Draft Environmental Impact Statement for the Targhee National Forest's Oil and Gas Leasing Analysis

August 1996

Forest Service

in cooperation with the

Bureau of Land Management

Draft Environmental Impact Statement

Targhee National Forest Oil and Gas Leasing Analysis

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Teton County, Wyoming

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Abstract

This Environmental Impact Statement documents the analysis of the potential effects of implementing each of five alternatives for oil and gas leasing on about 1.1 million acres of the Targhee National Forest. The alternatives are: (1) No Leasing (No Action), (2) Current Forest Plan, (3) Forest Plan Modification 1, (4) Forest Plan Modification 2, and (5) Lease with Standard Lease Terms. The Targhee National Forest's preferred alternative is Alternative 3, Forest Plan Modification 1. This alternative corresponds to Forest Plan Revision Alternative 3-M, which is the Forest Service's Preferred Alternative for revising the Forest Plan.

The alternative ultimately chosen may change based on input from the public, other agencies, and this agency's own internal deliberative process. That alternative, selected by the Forest Supervisor, will be published in a Record of Decision and will guide management oil and gas activities on the Targhee National Forest in the future.

Comments on this Draft EIS must be submitted to the Forest Supervisor by November 4, 1996.

Note to Reviewer

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decisionmaking process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. *Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. *City of Angoon v. Hodel* (9th Circuit, 1986) and *Wisconsin Heritages, Inc. v. Harris* 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Executive Summary — Targhee National Forest's Oil and Gas Leasing Analysis Draft Environmental Impact Statement

The United States Department of Agriculture, Forest Service (Forest Service) and United States Department of Interior, Bureau of Land Management (BLM) propose to determine which lands on the Targhee National Forest (Forest) should be made available for the exploration, development, and production of oil or natural gas. As part of this determination, the Supervisor of the Forest will decide which lands on the Forest will be available for the BLM to lease. Additionally, the Forest Service will decide under what conditions these specific lands may be leased. Subsequently, the State Director of the BLM will decide whether or not to offer for lease the specific lands authorized by the Forest Service. The analysis documented in the Draft Environmental Impact Statement (DEIS) will provide the basis for these decisions.

Specifically, the action being proposed by the Forest Service and BLM is to make available for oil and gas leasing all lands within the Forest that meet three primary criteria. First, the mineral rights must be federal because the BLM only manages the leasing of federal subsurface minerals. Areas under private ownership with private mineral rights are not under the jurisdiction of the Forest Service or BLM and, therefore, are not part of the proposal.

Second, the lands must be legally available for oil and gas leasing. Four classes of lands are legally unavailable for leasing and are specifically excluded from consideration in this proposal. They are:

(1) lands withdrawn from mineral leasing by an act of Congress or an order of the Secretary of the Interior;

(2) lands recommended for wilderness allocation by the Secretary of Agriculture;

(3) lands designated by statute as wilderness study areas (unless oil and gas leasing is specifically allowed by the statute), and

(4) lands within areas allocated for wilderness or further planning in Executive Communication 1504, Ninety-Sixth Congress (unless such lands subsequently have been allocated to uses other than wilderness by an approved Forest Land and Resource Management Plan or have been released to uses other than wilderness by an act of Congress).

An example of an area identified as withdrawn from mineral entry is Management Area 13 in the Forest Plan, the Winegar Hole Management Area.

Finally, the lands must have at least some potential for containing oil or natural gas. Although the Federal Onshore Oil and Gas Leasing Reform Act (Leasing Reform Act) does not exclude lands without any known potential for containing oil or natural gas from a leasing analysis, the Forest decided to exclude such lands from this leasing analysis. The BLM recently determined that most of the Forest overlies geological formations that may contain oil or natural gas. Thus, most of the Forest has at least a low potential for oil and gas resources. Essentially, the northwest and southeast portions of the Forest have low and moderate-to-high potential for oil and gas resources, respectively. The northeast portion immediately west of Teton and Yellowstone National Parks has no known potential for oil or gas resources.

The area containing lands that meet the three criteria described earlier encompasses about 1,200,000 acres. Within this 1,200,000-acre area, 1,102,800 acres meet all three criteria. These lands comprise the geographical scope of the proposed action (Figure 1).

The Forest's Land and Resource Management Plan (Forest Plan) directs the Forest to "integrate the exploration and development of mineral and energy resources on the Forest with the use and protection of other resource values". Additionally, it requires the Forest to review and process applications for minerals leases, permits, and licenses in a timely fashion. Finally, the Forest must recommend, to the BLM, measures and stipulations necessary to protect surface resources.

When the Forest Plan was developed, the Secretary of the Interior and BLM had the primary authority and responsibility for leasing lands administered by the Forest Service. Public domain minerals underlying parcels of land administered by the Forest Service were leased by submitting a request to the BLM. Although the Forest Service could make recommendations regarding the issuance of a lease and appropriate stipulations to protect the resources, the recommendations were not binding. Thus, the Forest Service had an advisory role in leasing, whereas the BLM had sole authority for making decisions on oil and gas leasing.

Since the Forest Plan was developed, the Forest Service's national and regional directions have changed. During 1987, Congress passed the Federal Onshore Oil and Gas Leasing Reform Act (Leasing Reform Act). This act changed the leasing process and increased the role of the Forest Service in that process. Although the BLM still issues the leases, the Act gave the Forest Service the authority to determine which lands under its jurisdiction should be available for leasing. In addition, the Forest Service's decision and authorization to lease with certain stipulations are binding on the BLM for all Federal leasable minerals on National Forest System lands. Finally, the regulations implementing the Leasing Reform Act include a requirement to conduct a site-specific environmental analysis that includes an assessment of the reasonable foreseeable impacts of projected post-leasing activity at the leasing stage.

In April 1990, the Forest Service adopted final regulations implementing the Leasing Reform Act. These regulations are codified in Title 36 of the Code of Federal Regulations (CFR), Parts 228 (Subpart E) and 261. They lay out the process for determining lands administratively available for leasing, including the designation of stipulations, and the projection and analysis of post-leasing activity. The regulations also describe the Forest Service's process for authorizing the BLM to issue leases.

The process established by the regulations for authorizing the issuance of leases and subsequent operations is a "staged" decision process. This process was specifically designed to accommodate the tentative, speculative, and costly nature of exploring for and developing oil and gas. The stages include: (1) the determination of lands available for leasing, (2) the decision to lease specific lands, (3) an Application for Permit to Drill (APD), and (4) an application to develop a field if oil or gas is discovered. Each decision is based on environmental analysis and disclosure of the probable effects in accordance with the National Environmental Policy Act (NEPA). Stages one and two specifically apply to this analysis.

The first stage involves determining which lands are administratively available for leasing using a process called the leasing analysis. Through the leasing analysis, the Forest Service identifies areas that will be:

(1) open to development subject to the terms and conditions of the standard oil and gas lease form,
(2) 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, and
(3) closed to leasing (distinguishing between areas that are being closed through exercise of management direction and those closed by law or regulations).

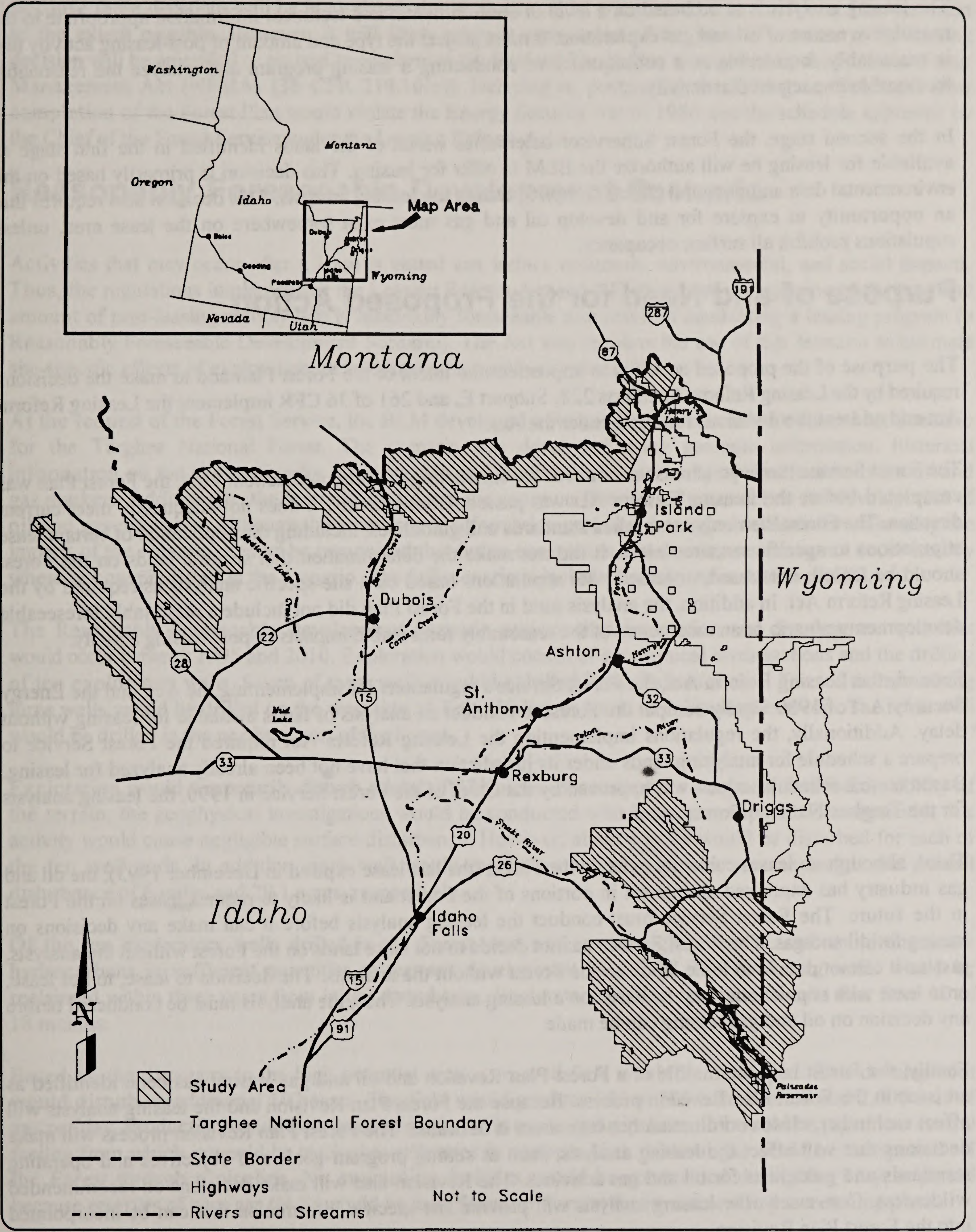

Figure 1 Study Area for the Targhee National Forest's Oil and Gas Leasing Analysis

The leasing analysis is to be based on a level of environmental and technical information appropriate to the speculative nature of oil and gas exploration. It must project the type and amount of post-leasing activity that is reasonably foreseeable as a consequence of conducting a leasing program and analyze the reasonably foreseeable impacts of that activity.

In the second stage, the Forest Supervisor determines which of the lands identified in the first stage as available for leasing he will authorize the BLM to offer for leasing. This decision is primarily based on the environmental data and potential effects compiled during the leasing analysis. This decision also requires that an opportunity to explore for and develop oil and gas must exist somewhere on the lease area, unless stipulations prohibit all surface occupancy.

Purpose of and Need for the Proposed Action

The purpose of the proposed action is to implement the intent of the Forest Plan and to make the decisions required by the Leasing Reform Act. Parts 228, Subpart E, and 261 of 36 CFR implement the Leasing Reform Act and address the decisions required under the Act.

The Forest Service has several reasons or needs for conducting the proposed action. First, the Forest Plan was completed before the Leasing Reform Act was passed. Consequently, it does not adequately meet current direction. The Forest Plan only established standards and guidelines, including the application of certain lease stipulations to specific resource areas. It did not make the determination that specific lands on the Forest should be leased, not leased, or leased with stipulations based on a site-specific analysis as required by the Leasing Reform Act. In addition, the analysis used in the Forest Plan did not include a reasonably foreseeable development scenario or an assessment of the reasonably foreseeable impacts of post-leasing activity.

Second, the Leasing Reform Act, the Forest Service's regulations for implementing the Act, and the Energy Security Act of 1980 legally compel the Forest to conduct an analysis of lands available for leasing without delay. Additionally, the regulations implementing the Leasing Reform Act required the Forest Service to prepare a schedule for analyzing lands under its jurisdiction that have not been already analyzed for leasing. Based on this schedule, which was approved by the Chief of the Forest Service in 1990, the leasing analysis for the Targhee National Forest is due.

Third, although no leases currently exist on the Forest (the last lease expired in December 1993), the oil and gas industry has expressed an interest in portions of the Forest and is likely to request leases on the Forest in the future. The Forest Service must conduct the leasing analysis before it can make any decisions on leasing for oil and gas. The Forest Service cannot decide to not lease lands on the Forest without the analysis, just as it cannot decide to lease lands on the Forest without the analysis. The decision to lease, to not lease, or to lease with stipulations must be based on a leasing analysis. Thus, the analysis must be conducted before any decision on oil and gas leasing can be made.

Finally, the Forest is in the middle of a Forest Plan Revision and oil and gas leasing has been identified as an issue in the Forest Plan Revision process. Because the Forest Plan Revision and the leasing analysis will affect each other, close coordination between them is desirable. The Forest Plan Revision process will make decisions that will affect the leasing analysis, such as setting program goals and objectives and operating standards and guidelines for oil and gas activities. The Revision also will make decisions on recommended wilderness. Conversely, the leasing analysis will provide site-specific information that can be incorporated into the Forest Plan Revision.

Because these decisions will be interrelated, this analysis will be coordinated with the Forest Plan Revision to the extent possible. However, it will likely precede completion of the plan. If necessary, the leasing decision will be amended or revised to conform to the Revised Forest Plan as required by the National Forest Management Act (NFMA) [36 CFR 219.10(e)]. Delaying or postponing the leasing analysis until after completion of the Forest Plan would violate the Energy Security Act of 1980 and the schedule approved by the Chief of the Forest Service under the Leasing Reform Act.

Reasonably Foreseeable Development Scenario

Activities that may occur after a lease is issued can induce economic, environmental, and social impacts. Thus, the regulations implementing the Leasing Reform Act and NEPA require a projection of the type and amount of post-leasing activity that is reasonably foreseeable as a result of conducting a leasing program (a Reasonably Foreseeable Development Scenario). The Act also requires the use of this scenario to estimate site-specific effects of exploration, development, and production activities.

At the request of the Forest Service, the BLM developed a Reasonably Foreseeable Development Scenario for the Targhee National Forest. The scenario was developed using geologic information, historical information on the exploration for oil and gas in and around the Forest, and projected trends in the oil and gas markets. Additionally, the scenario considered the common five-phased approach to the development of oil and gas resources. Although these sources of information provided a reasonable basis for estimating the impacts of the scenario, it must be recognized that future exploration and development may not occur exactly where or how predicted in the scenario. The full scenario is included as Appendix A to the DEIS.

The Reasonably Foreseeable Development Scenario projects that exploration and development activities would occur between 1995 and 2010. Exploration would consist of geophysical investigations and the drilling of ten exploratory wells. Seven of these wells would be drilled in the Palisades area. Two of the remaining three wells would be drilled on the west side of Teton Valley or south of Palisades Reservoir. The tenth well would be drilled in the northern part of the Forest.

Exploration would temporarily disturb a total of 331 acres. Because of the steepness and inaccessibility of the terrain, the geophysical investigations would be conducted with helicopter support. Consequently, this activity would cause negligible surface disturbance. However, about 4 acres would be disturbed for each of the ten well pads. In addition, each well would require an access road with a mean length and overall disturbance of 6 miles and 29.1 acres, respectively.

Of the ten exploratory wells drilled in the Forest, one well in the high potential area would encounter hydrocarbons in sufficient quantities to warrant development of a field. The remaining wells would be reclaimed within three years from initial disturbance. Exploratory drilling operations would take from 10 to 18 months.

Based on the discovery in the high potential area, a six-well field would be developed. This development would disturb an additional 102 acres. The field would produce 500 to 700 barrels of oil and 2,000 mcf of gas per day. Production would be moved to markets via trucks and pipelines. Oil would be piped to a central facility from which it would be trucked to refineries in northern Utah. Natural gas would be transported off the Forest through a pipeline. No sweetening facilities would be constructed during the 15-year period because reserves of sour gas (H_2S) would be insufficient to warrant the investment in a sweetening plant.

Decisions To Be Made

Based on the analysis documented in the EIS, the Supervisor of the Targhee National Forest will make two decisions and the State Director of the BLM will make one decision regarding oil and gas leasing on the Forest. First, the Forest Supervisor will decide which of the Forest's lands within the analysis area are administratively available for oil and gas leasing and under what conditions or stipulations (a stage one decision). Second, the Forest Supervisor will decide what specific lands in the Forest the BLM will be authorized to offer for lease, subject to the Forest Service ensuring that correct stipulations are attached to the leases issued by the BLM (a stage two decision). Finally, the State Director of the BLM will decide whether or not to offer for lease the specific lands authorized by the Forest Service. The Forest Service is exercising its discretion in combining and addressing the first two of the four decision stages in this leasing analysis and DEIS. The Forest Plan will be amended to incorporate the decisions after they are made.

Application of these decisions is limited by the legal authority of the Forest Service and BLM. These limits determine what the final decisions can and cannot do in several circumstances. First, the decisions can determine the management of Federal lands. In contrast, they cannot be applied to non-Federal minerals owned by private, state, or local entities. Because surface and mineral ownership within the overall boundaries of the Forest is a patchwork, major oil and gas operations could continue within the Forest on non-Federal lands even if the Federal government were never to issue another lease. Second, the decisions can result in new limitations on rights granted in future Federal leases. Third, the decisions can provide protection for surface resources on Federal lands. Finally, the decisions cannot preserve Federal or non-Federal deposits of oil and gas for the future.

Regardless of any decision made in the Record of Decision, oil and gas operators will be able to access non-Federal deposits in and adjoining the Forest. In doing so, they may drain Federal deposits if the adjacent Federal lands are not available for leasing. Thus, preservation of reserves of oil and gas on the Forest is beyond the scope of this EIS.

If, in the Record of Decision, the Forest Supervisor selects an action alternative and the State Director of the BLM decides to offer lands for lease, the leases would be issued without further NEPA documentation. However, additional environmental analysis and disclosure of the probable effects under NEPA would be required for stages three and four of the Forest Service's "staged decision process". Thus, although the decisions resulting from the leasing analysis are considered "an irretrievable and irreversible commitment of natural resources", additional analyses and approvals would be required prior to ground-disturbing activities.

Scoping

Scoping is the process used to identify issues related to a proposed action and the scope of issues to be addressed during the NEPA analysis. The Forest initiated scoping in April 1993 with the preparation of a scoping document. This formal scoping document was prepared to inform interested agencies, organizations, businesses, and individuals of the Forest Service and BLM's intent to conduct an environmental analysis of oil and gas leasing on portions of the Targhee National Forest. The document solicited comments from readers to assist the Forest Service and the BLM in identifying specific interests and concerns that should be addressed in the analysis.

The formal scoping process began on May 21, 1993 with the publishing in the Federal Register of a Notice of Intent to prepare the EIS. A public notice was also published in the following five newspapers serving the area in and around the Forest: the Rexburg Standard-Journal, Teton Valley News, Jefferson County Star, Post Register (Idaho Falls), and Jackson Hole News. Next, copies of the scoping document were sent on May 9, 1993 to almost 2,100 agencies, organizations, businesses, and individuals. In addition, two public meetings were held to discuss the proposal. Attendees were given the opportunity to ask questions and submit oral and written questions. These two meetings were held in Driggs, Idaho on June 16, 1993, and in Idaho Falls, Idaho on June 17, 1993.

Issues

The Forest Service reviewed and analyzed the 94 comments received during the scoping process. First, specific comments were arranged into groups of common concerns. Next, a primary issue statement was prepared for each group of comments. Finally, these issue statements were evaluated for applicability to the oil and gas leasing process. The 12 key issues described next in this section were incorporated into the leasing and NEPA process and were specifically used to compare the alternatives in this EIS.

Issue 1: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on threatened, endangered, candidate, or sensitive species of plants and animals.

Issue 2: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on species of wildlife and their habitats (particularly key habitats).

Issue 3: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on the Forest's ecological integrity and biological diversity.

Issue 4: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on roadless areas and other potential wilderness areas.

Issue 5: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on transportation and the need for additional roads being built within the Forest.

Issue 6: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on recreational opportunities and the recreational experience.

Issue 7: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on wetlands and riparian areas.

Issue 8: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on the Forest's visual resources.

Issue 9: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on fisheries and aquatic habitat.

Issue 10: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on soils, water, and air quality.

Issue 11: The interaction of oil and gas leasing, including possible subsequent activities associated with exploration and development, with geologic hazards (e.g. steep slopes and earthquakes).

Issue 12: The effects of the Federal leasing decisions on the opportunities to explore for and develop oil and gas resources within the study area.

Development of Alternatives

A multi-step process was used to develop the alternatives considered in the Forest's Oil and Gas Leasing Analysis. First, key resource areas and options available to the Forest for leasing were identified. Then, a leasing options analysis was conducted. Finally, alternatives were defined using the issues identified during scoping and the results of the leasing options analysis. The following discussion summarizes each of the primary steps in this process.

The initial step consisted of identifying (1) the key resource areas that occur within the analysis area and (2) which of these resource areas the leasing analysis should specifically address. After reviewing data on the resources present within the analysis area, the Forest Interdisciplinary Team (ID Team) determined ten key resource areas would be addressed in the analysis. They are:

- concentrated development (active mines, mineral material sites, communication sites, and administrative sites);
- riparian vegetation;
- recreation (motorized, non-motorized, developed sites, and special use permit sites);
- wilderness study areas and recommended or proposed wilderness;
- Special Management areas;
- threatened, endangered, proposed, or sensitive species;
- watersheds (lakes and streams, unstable soils, slopes greater than 40 percent, and municipal water supplies);
- wildlife (seasonal and critical habitat);
- wild rivers (eligible); and
- Visual Quality Objectives (retention and partial retention).

Next, the Forest determined the leasing options that would be evaluated. In the consideration to lease National Forest System lands for oil and gas exploration and development, six options are available for each parcel of land. These options are:

- No Lease (NL) — No new leases would be authorized.
- No Surface Occupancy (NSO) — Neither exploration nor production facilities (e.g. well pads, drilling rigs, and tank batteries) would be allowed to be constructed.
- Controlled Surface Use (CSU) — Surface occupancy and use are permitted, but are restricted to mitigate effects to particular resources. The CSU stipulation provides for mitigation measures that would not normally be met by relocating the drilling site 219 yards (200 meters) under the SLT. It is assumed that the well could be relocated within one-half mile of the proposed location, and the original targeted reservoir could be reached by directional drilling technology.

- ➢ Timing Limitations (TL) — Construction activities would be restricted or prohibited during certain periods to protect resources.
- ➢ Standard Lease terms (SLT) — No special limitations would be applied. Operations are only restricted by current laws, regulations, and Onshore Orders. Under the SLT, facilities could be moved up to 219 yards (200 meters) or rescheduled for up to 60 days to protect resources.
- ➢ Lease Notice (LN) — Provides information to a lessee concerning resources that are protected by law or regulation thereby making a specific lease stipulation unnecessary.

After the key resource areas and leasing options were identified, a leasing options analysis was conducted. This analysis consisted of determining the potential effects of each leasing option on each of the key resources areas independently. The purpose of the analysis was to determine which leasing option provided the fewest restrictions while granting reasonable access to federal hydrocarbons within the Forest and protecting the resource simultaneously. Regulations require this determination.

Finally, the ID Team developed the alternatives for the leasing analysis. The results of the leasing options analysis and issues raised during scoping comprised the primary factors used in defining alternatives. Essentially, the ID Team applied stipulations to the key resource areas in combinations that reflected the results of the leasing options analysis and addressed one or more of the key issues raised during scoping. The process resulted in the development of five alternatives.

Alternatives Carried Through the Analysis

Five alternatives developed for the leasing analysis also were carried through the NEPA analysis. They include a No Leasing alternative and four action alternatives. Each alternative consists of various combinations of leasing options for the key resources considered (Table 1). As a result of these various combinations of leasing options, the total acreage available for exploration, development, and production and under which conditions would vary (Table 2).

Although full implementation of the reasonably foreseeable development scenario would occur under alternatives 4 and 5, it is not expected to occur under alternatives 2 or 3. The projected exploration is likely to occur in the areas with a low or moderate potential for deposits of oil or gas. However, exploration and the subsequent development of the six-well field in the area with a high potential for oil or gas is not expected to occur under alternatives 2 or 3. Too much of this area would be covered by an NSO stipulation to allow development of the field, even if exploratory activities found oil or gas. Because field development would be questionable, oil and gas companies are not expected to invest much time or money in exploration in the area with a high potential for oil or gas. Thus, only three wells are likely to be drilled under this alternative. Because all three would likely be nonproductive, the wells and their associated roads would be reclaimed within three years of disturbance.

Affected Environment

The DEIS describes the existing physical, biological, and social-economic environments that may be affected by one or more of the alternatives. The existing conditions are described for the various components comprising the physical environment, including physiography, geology, minerals, soils, water resources, and air quality. Additionally, the existing conditions for vegetation; wildlife; fisheries; and threatened, endangered, or sensitive species are discussed. Finally, the DEIS describes the existing conditions for the

Table 1 Matrix of Protective Stipulations by Alternative

Resource Component	1 (No Lease)	2 (Forest Plan)	3 (Forest Plan Mod. 1)	4 (Forest Plan Mod. 2)	5 (Standard Lease Terms)
	Alternative				
Concentrated Development[1]	NL[2]	NSO	NSO	CSU	SLT
Riparian Vegetation	NL	NSO	CSU	CSU	SLT
Recreation					
Motorized	NL	SLT	CSU	SLT	SLT
Non-motorized	NL	SLT	CSU	SLT	SLT
Developed Sites	NL	NSO	NSO	SLT	SLT
Special-use Permit Sites	NL	NSO	NSO	CSU	SLT
Roadless					
Wilderness Study Area	NL	NSO	NSO	CSU	SLT
Rec./Proposed Wilderness					
Italian Peak & Lionhead	NL	NL	NL	NSO	SLT
Palisades	NL	NSO	NSO	CSU	SLT
Special Management Areas[3]	NL	NL	NSO	NSO	SLT
T,E,P, & S Species[4]					
T,E, & Proposed Species	NL	LN	LN	LN	SLT
Sensitive Species	NL	LN	CSU	CSU	SLT
Watersheds					
Lakes and Streams	NL	NSO	NSO	NSO	SLT
Unstable Soils	NL	NSO	NSO	CSU	SLT
Slopes > 40 percent	NL	NSO	NSO	CSU	SLT
Municipal	NL	NSO	NSO	CSU	SLT
Wildlife Seasonal Habitats	NL	TL	TL	TL	SLT
Wild River (Eligible)	NL	NSO	NSO	CSU	SLT
Visual Resources					
Partial Retention	NL	SLT	CSU	CSU	SLT
Retention	NL	NSO	CSU	CSU	SLT

Notes:
1. Active mines, mineral material sites, communication sites, utility corridors, and administrative sites.
2. NL = No Lease, NSO = NO Surface Occupancy Stipulation, CSU = Controlled Surface Use Stipulation, TL = Timing Limitation Stipulation, SLT = Standard Lease Terms, and LN = Lease Notice.
3. Management Area #18 (Snake River), areas of unique cultural, botanical, or zoological resource values.
4. T,E,P & S Species = Threatened, Endangered, Proposed, and Sensitive species.

transportation system, recreational resources, visual resources, recommended/proposed wilderness and roadless areas, cultural resources, and socio-economics.

