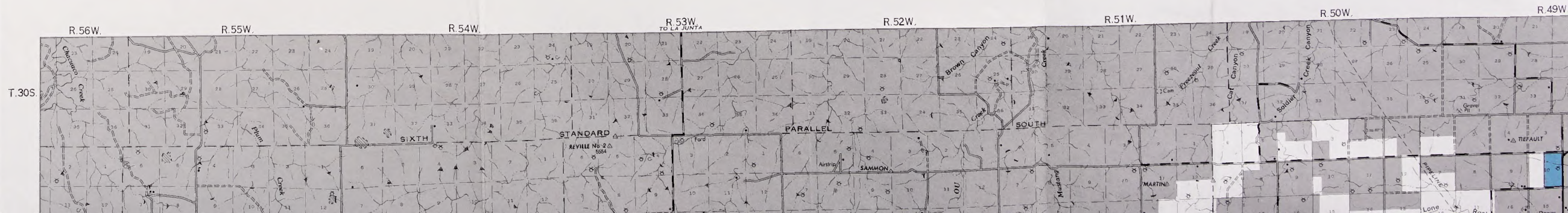
HD  
243  
.06  
P554  
1990

COMANCHE NATIONAL GRASSLAND  
TIMPAS UNIT



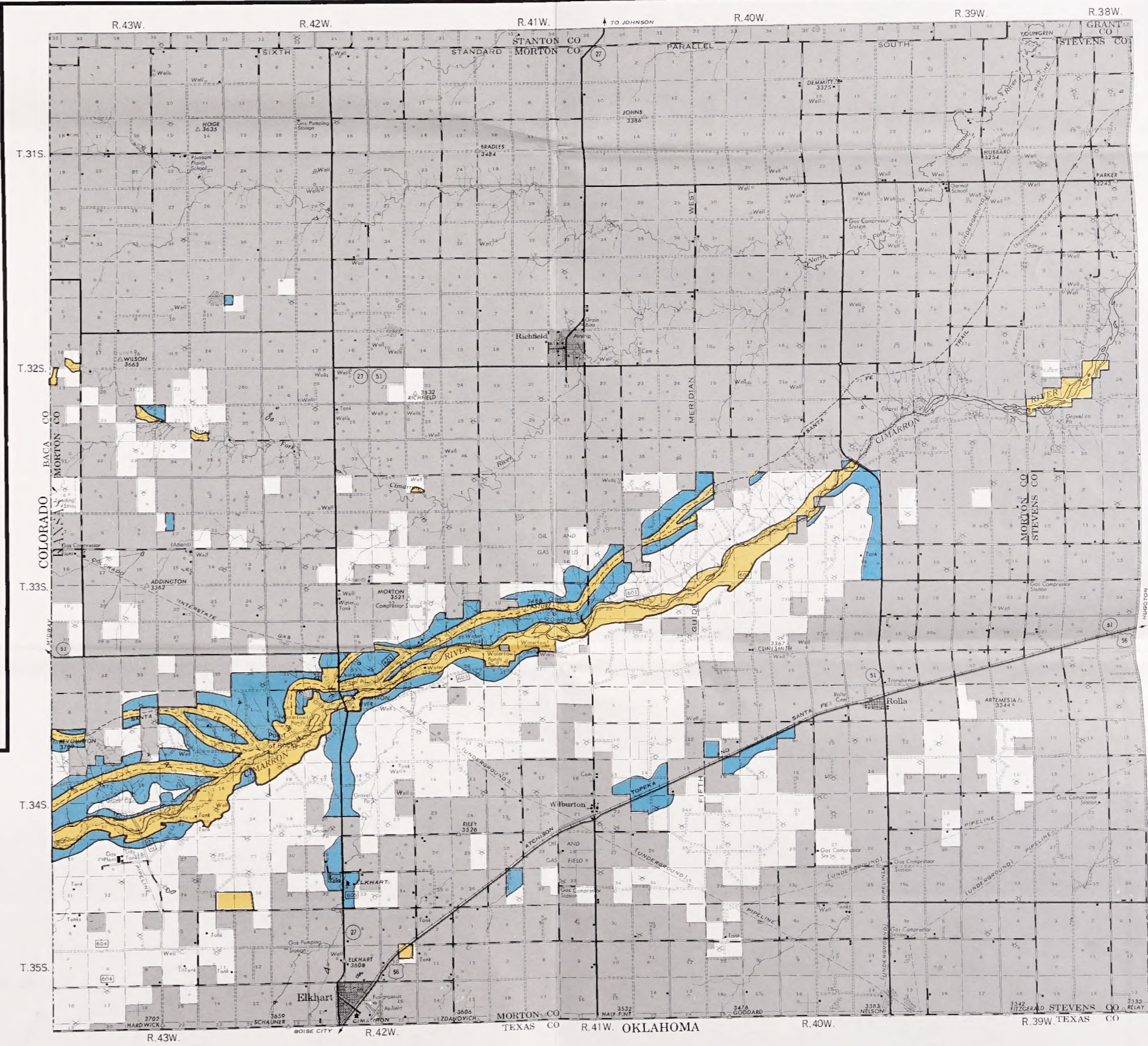
PRELIMINARY DRAFT - SUBJECT TO CORRECTION

COMANCHE NATIONAL GRASSLAND  
CARRIZO UNIT

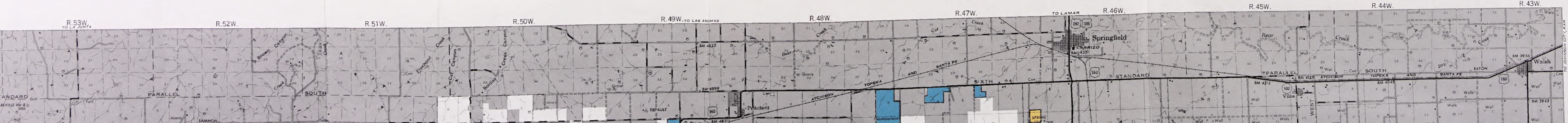


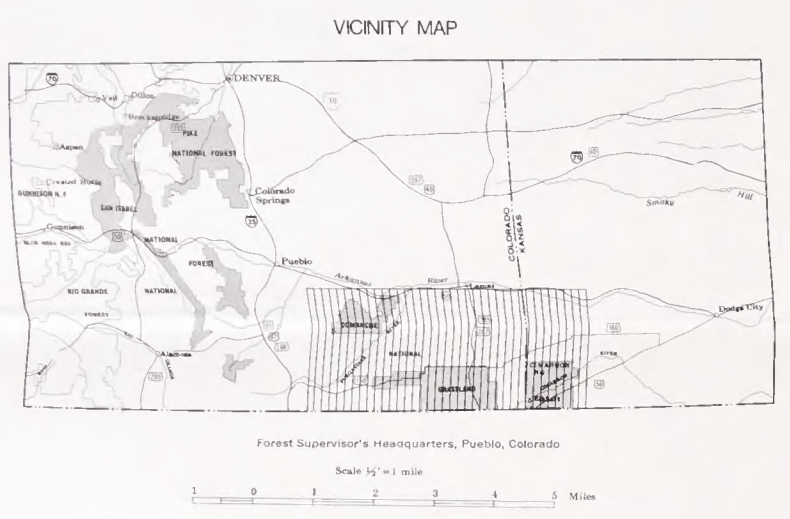
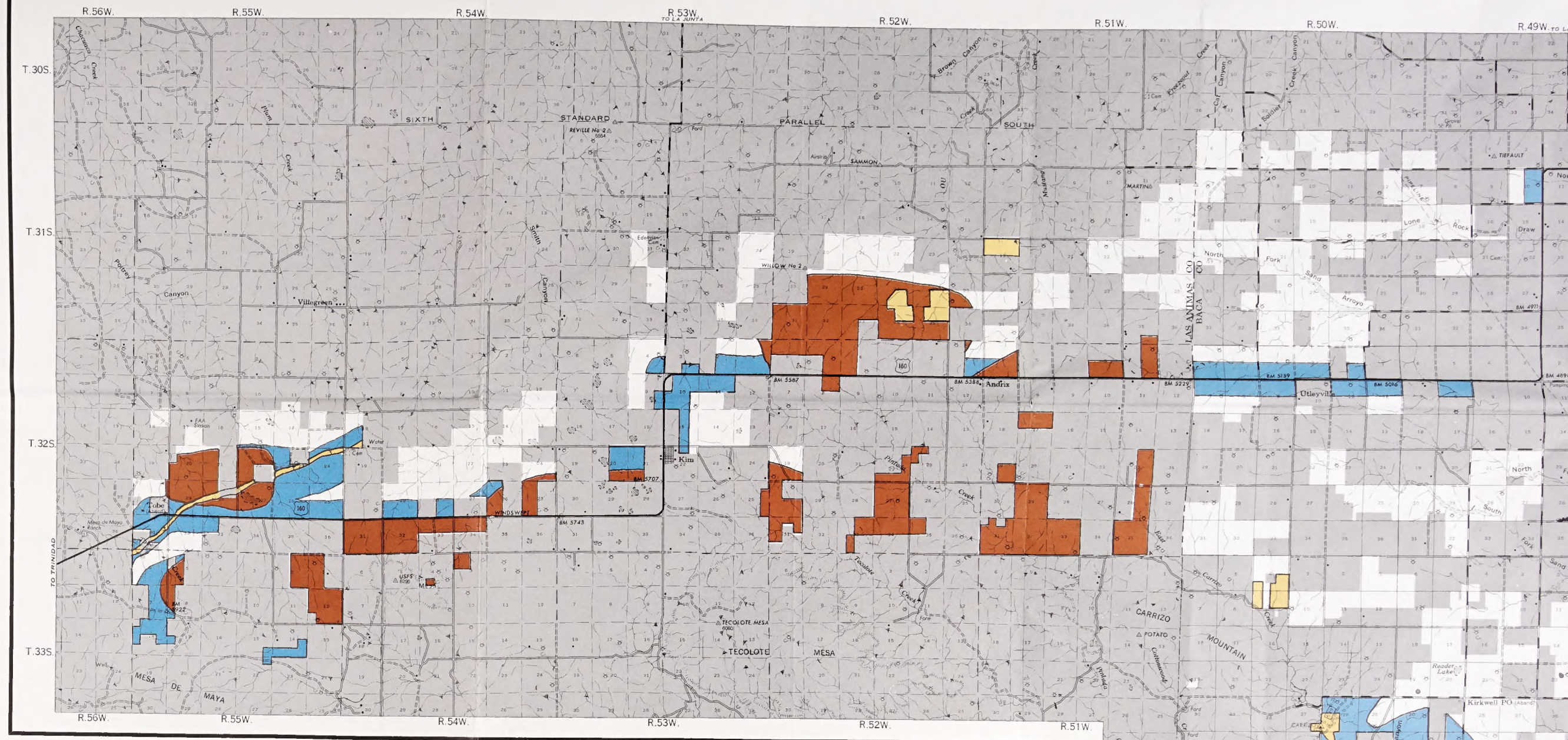
CIMARRON NATIONAL GRASSLAND

PRELIMINARY DRAFT - SUBJECT TO CORRECTION



COMANCHE NATIONAL GRASSLAND  
CARRIZO UNIT





**LEGEND**

- NO SURFACE OCCUPANCY (NSO)
- TIMING LIMITATION (SEASONAL)
- CONTROLLED SURFACE USE (CSU)
- STANDARD STIPULATIONS

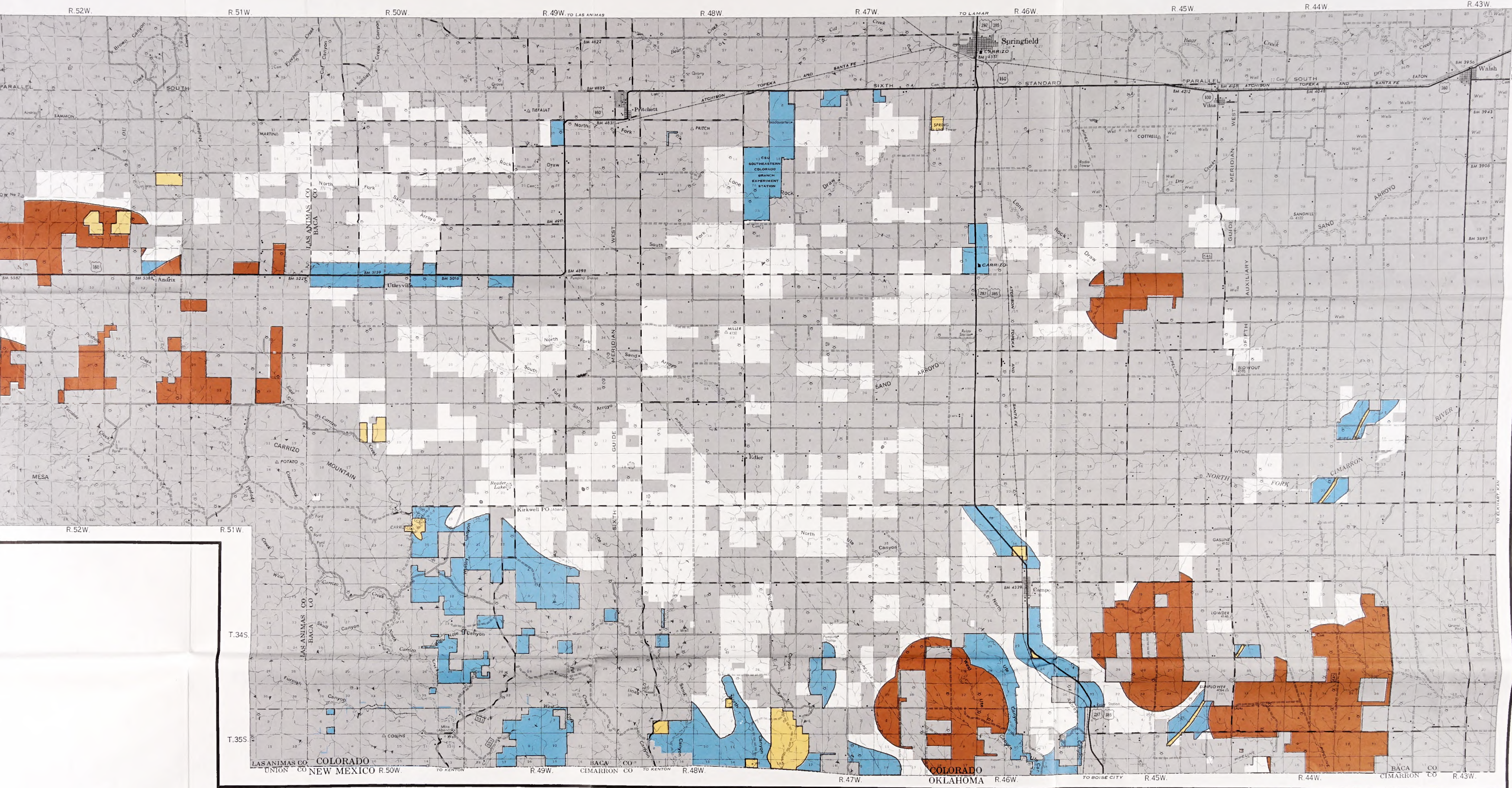
ANY CHANGES TO THESE STIPULATIONS WILL BE MADE IN ACCORDANCE WITH THE LAND USE PLAN AND/OR THE REGULATORY PROVISIONS FOR SUCH CHANGES.