The area comprising the affected environment for the oil and gas leasing analysis encompasses most of the Forest (about 1.2 million acres out of 1.8 million acres). Consequently, the affected environment is extremely varied. Also, it incorporates almost every aspect of the physical, biological, and social-economic environments present within the Forest.

Table 2 Distribution Analysis Area Acreage by Primary Stipulation[1] and Alternative

	Alternative				
Stipulation[2]	No Lease	Forest Plan	Forest Plan Modification 1	Forest Plan Modification 2	Standard Lease Terms
NL	1,101,607	63,842	58,512	0	0
NSO	0	531,159	485,155	81,295	0
CSU/TL	0	4,262	448,764	740,569	0
CSU	0	196	2,485	8,179	0
TL	0	500,378	106,688	271,491	0
SLT	0	1,767	0	70	1,101,607
LN	0	3	3	3	0
Non-Forest Inclusions	1,193	1,193	1,193	1,193	1,193
Total	1,102,800	1,102,800	1,102,800	1,102,800	1,102,800

Notes:
1. The primary stipulation is the most restrictive stipulation applied at any particular acreage.
2. NL = No Lease, NSO = No Surface Occupancy, CSU/TL = Overlapping CSU and TL, CSU = Controlled Surface Use, TL = Timing Limitation, SLT = Standard Lease Terms, and LN = Lease Notice.

Comparison of Alternatives

Table 3 contains a summary of the effects of the alternatives on each of the issues identified for the analysis.

Table 3 Comparison of Alternatives by Issue

Issue	Alternative 1	2	3	4	5
1. Effects on threatened, endangered, candidate, or sensitive (TECS) species of plants and animals.	No direct or indirect effects would occur	Under all action alternatives, short- and long-term effects may occur to TECS species, depending upon the location and timing of oil and gas activities. However, none of the effects would jeopardize the continued existence of any listed or proposed species.			
2. Effects on species of wildlife and their habitats (particularly key habitats).	No direct or indirect effects would occur.	Up to 99 acres of key habitats could be affected, depending upon the ultimate location of oil and gas activities. Most of this acreage would experience short-term effects. Because of the TL stipulation, effects to physically-undisturbed habitats would be minor. Unrelated NSO stipulations would provide some additional protection for key habitats.	Up to 99 acres of key habitats could be affected, depending upon the ultimate location of oil and gas activities. Most of this acreage would experience short-term effects. Because of the TL stipulation, effects to physically-undisturbed habitats would be minor. Unrelated NSO stipulations would provide some additional protection for key habitats.	Up to 433 acres of key habitats could be affected, depending upon the ultimate location of oil and gas activities. Most of this acreage would experience short-term effects. Because of the TL stipulation, effects to physically-undisturbed habitats would be minor. The NSO stipulations included under Alternatives 2 and 3 would not occur. Thus, more key wildlife habitat would be available for oil and gas activities.	Up to 433 acres of key habitats could be affected, depending upon the ultimate location of oil and gas activities. However, the SLT would not ensure the animals are protected when seasonal habitats are occupied (as provided by the TL stipulation in Alternatives 2, 3, & 4). Thus, this alternative has the highest potential for short- and long-term effects.
3. Effects on the Forest's ecological integrity and biological diversity.	No direct or indirect effects would occur.	All of these action alternatives would directly disturb up to 433 acres. About 135 acres of this disturbance would be long term. Overall, the disturbance would be distributed across the low, moderate, and high potential areas. Depending upon the ultimate location of oil and gas activities, fragmentation of habitats could occur.			

Table 3 Comparison of Alternatives by Issue

Issue	Alternative 1	2	3	4	5
4. Effects on roadless areas and other potential wilderness areas.	No direct or indirect effects would occur.	Up to 334 acres of direct disturbance could occur roadless areas in the high potential area (primarily the Palisades and Garns Mountain RAs), depending upon the ultimate location of oil and gas activities. However, most of the roadless resource is protected by unrelated NSO stipulations. Because no roads were previously constructed in the Palisades RA, any oil and gas activities occurring in this area would be very evident.	Up to 334 acres of direct disturbance could occur roadless areas in the high potential area (primarily the Palisades and Garns Mountain RAs), depending upon the ultimate location of oil and gas activities. As with Alternative 2, most of the roadless resource is protected by unrelated NSO stipulations. Because no roads were previously constructed in the Palisades RA, any oil and gas activities occurring in this area would be very evident.	Although roadless areas are protected by a CSU stipulation (similar to Alternatives 2 & 3), a similar level of protection as was provided by the NSO stipulations under Alternatives 2 & 3 would not exist. Thus, more of the roadless area acreage would be effectively available for oil and gas activities. The degree of short- and long-term effects that would occur depend upon the ultimate location of the proposed oil and gas activities in roadless areas.	This alternative has the highest potential for adverse effects to roadless areas. No CSU stipulation is included to require the location of oil and gas activities to avoid or minimize effects to roadless areas. However, as with the other alternatives, the types and degrees of effects that would occur depend upon the ultimate location of oil and gas activities in or near the roadless areas.

Table 3 Comparison of Alternatives by Issue

Issue	Alternative 1	2	3	4	5
5. Effects on transportation and the need for additional roads being built within the Forest.	No direct or indirect effects would occur.	As many as 18 miles of new roads could be constructed under this alternative. All would be obliterated and reclaimed over the short term: Because of NSO stipulations associated with other resources, most of the analysis area (>90%) effectively would be closed to roads because no wells would be allowed in those areas.	As many as 18 miles of new roads could be constructed under this alternative. All would be obliterated and reclaimed over the short term. Because of NSO stipulations associated with other resources, most of the analysis area (>90%) effectively would be closed to roads because no wells would be allowed in those areas.	As many as 60 miles of new roads could be constructed under this alternative. All but 12 miles would be obliterated and reclaimed over the short term. Unlike Alternatives 2 & 3, NSO stipulations associated with other resources would exclude wells from only a small portion of the analysis area (<1%). Thus, the potential for roads to be constructed over a larger portion of the analysis area is higher under this alternative.	As many as 60 miles of new roads could be constructed under this alternative. All but 12 miles would be obliterated and reclaimed over the short term. Road construction and design would have to meet Forest Plan standards and guidelines.

Table 3 Comparison of Alternatives by Issue

Issue	Alternative 1	2	3	4	5
6. Effects on recreational opportunities and the recreational experience.	No direct or indirect effects would occur.	The effects to recreation depend on the ultimate location of the oil and gas activities. Coincidental NSO stipulations associated with other resources would exclude wells from most of the analysis area and would effectively exclude roads from most of that area as well. However, if construction occurred in ROS II (non-motorized) areas, management objectives may not be met.	The effects to recreation depend on the ultimate location of the oil and gas activities. Coincidental NSO stipulations associated with other resources would exclude wells from most of the analysis area and would effectively exclude roads from most of that area as well. Unlike under Alternative 2, in areas where oil and gas activities could occur, recreational activities would be protected by TL and CSU stipulations.	The potential for adverse short- and long-term effects to recreational opportunities is considerably higher under this alternative relative to Alternatives 2 & 3. Most of the analysis area (99%) would be available for oil and gas activities without any NSO stipulations. Also, the protection provided by the TL and CSU stipulations included with Alternative 3 would not be available under this alternative.	The potential for adverse short- and long-term effects to recreation is greatest under this alternative. All of the analysis area would be available for oil and gas activities without any stipulations in excess of SLT. As with all action alternatives, the actual effects that would occur still depend upon the ultimate location of oil and gas activities proposed by the lessees.
7. Effects on wetlands and riparian areas.	No direct or indirect effects would occur.	Wetlands and riparian areas would be protected by NSO stipulations. Thus, adverse effects would be limited to those associated with crossings by linear features.	Wetlands and riparian areas would be protected by NSO stipulations. Thus, adverse effects would be limited to those associated with crossings by linear features.	Wetlands and riparian areas would be protected by a combination of NSO and CSU stipulations.	Wetlands and riparian areas under 40 acres in size would be adequately protected by SLT. However, wetlands and riparian areas larger than 40 acres may experience adverse effects, depending upon the ultimate location of oil and gas activities proposed by the lessees. ? not legal

Table 3 Comparison of Alternatives by Issue

Issue	Alternative 1	2	3	4	5
8. Effects on the Forest's visual resources.	No direct or indirect effects would occur.	More than 90% of the areas classified with the Partial Retention and Retention VQOs would be protected from the development of wells by NSO stipulations. Because the construction of roads is highly unlikely without the wells, most of these VQO areas would also be protected from the construction of roads and ancillary facilities. However, the actual degree of effects depends upon the ultimate location of oil and gas activities proposed by lessees.	Adverse effects from up to 433 acres of physical disturbance in Partial Retention and Retention areas would be short term in nature. These areas would be protected by a CSU stipulation requiring that proposed activities be designed or located in such a manner as to meet the objectives of Retention and Partial Retention within one year.	Adverse effects from up to 433 acres of physical disturbance in Partial Retention and Retention areas would be short term in nature. These areas would be protected by a CSU stipulation requiring that proposed activities be designed or located in such a manner as to meet the objectives of Retention and Partial Retention within one year.	This alternative has the highest potential for adverse effects to Retention and Partial Retention areas. No CSU stipulation is included. Thus, effects could be long term. Also, no NSO stipulations are included. As with all action alternatives, the actual degree of effect depends upon the ultimate location of oil and gas activities proposed by the lessees.

Table 3 Comparison of Alternatives by Issue

Issue	Alternative 1	2	3	4	5
9. Effects on fisheries and aquatic habitat.	No direct or indirect effects would occur.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects from sedimentation would be limited because steep slopes and unstable soils would be excluded from surface occupancy (NSO). Also, implementation of BMPs would minimize potential impacts of crossings. A low potential would exist for spills of oil or similar pollutants.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects from sedimentation would be limited because steep slopes and unstable soils would be excluded from surface occupancy (NSO). Also, implementation of BMPs would minimize potential impacts of crossings. A low potential would exist for spills of oil or similar pollutants.	Steep slopes and unstable soils would be protected by a CSU stipulation that would require avoidance and minimization. However, because activities could occur in these areas, the potential for impacts on fisheries, primarily from sedimentation, is higher than under Alternatives 2 or 3. Effects from the construction of crossings would be minimized through the use of BMPs. The ultimate level of impacts still would depend upon the proposed location of oil and gas activities.	The potential for adverse effects from sedimentation associated with physical disturbance would be greatest under this alternative. No requirement exists to avoid or minimize work on steep slopes and unstable soils. Thus, depending upon the ultimate location of oil and gas activities, adverse effects could be substantially higher than under Alternatives 2, 3, or 4.

Table 3 Comparison of Alternatives by Issue

Issue		Alternative 1	2	3	4	5
10.	Effects on soils, water, and air quality.	No direct or indirect effects would occur.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects to soils and water would be limited because steep slopes and unstable soils would be excluded from surface occupancy (NSO). Also, implementation of BMPs would minimize potential impacts of crossings. Increases in concentrations of particulates, NO_x, and CO would result in minor effects to the region's air quality.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects to soils and water would be limited because steep slopes and unstable soils would be excluded from surface occupancy (NSO). Also, implementation of BMPs would minimize potential impacts of crossings. Increases in concentrations of particulates, NO_x, and CO would result in minor effects to the region's air quality.	Steep slopes and unstable soils would be protected by a CSU stipulation that would require avoidance and minimization. However, because activities could occur in these areas, the potential for impacts on soils and water (primarily from erosion and sedimentation) is higher than under Alternatives 2 or 3. Effects from the construction of stream crossings would be minimized through the use of BMPs. The ultimate level of impacts still would depend upon the proposed location of oil and gas activities. Increases in concentrations of particulates, NO_x, and CO would result in minor effects to the region's air quality.	The potential for adverse effects to soils and water would be greatest under this alternative. No requirement exists to avoid or minimize work on steep slopes and unstable soils. Thus, depending upon the ultimate location of oil and gas activities, adverse effects (primarily erosion and sedimentation) could be substantially higher than under Alternatives 2, 3, or 4. Increases in concentrations of particulates, NO_x, and CO would result in minor effects to the region's air quality.

Table 3 Comparison of Alternatives by Issue

Issue		Alternative 1	2	3	4	5
11.	Interaction with geologic hazards (e.g. steep slopes and earthquakes).	No direct or indirect effects would occur.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects would be limited because steep slopes would be excluded from surface occupancy (NSO).	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects would be limited because steep slopes would be excluded from surface occupancy (NSO).	Steep slopes would be protected by a CSU stipulation that would require avoidance and minimization. However, because activities could occur in these areas, the potential for impacts (primarily slope failure) is higher than under Alternatives 2 or 3. The ultimate level of impacts still would depend upon the proposed location of oil and gas activities.	The potential for adverse effects from geologic hazards would be greatest under this alternative. No requirement exists to avoid or minimize work on steep slopes. Thus, depending upon the ultimate location of oil and gas activities, adverse effects (primarily slope failure) could be substantially higher than under Alternatives 2, 3, or 4.
12.	The effects of the Federal leasing decisions on the opportunities to explore for and develop oil and gas resources within the analysis area.	This alternative would eliminate all opportunities to explore for and develop oil and gas resources in the analysis area.	This alternative would severely restrict opportunities to explore for and develop oil and gas resources in the high potential area. Exploration and development of oil and gas resources would then be focused in the low to moderate potential areas.	Although this alternative would still severely restrict opportunities to explore for and develop oil and gas resources in the high potential area, greater opportunities would exist than under Alternative 2. Exploration and development of oil and gas resources would still be focused in the low to moderate potential areas.	This alternative would not severely restrict the opportunities to explore for and develop oil and gas resources.	This alternative would result in little reduction in the opportunities to explore for and develop oil and gas resources.

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Purpose and Need

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Introduction

The United States Department of Agriculture, Forest Service (Forest Service) and United States Department of Interior, Bureau of Land Management (BLM) propose to determine which lands on the Targhee National Forest (Forest) should be made available for the exploration, development, and production of oil or natural gas. As part of this determination, the Supervisor of the Forest will decide which lands on the Forest will be available for the BLM to lease. Additionally, the Forest Service will decide under what conditions these specific lands may be leased. Subsequently, the State Director of the BLM will decide whether or not to offer for lease the specific lands authorized by the Forest Service. The analysis documented in this Draft Environmental Impact Statement (DEIS) will provide the basis for these decisions.

Specifically, the action being proposed by the Forest Service and BLM is to make available for oil and gas leasing all lands within the Forest that meet three primary criteria. First, the mineral rights must be federal because the BLM only manages the leasing of federal subsurface minerals. Areas under private ownership with private mineral rights are not under the jurisdiction of the Forest Service or BLM and, therefore, are not part of the proposal.

Second, the lands must be legally available for oil and gas leasing. Four classes of lands are legally unavailable for leasing and are specifically excluded from consideration in this proposal. They are:

(1) lands withdrawn from mineral leasing by an act of Congress or an order of the Secretary of the Interior;
(2) lands recommended for wilderness allocation by the Secretary of Agriculture;
(3) lands designated by statute as wilderness study areas (unless oil and gas leasing is specifically allowed by the statute), and
(4) lands within areas allocated for wilderness or further planning in Executive Communication 1504, Ninety-Sixth Congress (unless such lands subsequently have been allocated to uses other than wilderness by an approved Forest Land and Resource Management Plan or have been released to uses other than wilderness by an act of Congress).

An example of an area identified as withdrawn from mineral entry is Management Area 13 in the Forest Plan, the Winegar Hole Management Area (Forest Service 1985b:393).

Finally, the lands must have at least some potential for containing oil or natural gas. Although the Federal Onshore Oil and Gas Leasing Reform Act (Leasing Reform Act) does not exclude lands without any known potential for containing oil or natural gas from a leasing analysis, the Forest decided to exclude such lands from this leasing analysis. The BLM recently determined that most of the Forest overlies geological formations that may contain oil or natural gas (Horsburgh 1992a). Thus, most of the Forest has at least a low potential for oil and gas resources. Essentially, the northwest and southeast portions of the Forest have low and moderate-to-high potential for oil and gas resources, respectively (Appendix A). The northeast portion immediately west of Teton and Yellowstone National Parks has no known potential for oil or gas resources.

Figure 1–1 shows the analysis area containing lands that meet the three criteria described earlier. Within this 1,200,000-acre area, 1,102,800 acres meet all three criteria. These lands comprise the geographical scope of the proposed action. Details of the proposed action are presented in Chapter 2.

This DEIS describes and explains the leasing decisions the Forest Service and BLM will make. Appendix B explains how the Forest Supervisor and State Director of the BLM will implement the decisions. This appendix also describes how future decisions will be made to issue permits to drill and potentially develop fields of oil and gas. Additionally, the DEIS describes the environmental significance of each decision and measures the Forest Service would use to ensure protection of the quality of the human environment.

Background

The Forest Service operates under a defined mission. This mission provides overall direction, purpose, and meaning. Specific to oil and gas resources, the mission directs the Forest Service to encourage, facilitate, and administer the orderly exploration, development, and production of these resources on National Forest System lands. The purpose of this direction is to help meet the present and future needs of the Nation. The primary means through which the Forest Service fulfills this direction is to work with the BLM to offer leases under the mineral leasing laws for the purpose of drilling exploratory wells and extracting oil, gas, or both.

The Forest Service implements its mission through planning and direction at three levels: national, regional, and forest. The national and regional levels concentrate on making and implementing policies, monitoring results, and coordinating efforts. The individual forests implement the national and regional directions. The Land Management Plan (Forest Plan) for the Targhee National Forest (Forest Service 1985b) specifically implements the Forest Service's mission, national direction, and regional direction on the Targhee National Forest.

The Forest Plan directs the Forest to "integrate the exploration and development of mineral and energy resources on the Forest with the use and protection of other resource values" (Forest Service 1985b:181). Additionally, it requires the Forest to review and process applications for minerals leases, permits, and licenses in a timely fashion. Finally, the Forest must recommend, to the BLM, measures and stipulations necessary to protect surface resources (Forest Service 1985b:181).

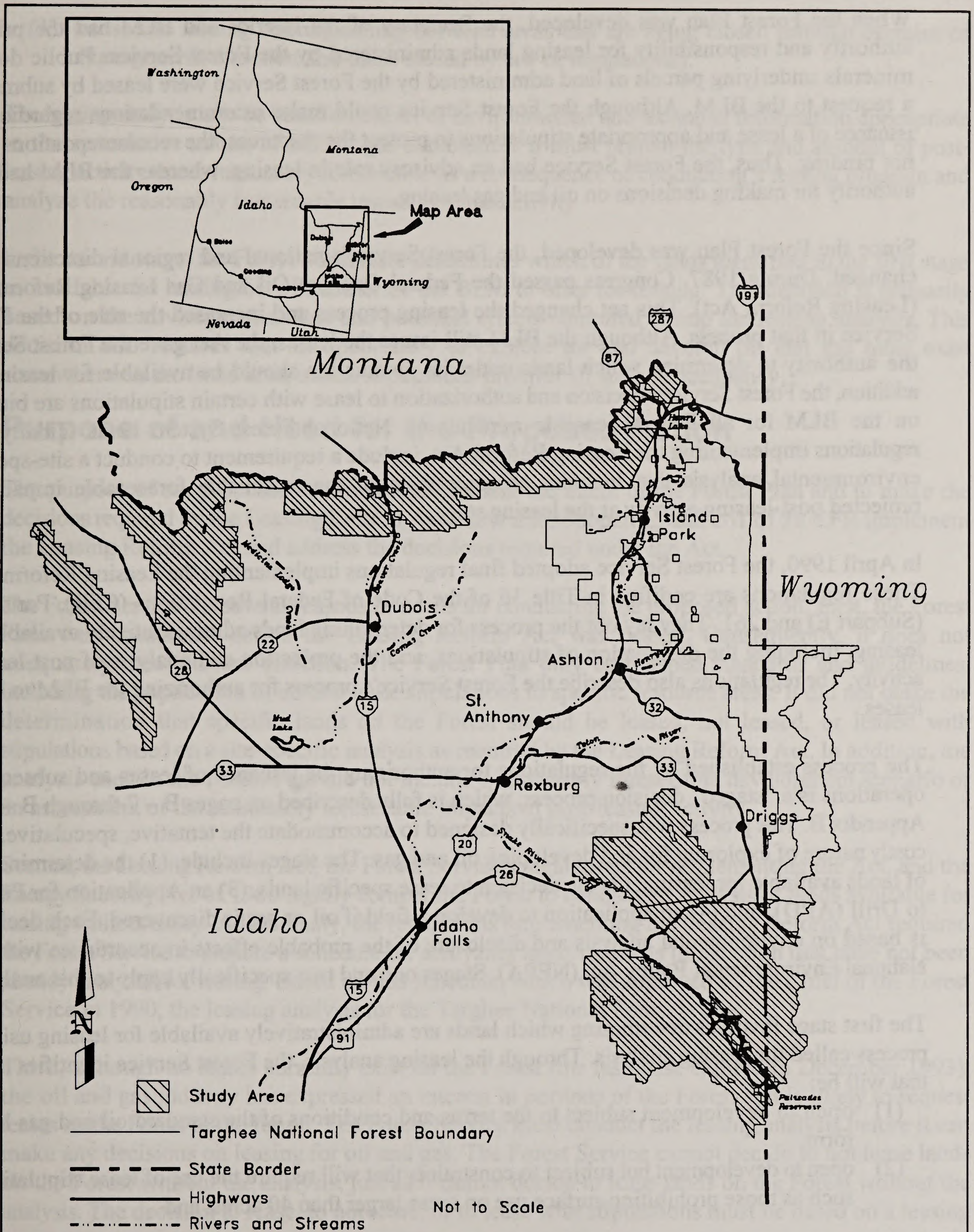

Figure 1–1 Study Area for the Targhee National Forest's Oil and Gas Leasing Analysis

When the Forest Plan was developed, the Secretary of the Interior and BLM had the primary authority and responsibility for leasing lands administered by the Forest Service. Public domain minerals underlying parcels of land administered by the Forest Service were leased by submitting a request to the BLM. Although the Forest Service could make recommendations regarding the issuance of a lease and appropriate stipulations to protect the resources, the recommendations were not binding. Thus, the Forest Service had an advisory role in leasing, whereas the BLM had sole authority for making decisions on oil and gas leasing.

Since the Forest Plan was developed, the Forest Service's national and regional directions have changed. During 1987, Congress passed the Federal Onshore Oil and Gas Leasing Reform Act (Leasing Reform Act). This act changed the leasing process and increased the role of the Forest Service in that process. Although the BLM still issues the leases, the Act gave the Forest Service the authority to determine which lands under its jurisdiction should be available for leasing. In addition, the Forest Service's decision and authorization to lease with certain stipulations are binding on the BLM for all Federal leasable minerals on National Forest System lands. Finally, the regulations implementing the Leasing Reform Act include a requirement to conduct a site-specific environmental analysis that includes an assessment of the reasonable foreseeable impacts of projected post-leasing activity at the leasing stage.

In April 1990, the Forest Service adopted final regulations implementing the Leasing Reform Act. These regulations are codified in Title 36 of the Code of Federal Regulations (CFR), Parts 228 (Subpart E) and 261. They lay out the process for determining lands administratively available for leasing, including the designation of stipulations, and the projection and analysis of post-leasing activity. The regulations also describe the Forest Service's process for authorizing the BLM to issue leases.

The process established by the regulations for authorizing the issuance of leases and subsequent operations is a "staged" decision process, which is fully described on pages B – 7 through B – 9 of Appendix B. This process was specifically designed to accommodate the tentative, speculative, and costly nature of exploring for and developing oil and gas. The stages include: (1) the determination of lands available for leasing, (2) the decision to lease specific lands, (3) an Application for Permit to Drill (APD), and (4) an application to develop a field if oil or gas is discovered. Each decision is based on environmental analysis and disclosure of the probable effects in accordance with the National Environmental Policy Act (NEPA). Stages one and two specifically apply to this analysis.

The first stage involves determining which lands are administratively available for leasing using a process called the leasing analysis. Through the leasing analysis, the Forest Service identifies areas that will be:

(1) open to development subject to the terms and conditions of the standard oil and gas lease form,
(2) 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, and

(3) closed to leasing (distinguishing between areas that are being closed through exercise of management direction and those closed by law or regulations).

The leasing analysis is to be based on a level of environmental and technical information appropriate to the speculative nature of oil and gas exploration. It must project the type and amount of post-leasing activity that is reasonably foreseeable as a consequence of conducting a leasing program and analyze the reasonably foreseeable impacts of that activity.

In the second stage, the Forest Supervisor determines which of the lands identified in the first stage as available for leasing he will authorize the BLM to offer for leasing. This decision is primarily based on the environmental data and potential effects compiled during the leasing analysis. This decision also requires that an opportunity to explore for and develop oil and gas must exist somewhere on the lease area, unless stipulations prohibit all surface occupancy.

Purpose of and Need for the Proposed Action

The purpose of the proposed action is to implement the intent of the Forest Plan and to make the decisions required by the Leasing Reform Act. Parts 228, Subpart E, and 261 of 36 CFR implement the Leasing Reform Act and address the decisions required under the Act.

The Forest Service has several reasons or needs for conducting the proposed action. First, the Forest Plan was completed before the Leasing Reform Act was passed. Consequently, it does not adequately meet current direction. The Forest Plan only established standards and guidelines, including the application of certain lease stipulations to specific resource areas. It did not make the determination that specific lands on the Forest should be leased, not leased, or leased with stipulations based on a site-specific analysis as required by the Leasing Reform Act. In addition, the analysis used in the Forest Plan did not include a reasonably foreseeable development scenario or an assessment of the reasonably foreseeable impacts of post-leasing activity.

Second, the Leasing Reform Act, the Forest Service's regulations for implementing the Act, and the Energy Security Act of 1980 legally compel the Forest to conduct an analysis of lands available for leasing without delay. Additionally, the regulations implementing the Leasing Reform Act required the Forest Service to prepare a schedule for analyzing lands under its jurisdiction that have not been already analyzed for leasing. Based on this schedule, which was approved by the Chief of the Forest Service in 1990, the leasing analysis for the Targhee National Forest is due.