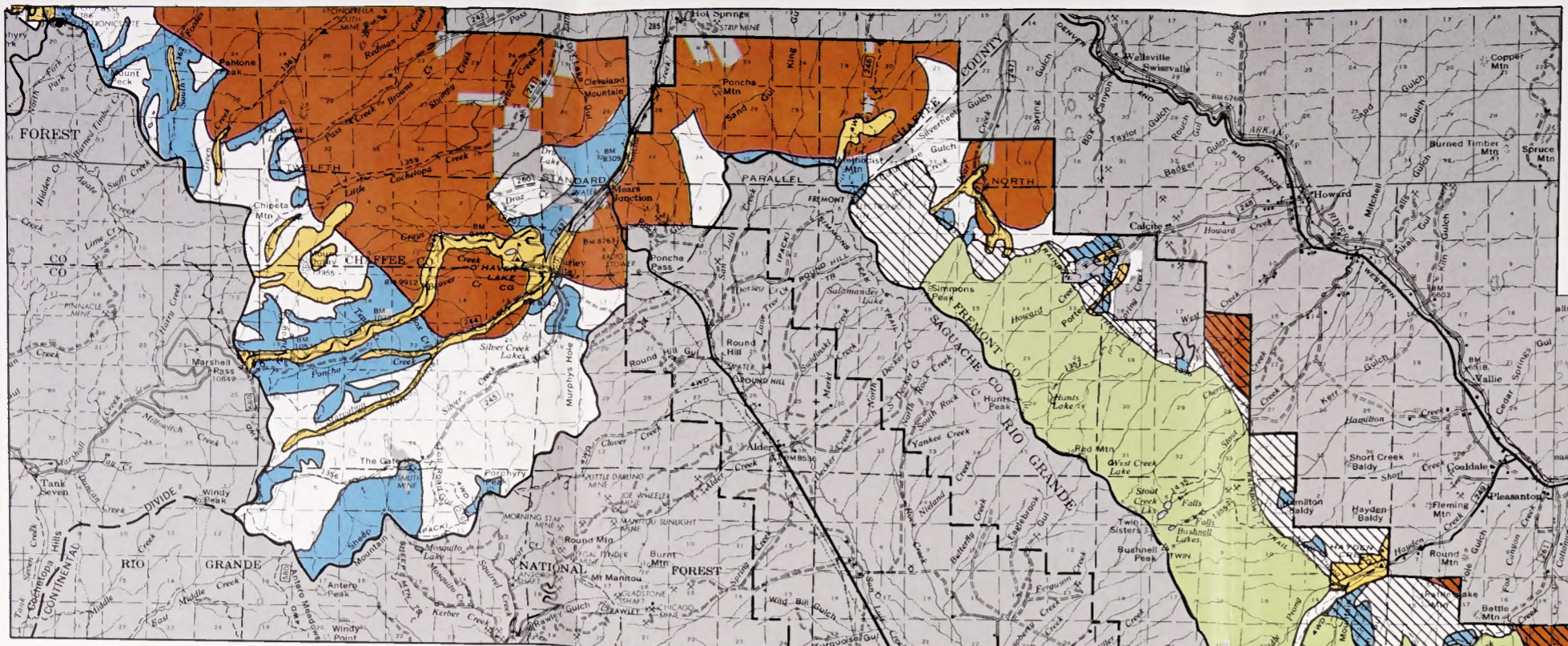
THIS MAP IS FOR GENERAL INFORMATIONAL PURPOSES. SPECIFIC RESOURCE AND STIPULATION BOUNDARIES ARE DISPLAYED ON LARGER SCALE MAPS PERMANENTLY AVAILABLE AT THE FOREST SUPERVISOR'S OFFICE, 1920 VALLEY DRIVE, PUEBLO, COLORADO. IF YOU WOULD LIKE TO REVIEW THESE MAPS, PLEASE CALL (719) 545-3550.

**STIPULATIONS ON AVAILABLE LANDS  
FOR OIL AND GAS LEASING**

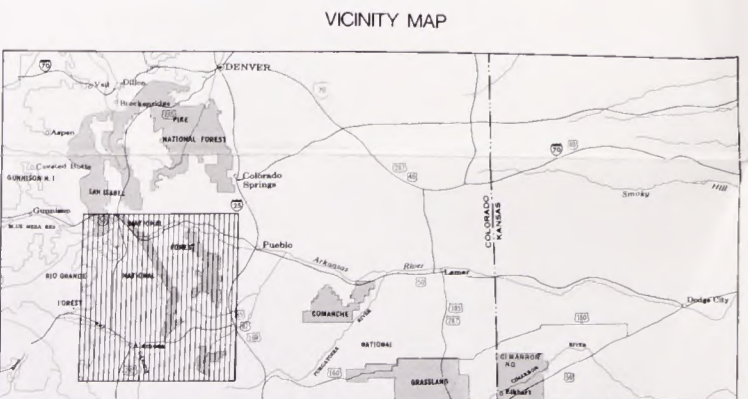
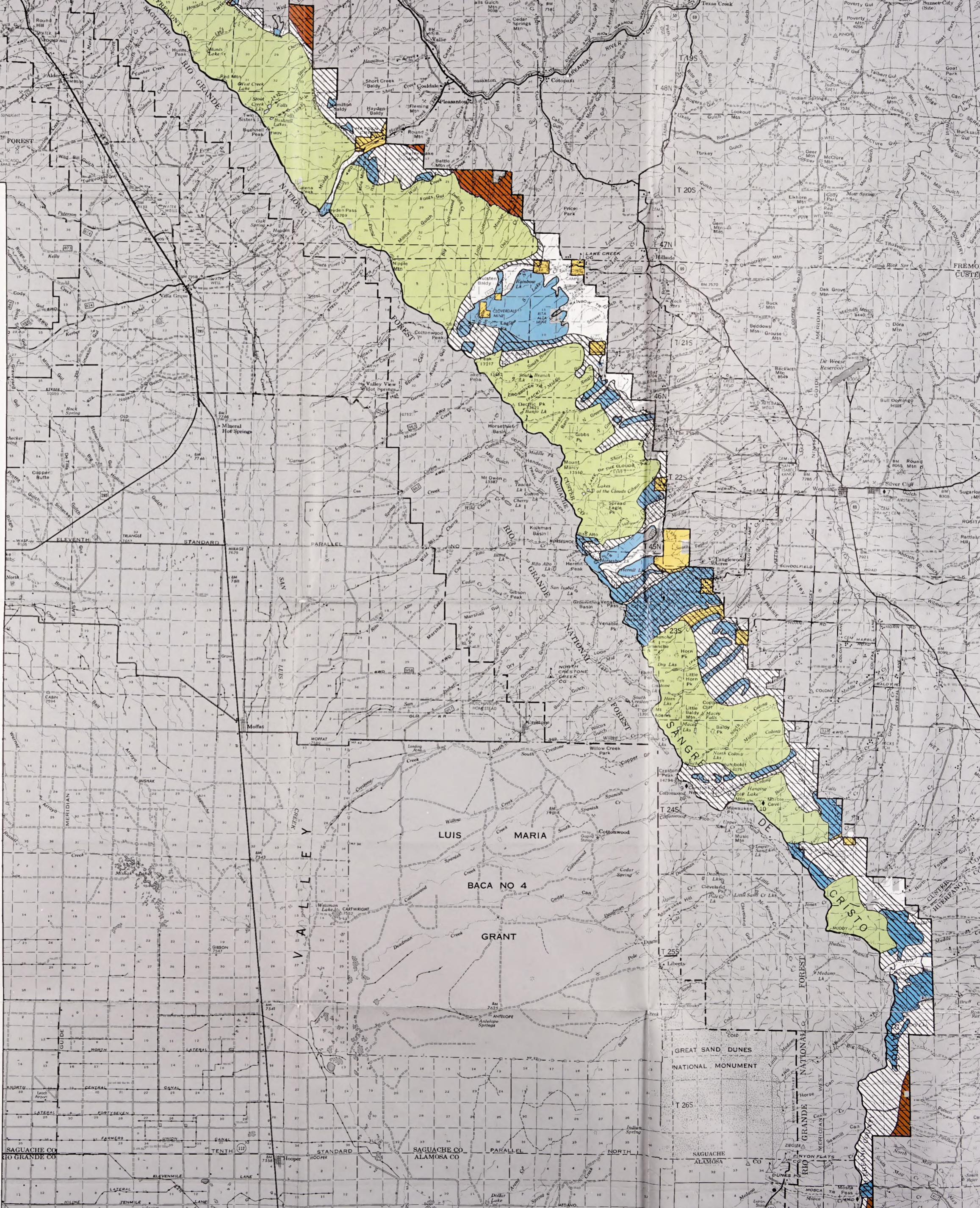
**PIKE AND SAN ISABEL  
NATIONAL FORESTS**

COMANCHE NATIONAL GRASSLAND  
CARRIZO UNIT





R. 11E. R. 12E. CANON CITY R. 73W. R. 72W.



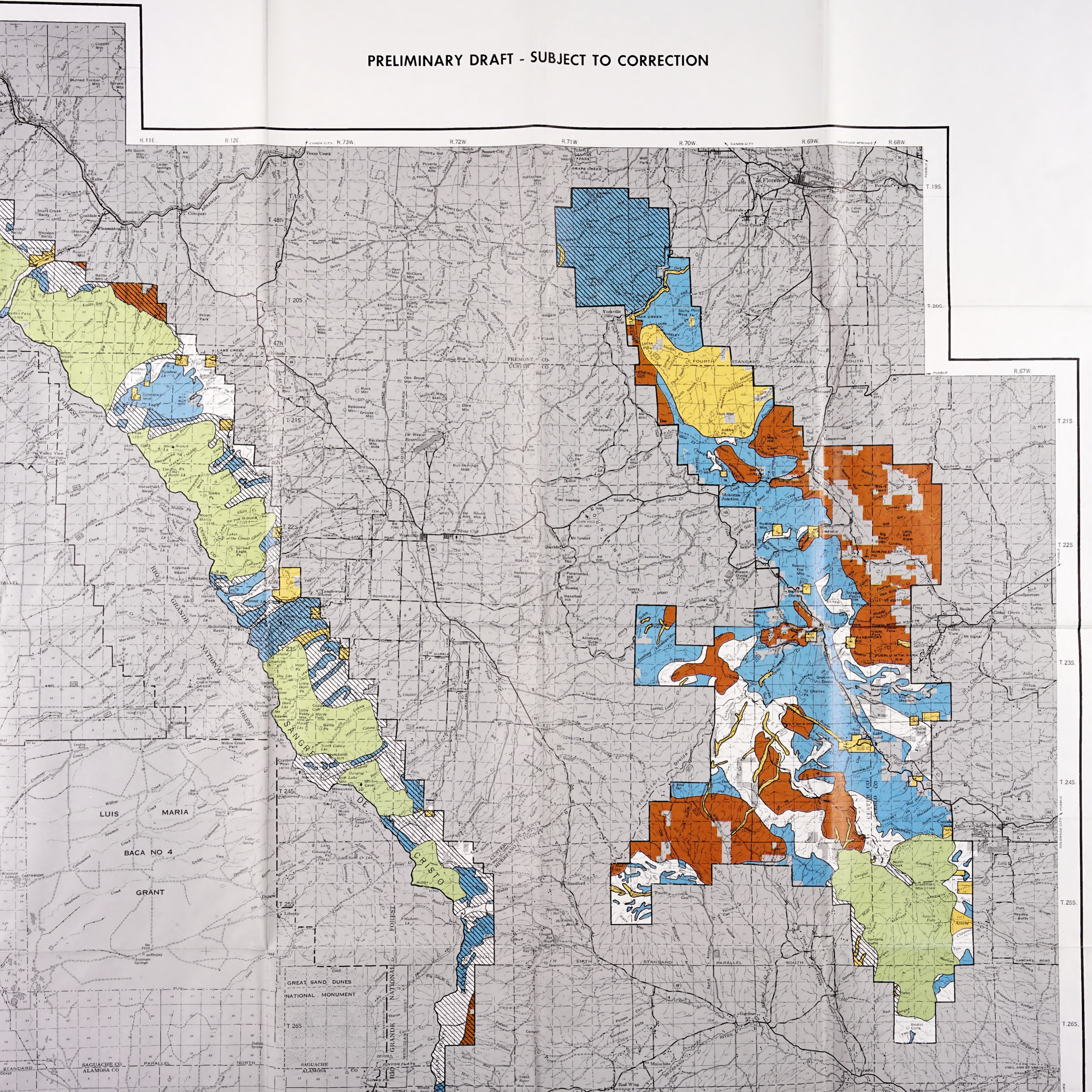
VICINITY MAP

Forest Supervisor's Headquarters, Pueblo, Colorado

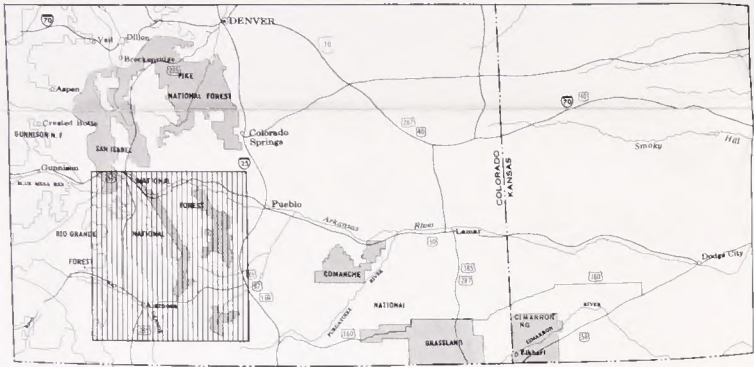
SAGUACHE CO. RIO GRANDE CO. SAGUACHE CO. ALAMOSA CO. SAGUACHE ALAMOSA CO. NATIONAL MONUMENT GREAT SAND DUNES NATIONAL MONUMENT