Third, although no leases currently exist on the Forest (the last lease expired in December 1993), the oil and gas industry has expressed an interest in portions of the Forest and is likely to request leases on the Forest in the future. The Forest Service must conduct the leasing analysis before it can make any decisions on leasing for oil and gas. The Forest Service cannot decide to not lease lands on the Forest without the analysis, just as it cannot decide to lease lands on the Forest without the analysis. The decision to lease, to not lease, or to lease with stipulations must be based on a leasing analysis. Thus, the analysis must be conducted before any decision on oil and gas leasing can be made.

Finally, the Forest is in the middle of a Forest Plan Revision and oil and gas leasing has been identified as an issue in the Forest Plan Revision process. Because the Forest Plan Revision and the leasing analysis will affect each other, close coordination between them is desirable. The Forest Plan Revision process will make decisions that will affect the leasing analysis, such as setting program goals and objectives and operating standards and guidelines for oil and gas activities. The Revision also will make decisions on recommended wilderness. Conversely, the leasing analysis will provide site-specific information that can be incorporated into the Forest Plan Revision.

Because these decisions will be interrelated, this analysis will be coordinated with the Forest Plan Revision to the extent possible. However, it will likely precede completion of the plan. If necessary, the leasing decision will be amended or revised to conform to the Revised Forest Plan as required by the National Forest Management Act (NFMA) [36 CFR 219.10(e)]. Delaying or postponing the leasing analysis until after completion of the Forest Plan would violate the Energy Security Act of 1980 and the schedule approved by the Chief of the Forest Service under the Leasing Reform Act.

Reasonably Foreseeable Development Scenario

Activities that may occur after a lease is issued can induce economic, environmental, and social impacts. Thus, the regulations implementing the Leasing Reform Act and NEPA require a projection of the type and amount of post-leasing activity that is reasonably foreseeable as a result of conducting a leasing program (a Reasonably Foreseeable Development Scenario). The Act also requires the use of this scenario to estimate site-specific effects of exploration, development, and production activities.

At the request of the Forest Service, the BLM developed a Reasonably Foreseeable Development Scenario for the Targhee National Forest. The scenario was developed using geologic information, historical information on the exploration for oil and gas in and around the Forest, and projected trends in the oil and gas markets (Horsburgh 1992b). Additionally, the scenario considered the common five-phased approach to the development of oil and gas resources (Appendix C). Although these sources of information provided a reasonable basis for estimating the impacts of the scenario, it must be recognized that future exploration and development may not occur exactly where or how predicted in the scenario. The full scenario is included as Appendix A.

The Reasonably Foreseeable Development Scenario projects that exploration and development activities would occur between 1995 and 2010. Exploration would consist of geophysical investigations and the drilling of ten exploratory wells (Horsburgh 1992b). Seven of these wells would be drilled in the Palisades area. Two of the remaining three wells would be drilled on the west side of Teton Valley or south of Palisades Reservoir. The tenth well would be drilled in the northern part of the Forest.

Exploration would temporarily disturb a total of 331 acres. Because of the steepness and inaccessibility of the terrain, the geophysical investigations would be conducted with helicopter support. Consequently, this activity would cause negligible surface disturbance. However, about 4 acres would be disturbed for each of the ten well pads. In addition, each well would require an access road with a mean length and overall disturbance of 6 miles and 29.1 acres, respectively.

Of the ten exploratory wells drilled in the Forest, one well in the high potential area would encounter hydrocarbons in sufficient quantities to warrant development of a field (Horsburgh 1992b). The remaining wells would be reclaimed within three years from initial disturbance. Exploratory drilling operations would take from 10 to 18 months.

Based on the discovery in the high potential area, a six-well field would be developed (Horsburgh 1992b). This development would disturb an additional 102 acres. The field would produce 500 to 700 barrels of oil and 2,000 mcf of gas per day.

Production would be moved to markets via trucks and pipelines. Oil would be piped to a central facility from which it would be trucked to refineries in northern Utah. Natural gas would be transported off the Forest through a pipeline. No sweetening facilities would be constructed during the 15-year period because reserves of sour gas (H_2S) would be insufficient to warrant the investment in a sweetening plant.

Federal Management of Leases and Associated Development

The Federal Leasing Process

The BLM is responsible for issuing oil and gas leases on the federal mineral estate. The BLM cannot issue leases for lands administered by the Forest Service without consent from the Secretary of Agriculture. The Mineral Leasing Act of 1920, as amended, and the Acquired Lands Leasing Act of 1947 for acquired lands provide the legislative authority for Federal oil and gas leasing. The regulatory basis for administering Federal oil and gas leasing is provided in 43 CFR Part 3100.

Under the Leasing Reform Act, all leases must be offered competitively before the leases can be issued noncompetitively. Competitive leasing occurs when the BLM takes competitive bids on a parcel or tract of land. Noncompetitive leasing occurs when the BLM receives an application for a parcel or tract of land that did not receive a bid when offered for competitive leasing.

Competitive leasing of a given parcel or tract of land can be initiated in three ways and involves two primary steps. First, an individual or company may make a nomination or pre-sale offer. Second, the BLM may request competitive leasing for a parcel. Finally, the Forest Service may initiate competitive leasing. After the BLM determines that lands will be offered for competitive leasing, it and the Forest Service will post a 45-day public notice identifying the lands to be offered for lease.

At the end of the posting period, the BLM offers the lease tracts for competitive bid at the next regularly scheduled oral auction.

Noncompetitive or over-the-counter leasing is initiated by an individual or company by filing an application for a tract of land that did not receive a bid when offered for competitive leasing. After a tract has been available for noncompetitive leasing for two years, it must be offered competitively again if nominated or applied for. Competitive and noncompetitive leases are issued for a primary term of ten years.

Standard Lease Terms and Stipulations

The standard lease terms are contained in BLM Lease Form 3100-11, "Offer to Lease for Oil and Gas" (Appendix D). As a minimum, all leases must contain standard lease terms. Under the standard lease terms, the lessee has the right to use as much of the leased lands as is necessary to explore or drill for, extract, remove, and dispose of oil and gas deposits that may be in the leased lands, together with the right to build and maintain necessary improvements thereon. Section six of the standard lease form requires the operator to conduct operations in a way that minimizes adverse impacts to surface resources and other land uses and users. The lessee also is required to comply with non-discretionary statutes, such as the Endangered Species Act, Clean Water Act, Clean Air Act, and National Historic Preservation Act, and the minimum operation standards of Onshore Orders and Notices to Lessees.

Expiration or Termination of a Lease

In general, oil and gas leases (competitive and noncompetitive) expire at the end of their 10-year primary term if they are not producing. If they produce paying quantities of oil or gas, the leases do not expire until production ends. In addition, certain adjustments to the term can be made. Leases may be extended for up to two years beyond their primary 10-year term for diligent drilling operations or when eliminated from an approved Unit Agreement. Finally, leases without producible wells automatically terminate if the lessee fails to make full and timely payment of the annual rent.

The owner of a lease also may relinquish the lease in whole or in part by filing a written relinquishment with the BLM State Office having jurisdiction over the leased Federal lands. A relinquishment takes effect on the date it is filed. The lessee is responsible for plugging any abandoned wells. The lessee also is responsible for other work required by the BLM to place the leasehold in proper condition for abandonment and bring the lease into good standing. If the lessee fails to perform the required abandonment work, the bond will be used to pay for the costs of abandonment and the lessee will be prohibited from leasing any additional Federal lands.

Decisions To Be Made

Based on the analysis documented in this EIS, the Supervisor of the Targhee National Forest will make two decisions and the State Director of the BLM will make one decision regarding oil and gas leasing on the Forest. First, the Forest Supervisor will decide which of the Forest's lands within the analysis area (Figure 1–1) are administratively available for oil and gas leasing and under what conditions or stipulations (a stage one decision). Second, the Forest Supervisor will decide what specific lands in the Forest the BLM will be authorized to offer for lease, subject to the Forest Service ensuring that correct stipulations are attached to the leases issued by the BLM (a stage two decision). Finally, the State Director of the BLM will decide whether or not to offer for lease the specific lands authorized by the Forest Service. The Forest Service is exercising its discretion in combining and addressing the first two of the four decision stages in this leasing analysis and DEIS. The Forest Plan will be amended to incorporate the decisions after they are made.

Application of these decisions is limited by the legal authority of the Forest Service and BLM (the statutes providing this authority are described in Appendix E). These limits determine what the final decisions can and cannot do in several circumstances. First, the decisions can determine the management of Federal lands. In contrast, they cannot be applied to non-Federal minerals owned by private, state, or local entities. Because surface and mineral ownership within the overall boundaries of the Forest is a patchwork, major oil and gas operations could continue within the Forest on non-Federal lands even if the Federal government were never to issue another lease. Second, the decisions can result in new limitations on rights granted in future Federal leases. Third, the decisions can provide protection for surface resources on Federal lands. Finally, the decisions cannot preserve Federal or non-Federal deposits of oil and gas for the future.

Regardless of any decision made in the Record of Decision, oil and gas operators will be able to access non-Federal deposits in and adjoining the Forest. In doing so, they may drain Federal deposits if the adjacent Federal lands are not available for leasing. Thus, preservation of reserves of oil and gas on the Forest is beyond the scope of this EIS.

If, in the Record of Decision, the Forest Supervisor selects an action alternative and the State Director of the BLM decides to offer lands for lease, the leases would be issued without further NEPA documentation. However, as described above and in Appendix B, additional environmental analysis and disclosure of the probable effects under NEPA would be required for stages three and four of the Forest Service's "staged decision process". Thus, although the decisions resulting from the leasing analysis are considered "an irretrievable and irreversible commitment of natural resources", additional analyses and approvals would be required prior to ground-disturbing activities.

Chapter 2

Proposed Action and Alternatives

Chapter 2 — Proposed Action and Alternatives

This chapter describes the alternatives that are evaluated within this EIS and the processes used to develop them. First, it describes the process used to identify the issues associated with the proposed project that would be addressed in the analysis. This process is known as scoping. Then, it describes the process used to evaluate the alternatives to determine which would be considered in the analysis. It also identifies each alternative dropped from detailed consideration and briefly describes the reasoning for the exclusion. Next, the project alternatives are defined with their specific features fully described. Finally, the chapter ends with a comparison of the environmental effects of the alternatives analyzed in detail.

Scoping

Scoping is the process used to identify issues related to a proposed action and the scope of issues to be addressed during the NEPA analysis. The Forest initiated scoping in April 1993 with the preparation of a scoping document. This formal scoping document was prepared to inform interested agencies, organizations, businesses, and individuals of the Forest Service and BLM's intent to conduct an environmental analysis of oil and gas leasing on portions of the Targhee National Forest. The document solicited comments from readers to assist the Forest Service and the BLM in identifying specific interests and concerns that should be addressed in the analysis.

The formal scoping process began on May 21, 1993 with the publishing in the Federal Register of a Notice of Intent to prepare the EIS. A public notice was also published in the following five newspapers serving the area in and around the Forest: the Rexburg Standard-Journal, Teton Valley News, Jefferson County Star, Post Register (Idaho Falls), and Jackson Hole News. Next, copies of the scoping document were sent on May 9, 1993 to almost 2,100 agencies, organizations, businesses, and individuals. In addition, two public meetings were held to discuss the proposal. Attendees were given the opportunity to ask questions and submit oral and written questions. These two meetings were held in Driggs, Idaho on June 16, 1993, and in Idaho Falls, Idaho on June 17, 1993.

Issues

The Forest Service reviewed and analyzed the 94 comments received during the scoping process. First, specific comments were arranged into groups of common concerns. Next, a primary issue statement was prepared for each group of comments. Finally, these issue statements were evaluated for applicability to the oil and gas leasing process. The 12 key issues described next in this section were incorporated into the leasing and NEPA process and were specifically used to compare the alternatives in this EIS.

Issue 1: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on threatened, endangered, candidate, or sensitive species of plants and animals.

Concerns were expressed that oil and gas leasing and the subsequent exploration for and potential development of oil and gas resources could adversely affect threatened, endangered, proposed, or sensitive species of plants, wildlife, and fish. Species of particular concern to respondents include the grizzly bear, wolf, peregrine falcon, bald eagle, lynx, and wolverine. Respondents also identified several areas, including the Centennial Mountains, roadless areas, Palisades area, and wolf and grizzly bear recovery zones (e.g. the Henry's Lake Bear Management Unit), as locations that are important to these species and as such, need special consideration in the analysis. Several respondents were concerned with potential effects on the movements of grizzly bears and wolves between the Greater Yellowstone Ecosystem and recovery zones in Central Idaho. The potential for an increase in conflicts between grizzlies and humans was also mentioned. Finally, some respondents noted the need for the analysis to comply with Section 7 of the Endangered Species Act.

Issue 2: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on species of wildlife and their habitats (particularly key habitats).

Concerns were expressed that oil and gas leasing and the subsequent exploration for and potential development of oil and gas resources could directly and indirectly affect species of wildlife and their habitats. Species for which concern was specifically identified include deer, elk, mountain goats, and the Forest's management indicator species. Respondents also were particularly concerned about potential effects on key habitats, including big game winter ranges, calving areas for elk, the Alpine Elk Feedground, migration corridors, and bird nesting areas. The effects about which most respondents were concerned are the direct loss of habitat, disturbance of the animals by humans, and fragmentation of habitat, primarily through the construction of new roads.

Issue 3: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on the Forest's ecological integrity and biological diversity.

Concerns were expressed that oil and gas leasing and the subsequent exploration for and potential development of oil and gas resources could adversely affect the natural ecological integrity of the Forest. Respondents were concerned that oil and gas activities could alter the Forest's biological diversity by changing species composition, abundance, and the distribution of plants and animals. Because different species of wildlife require different levels of habitat diversity, these changes are important to a number of species. In addition to threatened, endangered, proposed, and sensitive species, nongame species are of particular concern.

Issue 4: *The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on roadless areas and other potential wilderness areas.*

Concerns were expressed that oil and gas leasing and the subsequent exploration for and potential development of oil and gas resources could adversely affect the roadless resource. Respondents felt new roads in these areas would result in increased human intrusion and cause an irreparable change to the roadless resource. They believe the values of solitude provided by these areas are too unique to lose.

Issue 5: *The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on transportation and the need for additional roads being built within the Forest.*

Concerns were expressed that oil and gas leasing and the subsequent exploration for and potential development of oil and gas resources would result in too many additional roads being constructed in the Forest. Respondents expressing this concern felt the Forest presently has too many miles of road. Construction of new roads for oil and gas activities could greatly affect the existing density of roads. Also, an increase in the number of vehicles associated with the oil and gas industry in the area could require the widening of some roads. Additional roads will adversely affect many of the Forest's resources, including threatened, endangered, proposed, and sensitive species; wildlife; water quality; and the erosion of soils.

Issue 6: *The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on recreational opportunities and the recreational experience.*

Concerns were expressed that oil and gas leasing and the subsequent exploration for and potential development of oil and gas resources would alter the existing recreational setting and experience provided by the Forest. Activities would add new sources of noise and light that could diminish the recreational experience. New roads built into areas that are currently difficult to access would provide access for vehicles and promote an increase in human activity. Some respondents favoring primitive, dispersed recreational opportunities believe the oil and gas activities are incompatible with these opportunities. Other respondents favor the opportunity for increased access into undeveloped areas of the Forest and want new roads constructed for oil and gas activities left open to the public. Several believe the exploration for and potential development of oil and gas resources is fully compatible with most types of recreation, including semi-primitive recreation. Finally, some respondents are concerned with potential adverse effects on nearby trails and wish to see measures taken to protect the integrity of trails located near oil and gas activities.

Issue 7: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on wetlands and riparian areas.

Concerns were expressed that oil and gas leasing and the subsequent exploration for and potential development of oil and gas resources would adversely affect the Forest's wetlands and riparian areas. Respondents felt wetlands and riparian areas are limited on the Forest and are particularly important for the unique habitats they provide for wildlife and their functions in maintaining water quality. Thus, they felt no oil or gas activities should be allowed within or near wetlands and riparian areas.

Issue 8: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on the Forest's visual resources.

Concerns were expressed that oil and gas leasing and the subsequent exploration for and potential development of oil and gas resources would adversely affect the outstanding visual quality of many parts of the Forest. Respondents considered oil and gas drilling rigs an eyesore.

Issue 9: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on fisheries and aquatic habitat.

Concerns were expressed that oil and gas leasing and the subsequent exploration for and potential development of oil and gas resources could directly and indirectly affect fish and their habitats. Respondents believe the Forest contains world-class streams and spawning habitats for a variety of fish. The exploration for and potential development of oil and gas resources may adversely affect these streams and habitats.

Issue 10: The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on soils, water, and air quality.

Concerns were expressed that ground-disturbing activities associated with oil and gas exploration and development would disturb soils and subsequently cause effects to soils, water, and air.

Issue 11: The interaction of oil and gas leasing, including possible subsequent activities associated with exploration and development, with geologic hazards (e.g. steep slopes and earthquakes).

Concerns were expressed that activities associated with the exploration for and potential development of oil and gas resources could aggravate geologic hazards in the area. Respondents believe the analysis should address unstable bedrock and seismicity in addition to unstable soils.

Issue 12: The effects of the Federal leasing decisions on the opportunities to explore for and develop oil and gas resources within the study area.

Concerns were expressed about the effects of leasing decisions on the opportunities to explore for and develop oil and gas resources within the Forest. Respondents believe the lack of current industry interest should not be considered a basis for closing lands or imposing constraints on future development indiscriminately. Levels of interest can change overnight. Also, changes in technology may increase the ability of oil and gas industry to explore for and develop oil and gas resources in areas currently identified as low potential areas.

Development of Alternatives

A multi-step process was used to develop the alternatives considered in the Forest's Oil and Gas Leasing Analysis. First, key resource areas and options available to the Forest for leasing were identified. Then, a leasing options analysis was conducted. Finally, alternatives were defined using the issues identified during scoping and the results of the leasing options analysis. The following discussion summarizes each of the primary steps in this process.

The initial step consisted of identifying (1) the key resource areas that occur within the analysis area and (2) which of these resource areas the leasing analysis should specifically address. After reviewing data on the resources present within the analysis area, the Forest Interdisciplinary Team (ID Team) determined ten key resource areas would be addressed in the analysis. They are:

- concentrated development (active mines, mineral material sites, communication sites, and administrative sites);
- riparian vegetation;
- recreation (motorized, non-motorized, developed sites, and special use permit sites);
- wilderness study areas and recommended or proposed wilderness;
- Special Management areas (Management Area 18 - Snake River);
- threatened, endangered, proposed, or sensitive species;
- watersheds (lakes and streams, unstable soils, slopes greater than 40 percent, and municipal water supplies);
- wildlife (seasonal and critical habitat);
- wild rivers (eligible); and
- Visual Quality Objectives (retention and partial retention).

Next, the Forest determined the leasing options that would be evaluated. In the consideration to lease National Forest System lands for oil and gas exploration and development, six options are available for each parcel of land. These options are:

- *No Lease (NL)* — No new leases would be authorized.

- *No Surface Occupancy (NSO)* — Neither exploration nor production facilities (e.g. well pads, drilling rigs, and tank batteries) would be allowed to be constructed.

- *Controlled Surface Use (CSU)* — Surface occupancy and use are permitted, but are restricted to mitigate effects to particular resources. The CSU stipulation provides for mitigation measures that would not normally be met by relocating the drilling site 219 yards (200 meters) under the SLT. It is assumed that the well could be relocated within one-half mile of the proposed location, and the original targeted reservoir could be reached by directional drilling technology.

- *Timing Limitations (TL)* — Construction activities would be restricted or prohibited during certain periods to protect resources.

- *Standard Lease terms (SLT)* — No special limitations would be applied. Operations are only restricted by current laws, regulations, and Onshore Orders. Under the SLT, facilities could be moved up to 219 yards (200 meters) or rescheduled for up to 60 days to protect resources.

- *Lease Notice (LN)* — Provides information to a lessee concerning resources that are protected by law or regulation thereby making a specific lease stipulation unnecessary.

After the key resource areas and leasing options were identified, a leasing options analysis was conducted. This analysis consisted of determining the potential effects of each leasing option on each of the key resources areas independently. The purpose of the analysis was to determine which leasing option provided the fewest restrictions while granting reasonable access to federal hydrocarbons within the Forest and protecting the resource simultaneously. Regulations require this determination.

Finally, the ID Team developed the alternatives for the leasing analysis. The results of the leasing options analysis and issues raised during scoping comprised the primary factors used in defining alternatives. Essentially, the ID Team applied stipulations to the key resource areas in combinations that reflected the results of the leasing options analysis and addressed one or more of the key issues raised during scoping. The process resulted in the development of five alternatives.

Alternatives Considered but not Evaluated in Detail

One alternative was developed and considered but dropped from detailed evaluation. Under this alternative, an NSO stipulation would be applied to the entire analysis area. The alternative was dropped from detailed evaluation because the BLM could not legally lease most of the analysis area. Even with an NSO stipulation, the lessee must somehow have access to deposits of oil and gas on the lease. Typically, access is gained by drilling directionally from adjoining areas where surface occupancy exists. If the entire analysis area is leased with an NSO stipulation, large expanses of the area would not be accessible using available technology for drilling directionally. Thus, the access that must be available would not occur under this alternative and its implementation would have the same general effect as not leasing most of the analysis area.

Alternatives Carried Through the Analysis

All five alternatives developed for the leasing analysis also were carried through the NEPA analysis. They include a No Leasing alternative and four action alternatives. Each alternative consists of various combinations of leasing options for the key resources considered (Table 2–1). The following sections describe each of these alternatives in detail. Additionally, the sections identify the issues each alternative was developed to address.

Alternative 1 — No Leasing

This alternative represents the No Action alternative required by NEPA. No leases currently exist on the Forest (the last of the leases expired in December 1993). For the purposes of this analysis, it is assumed that, under this alternative, none of the Federal minerals on the Forest would be made available for oil and gas leasing and no new leases would be issued. The net effect would be that the entire analysis area (Figure 2–1 in a map pocket inside the back cover) and all areas of key resources present in the analysis area would be closed to leasing for oil and natural gas (Table 2–2).

This alternative would not preclude exploration and drilling on private lands within and adjacent to the Forest. However, the no lease alternative would probably preclude industry from acquiring sufficient acreage for field development in the event a productive well would be discovered. It is doubtful that industry would invest the funds and time if only limited wells could be drilled. Therefore, the ID Team believes this alternative would effectively preclude any exploration for oil and gas on or immediately adjacent to the Forest.

Action Alternatives

Excluding alternative 1, all alternatives carried through the analysis involved common features. To minimize repetition among the descriptions of these alternatives, features common to all of them are described first. The subsequent descriptions of the alternatives focus on differences among the alternatives.

Features Common to All Action Alternatives

Reasonably Foreseeable Development Scenario

The reasonably foreseeable development scenario (Horsburgh 1992) projects that exploration and development activities would occur between 1995 and 2010. The potential for discovering hydrocarbons in the Forest has been divided into three categories. In the northern portion of the

Table 2–1 Matrix of Protective Stipulations by Alternative

Resource Component	Alternative 1 (No Lease)	2 (Forest Plan)	3 (Forest Plan Mod. 1)	4 (Forest Plan Mod. 2)	5 (Standard Lease Terms)
Concentrated Development[1]	NL[2]	NSO	NSO	CSU	SLT
Riparian Vegetation	NL	NSO	CSU	CSU	SLT
Recreation					
Motorized	NL	SLT	CSU	SLT	SLT
Non-motorized	NL	SLT	CSU	SLT	SLT
Developed Sites	NL	NSO	NSO	SLT	SLT
Special-use Permit Sites	NL	NSO	NSO	CSU	SLT
Roadless					
Wilderness Study Area	NL	NSO	NSO	CSU	SLT
Rec./Proposed Wilderness					
Italian Peak & Lionhead	NL	NL	NL	NSO	SLT
Palisades	NL	NSO	NSO	CSU	SLT
Special Management Areas[3]	NL	NL	NSO	NSO	SLT
T,E,P, & S Species[4]					
T,E, & Proposed Species	NL	LN	LN	LN	SLT
Sensitive Species	NL	LN	CSU	CSU	SLT
Watersheds					
Lakes and Streams	NL	NSO	NSO	NSO	SLT
Unstable Soils	NL	NSO	NSO	CSU	SLT
Slopes > 40 percent	NL	NSO	NSO	CSU	SLT
Municipal	NL	NSO	NSO	CSU	SLT
Wildlife Seasonal Habitats	NL	TL	TL	TL	SLT
Wild River (Eligible)	NL	NSO	NSO	CSU	SLT
Visual Resources					
Partial Retention	NL	SLT	CSU	CSU	SLT
Retention	NL	NSO	CSU	CSU	SLT

Notes:

1. Active mines, mineral material sites, communication sites, utility corridors, and administrative sites.
2. NL = No Lease, NSO = NO Surface Occupancy Stipulation, CSU = Controlled Surface Use Stipulation, TL = Timing Limitation Stipulation, SLT = Standard Lease Terms, and LN = Lease Notice.
3. Management Area #18 (Snake River), areas of unique cultural, botanical, or zoological resource values.
4. T,E,P & S Species = Threatened, Endangered, Proposed, and Sensitive species.

Table 2–2 Distribution of Analysis Area Acreage by Resource Area and Stipulation, Alternative 1 — No Leasing

	Stipulation[1]							
Resource Area	NL (acres)	NSO (acres)	CSU&TL (acres)	CSU (acres)	TL (acres)	SLT (acres)	LN (acres)	Total (acres)
Concentrated Development	1,267							1,267
Riparian Vegetation	10,794							10,794
Motorized Recreation	364,448							364,448
Non-motorized Recreation	338,342							338,342
Developed Sites	1,252							1,252
Special Use Permit Sites	333							333
Wilderness Study Area	52,174							52,174
Recommended/Proposed Wilderness	145,563							145,563
Special Management Areas	5,331							5,331
T&E and Sensitive Species	94,496							94,496
Lakes & Streams	17,831							17,831
Unstable Soils	2,778							2,778
Slopes Greater Than 40 Percent	478,005							478,005
Municipal Watersheds	11,270							11,270
Wildlife Seasonal Habitats	1,083,854							1,083,854
Wild River (Eligible)	5,102							5,102
Partial Retention VQO	386,861							386,861
Retention VQO	105,392							105,392

Notes:

1. Stipulations, in order of decreasing restrictiveness, are: NL = No Lease, NSO = No Surface Occupancy, CSU/TL = Overlapping CSU and TL, CSU = Controlled Surface Use, TL = Timing Limitation, SLT = Standard Lease Terms, LN = Lease Notice.

analysis area, just south of the Continental Divide, the potential is rated low. In the southern portion of the analysis area, a moderate potential is expected in the areas south and west of the Palisades Reservoir. The highest probability of discovering hydrocarbons occurs in the area north and east of the Palisades Reservoir. Horsburgh's report, which is included as Appendix A, contains a map showing the distribution of the areas rated low, moderate, or high.

Exploration would consist of geophysical investigations and the drilling of ten exploratory wells. Exploration would focus on the southern part of the analysis area near the Palisades Reservoir. Seven exploratory wells would be drilled in the high potential area, whereas only two wells would be drilled on the west side of Teton valley or south of the Palisades Reservoir. Although the probability of success is considered low, one well would be drilled in the northern part of the analysis area.

Because of the steepness and inaccessibility of the terrain, geophysical investigations would be conducted using helicopters as the main mode of transportation. Once the decision is made to drill, the surface disturbance would be about four acres for the well pad. An access road with a mean length and overall disturbance of six miles and 29 acres, respectively, would be required for each exploratory well. Exploratory activities would take from 10 to 18 months. Total surface disturbance for exploratory activities could affect a maximum of 331 acres. Each non-producing exploratory well would be reclaimed within three years from initial disturbance.

Based on one discovery in the high potential area northeast of the Palisades Reservoir, a field consisting of six wells, including the successfully completed exploratory well, could be developed on 160-acre spacing. The field would produce 500 to 700 barrels of oil and two million cubic feet of gas per day. Access roads for each well in the field would be approximately one mile in length. Oil would be piped to a central facility from which it would be transported by truck off the Forest to refineries in northern Utah. Natural gas would be transported off the Forest through a pipeline. Construction of five new well pads, additional access roads, a central facility, and the gas pipeline would result in an additional 102 acres of surface disturbance.

Although the reasonably foreseeable development scenario applies to all four action alternatives equally, the scenario is unlikely to be implemented to the same degree under each alternative. Various combinations of stipulations would probably restrict the scenario's activities to such a degree that they would prevent full field development under two of the alternatives. The individual descriptions under each alternative below describe the degree of implementation of the scenario projected for each alternative.

Mitigation Measures

As part of analysis, the Forest Service has committed to a variety of measures designed to protect the area's natural resources. These measures are part of each action alternative and would be incorporated into any lease issued. The measures that were considered part of the analysis are listed in Appendix F. Where appropriate, they are grouped by phase of oil or gas activities (e.g. wells, roads, and pipelines) to facilitate their organization.

Overlap of Resources

Eighteen specific resources were considered using the leasing matrices in the Forest Plan and the issues raised during the scoping process. In many cases, the areas identified with a specific resource also were included within the areal extent of one or more other resources. Because potential lessees are concerned about restrictions, areas where multiple resources coexist have been identified by the most restrictive stipulation that was applied to those lands.

is there slopes of less than 90% covered by the NSO?

For example, consider 100,000 acres of land where the topography includes slopes of 40 percent or greater. An alternative may be considered to apply an NSO stipulation to this entire parcel because of the steep slopes. A part of this 100,000 acres also may have a TL stipulation applied because it is an elk winter range. Where the elk winter range overlaps with the 40 percent slopes, that area would be identified with the NSO stipulation because of the greater restriction of the 40 percent slopes. Even though a TL stipulation was applied to the entire winter range, only that portion where it does not overlap with steep slopes would be available for surface occupancy. The remaining portion of the winter range would be under an NSO stipulation in addition to the TL stipulation.

Alternative 2 - Current Forest Plan

This alternative reflects the current leasing matrix and represents the intent of management direction contained in the current Forest Plan. No amendments to the existing Forest Plan would be required to implement this alternative. Under this alternative, most of the analysis area (94 percent) would be available for leasing by the Federal Government (Figure 2–2 [in a map pocket inside the back cover] and Table 2–3). About 48 percent of the analysis area would be available for leasing with an NSO stipulation as the most-restrictive stipulation. Additionally, 46 percent of the analysis area would be available for leasing with a CSU, TL, or CSU and TL stipulation as the most-restrictive stipulation. The rest of the analysis area would be available for leasing under standard lease terms or lease notices. Table 2–4 lists the acreage by resource component and stipulation. The following describes the stipulations that would be applied under this alternative.

Full implementation of the reasonably foreseeable development scenario is not expected to occur under this alternative. The projected exploration is likely to occur in the areas with a low or moderate potential for deposits of oil or gas. However, exploration and the subsequent development of the six-well field in the area with a high potential for oil or gas is not expected to occur. Too much of this area would be covered by an NSO stipulation to allow development of the field, even if exploratory activities found oil or gas. Because field development would be questionable, oil and gas companies are not expected to invest much time or money in exploration in the area with a high potential for oil or gas. Thus, only three wells are likely to be drilled under this alternative. Because all three would be nonproductive, the wells and their associated roads would be reclaimed within three years of disturbance.

need to define

Table 2–3 Distribution Analysis Area Acreage by Primary Stipulation[1] and Alternative

	Alternative				
Stipulation[2]	No Lease	Forest Plan	Forest Plan Modification 1	Forest Plan Modification 2	Standard Lease Terms
NL	1,101,607	63,842	58,512	0	0
NSO	0	531,159	485,155	81,295	0
CSU/TL	0	4,262	448,764	740,569	0
CSU	0	196	2,485	8,179	0
TL	0	500,378	106,688	271,491	0
SLT	0	1,767	0	70	1,101,607
LN	0	3	3	3	0
Non-Forest Inclusions	1,193	1,193	1,193	1,193	1,193
Total	1,102,800	1,102,800	1,102,800	1,102,800	1,102,800

Notes:
1. The primary stipulation is the most restrictive stipulation applied at any particular acreage.
2. NL = No Lease, NSO = No Surface Occupancy, CSU/TL = Overlapping CSU and TL, CSU = Controlled Surface Use, TL = Timing Limitation, SLT = Standard Lease Terms, and LN = Lease Notice.

Concentrated Development Areas – An NSO stipulation would be applied to all active mines, mineral material sites, communication sites, and administrative sites.

Riparian Vegetation – An NSO stipulation would be applied to areas of riparian vegetation. Generally, the riparian zone has an associated boundary width defined by a 75 to 300 feet horizontal buffer.

Motorized Recreation – SLT would be applied to motorized recreation areas.

Nonmotorized Recreation – The SLT would apply.

Developed Recreation Sites – An NSO stipulation would be applied.

Special Use Permit Recreation Sites – An NSO stipulation would be applied to sites such as ski resorts, resorts, summer homes, and organization camps.

Table 2–4 Distribution of Analysis Area Acreage by Resource Area and Stipulation, Alternative 2 — Forest Plan

	Stipulation[1,2]							
Resource Area	NL (acres)	NSO (acres)	CSU/TL (acres)	CSU (acres)	TL (acres)	SLT (acres)	LN (acres)	Total (acres)
Concentrated Development		1,267						1,267
Riparian Vegetation	228	10,566						10,794
Motorized Recreation	44,535	147,394	127		172,332	60		364,448
Non-motorized Recreation	5,709	214,909	706	176	116,771	71		338,342
Developed Sites		1,252						1,252
Special Use Permit Sites		333						333
Wilderness Study Area		47,716	4,262	196				52,174
Recommended/Proposed Wilderness								
Italian Peak & Lionhead	58,511							58,511
Palisades		87,052						87,052
Special Management Areas	5,331							5,331
T&E and Sensitive Species	15,148	33,784			45,541	20	3	94,496
Lakes & Streams	379	17,452						17,831
Unstable Soils		2,778						2,778
Slopes Greater Than 40 Percent	40,850	437,155						478,005
Municipal Watersheds		11,270						11,270
Wild River (Eligible)	2,279	2,823						5,102
Wildlife Seasonal Habitats	63,842	515,370	4,262		500,380			1,083,854
Partial Retention VQO	31,163	124,081	837	196	228,887	1,697		386,861
Retention VQO	17,482	87,910						105,392

Notes:

1. Stipulations, in order of decreasing restrictiveness, are: NL = No Lease, NSO = No Surface Occupancy, CSU/TL = Overlapping CSU and TL, CSU = Controlled Surface Use, TL = Timing Limitation, SLT = Standard Lease Terms, LN = Lease Notice.
2. Many of the 18 resource areas overlap each other within the analysis area. Thus, their assigned stipulations also overlap one another. This table shows the relationships among these overlapping resources and stipulations for this alternative. The portion of each resource area appearing in each column was determined by the most-restrictive stipulation applied to a specific location, regardless of its source. Because of the overlap of resources, the columns cannot be totaled. However, the rows do total across the table. The section *Overlap of Resources* beginning on page 2–11 provides some additional discussion on the overlap of resource areas and stipulations.

? legal

Roadless Areas – Wilderness Study Area (Palisades/Idaho) – An NSO stipulation would be applied to most of this area due to steep slopes and unstable soils. There would be isolated areas available for drilling locations, primarily accessible by helicopter.

Recommended/Proposed Wilderness Area (Italian Peak and Lionhead) – This area would not be available for leasing.

? legal(?)

Recommended/Proposed Wilderness Area (Palisades/Idaho) – An NSO stipulation would be applied to most of this area because of steep slopes and unstable soils. There would be isolated areas available for drilling locations, primarily accessible by helicopter.

Special Management Areas – These areas would not be available for leasing.

Threatened, Endangered, or Proposed Species – A Lease Notice would be attached to the lease to inform the lessee of the potential presence of suitable habitat for species listed as threatened or endangered or proposed for such listing. The lessee may be required to collect baseline information for areas potentially affected by the proposal before the proposed operations are approved. The precise requirements for baseline data collection and monitoring would be determined on a site-specific basis.

Sensitive Species –A Lease Notice would be attached to the lease to inform the lessee of the potential presence of suitable habitat for sensitive species. The lessee may be required to collect baseline information for areas potentially affected by the proposal before the proposed operations are approved. The precise requirements for baseline data collection and monitoring would be determined on a site-specific basis.

Lakes and Streams – An NSO stipulation would be applied to protect water quality and aquatic habitat. In most cases, this stipulation would be included within the riparian vegetation NSO stipulation.

Unstable Soils – An NSO stipulation would be applied to areas of unstable soils. This stipulation would be applied to minimize erosion and sedimentation hazards.

Slopes Greater Than 40 Percent – An NSO stipulation would be applied to areas of unstable soils. This stipulation would be applied to minimize erosion and sedimentation hazards.

– how about the watershed?

Municipal Water Supplies – An NSO stipulation would be applied to all water bodies from which drinking water is withdrawn.

Wildlife Seasonal Habitat – A TL stipulation would be applied to leases within elk and deer winter ranges, elk summer ranges, elk summer concentration areas, elk calving areas, and moose winter ranges. The TL preclude construction activities from certain periods, but would not apply to production activities. Specific dates as they pertain to individual wildlife species are as follows:

➢ Elk/Deer Winter Range	November 30 to April 1 - seems early
➢ Elk Summer Range	April 1 to November 30
➢ Elk Summer Concentration	June 15 to August 15
➢ Elk Calving Area	May 15 to July 15
➢ Moose Winter Range	November 15 to April 30

are there good biological reasons for different dates?

Wild Rivers (Eligible) – An NSO stipulation would be applied along the banks of eligible wild rivers. The Snake River is the only river in this category within the analysis area. The Wild designation applies to approximately 24 river miles bordering the Forest and analysis area boundary adjacent to State Highway 26. The NSO would extend for ¼ mile horizontal distance from the normal high water mark of the river.

Retention VQO – An NSO stipulation would be applied to areas with a VQO of retention.

Partial Retention VQO – SLT would be applied to areas with a VQO of partial retention.

Alternative 3 — Forest Plan Modification 1

This alternative reflects the intent of management direction as presented in the Forest Plan Revision's forest-wide standards, guidelines, and management prescriptions. This alternative responds to the key resource issues identified in the scoping process. Under this alternative, most of the analysis area (95 percent) would be available for leasing (Figure 2–3 [in a map pocket inside the back cover] and Table 2–3). About 44 percent of the analysis area would be available for leasing with an NSO stipulation. Fifty-one percent of the analysis area would be available for leasing with a CSU stipulation, TL stipulation, or combination of CSU and TL stipulations. Table 2–5 shows the distribution of acreage by resource component and stipulation. The following describes stipulations that would be applied to each resource.

Full implementation of the reasonably foreseeable development scenario is not expected to occur under this alternative. The projected exploration is likely to occur in the areas with a low or moderate potential for deposits of oil or gas. However, exploration and the subsequent development of the six-well field in the area with a high potential for oil or gas is not expected to occur. Too much of this area would be covered by an NSO stipulation to allow development of the field, even if exploratory activities found oil or gas. Because field development would be questionable, oil and gas companies are not expected to invest much time or money in exploration in the area with a high potential for oil or gas. Thus, only three wells are likely to be drilled under this alternative. Because all three would be nonproductive, the wells and their associated roads would be reclaimed within three years of disturbance.

Concentrated Development Areas – An NSO stipulation would be applied to all active mines, mineral material sites, communication sites, and administrative sites.

Table 2–5 Distribution of Analysis Area Acreage by Resource Area and Stipulation, Alternative 3 — Forest Plan Modification 1

	Stipulation[1, 2]							
Resource Area	NL (acres)	NSO (acres)	CSU/TL (acres)	CSU (acres)	TL (acres)	SLT (acres)	LN (acres)	Total (acres)
Concentrated Development		1,267						1,267
Riparian Vegetation	101	10,088	546	59				10,794
Motorized Recreation	43,224	138,673	182,469	82				364,448
Non-motorized Recreation	3,838	204,550	129,706	248				338,342
Developed Sites		1,252						1,252
Special Use Permit Sites		333						333
Wilderness Study Area		47,696	4,282	196				52,174
Recommended/Proposed Wilderness								
Italian Peak and Lionhead	58,511							58,511
Palisades		87,052						87,052
Special Management Areas		5,331						5,331
T&E and Sensitive Species	11,074	28,784	50,306	21	4,308		3	94,496
Lakes & Streams	19	17,812						17,831
Unstable Soils		2,778						2,778
Slopes Greater Than 40 Percent	38,442	439,563						478,005
Municipal Watersheds		11,270						11,270
Wild River (Eligible)		5,102						5,102
Wildlife Seasonal Habitats	58,512	469,889	448,765		106,688			1,083,854
Partial Retention VQO	31,16[illegible]	123,876	229,882	1,941				386,861
Retention VQO	17,482	36,892	50,555	463				105,392

Notes:

1. Stipulations, in order of decreasing restrictiveness are: NL = No Lease, NSO = No Surface Occupancy, CSU/TL = Overlapped CSU and TL, CSU = Controlled Surface Use, TL = Timing Limitation, SLT = Standard Lease Terms, and LN = Lease Notice.
2. Many of the 18 resource areas overlap each other within the analysis area. Thus, their assigned stipulations also overlap one another. This table shows the relationships among these overlapping resources and stipulations for this alternative. The portion of each resource area appearing in each column was determined by the most-restrictive stipulation applied to a specific location, regardless of its source. Because of the overlap of resources, the columns cannot be totaled. However, the rows do total across the table. The section *Overlap of Resources* beginning on page 2–11 provides some additional discussion on the overlap of resource areas and stipulations.

Riparian Vegetation –A CSU stipulation would be applied to all riparian vegetation. Generally, the riparian zone has an associated boundary width defined by a 75 to 300 feet horizontal buffer.

Motorized Recreation – A CSU stipulation would be applied to motorized recreation areas. Construction activities would be limited to periods that minimize conflicts with present uses of the areas.

Nonmotorized Recreation – A CSU stipulation would apply to nonmotorized recreation areas. The stipulation would require activities to be located and operations conducted in a manner that would avoid or minimize the effects on the non-motorized characteristics of these areas. Also, the design and reclamation plans for the activities would have to provide for adequate mitigation.

Developed Recreation Sites – An NSO stipulation would be applied.

Special Use Permit Recreation Sites – An NSO stipulation would be applied to sites such as ski resorts, resorts, summer homes, and organization camps.

Roadless Areas – Wilderness Study Area (Palisades/Idaho) – An NSO stipulation would be applied to most of this area due to steep slopes and unstable soils. There would be isolated areas available for drilling locations, primarily accessible by helicopter.

Recommended/Proposed Wilderness Area (Italian Peak and Lionhead) – This area would not be available for leasing.

Recommended/Proposed Wilderness Area (Palisades/Idaho) – An NSO stipulation would be applied to most of this area because of steep slopes and unstable soils. There would be isolated areas available for drilling locations, primarily accessible by helicopter.

Special Management Areas – An NSO stipulation would be applied to all areas.

Threatened, Endangered, or Proposed Species – A Lease Notice would be attached to the lease to inform the lessee of the potential presence of suitable habitat for species listed as threatened or endangered or proposed for such listing. The lessee may be required to collect baseline information for areas potentially affected by the proposal before the proposed operations are approved. The precise requirements for baseline data collection and monitoring would be determined on a site-specific basis.

Sensitive Species – A stipulation for CSU would be applied to leases that contain sensitive species or their habitats. The CSU stipulation would require activities to be located and operations conducted in a manner that would minimize the effects on these species and would not result in a downward trend toward listing.

Lakes and Streams – An NSO stipulation would be applied to protect water quality and aquatic habitat. In most cases, this stipulation would be included within the riparian vegetation NSO stipulation.

Unstable Soils – An NSO stipulation would be applied to areas of unstable soils. This stipulation would be applied to minimize erosion and sedimentation hazards.

Slopes Greater Than 40 Percent – An NSO stipulation would be applied to slopes of 40 percent or greater to minimize the potential for erosion and to enable or ensure the site's reclamation. (?)

Municipal Water Supplies – An NSO stipulation would be applied to all water bodies from which drinking water is withdrawn.

Wildlife Seasonal Habitat – A TL stipulation would be applied to leases within elk and deer winter ranges, elk summer ranges, elk summer concentration areas, elk calving areas, and moose winter ranges. The TL would exclude construction activities from certain periods, but would not apply to production activities. Specific dates as they pertain to individual wildlife species are as follows:

➢ Elk/Deer Winter Range	November 30 to April 1 *
➢ Elk Summer Range	April 1 to November 30
➢ Elk Summer Concentration	June 15 to August 15
➢ Elk Calving Area	May 15 to July 15
➢ Moose Winter Range	November 15 to April 30 *

Wild Rivers (Eligible) – An NSO stipulation would be applied along the banks of eligible wild rivers. The Snake River is the only river in this category within the analysis area. The Wild designation applies to approximately 24 river miles bordering the Forest and analysis area boundary adjacent to State Highway 26. The NSO would extend for ¼ mile horizontal distance from the normal high water mark of the river.

Retention VQO – A CSU stipulation would be applied to areas with a VQO of retention. The stipulation would require that proposed activities within these areas must be designed or located in such a manner as to meet the objective of retention within one year.

Partial Retention VQO – A CSU stipulation would be applied to areas with a VQO of partial retention. The stipulation would require that proposed activities within these areas must be designed or located in such a manner as to meet the objective of partial retention within one year.

Alternative 4 — Forest Plan Modification 2

This alternative was developed in response to the Issue #12 relating to the effects of leasing decisions on the opportunities to explore for and develop oil and gas resources within the Forest. Under this alternative, all lands in the analysis area would be available for leasing (Figure 2–4 [in a map pocket inside the back cover] and Table 2–3). Most of the area (71 percent) would be leased with a CSU stipulation, TL stipulation, or combination of CLS and TL stipulations (Table 2–3). About 15 percent would be available for leasing with the NSO stipulation. The following describes stipulations that would be applied to each resource. Table 2–6 shows the distribution of acreage by resource component and stipulation.

Full development of the reasonably foreseeable development scenario would occur under this alternative. Sufficient acreage without an NL or NSO stipulation would exist within the area with a high potential for oil or gas for an oil or gas company to develop the scenario's six-well field. Thus, oil and gas companies could be expected to invest the time and money necessary to explore for and develop deposits of oil or gas in the area with the high potential for these resources.

Concentrated Development Areas – A CSU stipulation would be applied to all active mines, mineral material sites, communication sites, and administrative sites. The stipulation would require that any activities be located so as to avoid or minimize impacts to these areas and that the design and reclamation plans for the activities provide for mitigation.

Riparian Vegetation – A CSU stipulation would be applied to all riparian vegetation. Generally, the riparian zone has an associated boundary width defined by a 75 to 300 feet horizontal buffer.

Motorized Recreation – SLT would be applied to motorized recreation areas.

Non-motorized Recreation – SLT would apply to non-motorized recreation areas.

Developed Recreation Sites – SLT would apply.

Special Use Permit Recreation Sites – A CSU stipulation would be applied to sites such as resorts, summer homes, and organization camps. The stipulation would require that any activities be located so as to avoid or minimize impacts to these areas. Also, the design and reclamation plans for the activities would have to provide for mitigation.

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Roadless Areas – Wilderness Study Area (Palisades/Idaho) – A CSU stipulation would apply. The stipulation would require that any activities be located so as to avoid or minimize impacts to the roadless/wilderness characteristics of these areas and that the design and reclamation plans for the activities provide for mitigation.

Recommended/Proposed Wilderness Area (Italian Peak and Lionhead) –An NSO stipulation would be applied to most of this area because of steep slopes and unstable soils. There would be isolated areas available for drilling locations, primarily accessible by helicopter.

Recommended/Proposed Wilderness Area (Palisades/Idaho) – A CSU stipulation would be applied to most of this area because of steep slopes and unstable soils. There would be isolated areas available for drilling locations, primarily accessible by helicopter.

Table 2–6 Distribution of Analysis Area Acreage by Resource Area and Stipulation, Alternative 4 — Forest Plan Modification 2

	Stipulation[1, 2]							
Resource Area	NL (acres)	NSO (acres)	CSU/TL (acres)	CSU (acres)	TL (acres)	SLT (acres)	LN (acres)	Total (acres)
Concentrated Development		49	1,212	6				1,267
Riparian Vegetation		9,522	1,203	69				10,794
Motorized Recreation		44,980	225,261	410	93,777	20		364,448
Non-motorized Recreation		11,879	251,762	3,626	71,025	50		338,342
Developed Sites		49	1,198	5				1,252
Special Use Permit Sites		33	299	1				333
Wilderness Study Area		3	50,694	1,477				52,174
Recommended/Proposed Wilderness								
Italian Peak & Lionhead		58,511						58,511
Palisades		112	86,530	410				87,052
Special Management Area 18 - Snake River		5,331						5,331
T&E and Sensitive Species		16,823	65,496	345	11,809	20	3	94,496
Lakes & Streams		17,831						17,831
Unstable Soils		5	2,725	48				2,778
Slopes Greater Than 40 Percent		40,924	431,878	5,203				478,005
Municipal Watersheds		1	9,888	1,381				11,270
Wild River (Eligible)		2,686	2,416					5,102
Wildlife Seasonal Habitats		71,794	740,569		271,490			1,083,853
Partial Retention VQO		31,437	351,651	3,773				386,861
Retention VQO		17,944	85,596	1,852				105,392

Notes:

1. Stipulations, in order of decreasing restrictiveness, are: NL = No Lease, NSO = No Surface Occupancy, CSU/TL = Overlapping CSU and TL, CSU = Controlled Surface Use, TL = Timing Limitation, SLT = Standard Lease Terms, and LN = Lease Notice.
2. Many of the 18 resource areas overlap each other within the analysis area. Thus, their assigned stipulations also overlap one another. This table shows the relationships among these overlapping resources and stipulations for this alternative. The portion of each resource area appearing in each column was determined by the most-restrictive stipulation applied to a specific location, regardless of its source. Because of the overlap of resources, the columns cannot be totaled. However, the rows do total across the table. The section *Overlap of Resources* beginning on page 2–11 provides some additional discussion on the overlap of resource areas and stipulations.

Special Management Areas – An NSO stipulation would apply for this special management area along the banks of the Snake River.

Threatened, Endangered, or Proposed Species – A Lease Notice would be attached to the lease to inform the lessee of the potential presence of suitable habitat for species listed as threatened or endangered or proposed for such listing. The lessee may be required to collect baseline information for areas potentially affected by the proposal before the proposed operations are approved. The precise requirements for baseline data collection and monitoring would be determined on a site-specific basis.

Sensitive Species – A stipulation for CSU would be applied to leases that contain sensitive species or their habitats. The CSU stipulation would require activities to be located and operations conducted in a manner that would minimize the effects on these species and would not result in a downward trend toward listing.

Lakes and Streams – An NSO stipulation would be applied to protect water quality and aquatic habitat.

Unstable Soils – A CSU stipulation would be applied to areas of unstable soils. This stipulation would be applied to minimize erosion and sedimentation hazards.

Slopes Greater Than 40 Percent – A CSU stipulation would be applied to slopes of 40 percent or greater to minimize the potential for erosion and to enable or ensure the site's reclamation.

Municipal Water Supplies – A CSU stipulation would be applied to all water bodies from which drinking water is withdrawn.

Wildlife Seasonal Habitat – A TL stipulation would be applied to leases within elk and deer winter ranges, elk summer ranges, elk summer concentration areas, elk calving areas, and moose winter ranges. The TL would exclude construction activities from certain periods, but would not apply to production activities. Specific dates as they pertain to individual wildlife species are as follows:

➢ Elk/Deer Winter Range	November 30 to April 1
➢ Elk Summer Range	April 1 to November 30
➢ Elk Summer Concentration	June 15 to August 15
➢ Elk Calving Area	May 15 to July 15
➢ Moose Winter Range	November 15 to April 30

Wild Rivers (Eligible) – A CSU stipulation would be applied along the banks of eligible wild rivers. The Snake River is the only river in this category within the analysis area. The Wild designation applies to approximately 24 river miles bordering the Forest and analysis area boundary adjacent to State Highway 26. The CSU stipulation would extend for ¼ mile horizontal distance from the normal high water mark of the river.

Retention VQO – A CSU stipulation would be applied to areas with a VQO of retention. The stipulation would require that proposed activities within these areas must be designed or located in such a manner as to meet the objective of retention within one year.

Partial Retention VQO – A CSU stipulation would be applied to areas with a VQO of partial retention. The stipulation would require that proposed activities within these areas must be designed or located in such a manner as to meet the objective of partial retention within one year.

Alternative 5 — Standard Lease Terms

This alternative is basically the opposite of Alternative 1, in which no lands would be available for leasing. Under this alternative, all lands would be made available for leasing and would be leased under SLT. No extra stipulations would be applied. Mitigation of impacts on resources would be based on existing laws, such as the Clean Water Act, the Clean Air Act, and the Endangered Species Act. Under this alternative, surface facilities could be moved up to 200 meters from the planned location and construction could be delayed up a maximum of 60 days. Table 2–7 lists the acreages by resource component and stipulation.

Full development of the reasonably foreseeable development scenario would occur under this alternative. Sufficient acreage without an NL or NSO stipulation would exist within the area with a high potential for oil or gas for an oil or gas company to develop the scenario's six-well field. Thus, oil and gas companies could be expected to invest the time and money necessary to explore for and develop deposits of oil or gas in the area with the high potential for these resources.

Comparison of Alternatives

This section presents a comparison of the five alternatives analyzed for the impacts of oil/gas leasing scenarios in tabular format. Table 2 – 8 summarizes the results of the analyses described in Chapter 4 of this DEIS. Also, the table focuses on the 12 primary issues identified as being specifically used to compare the alternatives.