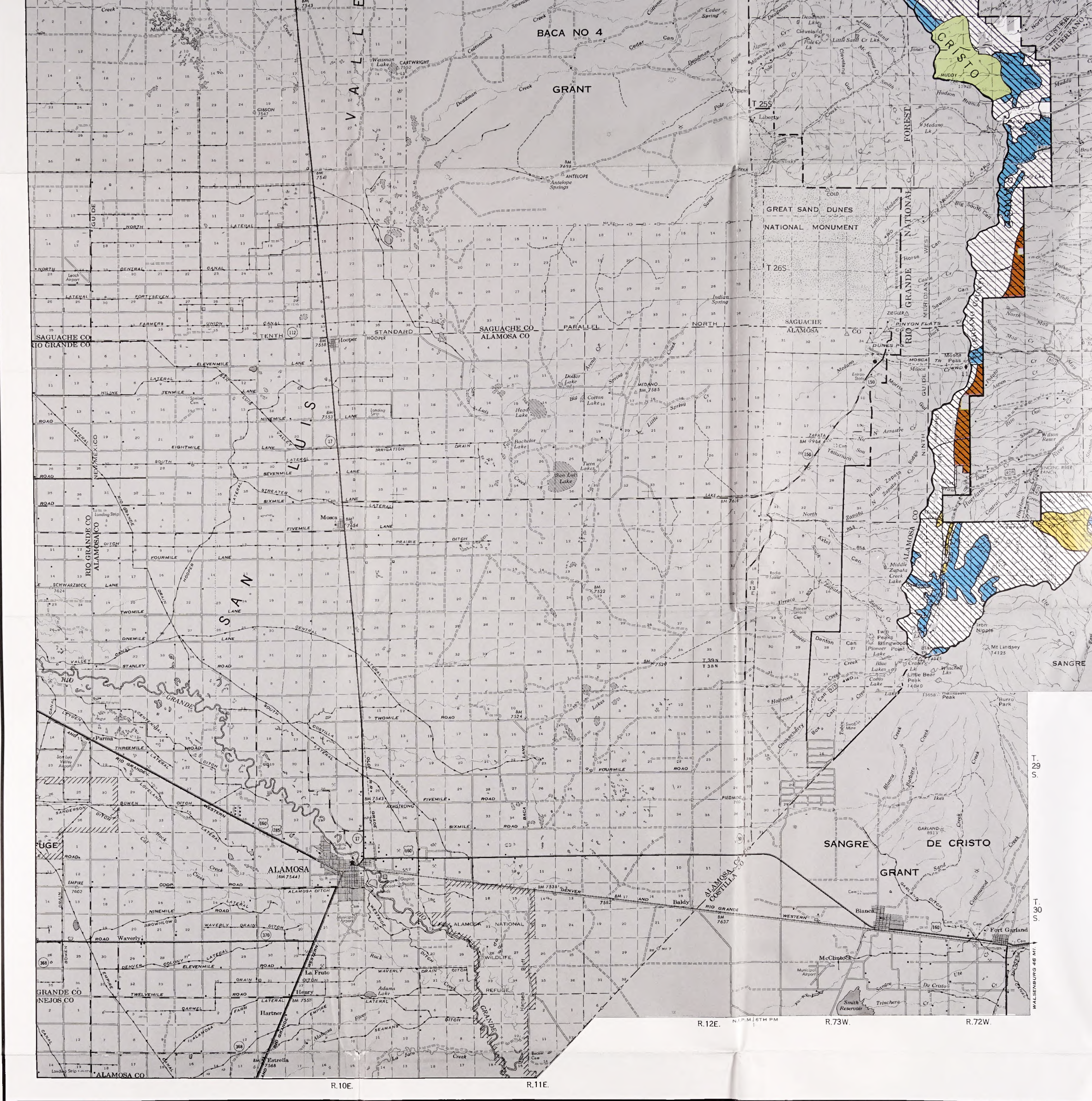
PRELIMINARY DRAFT - SUBJECT TO CORRECTION



VICINITY MAP



Forest Supervisor's Headquarters, Pueblo, Colorado




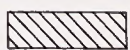
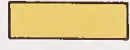



**STIPULATIONS ON AVAILABLE LANDS FOR OIL AND GAS LEASING**

**PIKE AND SAN ISABEL NATIONAL FORESTS**

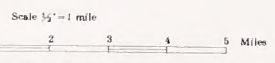
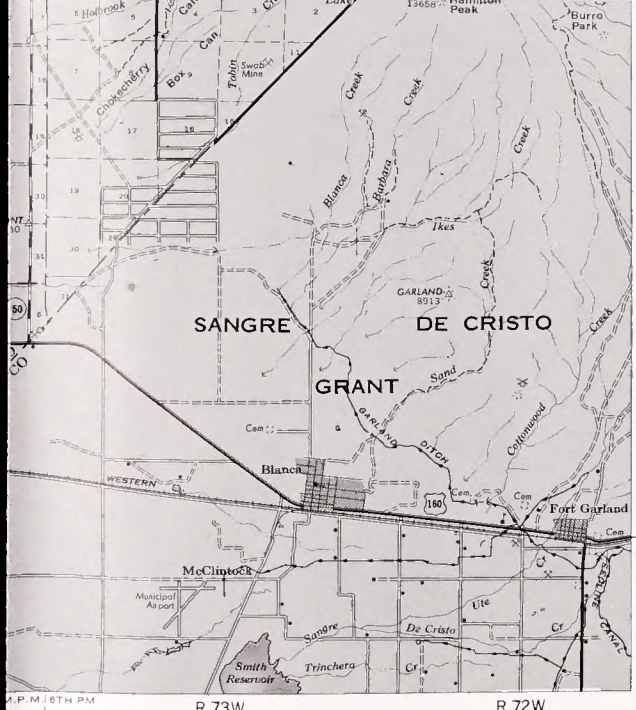
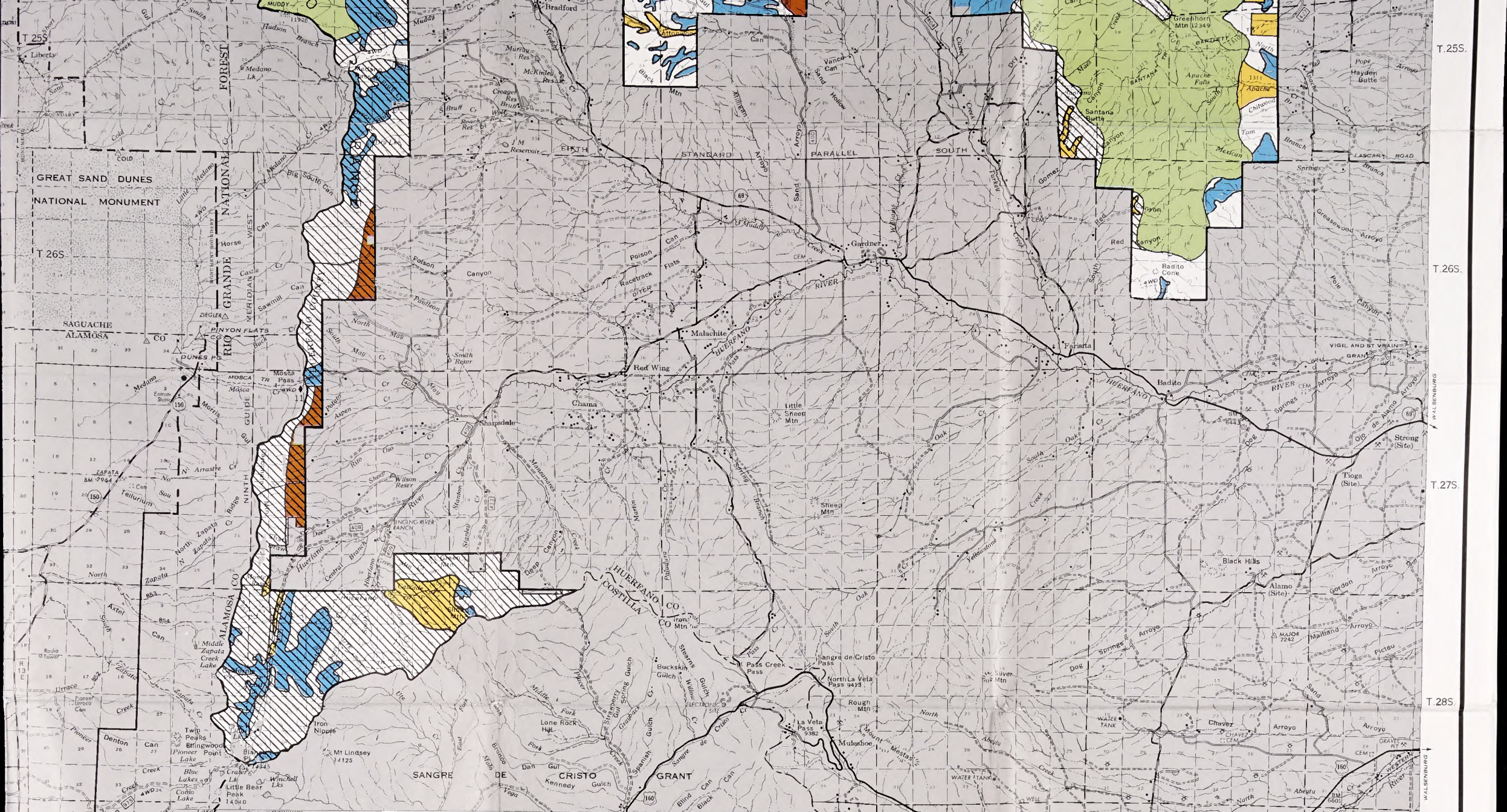
**APPENDIX F**

**SOUTH PORTION**

**LEGEND**

-  NO LEASE FORMALLY WITHDRAWN FROM LEASING
-  DISCRETIONARY NO LEASE  
SUBJECT TO MULTIPLE USE MGMT. PENDING SUITABILITY DETERMINATION.
-  NO SURFACE OCCUPANCY (NSO)
-  TIMING LIMITATION (SEASONAL)
-  CONTROLLED SURFACE USE (CSU)
-  STANDARD STIPULATIONS

ANY CHANGES TO THESE STIPULATIONS WILL BE MADE IN ACCORDANCE WITH THE LAND USE PLAN AND/OR THE REGULATORY PROVISIONS FOR SUCH CHANGES.  
THIS MAP IS FOR GENERAL INFORMATIONAL PURPOSES. SPECIFIC RESOURCE AND STIPULATION BOUNDARIES ARE DISPLAYED IN LARGER SCALE MAPS PERMANENTLY AVAILABLE AT THE FOREST SUPERVISOR'S OFFICE, 920 VALLEY DRIVE, PUEBLO, COLORADO. IF YOU WOULD LIKE TO REVIEW THESE MAPS, PLEASE CALL (719) 545-3550.

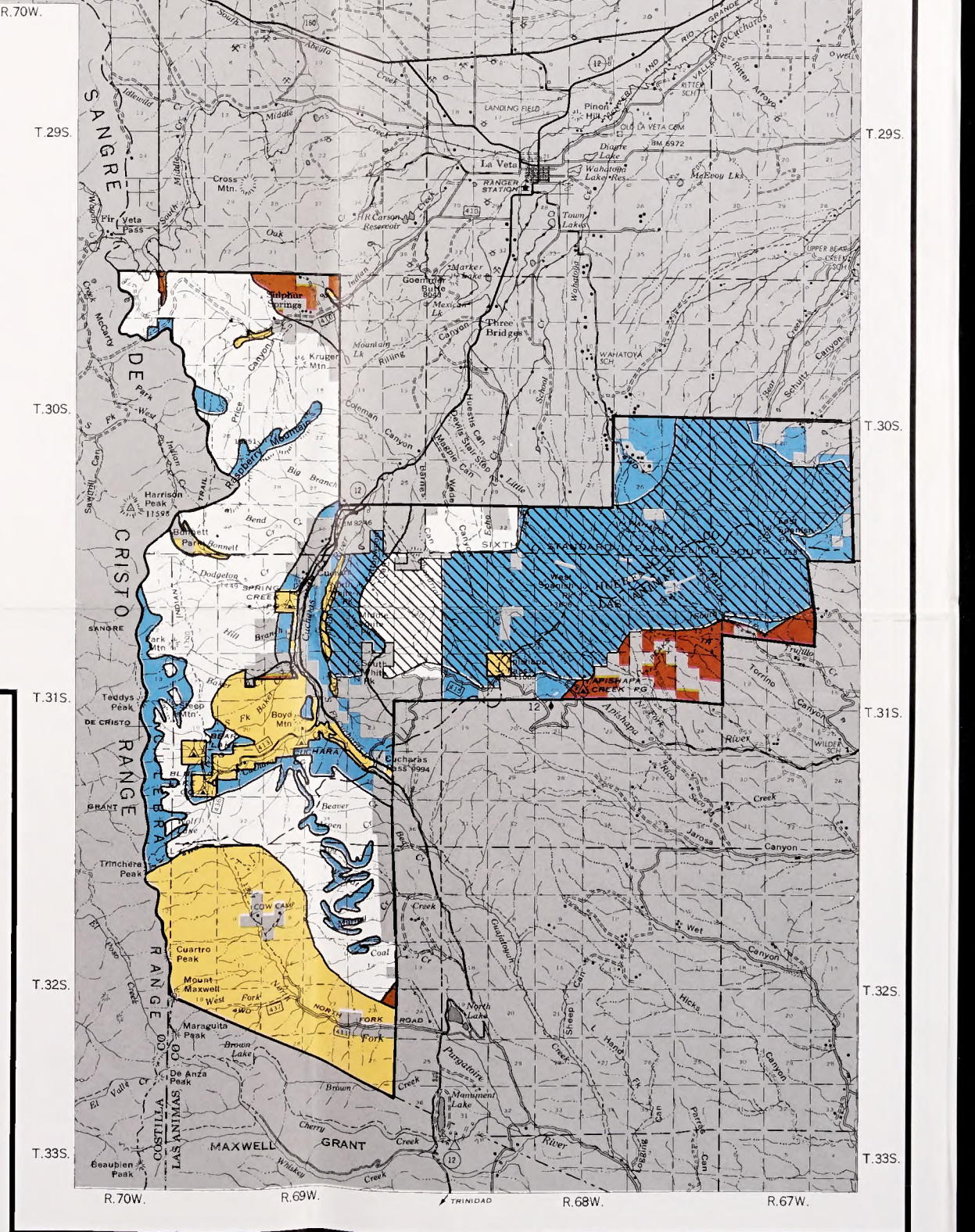


**LEGEND**

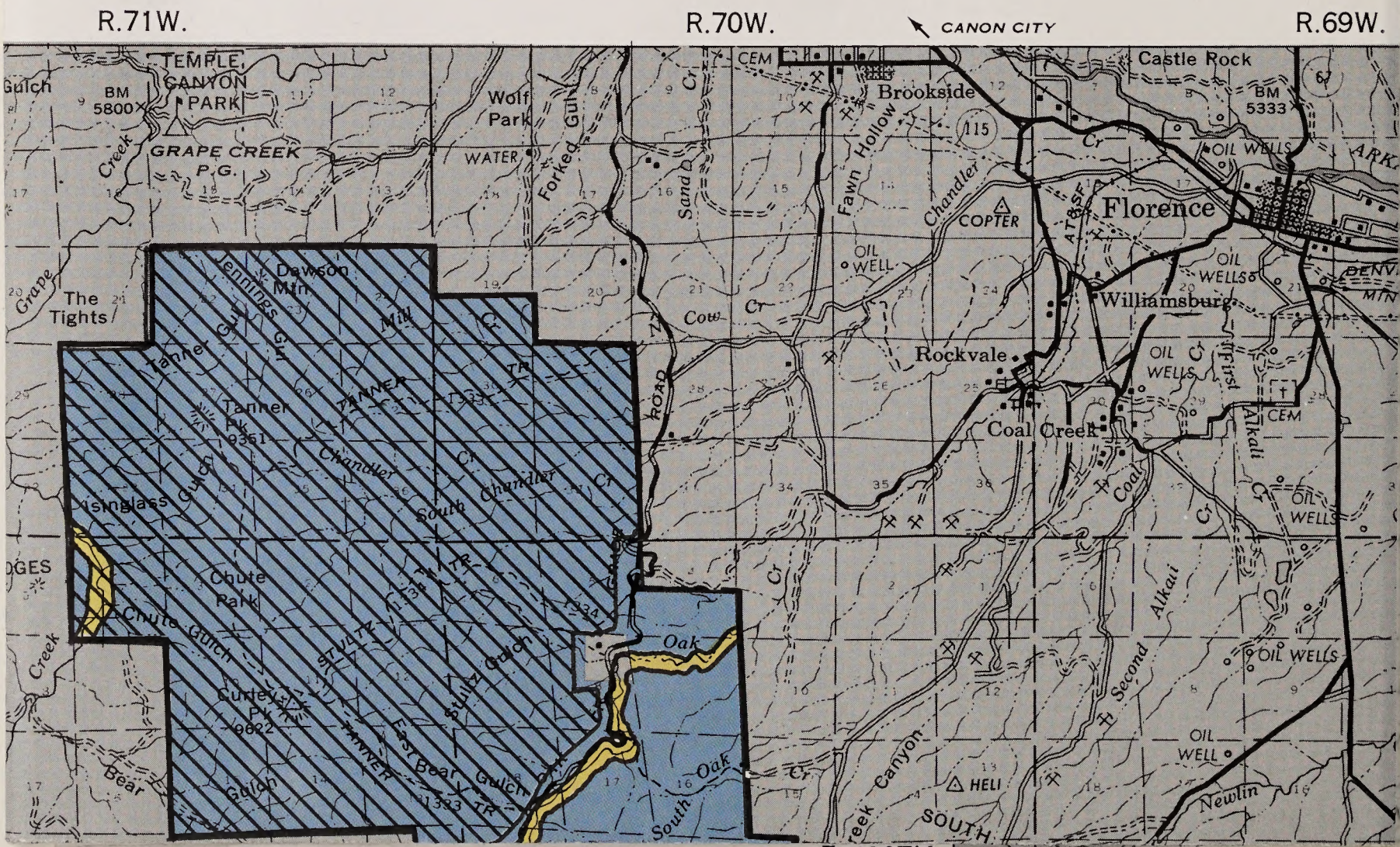
- YELLOW: NO LEASE
- BLUE: SEASONAL OCCUPANCY (NSO)
- ORANGE: OCCUPANCY (NSO) PENDING SUITABILITY DETERMINATION
- DIAGONAL HATCHING: SURFACE USE (CSU)
- SHADY GRAY: REGULATIONS

REGULATIONS WILL BE MADE IN ACCORDANCE WITH THE LAND USE REGULATIONS FOR SUCH CHANGES.

FOR ADDITIONAL PURPOSES, SPECIFIC RESOURCE AND STIPULATED LARGER SCALE MAPS PERMANENTLY AVAILABLE AT 120 VALLEY DRIVE, PUEBLO, COLORADO. IF YOU WOULD LIKE TO CALL (719) 545-3550.



# OBJECT TO CORRECTION





United States  
Department of  
Agriculture

Forest  
Service

Pike and San Isabel  
National Forests  
Comanche and Cimarron  
National Grasslands

1920 Valley Dr.  
Pueblo, CO  
81008-1797

Reply to: 1950

Date: July 11, 1991

Dear Participant:

The Forest Service has prepared a new Draft Environmental Impact Statement (DEIS). This analysis discloses expected environmental impacts, including possible cumulative effects, resulting from alternative oil and gas leasing programs on the Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands. The first DEIS, published in June of 1990, was set aside because of changes in the Forest Service Oil and Gas Regulations and the scope of public comments. The U.S. Department of Interior, Bureau of Land Management (BLM), is a cooperating agency and has assisted the Forest Service in preparing the DEIS.