Table 2–7 Distribution of Analysis Area Acreage by Resource Area and Stipulation, Alternative 5 — Standard Lease Terms

	Stipulation[1]							
Resource Area	NL (acres)	NSO (acres)	CSU/TL (acres)	CSU (acres)	TL (acres)	SLT (acres)	LN (acres)	Total (acres)
Concentrated Development						1,267		1,267
Riparian Vegetation						10,794		10,794
Motorized Recreation						364,448		364,448
Non-motorized Recreation						338,342		338,342
Developed Sites						1,252		1,252
Special Use Permit Sites						333		333
Wilderness Study Area						52,174		52,174
Recommended/Proposed Wilderness						145,563		145,563
Special Managements						5,331		5,331
T&E and Sensitive Species						94,496		94,496
Lakes & Streams						17,831		17,831
Unstable Soils						2,778		2,778
Slopes Greater Than 40 Percent						478,005		478,005
Municipal Watersheds						11,270		11,270
Wild River (Eligible)						5,102		5,102
Wildlife Seasonal Habitats						1,083,564		1,083,564
Partial Retention VQO						386,861		386,861
Retention VQO						105,392		105,392

Notes:
1. Stipulations, in order of decreasing restrictiveness, are: NL = No Lease, NSO = No Surface Occupancy, CSU/TL = Overlapping CSU and TL, CSU = Controlled Surface Use, TL = Timing Limitation, SLT = Standard Lease Terms, and LN = Lease Notice.

Table 2–8 Comparison of Alternatives by Issue

Issue	Alternative 1	2	3	4	5
1. Effects on threatened, endangered, candidate, or sensitive (TECS) species of plants and animals.	No direct or indirect effects would occur	Under all action alternatives, short- and long-term effects may occur to TECS species, depending upon the location and timing of oil and gas activities. However, none of the effects would jeopardize the continued existence of any listed or proposed species.			
2. Effects on species of wildlife and their habitats (particularly key habitats).	No direct or indirect effects would occur.	Up to 99 acres of key habitats could be affected, depending upon the ultimate location of oil and gas activities. Most of this acreage would experience short-term effects. Because of the TL stipulation, effects to physically-undisturbed habitats would be minor. Unrelated NSO stipulations would provide some additional protection for key habitats.	Up to 99 acres of key habitats could be affected, depending upon the ultimate location of oil and gas activities. Most of this acreage would experience short-term effects. Because of the TL stipulation, effects to physically-undisturbed habitats would be minor. Unrelated NSO stipulations would provide some additional protection for key habitats.	Up to 433 acres of key habitats could be affected, depending upon the ultimate location of oil and gas activities. Most of this acreage would experience short-term effects. Because of the TL stipulation, effects to physically-undisturbed habitats would be minor. The NSO stipulations included under Alternatives 2 and 3 would not occur. Thus, more key wildlife habitat would be available for oil and gas activities.	Up to 433 acres of key habitats could be affected, depending upon the ultimate location of oil and gas activities. However, the SLT would not ensure the animals are protected when seasonal habitats are occupied (as provided by the TL stipulation in Alternatives 2, 3, & 4). Thus, this alternative has the highest potential for short- and long-term effects.
3. Effects on the Forest's ecological integrity and biological diversity.	No direct or indirect effects would occur.	All of these action alternatives would directly disturb up to 433 acres. About 135 acres of this disturbance would be long term. Overall, the disturbance would be distributed across the low, moderate, and high potential areas. Depending upon the ultimate location of oil and gas activities, fragmentation of habitats could occur.			

Table 2–8 **Comparison of Alternatives by Issue**

	Alternative				
Issue	1	2	3	4	5
4. Effects on roadless areas and other potential wilderness areas.	No direct or indirect effects would occur.	Up to 334 acres of direct disturbance could occur roadless areas in the high potential area (primarily the Palisades and Garns Mountain RAs), depending upon the ultimate location of oil and gas activities. However, most of the roadless resource is protected by unrelated NSO stipulations. Because no roads were previously constructed in the Palisades RA, any oil and gas activities occurring in this area would be very evident.	Up to 334 acres of direct disturbance could occur roadless areas in the high potential area (primarily the Palisades and Garns Mountain RAs), depending upon the ultimate location of oil and gas activities. As with Alternative 2, most of the roadless resource is protected by unrelated NSO stipulations. Because no roads were previously constructed in the Palisades RA, any oil and gas activities occurring in this area would be very evident.	Although roadless areas are protected by a CSU stipulation (similar to Alternatives 2 & 3), a similar level of protection as was provided by the NSO stipulations under Alternatives 2 & 3 would not exist. Thus, more of the roadless area acreage would be effectively available for oil and gas activities. The degree of short- and long-term effects that would occur depend upon the ultimate location of the proposed oil and gas activities in roadless areas.	This alternative has the highest potential for adverse effects to roadless areas. No CSU stipulation is included to require the location of oil and gas activities to avoid or minimize effects to roadless areas. However, as with the other alternatives, the types and degrees of effects that would occur depend upon the ultimate location of oil and gas activities in or near the roadless areas.

Table 2–8 Comparison of Alternatives by Issue

Issue	Alternative 1	2	3	4	5
5. Effects on transportation and the need for additional roads being built within the Forest.	No direct or indirect effects would occur.	As many as 18 miles of new roads could be constructed under this alternative. All would be obliterated and reclaimed over the short term. Because of NSO stipulations associated with other resources, most of the analysis area (>90%) effectively would be closed to roads because no wells would be allowed in those areas.	As many as 18 miles of new roads could be constructed under this alternative. All would be obliterated and reclaimed over the short term. Because of NSO stipulations associated with other resources, most of the analysis area (>90%) effectively would be closed to roads because no wells would be allowed in those areas.	As many as 60 miles of new roads could be constructed under this alternative. All but 12 miles would be obliterated and reclaimed over the short term. Unlike Alternatives 2 & 3, NSO stipulations associated with other resources would exclude wells from only a small portion of the analysis area (<1%). Thus, the potential for roads to be constructed over a larger portion of the analysis area is higher under this alternative.	As many as 60 miles of new roads could be constructed under this alternative. All but 12 miles would be obliterated and reclaimed over the short term. Road construction and design would have to meet Forest Plan standards and guidelines.

Issue	Alternative 1	2	3	4	5
6. Effects on recreational opportunities and the recreational experience.	No direct or indirect effects would occur.	The effects to recreation depend on the ultimate location of the oil and gas activities. Coincidental NSO stipulations associated with other resources would exclude wells from most of the analysis area and would effectively exclude roads from most of that area as well. However, if construction occurred in ROS II (non-motorized) areas, management objectives may not be met.	The effects to recreation depend on the ultimate location of the oil and gas activities. Coincidental NSO stipulations associated with other resources would exclude wells from most of the analysis area and would effectively exclude roads from most of that area as well. Unlike under Alternative 2, in areas where oil and gas activities could occur, recreational activities would be protected by TL and CSU stipulations.	The potential for adverse short- and long-term effects to recreational opportunities is considerably higher under this alternative relative to Alternatives 2 & 3. Most of the analysis area (99%) would be available for oil and gas activities without any NSO stipulations. Also, the protection provided by the TL and CSU stipulations included with Alternative 3 would not be available under this alternative.	The potential for adverse short- and long-term effects to recreation is greatest under this alternative. All of the analysis area would be available for oil and gas activities without any stipulations in excess of SLT. As with all action alternatives, the actual effects that would occur still depend upon the ultimate location of oil and gas activities proposed by the lessees.
7. Effects on wetlands and riparian areas.	No direct or indirect effects would occur.	Wetlands and riparian areas would be protected by NSO stipulations. Thus, adverse effects would be limited to those associated with crossings by linear features.	Wetlands and riparian areas would be protected by NSO stipulations. Thus, adverse effects would be limited to those associated with crossings by linear features.	Wetlands and riparian areas would be protected by a combination of NSO and CSU stipulations.	Wetlands and riparian areas under 40 acres in size would be adequately protected by SLT. However, wetlands and riparian areas larger than 40 acres may experience adverse effects, depending upon the ultimate location of oil and gas activities proposed by the lessees.

Table 2–8 **Comparison of Alternatives by Issue**

Issue	Alternative 1	2	3	4	5
8. Effects on the Forest's visual resources.	No direct or indirect effects would occur.	More than 90% of the areas classified with the Partial Retention and Retention VQOs would be protected from the development of wells by NSO stipulations. Because the construction of roads is highly unlikely without the wells, most of these VQO areas would also be protected from the construction of roads and ancillary facilities. However, the actual degree of effects depends upon the ultimate location of oil and gas activities proposed by lessees.	Adverse effects from up to 433 acres of physical disturbance in Partial Retention and Retention areas would be short term in nature. These areas would be protected by a CSU stipulation requiring that proposed activities be designed or located in such a manner as to meet the objectives of Retention and Partial Retention within one year.	Adverse effects from up to 433 acres of physical disturbance in Partial Retention and Retention areas would be short term in nature. These areas would be protected by a CSU stipulation requiring that proposed activities be designed or located in such a manner as to meet the objectives of Retention and Partial Retention within one year.	This alternative has the highest potential for adverse effects to Retention and Partial Retention areas. No CSU stipulation is included. Thus, effects could be long term. Also, no NSO stipulations are included. As with all action alternatives, the actual degree of effect depends upon the ultimate location of oil and gas activities proposed by the lessees.

Table 2–8 **Comparison of Alternatives by Issue**

Issue	Alternative 1	2	3	4	5
9. Effects on fisheries and aquatic habitat.	No direct or indirect effects would occur.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects from sedimentation would be limited because steep slopes and unstable soils would be excluded from surface occupancy (NSO). Also, implementation of BMPs would minimize potential impacts of crossings. A low potential would exist for spills of oil or similar pollutants.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects from sedimentation would be limited because steep slopes and unstable soils would be excluded from surface occupancy (NSO). Also, implementation of BMPs would minimize potential impacts of crossings. A low potential would exist for spills of oil or similar pollutants.	Steep slopes and unstable soils would be protected by a CSU stipulation that would require avoidance and minimization. However, because activities could occur in these areas, the potential for impacts on fisheries, primarily from sedimentation, is higher than under Alternatives 2 or 3. Effects from the construction of crossings would be minimized through the use of BMPs. The ultimate level of impacts still would depend upon the proposed location of oil and gas activities.	The potential for adverse effects from sedimentation associated with physical disturbance would be greatest under this alternative. No requirement exists to avoid or minimize work on steep slopes and unstable soils. Thus, depending upon the ultimate location of oil and gas activities, adverse effects could be substantially higher than under Alternatives 2, 3, or 4.

Table 2–8 Comparison of Alternatives by Issue

Issue	Alternative 1	2	3	4	5
10. Effects on soils, water, and air quality.	No direct or indirect effects would occur.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects to soils and water would be limited because steep slopes and unstable soils would be excluded from surface occupancy (NSO). Also, implementation of BMPs would minimize potential impacts of crossings. Increases in concentrations of particulates, NO_x, and CO would result in minor effects to the region's air quality.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects to soils and water would be limited because steep slopes and unstable soils would be excluded from surface occupancy (NSO). Also, implementation of BMPs would minimize potential impacts of crossings. Increases in concentrations of particulates, NO_x, and CO would result in minor effects to the region's air quality.	Steep slopes and unstable soils would be protected by a CSU stipulation that would require avoidance and minimization. However, because activities could occur in these areas, the potential for impacts on soils and water (primarily from erosion and sedimentation) is higher than under Alternatives 2 or 3. Effects from the construction of stream crossings would be minimized through the use of BMPs. The ultimate level of impacts still would depend upon the proposed location of oil and gas activities. Increases in concentrations of particulates, NO_x, and CO would result in minor effects to the region's air quality.	The potential for adverse effects to soils and water would be greatest under this alternative. No requirement exists to avoid or minimize work on steep slopes and unstable soils. Thus, depending upon the ultimate location of oil and gas activities, adverse effects (primarily erosion and sedimentation) could be substantially higher than under Alternatives 2, 3, or 4. Increases in concentrations of particulates, NO_x, and CO would result in minor effects to the region's air quality.

Table 2–8 Comparison of Alternatives by Issue

Issue		Alternative 1	2	3	4	5
11.	Interaction with geologic hazards (e.g. steep slopes and earthquakes).	No direct or indirect effects would occur.	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects would be limited because steep slopes would be excluded from surface occupancy (NSO).	Although the ultimate level of impact depends upon the location of oil and gas activities proposed by lessees, the potential for adverse effects would be limited because steep slopes would be excluded from surface occupancy (NSO).	Steep slopes would be protected by a CSU stipulation that would require avoidance and minimization. However, because activities could occur in these areas, the potential for impacts (primarily slope failure) is higher than under Alternatives 2 or 3. The ultimate level of impacts still would depend upon the proposed location of oil and gas activities.	The potential for adverse effects from geologic hazards would be greatest under this alternative. No requirement exists to avoid or minimize work on steep slopes. Thus, depending upon the ultimate location of oil and gas activities, adverse effects (primarily slope failure) could be substantially higher than under Alternatives 2, 3, or 4.
12.	The effects of the Federal leasing decisions on the opportunities to explore for and develop oil and gas resources within the analysis area.	This alternative would eliminate all opportunities to explore for and develop oil and gas resources in the analysis area.	This alternative would severely restrict opportunities to explore for and develop oil and gas resources in the high potential area. Exploration and development of oil and gas resources would then be focused in the low to moderate potential areas.	Although this alternative would still severely restrict opportunities to explore for and develop oil and gas resources in the high potential area, greater opportunities would exist than under Alternative 2. Exploration and development of oil and gas resources would still be focused in the low to moderate potential areas.	This alternative would not severely restrict the opportunities to explore for and develop oil and gas resources.	This alternative would result in little reduction in the opportunities to explore for and develop oil and gas resources.

Chapter 3

Affected Environment

Chapter 3 — Affected Environment

This chapter describes the environment of the area that may be affected by implementation of the alternatives described in Chapter 2. This information served as the base line from which the potential effects of the alternatives were determined. All resources relevant to the issues and alternatives are addressed. However, the discussions focus on elements related to the key issues identified during scoping and described in Chapter 2. The affected environment consists of physical, biological, social, and economic components.

The area considered in this analysis encompassed 1,102,828 acres of the Targhee National Forest in Idaho and Wyoming. The analysis area encompassed all or parts of four Ranger Districts. They are the Dubois, Island Park, Teton Basin, and Palisades Ranger Districts.

Forest Service Mineral Program Policy

On August 3, 1995, Chief Jack Ward Thomas signed a Minerals Program Policy. This policy focuses on ecosystem management in relation to minerals activities. The policy statement reiterates the 1970 Mining and Minerals Policy Act while emphasizing the Forest Service's responsibility to administer the minerals program within the overall context of the principles of ecosystem management. The Act directs Federal agencies to "foster and encourage private enterprise in the development of economically sound and stable industries and in the orderly and economic development of domestic resources to help assure satisfaction of industrial, security, and environmental needs." The policy statement recognizes the human component of ecosystem management and the need for energy and minerals, making it clear that mineral activities and ecosystem management are not mutually exclusive. Thus, the Forest Service will administer its minerals program to provide commodities for current and future generations commensurate with the need to sustain the long-term health and biological diversity of ecosystems.

Forest Plan Management Direction

The Forest Plan (Forest Service 1985a) guides the management activities for natural resources and establishes management standards and guidelines for the Targhee National Forest. It describes resource management practices, levels of resource production and management practices, and the availability and suitability of lands for resource management. Finally, the Forest Plan provides Forest-wide goals and objectives and standards and guidelines.

The following discussion highlights the Forest-wide goals and objectives and the standards and guidelines most relevant to the issues, proposed action, and alternatives presented in this EIS.

Geology and Minerals

The primary goal is to integrate the exploration and development of mineral and energy resources on the Forest with the use and protection of other resource values. The management direction includes:

- ➢ assign specific stipulations to mineral activities, as necessary, to protect other resources;
- ➢ coordinate activities to minimize adverse effects in sensitive wildlife areas;
- ➢ minimize activities and effects in areas with special environmental concerns, such as on steep slopes, in riparian areas, and in areas with high mass instability;
- ➢ prohibit activity during muddy or wet periods; and
- ➢ control or limit surface uses in areas with ROS I or VQO Retention or Partial Retention designations.

Soils

The primary goal is to minimize soil erosion and maintain soil productivity. Management direction includes:

- ➢ prohibit occupancy on lands identified in soil resource inventories as exhibiting high mass stability hazard, when the hazard is verified on-site;
- ➢ permit occupancy on lands identified in soil resource inventories as exhibiting moderate mass stability hazard, when the hazard is verified on-site, only when it can be shown that project design can satisfactorily mitigate or prevent potential soil movement; and
- ➢ evaluate soil moisture, where soil compaction is a factor or where available moisture is critical to meet project objectives, before projects are implemented.

Water Resources

The primary goal is to protect, conserve, and enhance water resources. Emphasis is on meeting water quality and quantity standards on site and off site, to reduce pollution, and minimize stream sedimentation. In addition to the management direction for soils, management direction for water resources includes:

- ➢ prohibit projects that would adversely modify a stream channel's gradient, width, or bank or bed stability beyond the immediate project area;
- ➢ implement Best Management Practices and monitor their effects;
- ➢ prohibit the construction of oil or gas wells within the 100-year floodplain;
- ➢ follow the guidelines established by Executive Orders 11988 and 11990 on projects involving floodplains or wetlands; and
- ➢ maintain or improve the quality of water in all water bodies.

Vegetation

Vegetation is an integral part of all management activities on the Forest because vegetation is grazed, is harvested, and provides wildlife habitats. The primary goals for vegetation on the Forest are:

- manage vegetation resources in coordination with other resources and uses;
- manage range resources to optimize the production and use of forage on all suitable range and provide for wildlife needs in harmony with other resources and uses;
- follow the guidelines established by Executive Orders 11988 and 11990 on projects involving floodplains or wetlands; and
- manage riparian areas to maintain or enhance riparian vegetation, aquatic habitat, and water quality.

Management direction includes:

- control noxious weeds to maintain range in good vegetative condition;
- provide adequate forage to meet big game population objectives; and
- minimize road construction within riparian areas.

Wildlife and Fish

The primary goals for wildlife and fish on the Forest are to:

- provide a variety and diversity of habitats necessary to support viable populations of existing wildlife and meet State population objectives; and
- improve wildlife habitats through specific wildlife habitat improvement projects.

Management direction includes:

- provide enough forage to feed the target populations of big game animals;
- maintain sufficient cover on big game seasonal ranges to support big game population objectives of State Game and Fish Departments;
- reduce human disturbance of wildlife during critical periods;
- coordinate oil and gas activities to minimize adverse effects in sensitive wildlife areas;
- improve riparian areas to maintain and improve fisheries habitat; and
- monitor activities on the Forest to ensure fish and wildlife management objectives are being met.

Threatened, Endangered, or Sensitive Species

The primary goals are to:

- ➢ provide habitat to contribute toward a recovered population of threatened or endangered species where essential habitats for these species exist on the Forest; and
- ➢ ensure populations of species listed as sensitive by the Regional Forester do not trend toward threatened or endangered status because of activities on the Forest.

Management direction includes:

- ➢ manage identified habitat on the Forest to aid in the recovery of populations of threatened or endangered species;
- ➢ manage delineated Situation I, II, and III grizzly habitat in accordance with "Guidelines for Management Involving Grizzly Bear in the Greater Yellowstone Area" and the Targhee Threatened and Endangered Species Management Plan;
- ➢ cooperate with other agencies in developing recovery plans and habitat management guidelines;
- ➢ apply seasonal use restrictions within key habitats to prevent disturbances;
- ➢ design resource activities to maintain or enhance key habitat elements;
- ➢ restrict the use of toxic chemicals within key habitats and regulate use in adjacent areas; and
- ➢ identify and protect key feeding areas, such as wet meadows, ponds, and streams.

Transportation System

The primary goal is to provide and maintain roads and bridges in support of resource management and protection needs. Management direction includes:

- ➢ manage the Forest development road system to a maintenance level that meets resource needs;
- ➢ obliterate temporary roads when specific resource management needs justifying continued use have been achieved;
- ➢ include transportation analyses as an integral part of all proposed project planning with access needs;
- ➢ Forest roads shall be designed to serve the projected traffic requirements at the lowest cost for transportation consistent with environmental protection and safety consideration;
- ➢ manage access roads constructed for oil and gas exploration in the following manner;
  - a. Roads located in Recreation Opportunity Spectrum (ROS) categories I, II, and III will require that the road prism be restored to the original surface contour and pre-road vegetation reestablished upon completion of the exploration activity.
  - b. Roads located in ROS categories IV and V will be obliterated or retained based on an analysis of future need.

c. Access roads may be retained and added to the system if an environmental assessment indicated a management need for the road.
d. Before any road is constructed or reconstructed, they shall meet the requirements outlined in the "Forest Service Specification for Construction of Roads and Bridges Book." All designs will be approved and signed off on by the Forest Engineer, prior to beginning any such work.

Recreation

The primary goal is to provide a broad range of outdoor recreational opportunities for both developed and dispersed activities for all segments of the public. The Recreation Opportunity Spectrum (ROS) is used on the forest as a guideline for the management of recreational resources. Management direction includes:

- ➢ manage Forest Service developed sites to provide for 90 percent of the Persons at One Time (PAOT) capacity open to the user public during the managed season of use;
- ➢ protect, manage, and provide trails and other access to the scenic and cultural resources of the Forest;
- ➢ manage dispersed recreation activities and areas to provide a diversity of recreational opportunities ranging from primitive to rural according to the ROS system; and
- ➢ minimize conflicts between uses.

Visual Resources

Visual resources are an integral part of the management direction for the Forest. Protection of the visual quality is a priority. The Forest Service Visual Management System (VMS) is used as a guideline for the management of visual resources. The primary management direction is to manage the visual landscape in accordance with the planned visual quality objectives (VQO).

Roadless Areas

The management direction for roadless areas depends on whether the area has been recommended for wilderness designation. Areas recommended for wilderness are managed to protect the wilderness characteristics until such a time as Congress acts on the recommendation. Roadless areas identified for nonwilderness (NW) management are available for the full range of resource activities. Roadless areas identified for roadless management will be managed as undeveloped, but without formal wilderness classification. Mineral leases will be issued, but will contain stipulations to return facilities, such as roads and drill pads, to their former natural condition.

Cultural Resources

The primary goal is to protect cultural resources from disturbance and vandalism. Management direction includes:

- prevent loss or damage of cultural resources until they can be evaluated for significance and appropriate uses;
- identify and nominate significant Forest sites and structures for the National Register of Historic Places;
- manage sites and structures to maintain their recreational, educational, social, and scientific values; and
- complete surveys and evaluations of sensitive areas before authorizing ground-disturbing activities.

Physiography, Geology, and Minerals

This section addresses:

Issue 11 – The interaction of oil and gas leasing, including possible subsequent activities associated with exploration and development, with geologic hazards (e.g. steep slopes and earthquakes).

Physiography

The analysis area is located within two physiographic provinces. Those portions of the analysis area located along and near the Idaho–Montana state line north and west of St. Anthony, Idaho lie within the Northern Rocky Mountains Province. The portions located along and near the Idaho–Wyoming state line southeast of St. Anthony lie within the Middle Rocky Mountains Province.

The Northern Rocky Mountains Province is characterized by high mountain ranges with deep and wide intermontane valleys. These mountains are comprised of folded and faulted sedimentary and volcanic rocks. The highest elevations have been glaciated.

Several principal mountain ranges occupy the portion of the analysis area in the Northern Rocky Mountain Province. The Lemhi Range (highest elevation 12,200 feet) and the Beaverhead Mountains (highest elevation 11,400 feet) are northwesterly trending. The Centennial Mountains (highest elevation 9,900 feet) trend east-west along the Continental Divide between Idaho and Montana. The Henry's Lake Mountains (highest elevation 10,250 feet) straddle the Continental Divide forming a semi-circle around Henry's Lake. The lowest elevations (approximately 5,800 to 6,500 feet) are found in stream valleys near the margins of this portion of the analysis area. Local relief is 3,000 to 6,000 feet.

The portion of the analysis area located within the Middle Rocky Mountains Province is characterized by complexly folded and faulted high mountain ranges with narrow valleys. These mountain ranges are separated by the northwest-flowing Snake River. Northeast of the river are the Big Hole Mountains, Snake River Mountains, and other faulted, northwest-trending ranges. Elevations range from 5,000 feet in the Snake River valley to more than 10,000 feet. The Caribou Mountains, a series of folded northwest trending ridges, are found southwest of the Snake River. Elevations range from 5,250 feet in the Snake River valley to 9,500 feet.

Geology

The geology of the analysis area is complex. It evolved through the uplifting, folding, and faulting of sedimentary, igneous, and metamorphic bedrock during the formation of the Rocky Mountains. The formation of the Rocky Mountains occurred during the late Cretaceous and early Tertiary periods. The form of the present landscape has been further shaped by alpine glaciation, surface runoff of precipitation, stream erosion, and slope failure.

The Lemhi and Beaverhead Ranges were formed by late Cretaceous and Paleocene thrust faulting. This faulting uplifted and deformed Paleozoic sedimentary rocks. Normal faulting has continued to modify these ranges since their initial uplift.

Strata in the Centennial, Big Hole, and Snake River Mountains consist of Mesozoic and Paleozoic sedimentary rocks. At the southern end of the Centennial Mountains, these sedimentary rocks are mantled by discontinuous Tertiary volcanics. During late Cretaceous and Paleocene time, the Big Hole and Snake River Mountains were uplifted by thrust faulting. In contrast, the Centennial Mountains were uplifted relatively recently, during the Pliocene Epoch, as the Snake River plain to the south was downwarped.

Precambrian metamorphic rock and Paleozoic sedimentary strata make up the Henry's Lake Mountains. These mountains were uplifted during late Cretaceous and Paleocene time by thrust faulting and folding. This uplifting was followed by block faulting which continues to the present.

On the southwest side of the Snake River, the Caribou Mountains are capped by Mesozoic sedimentary bedrock. As with the ranges to the northeast, they were uplifted by thrust faulting during late Cretaceous and Paleocene time.

Geologic formations, including source rocks, reservoir rocks, and geologic favorable for the accumulation of hydrocarbons exist within the analysis area. Possible source rocks occur in nine formations in the thrust belt. Also, possible reservoir rocks occur in 16 formations in anticlinal traps in the thrust belt. Finally, structures that can trap oil or gas are present in the analysis area. They include thrust folds of the Idaho–Wyoming–northern Utah thrust belt. Appendix A provides a more detailed discussion of the analysis area's geology as it relates to petroleum and gas specifically.

Geologic Hazards

Geologic hazards present in the analysis area consist of two primary types. They are earthquakes and slope failures. Both are discussed below.

Earthquakes

The United States has been divided into 4 seismic risk zones (Algermissen 1969). These zones range from seismically stable areas (Zone 0) to seismically unstable areas with a history of earthquakes that have caused major damage (Zone 3). The analysis area lies within Seismic Risk Zone 3.

Numerous earthquakes of various intensity have occurred within the analysis area and within a 50-mile radius of this area during the past 125 years (Figure 3–1). The largest of these was centered at Hebgen Lake, Montana, approximately 10 miles north of the Henry's Lake Mountains. It occurred in August 1959 with a magnitude of 7.1 on the Richter scale and a maximum intensity of X on the modified Mercali scale.