The DEIS includes four alternatives, including a no action alternative (current management), pertaining to management of an oil and gas leasing program on National Forest System lands. These lands are located in central and southeastern Colorado and southwestern Kansas. The DEIS also makes leasing recommendations for split-estate lands within the administrative boundaries of the Forest. Split-estate lands are those where mineral rights are federally held but the surface is owned by parties other than the Forest Service.

A full set of the working maps represented in Appendix G are available for review at the Supervisor's Office in Pueblo and the BLM State Office in Denver. In addition, each of the Ranger District offices (Leadville, Salida, San Carlos, Pikes Peak, South Park, South Platte, Comanche, and Cimarron) has the maps which pertain to that specific District.

The Forest Service invites written comments on the DEIS. Those comments must be received by September 3, 1991, or 45 days after the notice is published in the Federal Register, whichever is later. They will be assessed and considered in the Final EIS to be completed later this year. Written comments should be submitted to Jack Weissling, Forest Supervisor, USDA Forest Service, 1920 Valley Drive, Pueblo, CO 81008-1797.

There will be three open house public meetings at which comments will be accepted:

|                |                  |   |
|----------------|------------------|---|
| August 6, 1991 | 5:00 - 9:00 p.m. | Holiday Inn<br>4001 N. Elizabeth<br>Pueblo, Colorado                          |
| August 7, 1991 | 4:00 - 8:00 p.m. | US Forest Service (auditorium)<br>11177 West 8th Avenue<br>Lakewood, Colorado |



Caring for the Land and Serving People



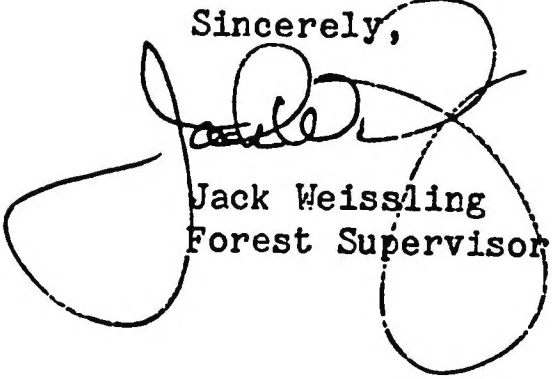
August 13, 1991

7:00 - 9:00 p.m.

Morton County Courthouse  
1025 Morton Street  
Elkhart, Kansas

For additional information, call 719-545-8737.

Sincerely,



Jack Weissling  
Forest Supervisor



Caring for the Land and Serving People

FS-6200-28 (7-82)

**ERRATA**

**OIL AND GAS LEASING DRAFT ENVIRONMENTAL IMPACT STATEMENT  
WITH APPENDICES**

**PIKE AND SAN ISABEL NATIONAL FORESTS  
COMANCHE AND CIMARRON NATIONAL GRASSLANDS**

**\* \* \* PLEASE NOTE \* \* \***

This Draft Environmental Impact Statement (EIS) for Oil and Gas Leasing **replaces** the Draft EIS that was issued in March, 1990. The **old** Draft EIS has been set aside and is **null and void**.