Intensity (ranging from I to XII) is a qualitative measure of the degree of shaking an earthquake imparts on people, structures, and the ground (Case 1986). An intensity X event results in destruction of many structures and can trigger landslides on steep, unstable slopes. Even smaller intensity events can rupture pipes, damage structures, crack the ground surface, and result in slope failures. Examples of common slope failures in the analysis area which are often related to earthquakes are liquefaction, slumps, earthflows, landslides, and rockfall.

Slope Failure

Slope stability varies within the analysis area. The stability of a slope is a function of several interrelated factors. These include the steepness of the slope, degree of saturation of the soils, presence of swelling clays, competence of the bedrock, vegetative cover, bedrock angle, and orientation of the bedding plane.

Figure 3–2 illustrates the potential for mass movement (slope failure) within the analysis area. It indicates that slopes within the Lemhi Mountains are relatively stable. Landslides have occurred in several locations within the Beaverhead, Centennial, and Caribou ranges, and portions of this area have a moderate to high potential for mass movement.

Although the potential for mass movement exists elsewhere in the analysis area, the least stable slopes are in the Big Hole and Snake River Mountains. Most of these ranges have a high potential for mass movement and several slides have occurred in the northwestern portion of these ranges. Landslides also have been recorded within the Caribou Mountains. The majority of this range has a moderate to high mass movement potential.

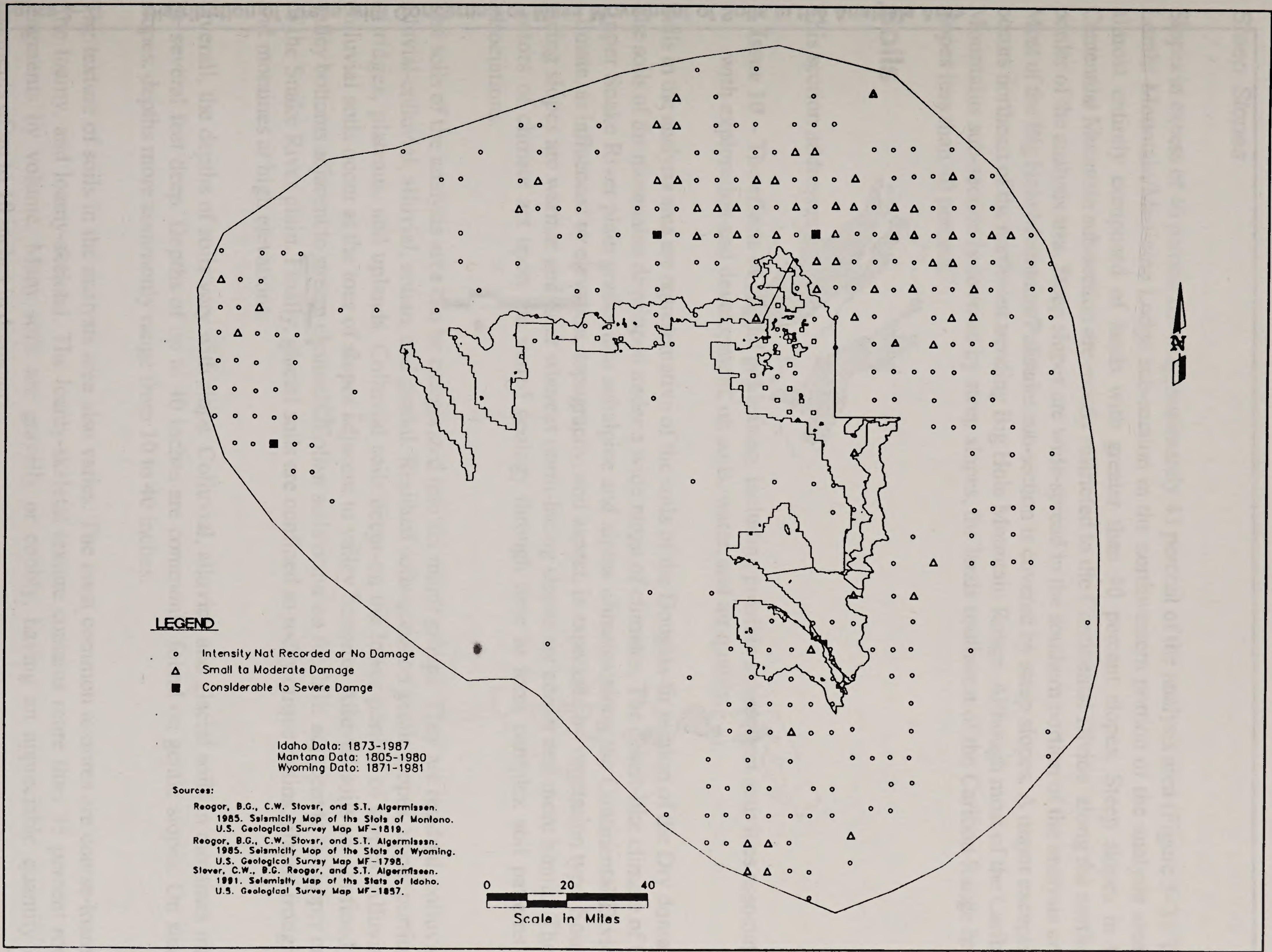

Figure 3–1 Seismicity Within 50 Miles of the Analysis Area for the Targhee National Forest's Oil and Gas Leasing Analysis

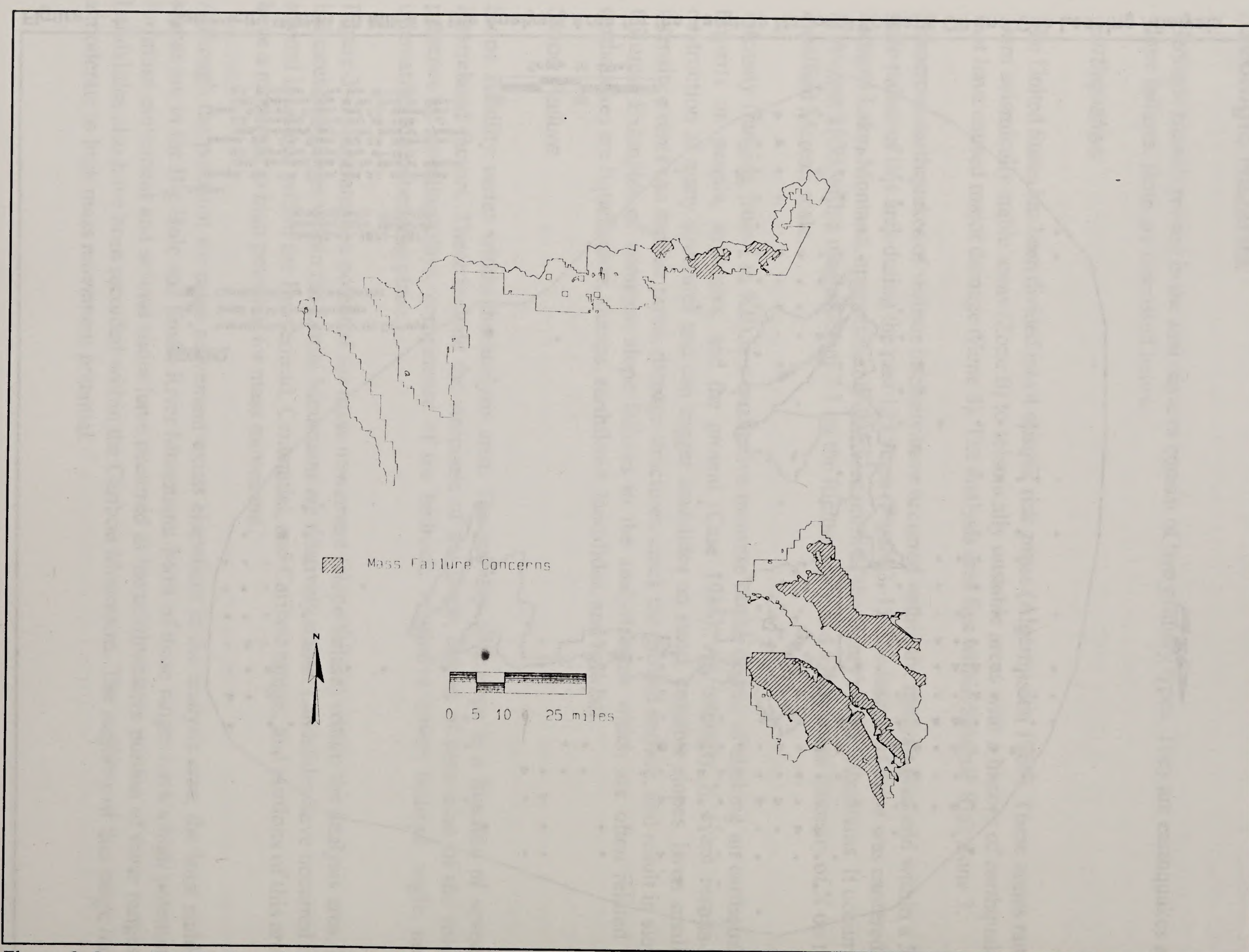

Figure 3–2 Distribution of Areas with Concerns For Mass Movement of Soils in the Analysis Area

Steep Slopes

Slopes in excess of 40 percent cover approximately 43 percent of the analysis area (Figure 3–3). The Lemhi Mountain/Medicine Lodge sub-section in the northwestern portion of the analysis area is almost entirely composed of lands with greater than 40 percent slopes. Steep slopes in the Centennial Mountain sub-section are mostly restricted to the Continental Divide along the northern border of the analysis area. Steep slopes are wide-spread in the southern portion of the analysis area. Most of the Big Hole Mountains/Palisades sub-section is covered by steep slopes. A major exception occurs northeast of the northwest trending Big Hole Mountain Range. Although most of the Caribou Mountains sub-section is covered by steep slopes, the lands southwest of the Caribou Range have slopes less than 40 percent.

Soils

This section addresses:

Issue 10 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on soils, water, and air quality.

Soils in the analysis area are representative of the soils of the Douglas-fir section of the Dry domain. The soils of the mountains developed under a wide range of climates. The desert-like climate of the Upper Snake River plain grades into subalpine and alpine climates along the Continental Divide. Climate, as influenced by elevation, topography, and aspect, is expressed by vegetation type. South-facing slopes are warmer and drier whereas north-facing slopes are cooler and more humid. These factors of climate act upon the varied geology through time to form complex soil patterns or associations.

The soils of the analysis area can be categorized into six major groups. They are residual, colluvial, alluvial-colluvial, alluvial, eolian, and glacial. Residual soils occur on gentle slopes, upper portions of ridges, plateaus, and uplands. Colluvial soils occur on the lower portion of slopes. Alluvial-colluvial soils occur at the toes of slopes adjacent to valley bottoms. Alluvial soils are confined to valley bottoms adjacent to stream channels. Eolian soils occur on foothills adjacent to the upper end of the Snake River plain. Finally, glacial soils are confined to rocky cirque basins, glacial troughs, and moraines at high elevations.

Overall, the depths of soils vary with slope. Colluvial, alluvial, and glacial soils in moraines may be several feet deep. Depths of up to 40 inches are commonly found on gentle slopes. On steep slopes, depths more commonly range from 10 to 40 inches.

The texture of soils in the analysis area also varies. The most common textures are coarse-loamy, fine loamy, and loamy-skeletal. The loamy-skeletal texture contains more than 35 percent rock fragments by volume. Many soils are gravelly or cobbly, having an appreciable quantity of fragments of up to 10 inches in diameter.

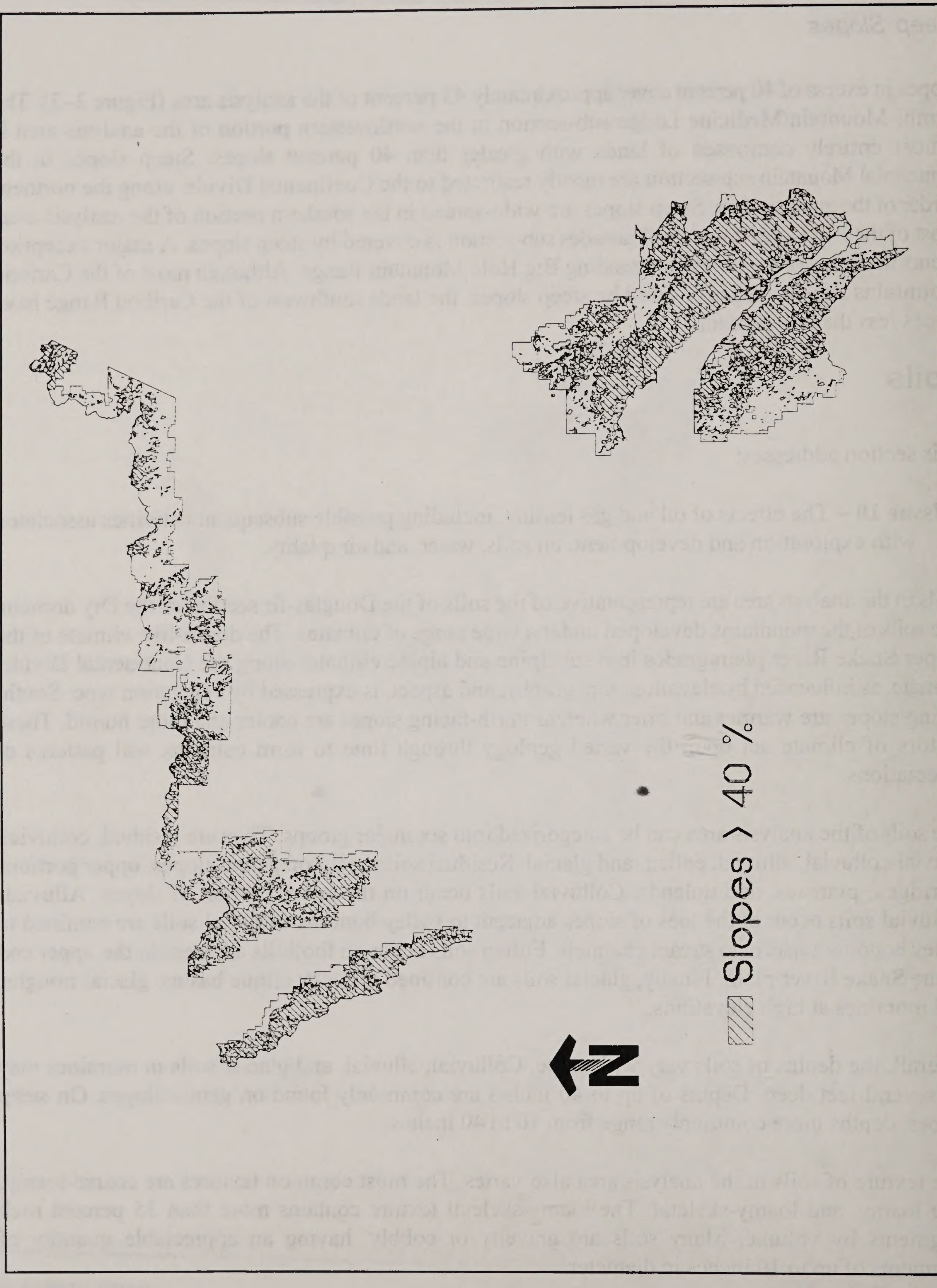

Figure 3–3 Distribution of Steep Slopes in the Analysis Area

Four orders of soils occur within the analysis area: Alfisols, Mollisols, Inceptisols, and Entisols. Alfisols have light colored surface layers and accumulations of clay in the subsoil. They are typically found on forested sites. Alfisols in the analysis area commonly belong to the great group Cryoboralfs.

Mollisols have dark surface layers containing accumulations of organic matter. They typically develop in open brush or grass and sedge communities. In the analysis area, Mollisols commonly belong to the great group Cryoborolls.

Inceptisols are young soils with horizons that are weakly developed. They are found in both open and forested areas. Inceptisols in the analysis area commonly belong to the great group Cryochepts.

Finally, Entisols have no horizon development. They are found in recent deposits or in areas that are actively eroding. Within the analysis area, Entisols commonly belong to the great group Cryorthents.

To facilitate the discussion of varying geographic conditions, the Forest has been divided into subsections. The analysis area encompasses all or portions of five of these subsections (Figure 3-4). The five subsections are the Lemhi/Medicine Lodge, Centennial Mountains, Madison Plateau, Big Hole Mountains/Palisades, and Caribou Range Mountains. The following paragraphs describe the soils present in each of these five subsections.

Lemhi/Medicine Lodge Subsection

This subsection, which encompasses all of the northern portion of the analysis area west of Interstate 15, consists of fault block mountains that exhibit a northwest-southeast trend. Elevation ranges from 5,500 to 12,200 feet and slopes range from 4 to 70 percent. The dominant types of rocks are limestone and sandstone. The landscape is dissected by parallel drainage systems. This subsection consists of three primary landscape settings: fan remnants on the lower elevations, mountain side slopes on the mid elevations, and mountain side slopes and ridge tops on the higher elevations.

The lower elevations have a dominant slope gradient from 4 to 20 percent. These landscapes include fan remnant landforms. The primary soils are greater than 60 inches to bedrock. They have gravelly, medium-textured surface layers and extremely gravelly, medium- to moderately-fine-textured subsurface layers. These soils are classified as Calcic Cryoborolls and Argic Cryoborolls.

The mid elevations have a dominant slope gradient from 20 to 60 percent. These landscapes include mountain side slopes. The primary soils are greater than 60 inches to bedrock. They have gravelly, medium-textured surface layers and extremely gravelly, medium-textured subsurface layers. These soils are classified as Calcic Cryoborolls.

The high elevations have a dominant slope gradient from 50 to 70 percent. These landscapes include mountain side slopes and ridges. The primary soils are greater than 60 inches to bedrock. They have

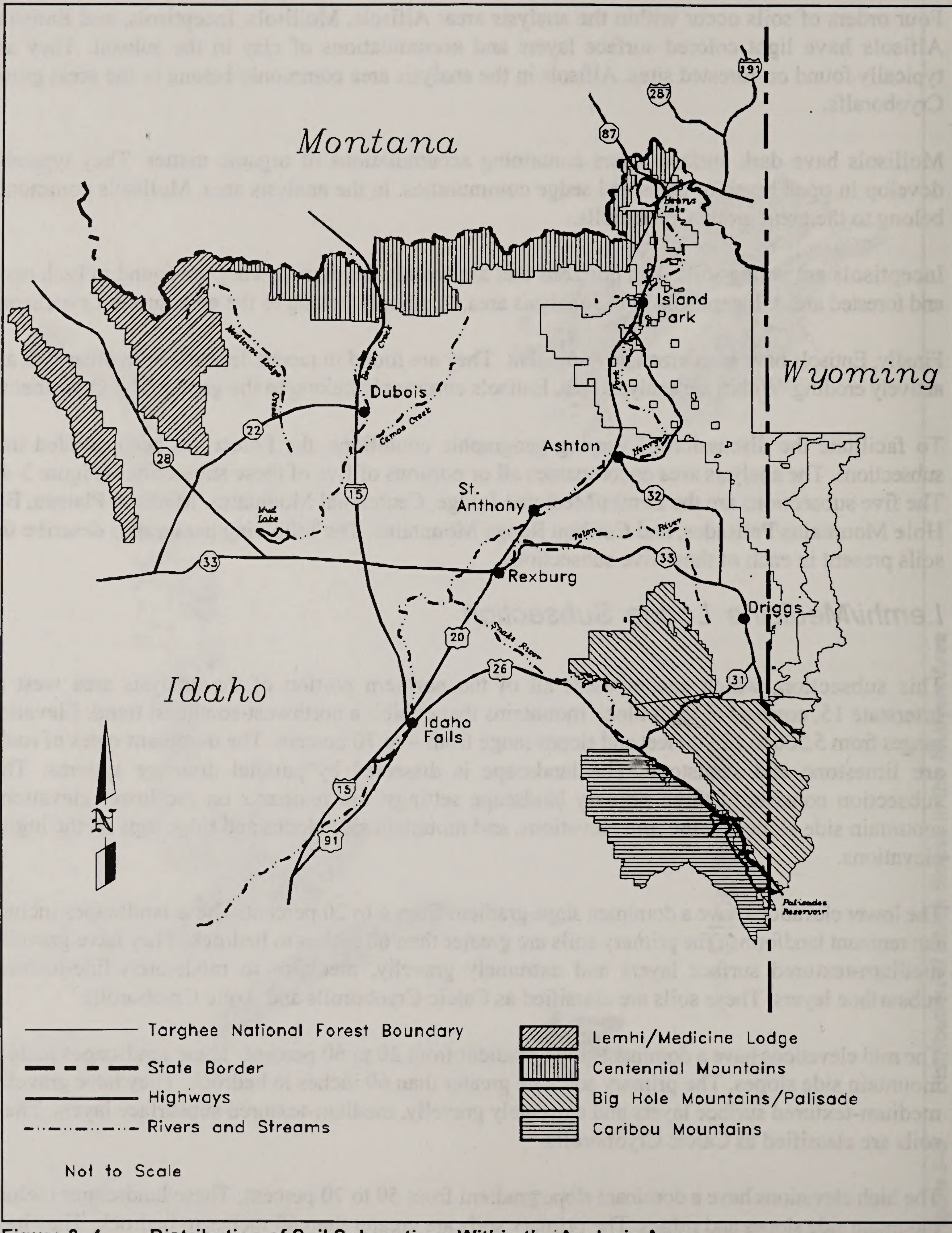

Figure 3–4 Distribution of Soil Subsections Within the Analysis Area

medium-textured layers that are fragmental. These soils are classified as Typic Cryochrepts and rubble land.

Centennial Mountains Subsection

This subsection encompasses the portion of the northern analysis area east of Interstate 15 and west of the Sawtell Creek–Rock Creek Basin. It consists of a fault block mountain range that exhibits an east-west trend along the Continental Divide. The range forms a gentle dip slope to the south and a steeper escarpment to the north. Elevation ranges from 6,000 to 10,000 feet with slopes ranging from 4 to 60 percent. The three primary landscape settings are fan remnants/dissected tablelands on lower elevations, volcanic dip slopes on mid elevations, and mountain side slopes and escarpments on higher elevations.

The lower elevations have a dominant slope gradient from 4 to 15 percent. These landscapes include fan remnants and foothills. The primary soils are greater than 60 inches to bedrock. They have gravelly to very gravelly, medium-textured surface layers and very gravelly or very cobbly, medium- to moderately-fine-textured subsurface layers. These soils are classified as Argic Cryoborolls and Boralfic Cryoborolls.

The mid elevations have a dominant slope gradient from 4 to 40 percent on south-facing slopes and 35 to 60 percent on north-facing slopes. These landscapes include volcanic dip slopes that are moderately dissected by drainageways. The primary soils are greater than 60 inches to bedrock. They have medium-textured or gravelly, medium-textured surface layers and gravelly through extremely gravelly, medium- to moderately-fine-textured subsurface layers. These soils are classified as Typic Crymbrepts, Mollic Paleboralfs, and Dystric Cryochrepts.

The high elevations have a dominant slope gradient from 4 to 25 percent on plateaus and 8 to 60 percent on mountains and escarpments. These landscapes include mountains, plateaus, and basins (slump prone). The primary soils are greater than 60 inches to bedrock. They have gravelly, medium- to moderately-fine-textured surface layers and a gravelly to extremely cobbly, medium-textured subsurface layer (in slump earth flow areas the subsurface layers are cobbly and fine textured). These soils are classified as Typic Cryumbrepts and Vertic Cryoborolls.

Big Hole Mountains/Palisades Subsection

The Big Hole Mountains/Palisades subsection lies within the southern portion of the analysis area north and east of the Snake River. It consists of a mountain range of multiple, parallel overthrusts and benches of mixed rock and eolian material that have been modified by thrust faulting. Elevations range from 5,200 to 10,000 feet with slopes ranging from 4 to 70 percent. The subsection consists of moderate-relief mountains on mid elevations and high-relief mountains on higher elevations.

The moderate-relief mountains are on mid elevation sites with dominant slope gradients from 10 to 40 percent. These landscapes include mountain side slope landforms. The primary soils are greater than 60 inches to bedrock. They have gravelly, medium-textured surface layers and very gravelly, moderately-coarse- to moderately-fine-textured subsurface layers. These soils are classified as Typic Cryoborolls, Pachic Cryoborolls, Argic Pachic Cryoborolls, and Dystric Cryochrepts.

The high-relief mountains are on mid elevation sites with dominant slope gradients from 30 to 70 percent. These landforms include mountain side slope landforms. The primary soils are greater than 60 inches to bedrock. They have gravelly, medium-textured surface layers and very gravelly, medium-textured subsurface layers. These soils are classified as Calcic Cryoborolls and Aridic Calcixerolls.

Caribou Range Mountains Subsection

The Caribou Range Mountains subsection lies within the southern portion of the analysis area south and west of the Snake River. It consists of steep mountain slopes and canyons. The landscape is dissected by dendritic drainage patterns. The Caribou Range is a southeast-northwest trending overthrust. The northeast side of the range has moderate relief mountains on mixed sediments. The southwest side of the range has low relief foothills and basins on textured marine sediments. Elevation ranges from 5,600 to 8,700 feet with slopes ranging from 15 to 65 percent. The dominant rock types are a mixture of sedimentary materials with a loess influence. The two primary landscape settings are foothills and basins and mountains.

The foothills and basins occur on the southwest side of the range and have dominant slope gradients from 15 to 60 percent. The primary soils are greater than 60 inches to bedrock. They have medium-textured surface layers and fine-textured subsurface layers. These soils are classified as Argic Cryoborolls.

The mountains occur on the northeast side of the range and have dominant slope gradients from 20 to 65 percent. The primary soils are greater than 60 inches to bedrock. They have medium-textured surface layers and moderately-coarse- to fine-textured subsurface layers. These soils are classified as Pachic Cryoborolls, Argic Pachic Cryoborolls, and Cryic Pachic Paleborolls.

Water Resources

This section addresses:

Issue 10 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on soils, water, and air quality.

Surface Water

All of the analysis area lies within the Upper Snake River Basin (Figure 3–5). Thus, most of the perennial and intermittent streams in the analysis area ultimately drain into the Snake River. From the Palisades Reservoir on the Wyoming–Idaho state line, the Snake River flows northwesterly. North of Idaho Falls, Idaho, it turns south. From here, it flows west and north joining the Columbia River near Pasco, Washington. The Snake River is the principal source of irrigation water for southern Idaho. It also is important for generating power; recreation, including hunting and fishing; and fish and wildlife habitat.

Streams in the northern portion of the analysis area generally have headwaters along the Continental Divide. Henry's Lake and Henry's Fork collect drainage from streams in the eastern portion of this area. Streams in the central portion of this area flow south into Camas and Beaver creeks, which merge and flow into Mud Lake. Mud Lake has no outlet. Drainage in the western end of the northern portion of the analysis area is to Medicine Lodge Creek, and Birch Creek. These are southeasterly-flowing streams that disappear in Snake River Plain lava flow deposits. Most streams in the southern portion of the analysis area eventually flow to either the South Fork of the Snake River or the Teton River.

Stream Flow

The U.S. Geological Survey (USGS) maintains several gauging stations in and near the analysis area (Figure 3–5). Data collected from these stations indicate streams in the analysis area exhibit characteristics typical of mountain streams. Volumes of flows peak during the spring snowmelt and then gradually decrease to minimal flows (Table 3–1).

Although the data from the gauging stations show fluxuations typical of mountain streams, the volumes recorded at the gauges vary substantially. The flows recorded at the three gauges located in the northern portion of the analysis area are substantially smaller than those in the Snake and Teton rivers. Moreover, flows in Beaver Creek are nonexistent by late summer (Table 3–1). Additionally, flows in the Snake River downstream of Palisades Reservoir are controlled by releases from the Palisades Dam.

Stream Density

Many perennial and intermittent streams occur within the 32 sub-watersheds encompassed by the analysis area (Figure 3–6). However, the density of streams within these sub-watersheds varies (Figure 3–7). Density is calculated using miles of perennial and intermittent streams per square miles of sub-watershed (e.g. a density of 0.75 indicates that 0.75 miles of streams would be encountered within a given square mile of land). The density of streams gives some indication of lands covered by water in each sub-watershed. For example, a relatively low density indicates more dry land available for oil and gas exploration and operations. A higher density indicates less land is available

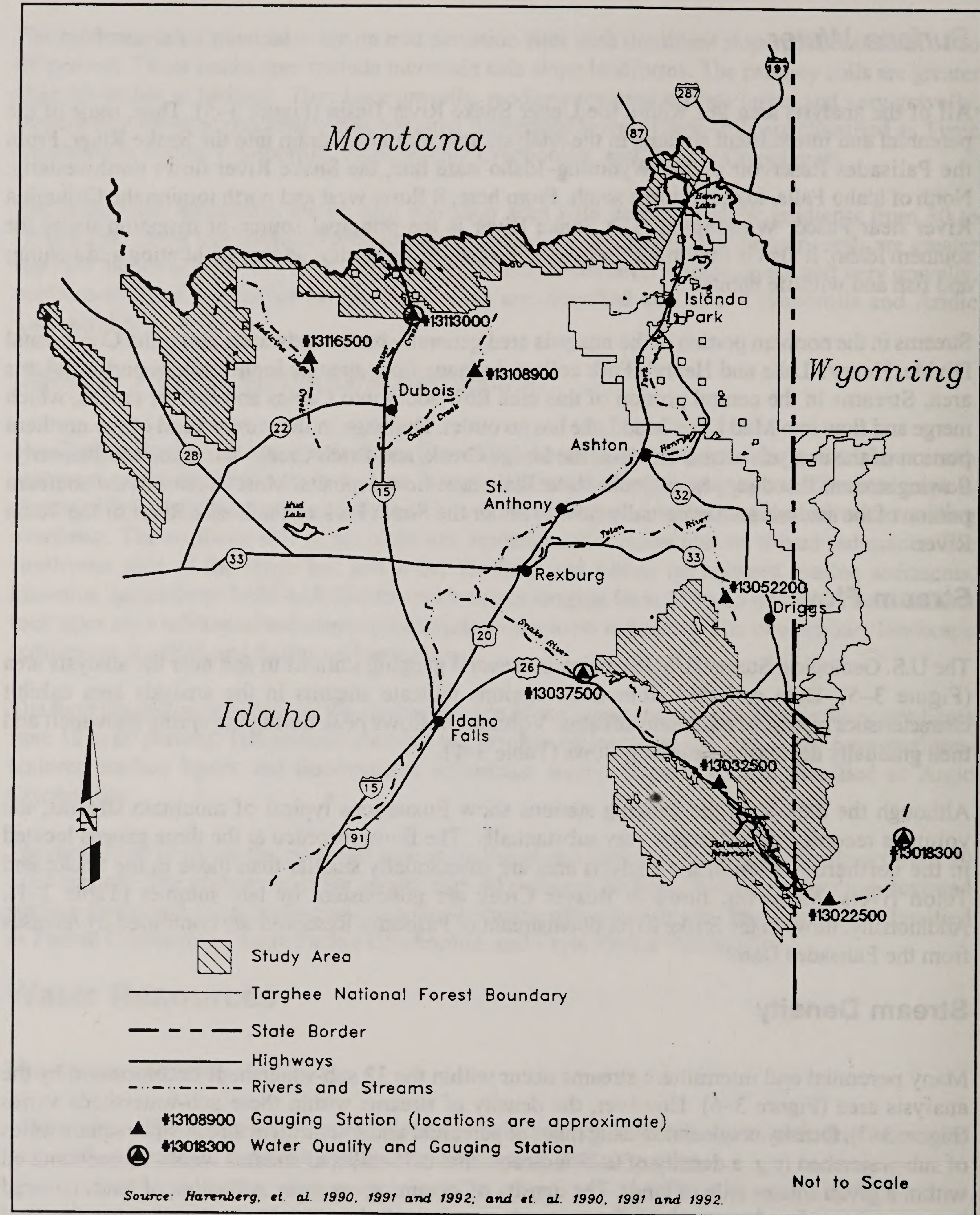

Figure 3–5 **Distribution of Major Streams and USGS Gauging Stations in and Near the Analysis Area**

Table 3–1 Selected Streamflow Characteristics for Major Streams in and Near the Analysis Area

				Discharge (cubic feet per second)						
Station Number	Location	Period of Record	Mean Annual Runoff (acre feet)	Annual Mean	Maximum Monthly Flow	Month of Occurrence	Minimum Monthly Flow	Month of Occurrence	Instantaneous Peak Flow	Instantaneous Low Flow
13022500	Snake River above Reservoir near Alpine, Wyo.	1937–1992	3,276,000	4,522	24,090	June	1,071	February	NA	740
13032500	Snake River near Irwin, Id.	1935–1992	4,677,000	6,455	25,420	June	607	March	31,800	19
13037500	Snake River near Heise, Id.	1911–1992	5,037,000	6,953	36,520	June	983	March	60,000	460
13052200	Teton River above South Leight Creek near Driggs, Id.	1962–1992	286,000	395	1,526	June	122	January	2,460	54
13108900	Camas Creek at Red Road near Kilgore, Id.	1986–1992	40,652	56	519	May	6	February	NA	NA
13113000	Beaver Creek at Spencer, Id.	1941–1992	25,690	36	387	May	0	July, August, September	1,190	NA
11116500	Medicine Lodge near Small, Id.	1921–1992	40,870	56	154	June	18	January	265	8

Sources: Harenberg et al. 1990, 1991, 1992 and Druce et al. 1990, 1991, 1992.

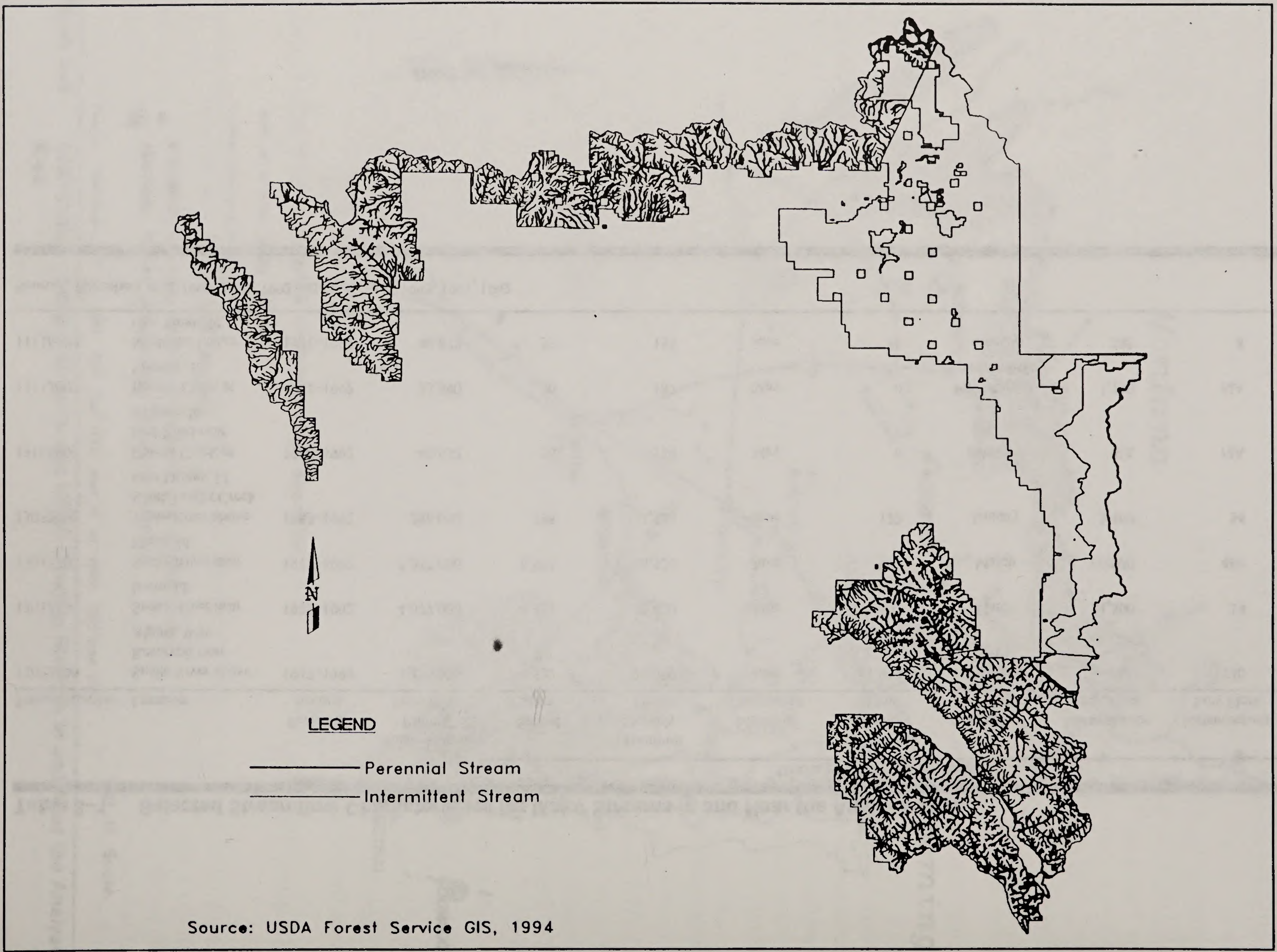

Figure 3–6 Distribution of Streams Within the Analysis Area

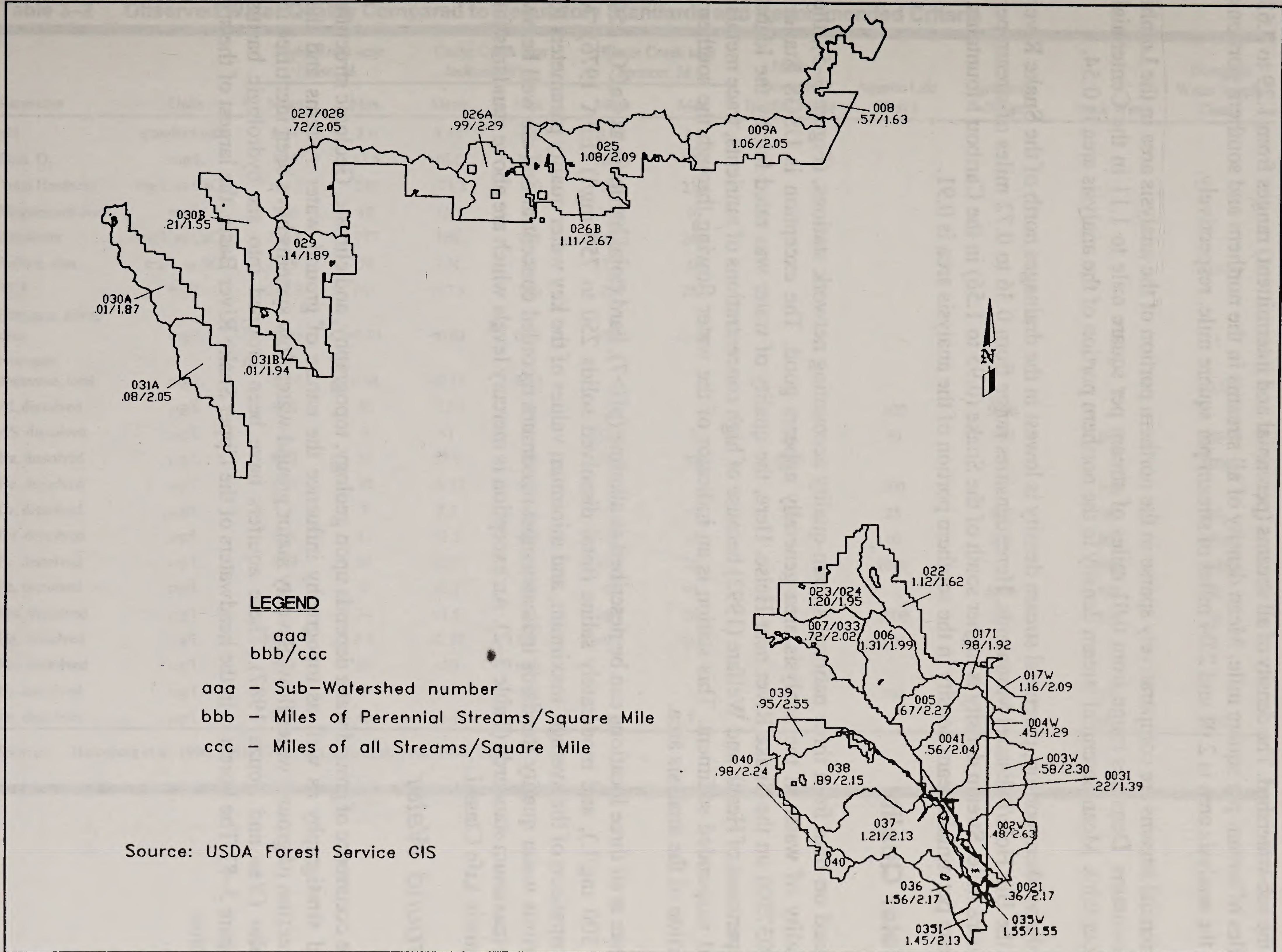

Figure 3–7 Density of Streams Within the Analysis Area, by Sub-Watershed

in the sub-watershed. The density of all streams (perennial and intermittent) ranges from 1.29 to 2.63 miles of stream per square mile. Mean density of all streams in the northern and southern portions of the analysis area is 2.01 and 2.04 miles of stream per square mile, respectively.

Perennial streams are comparatively sparse in the northern portion of the analysis area in the Lemhi Mountains. Densities range from 0.01 miles of stream per square mile to 1.11 in the Centennial Mountains. Mean perennial stream density in the northern portion of the analysis area is 0.54.

In the southern portion, perennial stream density is lowest in the drainages north of the Snake River in the Big Hole/Palisades Mountains. Here, densities range from 0.36 to 0.72 miles of stream per square mile. Stream density is higher south of the Snake (0.95 to 1.56) in the Caribou Mountains. Mean perennial stream density in the southern portion of the analysis area is 0.91.

Water Quality

Based on data from three national stream-quality accounting network stations, (Figure 3–5), the quality of water in the analysis area generally appears good. The exception is USGS Station 13037500 on the Snake River near Heise. Here, the quality of water was rated fair by the Idaho Department of Health and Welfare (1992) because of high concentrations of nutrients, trace metals, and suspended sediment. This station is an indicator of the water flowing through the southern portion of the analysis area.

Water at all three locations can be described as alkaline (pH>7), hard (total hardness as $CaCO_3$ 150 to 300 mg/L), and moderately saline (total dissolved solids 250 to 750 mg/l) (EPA 1976). A comparison of the average, maximum, and minimum values of the key water quality parameters to various water quality standards indicates most maximum recorded concentrations are well below the maximum standards (Table 3–2). An exception is mercury levels which are above standards for Aquatic Life Class 1.

Ground Water

The occurrence of ground water depends upon geology, topography, and climate. Geologic structure and stratigraphy as well as topography influence the nature of ground water systems and the direction of ground water flow. Seventy major ground water flow systems have been identified in Idaho (Yee and Souza 1987). These aquifers have been grouped into six hydrologic basins (Figure 3–8). The Forest is in the headwaters of the Upper Snake River Basin, the largest of the six basins.

Table 3–2 Observed Water Quality Compared to Regulatory Standards and Recommended Criteria

Parameter	Units	Snake River near Heise, Id. Mean	Snake River near Heise, Id. Max.	Cache Creek near Jackson, Wyo. Mean	Cache Creek near Jackson, Wyo. Max.	Beaver Creek near Spencer, Id. Mean	Beaver Creek near Spencer, Id. Max.	Idaho Domestic Potable Water	Aquatic Life Class I	Irrigation Water	Stock Water	Domestic Water Supply Class I
pH	standard units	8.24	8.6	8.48	8.8	8.38	8.8					
Diss. O_2	mg/L	10.6	13.5	10.6	11.9	10.85	12.2					
Total Hardness	mg/L as $CaCO_3$	190.7	240	173.3	190	220	230					
Magnesium diss.	mg/L	13.6	18	13.7	16	14.2	16					
Alkalinity	mg/L as CaCO	146.8	177	160	195	218.3	245					
Sulfate, diss.	mg/L as SO_4	54.9	78	7.01	15	11.17	16					250
TDS	mg/L	257.9	341	167.5	190	254	283					
Nitrogen, nitrite diss.	mg/L	<0.01	<0.01	<0.01	0.02	<0.01	<0.01					1
Nitrogen, ammonia, total	mg/L	<0.17	0.04	<0.17	0.23							0.5
Al, dissolved	µg/L	11.6	30	<13.3	30				100	5000		
AS, dissolved	µg/L	3	9	<1	<1	<2.0	3	50	50	100	100	50
Ba, dissolved	µg/L	49.2	58	33.9	49	79.2	91	1000				1000
Be, dissolved	µg/L	2.95	30	<0.57	0.9				300		100	
Cr, dissolved	µg/L	1.7	7	2.2	6	<1	<1	50	25	100	50	50
Cu, dissolved	µg/L	3.4	13	<2.5	<10	<1	<1		10	200	200	1000
Fe, dissolved	µg/L	10.9	34	10.5	22	19.5	26		1000		5000	300
Pb, dissolved	µg/L	2	6	<2.2	10	<1	<1	50		5000	100	50
Mn, dissolved	µg/L	5	14	<1.8	4	16.7	26		1000	200	200	50
Hg, dissolved	µg/L	0.12	0.3	<0.17	0.4	<0.1	<0.1	2	0.05			2
Mo, dissolved	µg/L	<10	10	<10	<10					100		
Ni, dissolved	µg/L	<1	1	<1.7	<10				100	200	200	
Zn, dissolved	µg/L	12.7	40	<6.1	10	<4.0	7				2000	5000

Sources: Harenberg et al. 1990, 1991, 1992 and Druce et al. 1990, 1991, 1992

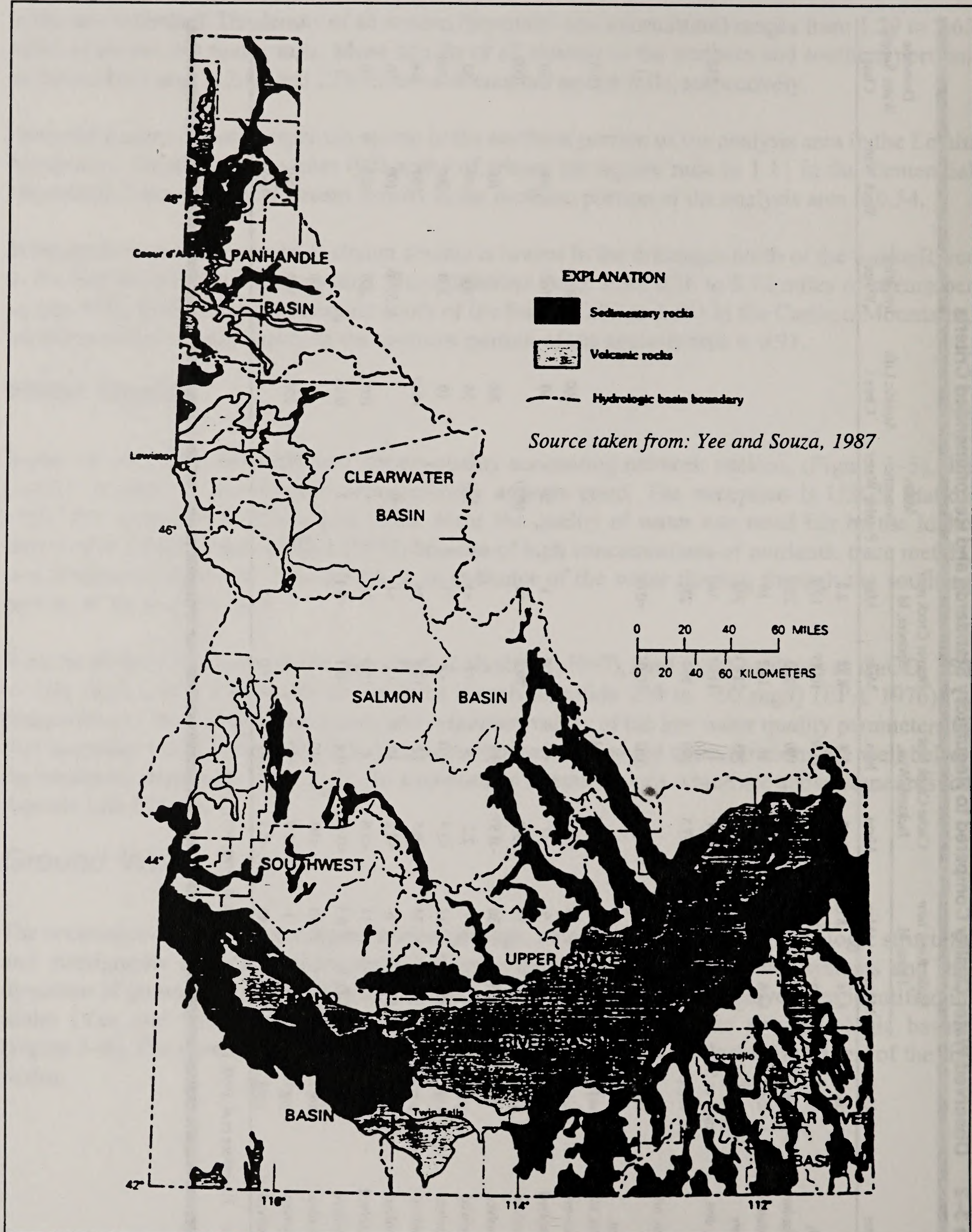

Figure 3–8 Hydrologic Basins and Generalized Areal Extent of Major Aquifers in Idaho

Water Quality

Natural processes and human activities affect the quality of ground water. Natural influences include the chemical constituents of precipitation; the organic and mineral substances originating from vegetation, soil, and rocks that dissolve as water percolate through these materials; and the length of time percolating water is in contact with soil and rocks (Table 3–3). Human activities cause qualitative changes either by withdrawing water from the ground water system or by directly adding chemical or organic contaminants to the aquifers. Contaminants are added primarily through discharges of waste from agricultural, industrial, and urban sources (Table 3–3). The sources of these constituents and their significance are presented in Table 3–4.

The Targhee National Forest is considered a recharge zone for the northeastern limits of ground water in the Snake River Plain. As a result, the quality of ground water deteriorates as it migrates through and out of the Forest. The water picks up traces of metals and salts as it migrates through the soil and bedrock. Also, the impacts of fertilizers, irrigation practices, and other human activities increase as ground water migrates farther from the Forest's boundaries.

The USGS monitors the quality of ground water at 23 wells in or near the analysis area (Figure 3–9). The maximum and minimum levels of selected parameters evaluated for these wells are shown on Table 3–5. The maximum values of all parameters shown are well below the State of Idaho's standards for domestic potable water. However, fluoride and nitrates have values within 60 to 70 percent of the maximum allowable levels. The levels of nitrates observed are probably the result of the application of fertilizers in nearby agricultural areas.

The ground water in this area is within the Snake River Plain aquifer. It extends in a northeasterly direction, approximately 200 miles from Bliss to near Ashton, Idaho. It is the highest-yielding aquifer in Idaho and discharges about 6.5 million acre-feet of water annually to the Snake River. It is composed of Quaternary-age basalt and unconsolidated sediments. Calcium bicarbonate type water is typical for this aquifer reflecting the natural chemical conditions of the bedrock and sediment through which it flows. Most of the recharge water has low concentrations of dissolved solids, averaging less than 250 mg/L. Concentrations of dissolved solids average 282 mg/L in the basalt and 263 mg/L in the Quaternary sediments (Lee and Souza 1987).

Air Quality

This section addresses:

Issue 10 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on soils, water, and air quality.

Table 3–3 Natural and Human Factors Affecting the Quality of Ground Water

Natural Source	Types of Contaminant
Natural Factors	
Precipitation	Dissolved gases, dust, and emission particles
Infiltration through vegetation, swamps, or soil and rocks (above the water table)	Biochemical products, organic materials, color, and minerals
Aquifer rocks	Minerals content (increases with time of contact)
Interaquifer mixing of cold water and thermal water	Minerals
Human Factors	
Waste Source	**Types of Contaminant**
Agricultural activities	Fertilizers, pesticides, and herbicides
Mining operations (ore-processing plants)	Metallic trace elements and phosphates
Nuclear facilities	Radiochemicals, heat, dissolved solids
Urban activities (storm and sanitary sewers, sewage-disposal plants, cesspools and septic tanks, and sanitary landfills)	Organic materials, dissolved solids, suspended solids, detergents, bacteria, phosphate, nitrate, sodium, chloride, sulfate, and metallic trace elements
Industrial facilities (food processors)	Biochemical oxygen demand, suspended solids, sodium, and chloride
Geothermal activities	Heat, dissolved solids, fluoride, metallic trace elements
Hazardous waste and toxic waste disposal sites	Toxic metals, hazardous chemicals, organic compounds

Source: Lee and Souza 1987.

Climate

The climate of the analysis area is characterized by cold, wet winters and cool, drier summers. Average monthly temperatures in the analysis area range from highs of 67 to 79°F in July and August to 13 to 25°F in December. Average minimum temperatures vary from 30 to 42°F in July and August to -5 to 5°F in December and January (NOAA 1992).

The climate is greatly influenced by the mountainous topography of Idaho, the high latitude, and the frequency of large-scale storm systems bearing moisture-laden air from the Pacific Ocean into Idaho. These storms occur most frequently, and are most intense, from late fall through early spring. Precipitation is quite variable due to the complex topography and variations in elevation. Average

Table 3–4 Source Constituents of Ground Water and their Significance

Constituent	Significance
Dissolved Solids	Mineral constituents dissolved in water constitute dissolved solids. Water having concentrations greater than 500 mg/L is undesirable for drinking and for many industrial uses.
Nitrogen, nitrite plus nitrate	Nitrogen content is an indicator of sewage and agricultural contamination. Water containing more than 10 mg/L may cause methemoglbinemia in infants.
Sulfate	Sulfate is dissolved in water from rocks and oils containing sulfur compounds and from industrial wastes. More than 250 mg/L is objectionable in drinking water supplies.
Hardness	Hardness in water is caused primarily by calcium and magnesium concentrations. Hard water consumes soap and synthetic detergents. Hardness of water is classified by Durfor and Becker (1964) as follows.