Public comments submitted on the old Draft EIS will **not** be used in the analysis for the Final EIS. Any previous comments that are pertinent to the new Draft EIS will have to be submitted again.

**\* \* \* \* \***

***Summary***

Page 1 Minerals: 1st paragraph, 2nd sentence, change to read, "The operation of some statutes makes some specific lands unavailable for mineral activities, e.g., the Wilderness Act, the Federal Onshore Oil and Gas Leasing Reform Act, etc."

***Table of Contents***

Page i-5 See attached i-5 for correct page numbers for Chapter IV.

Page i-6 See attached i-6 for page numbers for Appendix B.

***Chapter I - Purpose and Need***

Page I-16 Prior to 1987 Leasing Reform Act: 1st paragraph, 2nd sentence, change to read, "The Mineral Leasing Act for Acquired Lands of August 7, 1947, (USC 351-359) provided for oil and gas leases on mineral deposits of coal, phosphate, oil, oil shale, gas, sodium, potassium, and sulphur which are owned or may be acquired by the United States and which are within the lands acquired by the United States."

Page I-25 Last paragraph on page, change Chapter III to read "Chapter II".

***Chapter II - Alternatives***

Page II-5 Last paragraph, change Figures II-3 through II-8 to "Figures II-4 through II-9".

Page II-17 Table II-2: Wells 1C through 4C should be 1R through 4R.

Page II-18 3rd paragraph, change Figures II-9 through II-14 to "Figures II-10 through II-15".

- Page II-26 5th paragraph, last sentence, change Table II-11 on page II-34 to read "Table II-11 on page II-36".
- Page II-27 Paragraph 6, change Figures II-15 through II-17 to "Figures II-16 through II-18".
- Page II-27 Paragraph 7, change Figures II-3 through II-8 to "Figures II-4 through II-9".
- Page II-35 2nd paragraph, change Table II-9 to "Table II-11".

### ***Chapter III - Affected Environment***

- Page III-62 Item 19: 550 acres should read "5500 acres".

### ***Appendix C - Reasonably Foreseeable Activity***

- Page C-9 Table C-7: 2nd column of figures under both Reclaimed, Alt. IV, and Unreclaimed, Alt. IV, should be deleted.
- Page C-10 Table C-10: change numbers to: Sandy Lands, Expl.-13, Prod.-17; Hard Lands, Expl.-5, Prod.-8.
- Page C-11 Table C-12: Wells 1R through 4R should be 1C through 4C.

### ***Appendix H - Public Notice and Response to Issues***

- Page H-37 Text for Response and Action to canyonlands concern should read, "For cultural resources, Vogel Canyon, Picture Canyon, and some portions of Carizzo Creek, Holt Canyon, and Sand Canyon are proposed for protection through designation as discretionary no lease areas. Final management strategies for these areas will be presented in a future Forest Plan revision."

### ***Appendix I - Monitoring***

- Page I-7 Watershed Resource: Delete "or may require the operator to monitor" in the first sentence of the first paragraph.
- Page I-7 Watershed Resource: Delete last sentence on page which reads "The operator will be required to pay for the monitoring costs".



## **CHAPTER IV - ENVIRONMENTAL CONSEQUENCES**

|  |       |
|--|-------|
| Introduction   | IV-1  |
| The Analysis   | IV-2  |
| On the Mountain Districts  | IV-2  |
| On the Grasslands  | IV-2  |
| Display of Effects   | IV-2  |
| Analysis versus Implementation   | IV-3  |
| Analysis   | IV-3  |
| Implementation   | IV-3  |
| Definitions  | IV-4  |
| Description of Alternatives  | IV-4  |
| Environmental Consequences   | IV-5  |
| Comparing Alternatives   | IV-5  |
| Disturbed Acres  | IV-5  |
| Impacted Acres   | IV-7  |
| Abandonment and Reclamation  | IV-7  |
| Effects Common to All Alternatives                                       | IV-8  |
| Vegetation   | IV-10 |
| Soils  | IV-12 |
| Water  | IV-15 |
| Wildlife   | IV-18 |
| Threatened and Endangered Species  | IV-19 |
| Aquatic and Riparian   | IV-20 |
| Range  | IV-23 |
| Visuals  | IV-24 |
| Cultural   | IV-25 |
| Recreation   | IV-26 |
| Special Uses   | IV-27 |
| Cumulative Impacts   | IV-28 |
| Vegetation   | IV-29 |
| Soils  | IV-30 |
| Water  | IV-33 |
| Aquatic and Riparian   | IV-35 |
| Visuals  | IV-37 |
| Cultural, Paleontological, and Cave Resources                            | IV-38 |
| Recreation   | IV-39 |
| Special Uses   | IV-40 |
| Experimental Forest, Natural National Landmarks, Research Natural Areas, | IV-40 |
| Special Interest Areas   |       |
| Wilderness and W&S Rivers  | IV-40 |
| Minerals   | IV-41 |
| Human and Community Development  | IV-41 |
| Transportation   | IV-42 |
| Irreversible and Irretrievable Impacts                                   | IV-42 |
| Summary by Alternative   | IV-43 |
| Proposed Action  | IV-45 |
| Implementation of Site-Specific Decisions                                | IV-45 |
| Footnotes  | IV-46 |

## **APPENDIX B - MITIGATION**

|   |         |
|---|---------|
| Introduction  | B-1     |
| Standard Lease Terms  | B-2     |
| Supplemental Stipulations   | B-2     |
| No Surface Occupancy Stipulation Guidance   | B-3     |
| Timing Limitation Stipulation Guidance  | B-3     |
| Controlled Surface Use Stipulation Guidance   | B-3     |
| Stipulations for use on the Unit  | B-4     |
| NSO - Cultural  | B-6     |
| NSO - Recreation  | B-8     |
| NSO - Riparian/Water/Fisheries  | B-10    |
| NSO - Soils   | B-12    |
| NSO - Special Uses (Recreation Sites)   | B-14    |
| NSO - Visual  | B-16    |
| Timing - Wildlife   | B-18    |
| Timing - Wildlife (MIS)   | B-20    |
| CSU - Soils   | B-22    |
| CSU - Special Area (NNL)  | B-24    |
| CSU - Vegetation (Alpine)   | B-26    |
| CSU - Visual  | B-28    |
| CSU - Water   | B-30    |
| Lease Notices   | B-31    |
| Lease Notice - Research/Special Interest Areas  | B-32    |
| Lease Notice - Special Uses (Communication Sites)   | B-34    |
| Lease Notice - Threatened & Endangered Species  | B-36    |
| Lease Notice - Vegetation (Timber)  | B-38    |
| Conditions of Approval  | B-40    |
| Standard COA's for Use on the Unit  | B-40    |
| Pre-activity Inventories  | B-40    |
| Mitigation Plans  | B-41    |
| General Conditions for all Site-Disturbing Activities   | B-42    |
| Road Construction and Operations  | B-43    |
| Drill Pad Development   | B-45    |
| Pits  | B-46    |
| Pipelines   | B-47    |
| Production  | B-48    |
| Reclamation   | B-48    |
| Split-Estate Mineral Resources  | B-50    |
| Bureau of Land Management Stipulations  | B-50    |
| Lease Notices   | B-51    |
| Conditions of Approval  | B-52    |
| Morton & Stevens Counties, Kansas, Analysis of Split-Estate Tracts for USFS (Including Reverted Tracts) | B-52    |
| Exhibits B-1 through B-4  | B-57-71 |
| Notes   | B-73    |

BLM LIBRARY  
BLDG 50, ST-150A  
DENVER FEDERAL CENTER  
P.O. BOX 25047  
DENVER, COLORADO 80225