Description	Hardness range (Ca or Mg contents in mg/L)
Soft	0-60
Moderately Hard	61-120
Hard	121-180
Very Hard	More than 180

Constituent	Significance
Silica	Silica is dissolved from rocks and soil. Together with calcium and magnesium, silica forms scale in boilers and steam turbines.
Fecal coliform bacteria	The presence of fecal coliform bacteria in water indicates contamination from human or animal wastes. Fecal coliforms are present in the intestines and feces of warmblooded animals.
Total coliform bacteria	Total coliform densities are used to indicate sanitary conditions for drinking water. The absence of total coliforms is evidence of a bacteriologically safe water.
Iron	Iron is dissolved from practically all soils and rocks. Iron is derived also from industrial wastes, corroded well casings, and pipes, pumps and other cast iron or steel objects in contact with water. Iron concentration greater than 0.3 mg/L (300μg/L) is not recommended for public water supply without treatment.

Source: Lee and Souza, 1987

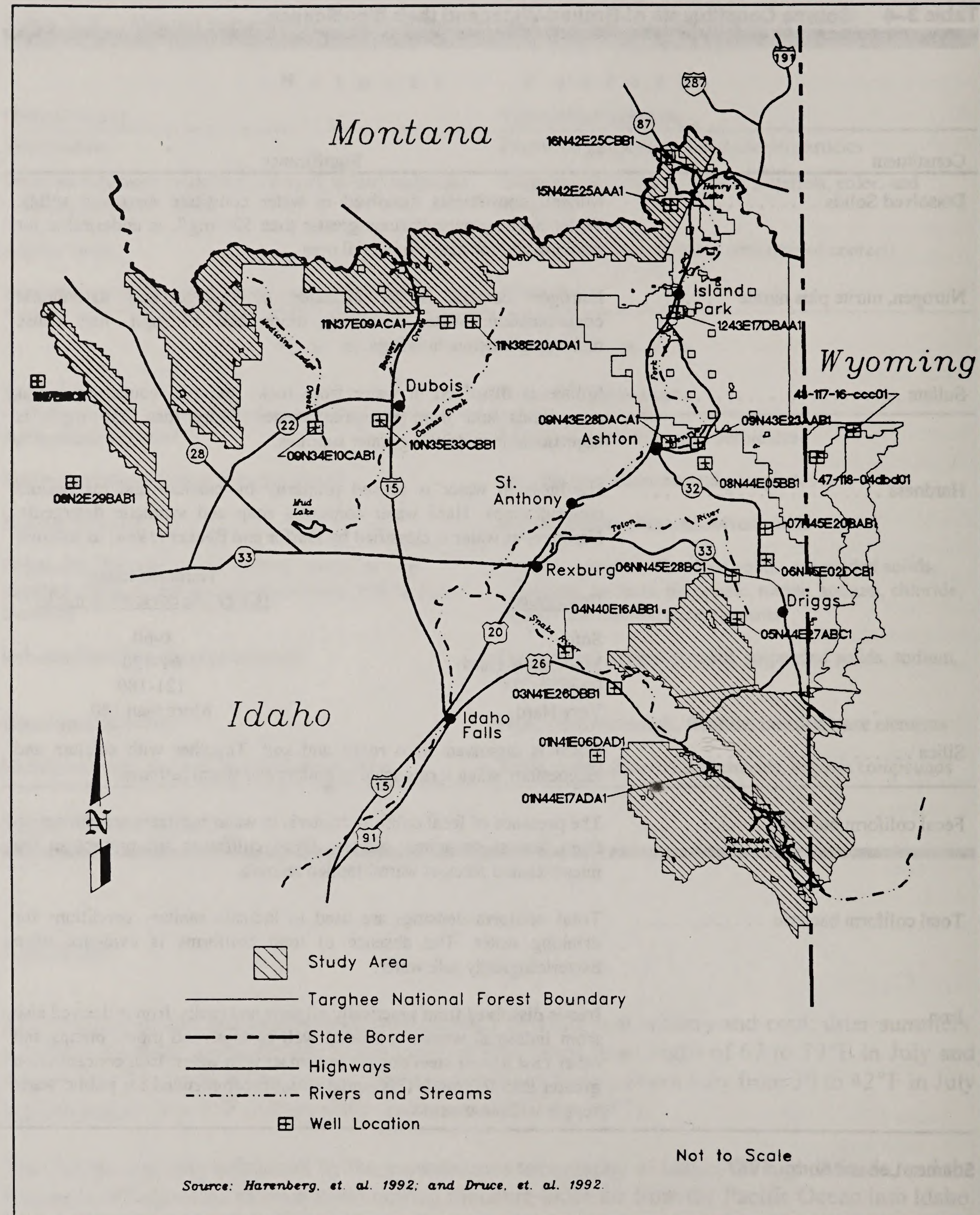

Figure 3–9 Distribution of the USGS's Ground Water Monitoring Wells In and Near the Analysis Area

Table 3–5 Levels of Contaminants in Ground Water Wells in the Analysis Area

Parameter	Units	Maximum Measured	Minimum Measured	Idaho Domestic Potable Water Standard
Fluoride	mg/L	1.4	<0.1	2.4
Nitrates	mg/L	7.6	<1	10
Arsenic	μg/L	6	<1	50
Cadmium	μg/L	<1	<1	10
Chromium	μg/L	5	<1	50
Lead	μg/L	3	<1	50
Mercury	μg/L	0.2	<0.1	2
Selenium	μg/L	3	<0.01	10
Cyanide	μg/L	<0.01		200

Sources: Harenberg et al. 1992, Druce et al. 1992, Wyo. Dep. of Environ. Qual. 1980.

annual precipitation totals vary from 24 inches in the southern portion of the analysis area to 32 inches in the northern portions of the analysis area along the Continental Divide (NOAA 1979).

The seasonal distribution of precipitation shows a distinct winter maximum. Climatological data from Island Park (NOAA 1992), elevation 6,116 feet, is representative of the seasonal distribution of precipitation in the analysis area. From November to April, the analysis area receives approximately 60 percent of its annual precipitation. Depending on elevation, the northern portion of the analysis area receives about 200 to 250 inches of snow annually. In contrast, the southern portion of the analysis area receives about 150 to 200 inches. During the remainder of the year, storms are weaker and less frequent. Also, precipitation takes the form of short duration, but locally intense, thunderstorms. During this period, monthly precipitation ranges from 1.5 to 2.5 inches.

Air Quality

The Idaho Department of Environmental Quality, Air Quality Bureau (IAQB) and the United States Environmental Protection Agency (EPA) have established National Ambient Air Quality Standards (NAAQS) for "criteria pollutants" to protect the public health and welfare. PM_{10}, defined as "particles with an aerodynamic diameter of 10 microns or less", is the only criteria pollutant of concern within the analysis area. Vehicle gases (carbon monoxide, nitrogen oxides, and non-methane hydrocarbons) are emitted in insignificant quantities.

PM_{10} is a criteria pollutant because particles less than 10 microns in size will penetrate deeper and remain longer in the lungs than larger particulates. Accordingly, PM_{10} has replaced Total Suspended Particulates as a primary criteria pollutant. The NAAQS for PM_{10} are 150 micrograms per cubic meter ($\mu g/m^3$) for any 24-hour averaging period, and 50 $\mu g/m^3$ for the annual arithmetic mean. The 24-hour standard cannot be exceeded more than once per year.

In general, the analysis area's air quality is very good. The area lies in a rural and mountainous region of northeastern Idaho. The analysis area is encompassed by a Class II airshed, which is a region that can accommodate moderate, well-managed industrial growth before a significant deterioration in air quality would occur. The analysis area also is in an attainment status for air quality. Thus, levels of PM_{10} and the other criteria pollutants are below the NAAQS.

The primary sources of PM_{10} within the analysis area include dust generated from roads by vehicular traffic and smoke from prescribed burning and wildfires (USDA 1984). The major source of PM_{10} outside the analysis area is dust generated naturally (e.g. wind erosion on plowed fields) and mechanically (e.g. plowing, planting, and harvesting) from agricultural activities.

The analysis area is bordered on the east by the Yellowstone and Grand Teton National Parks. Both of these National Parks are designated as Class I airsheds. In Class I airsheds, the smallest degree of deterioration in air quality resulting from industrial growth is allowed. Very small incremental increases in ambient levels of air pollutants are permitted.

The point closest to Yellowstone and Grand Teton National Parks where air quality is measured is Jackson, Wyoming (WDEQ 1994). PM_{10} has been monitored here since 1986. During this period, the highest 24-hour mean PM_{10} reading recorded was 124 μg/m3 in 1992, a value 26 μg below the NAAQS. During 1993, the maximum 24-hour value was 66 $\mu g/m^3$. However, a value of 248 $\mu g/m^3$ was recorded in 1988 while the fires were burning in Yellowstone. Annual arithmetic averages have ranged form a high of 39.8 $\mu g/m^3$ in 1988 (biased by the Yellowstone forest fires), to the next highest 37.0 $\mu g/m^3$ in 1987, and finally to a minimum of 25.5 $\mu g/m^3$ in 1993.

Vegetation

This section addresses:

Issue 3 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on the Forest's ecological integrity and biological diversity.

Issue 7 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on wetlands and riparian areas.

Issue 14 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on rangeland resources and grazing operations.

Vegetation within the Forest is very diverse due to the broad range of site conditions. These conditions, including topography, climate, soils, hydrology, geology, and disturbance, all contribute to the high level of diversity. The Forest is dominated by coniferous forest with associated vegetation communities including alpine tundra, montane meadows, shrublands, grasslands, deciduous woodlands, riparian areas, and wetlands.

Coniferous Forest

Lodgepole pine, Douglas-fir, and Englemann spruce/subalpine fir are the dominant conifers that occur in the Forest. Lodgepole pine is the most dominant conifer. It is common in burned-over or disturbed areas occurring on well-drained soils often in pure stands. It sometimes occurs with a deciduous component of quaking aspen.

Douglas-fir is generally found on rocky soils of mountain slopes at elevations below 8,000 feet in pure or mixed coniferous or deciduous stands of whitebark pine, limber pine, lodgepole pine, and aspen. Douglas-fir prefers northern aspects, but is not limited to them. Whitebark pine and limber pine are associates on dry, rocky soils on exposed slopes and ridges. Both can occur in pure stands, while whitebark pine often occurs as thickets.

Subalpine fir usually forms a spruce-fir forest with Englemann spruce from the subalpine zone to timberline (elevations ranging from approximately 8,500 to 12,000 feet). The spruce-fir community type often dominates in upper montane and subalpine zones up to timberline.

Occasionally, white or blue spruce is intermixed among the pine-fir forests. White spruce occurs on many types of soil within coniferous forests and swampy areas below elevations of 5000 feet. Blue spruce prefers narrow bottomlands along mountain streams from foothills to the montane zone. Blue spruce often occurs in pure stands.

Old-Growth Forest

Old-growth forest is characterized by large-diameter trees often in excess of 200 years old and a relatively dense, often multi-layered canopy. Old-growth stands also contain large, standing dead or dying trees. Many species of wildlife rely upon these snags and decaying logs as important habitat components. Within the analysis area, about 4,665 acres of forest have been classified as old growth.

Alpine Tundra

Alpine tundra is a treeless area that occurs above krummholz, usually above elevations of 9,500 feet. It is interspersed among the rocky outcrops, crags, and talus slopes, but also occurs on flat alpine meadows with deep, humic soil. Vegetation is usually comprised of a series of small shrubs in depressions and somewhat unexposed areas with underlying forbs, sedges, mosses, lichens, and grasses.

Montane Meadows

Montane meadows occur in pockets among the coniferous and coniferous/deciduous forests. Dry meadows occur on very well-drained soils. Wet meadows occur on soils with a high water table. Additionally, wet meadows often support fens, carrs, bogs, and other wetlands. Meadows may be natural or they may be the result of deforestation. In either situation, they may eventually be succeeded by shrubland or forest.

Shrublands

Two types of shrublands occur in the analysis area. They are mountain shrublands and sagebrush shrublands. Both occur between forest breaks on flat, open, or rocky areas. Sagebrush shrublands occur in semidesert lowlands. In contrast, mountain shrublands occur at higher elevations.

Mountain shrublands occur throughout the lower mountains. They often form transitional belts between plains grasslands and coniferous forests. Also, they are characterized by dense-to-sparse deciduous shrubs.

Sagebrush shrublands usually occur on deep, moderately fine-grained soils. However, they can tolerate acidic, alkaline, or shallow soils. Sagebrush often forms very dense stands and is even associated with the margins of wetlands. Some juniper trees with scattered limber pine may occur in sagebrush shrublands located on south-facing slopes.

Grasslands

Grassland communities are characterized by a mix of perennial mixed grasses and forbs with a scattered woody stem component. Principle grasses present within the grassland communities include wheatgrasses, fescues, bluegrasses, bromes, ricegrass, and wildrye. The forb component is very diverse and includes arrowleaf balsamroot, yarrow, pussytoes, locoweed, daisy, lupine, mulesears, and groundsels.

Deciduous Woodlands

Quaking aspen is the dominant deciduous tree type occurring in the analysis area. It occurs in many soil types, but prefers sandy and gravelly slopes with northern or eastern aspects. It is often found in pure stands in an altitudinal zone below spruce-fir forests. Aspen are short-lived and replaced successionally by conifers. Aspen tend to be opportunistic and readily colonize disturbances in coniferous forest. Cottonwoods may also occur in more mesic, north-facing gullies and draws.

Riparian Communities and Wetlands

Riparian areas and wetlands are important resources to the Forest due to the primary functions they fulfill. First, riparian areas and wetlands contribute to the stability and quality of streams and watersheds. They often regulate flows of water through them via their ability to absorb short-term high flows. They also function as traps for sediment and various pollutants.

Second, these resources provide important, and often limited, habitats for terrestrial wildlife and aquatic life. The high vertical and horizontal diversity present in wetlands and riparian areas provides cover and sources of food for many species. Consequently, wetlands and riparian areas often have some of the highest densities of animals and largest numbers of individuals of any vegetation type present.

Finally, riparian areas and wetlands are employed by man for various land uses. These areas contribute to an area's visual quality at the landscape level. They provide numerous opportunities for recreation, including fish and hunting. Also, livestock are grazed in riparian areas and wetlands.

Riparian Communities

Riparian communities occur in areas with seasonally high water tables and consist of vegetation adapted to the these conditions (Padgett et al. 1989). Because of these adaptations, riparian communities often mark the boundary between wetlands and upland vegetation types. Thus, riparian communities may include features common to both wetland and upland environments.

Riparian communities cover about two percent of land within the Forest (Forest Service 1985a). Within the Forest overall and the analysis area particularly, these communities include a variety of types, including communities dominated by coniferous trees, deciduous trees, willows, shrubs, and herbaceous vegetation. The dominant communities vary in ecological characteristics and representative species.

In addition to contributing important habitat for wildlife and augmenting the stability of watersheds, these communities consist of diverse vegetation. The riparian communities on the Forest include a high proportion of endemic plant species and unique plant associations. They also exhibit high levels of structural diversity. Thus, although riparian communities serve important functions in local ecosystems, some may have unique attributes.

Riparian areas present in several watersheds are of particular concern due to their perceived ecological significance. They include riparian areas within the Big Elk Creek, Willow Creek, Webber Creek, Moose Creek Plateau, and Targhee Creek watersheds. Following examination by the Idaho Natural Areas Coordinating Committee in 1980, these areas were recommended for further study under the Research Natural Areas program (Forest Service 1985a).These riparian areas were selected for study due to the importance of riparian habitat, the presence of unique assemblages of plant communities, the significance of watershed features, or the contribution each of these areas makes to adjacent ecosystems. All but one of these areas occur in the northern part of the analysis area in locations with a low potential for deposits of oil and natural gas. Big Elk Creek occurs northeast of Palisades Reservoir in the area with a high potential for deposits of oil and gas.

Wetlands

Wetlands are habitats that occur on soils that are at least periodically saturated with water or are inundated (Cowardin et al. 1979). To be classified as jurisdictional wetlands, they must have the following attributes: hydrophytic vegetation, hydric soils, and hydrology. Within the analysis area, wetlands occur in or along perennial and intermittent streams, marshlands, swamps, lakes, ponds, springs, canals, ditches, and aqueducts.

Three overall systems of wetlands occur in the analysis area. They are palustrine, riverine, and lacustrine. The palustrine system includes non-tidal wetlands dominated by trees, shrubs, persistent emergents (herbaceous plants adapted to wet environments), or emergent mosses or lichens (Cowardin et al. 1979). In general, palustrine wetlands present in the analysis area occur between upland vegetation types and the other two types of wetlands (riverine or lacustrine). Consequently, palustrine systems of wetlands most often occur along streams and springs; along the shores of lakes and ponds; and in marshes, bogs, and swamps. Palustrine wetlands are most extensive along the 1400 miles of perennial streams and 433 lakes present in the analysis area. Here shrub communities with defined herbaceous layers are common.

The riverine system of wetlands includes non-tidal wetlands and deepwater habitats that are contained within a channel (Cowardin et al. 1979). Additionally, these wetlands are not dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens. Classes of riverine wetlands occurring within the analysis area include streambed, open water, unconsolidated shore, and unconsolidated bottom. Riverine wetlands may occur within the channels of rivers, perennial streams, intermittent streams, canals, and aqueducts.

Within the analysis area, about 993 acres are occupied by the channels of streams, rivers, canals, or aqueducts. Most of this acreage occurs in the areas with the moderate potential for deposits of oil and natural gas. The remaining acreage occurs in the areas with the high potential for deposits of oil and gas.

The lacustrine systems of wetlands includes topographic depressions or dammed river channels that have less than 30 percent cover by trees, shrubs, persistent emergents, or emergent mosses and lichens. In general, these areas occupy more than 20 acres (Cowardin et al. 1979). However, reservoirs or lakes under 20 acres in size may still be classified as lacustrine if water depths exceed 6.6 feet or have a rocky shoreline. Classes of lacustrine wetlands present within the analysis area include open water, unconsolidated shore, and unconsolidated bottom.

Within the analysis area, the Palisades Reservoir and at least one of the 434 smaller lakes meet or appear to meet the requirements for classification as lacustrine wetlands. Palisades Reservoir occupies about 15,943 acres. More than 97 percent of Palisades Reservoir is within the areas with a moderate potential for deposits of oil and natural gas. The rest of the reservoir borders the area with a high potential for deposits of oil and gas.

Rangelands

Rangelands are those areas, which by reason of physical limitations (low and erratic precipitation, rough topography, poor drainage, or cold temperatures), are unsuited to cultivation but are a source of forage for free-ranging native and domestic animals, wood products, water, and wildlife (Stoddart et al. 1975). Thus, most of the analysis area is considered rangeland. Most of the analysis area has been divided into about 140 range allotments for grazing cattle and sheep. Some rangeland is not open to grazing because of poor watershed conditions, conflicts with grizzly bears, or some other recreation or wildlife resource needs.

Overall, the ecological condition of range in the analysis area is stable or up. However, some areas, such as riparian areas, could be experiencing some adverse effects from grazing. The overall ecological condition is partly the result of actual grazing use being below the permitted use. Thus, the number of animals grazing on range within the analysis area is less than that which the range can support.

Noxious Weeds

Noxious weeds generally possess one or more of several characteristics. They include being aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new to, or uncommon to the United States. The Federal and state governments designate which plants are to be considered noxious weeds.

On the Forest, the establishment of noxious weeds is commonly associated with soil-disturbing activities, such as logging and the construction of roads. However, other activities also contribute to the establishment and spread of noxious weeds. They include the use of weed-infested hay, routine road maintenance, snow removal, and lack of weed control on adjacent lands.

At least nine species of plants designated as noxious weeds occur or potentially occur in the analysis area. They are black henbane, Canada thistle, musk thistle, plumeless thistle, poison hemlock, leafy spurge, spotted knapweed, common St. Johnswort, and yellow toadflax. The worst infestations are leafy spurge and Canada thistle, both of which may involve about 500 acres in the analysis area.

Wildlife

This section addresses:

Issue 2 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on species of wildlife and their habitats (particularly key habitats).

The analysis area supports a diverse assemblage of species of wildlife. About 400 species occur or potentially occur in the analysis area. They include 85 species of mammals, 300 species of birds, 7 species of amphibians, and 10 species of reptiles.

The wildlife resource present in the leasing area is predominantly upland in character and reflects the alpine, subalpine, montane, and sagebrush-grassland life zones. All the major wildlife groups are represented (Table 3–6). Aquatic and semi-aquatic wildlife are uncommon overall. However, they may be abundant where suitable habitat occurs.

Within the analysis area, several species or groups of species are of primary interest and concern to resource management agencies and the public. Species with key habitats identified include elk, deer, moose, bighorn sheep, mountain goat, and antelope. Additionally, species identified as sensitive by the Forest Service and species listed as threatened or endangered or proposed for listing as threatened or endangered also are of primary concern (these are discussed in the Threatened, Endangered, and Sensitive Species section below).

Elk

Economically, the elk is the most important big game animal in the analysis area. Elk occur in a variety of habitat types and are considered a forest generalist. Within the analysis area, elk use subalpine and upper montane habitat types during the summer and lower elevation sagebrush-grassland habitats in the winter. Within the analysis area, several ranges used by elk seasonally have been delineated. They are winter range, summer range, summer concentration areas, and calving areas.

Winter Range

Winter ranges are considered critical for maintaining populations of elk because of their limited areal extent and the increased level of stress the animals experience during the winter. As the depth of snow increases, elk are forced into the limited areas where they can still obtain food and avoid disturbance and predators. Because the animals' need for browse may double due to the increased stress of cold weather (Thomas and Toweill 1982), sufficient browse is important. Additionally, the same areas that attract elk during the winter also attract humans. Thus, at least portions of the traditional winter ranges often experience levels of human activity and development unacceptable to elk. This situation further restricts the amount of habitat available for elk and places additional stress on the animals. If the stresses cumulatively become too great, the herd will suffer losses greater than it can withstand and still maintain population size and productivity. Consequently, the herd's stability decreases and population size and/or productivity decreases.

Within central Idaho, the most commonly used winter ranges occur on abrupt east-west ridgetops between Douglas-fir and sagebrush-grassland habitats. In years with heavy snows or when snow on the ground is crusted, timbered areas are used for wintering (Ralphs 1981). Overall, elk are present on their winter range between November 30 and April 1.

Table 3–6 Summary of the Wildlife Resource in the Analysis Area

Wildlife Group	Common Representatives	Common Vegetation Associations	Comments
Big Game	Elk Mule Deer Moose Antelope Bighorn Sheep Mountain Goats	Coniferous Forest Deciduous Woodland Shrublands Montane Meadow Wetland/Riparian Grassland	Use higher-elevation habitats as summer range, and lower elevations as winter range
Small Mammals	Red-backed Voles Snowshoe Hare Uinta Chipmunk Dusky Shrew Montane Vole Deer Mouse	Coniferous Forest Alpine Tundra Shrublands Riparian/Wetland Deciduous Woodland Montane Meadow Grassland	Species composition diverse and all vegetation types occupied
Furbearers	Coyote Red Fox Muskrat Beaver Pine Marten	Coniferous Forest Montane Meadow Shrublands Riparian/Wetland Deciduous Woodland Grassland	Except for muskrat and beaver, members of this group tend to possess large home ranges
Waterbirds	Mallard American Coot Redhead Common Merganser Canada Goose Northern Pintail	Streams Lakes Riparian/Wetland	Most representatives of the group are migrants
Upland Gamebirds	Gray Partridge Sage Grouse Ruffed Grouse	Shrublands Montane Meadow Riparian/Wetland Grassland Deciduous Woodland Coniferous Forest	Members of this group occur within all vegetation types
Raptors	Red-tailed Hawk Cooper's Hawk Northern Harrier Great Horned Owl American Kestrel Prairie Falcon	Coniferous Forest Riparian/Wetland Grassland Shrublands Deciduous Woodland Montane Meadow	Members of this group tend to hunt large territories
Songbirds/Passerines	Mountain Bluebird Pine Siskin Dark-eyed Junco Brown Creeper Cassin's Finch Vesper Sparrow Sage Thrasher Black-capped Chickadee	Coniferous Forest Alpine Tundra Montane Meadow Sagebrush Shrubland Riparian/Wetland Mountain Shrubland Grassland Deciduous Woodland	Species composition diverse all vegetation types occupied, and species mixture changes seasonally
Reptiles and Amphibians	Tiger Salamander Western Rattlesnake Garter Snake	Riparian/Wetland Sagebrush Shrubland	Wetlands and riparian areas are especially important

Sources: Forest Service 1994, Stephens and Sturts 1991, Stebbins 1966, Clark et al. 1993, and Burt and Grossenheider 1976.

A total of 494,151 acres of elk winter range has been identified within the analysis area and is widely distributed (Figure 3–10). Thus, approximately 45 percent of the analysis area consists of elk winter range. Most of this acreage (57 percent) occurs in areas with a low potential for deposits of oil or natural gas (Table 3–7).

Summer Range

In general, summer range includes areas used by elk outside of winter (April 1 through November 30). However, some elk may stay on summer range or winter range throughout the year. Therefore, summer and winter ranges overlap somewhat (Figure 3–10).

Generally, summer ranges do not have the limiting effect that winter ranges have on elk populations. Without the snow cover that restricts the use of habitats during the winter, elk are able to make use of a wider range of habitats. Also, levels of stress in response to human disturbances are not as great on summer ranges because: 1) most summer ranges are at high elevations where human activity is more limited compared to that on winter ranges; and 2) forage is more abundant, of higher quality, and better distributed.

Within the analysis area, 801,526 acres (73 percent of the total area) have been designated as elk summer range (Table 3–7). About 16 percent of the summer range occurs in areas with a high potential for deposits of oil and natural gas. In contrast, 36 percent and 48 percent of the summer range occur in areas with a moderate or low potential for deposits of oil and gas, respectively.

Summer Concentration Areas

Elk summer concentration areas provide the necessary forage and security for elk to prepare for both the breeding and winter seasons. Disturbance within these areas when they are occupied by the elk can decrease the fitness of the herd before entering winter. On the Forest, elk summer concentration areas are those in which elk typically reside from June 15 through August 15.

Within the analysis area, approximately 24,720 acres of habitat (2 percent of the total analysis area) have been designated as elk summer concentration areas (Table 3–7). All of this habitat occurs in the area with a high potential for deposits of oil and gas.

Calving Areas

Calving areas for elk primarily consist of the transitional habitats between winter and summer range where calves are produced (Lyons and Christensen 1992). Cows typically follow the retreating snow line as they move onto summer ranges. Therefore, depending upon snow conditions, calving may occur in either summer or winter ranges as well as in transitional ranges (Leege 1984). Within the analysis area, calving primarily occurs between May 15 and July 15 and the peak of calving occurs between June 5 and 10.

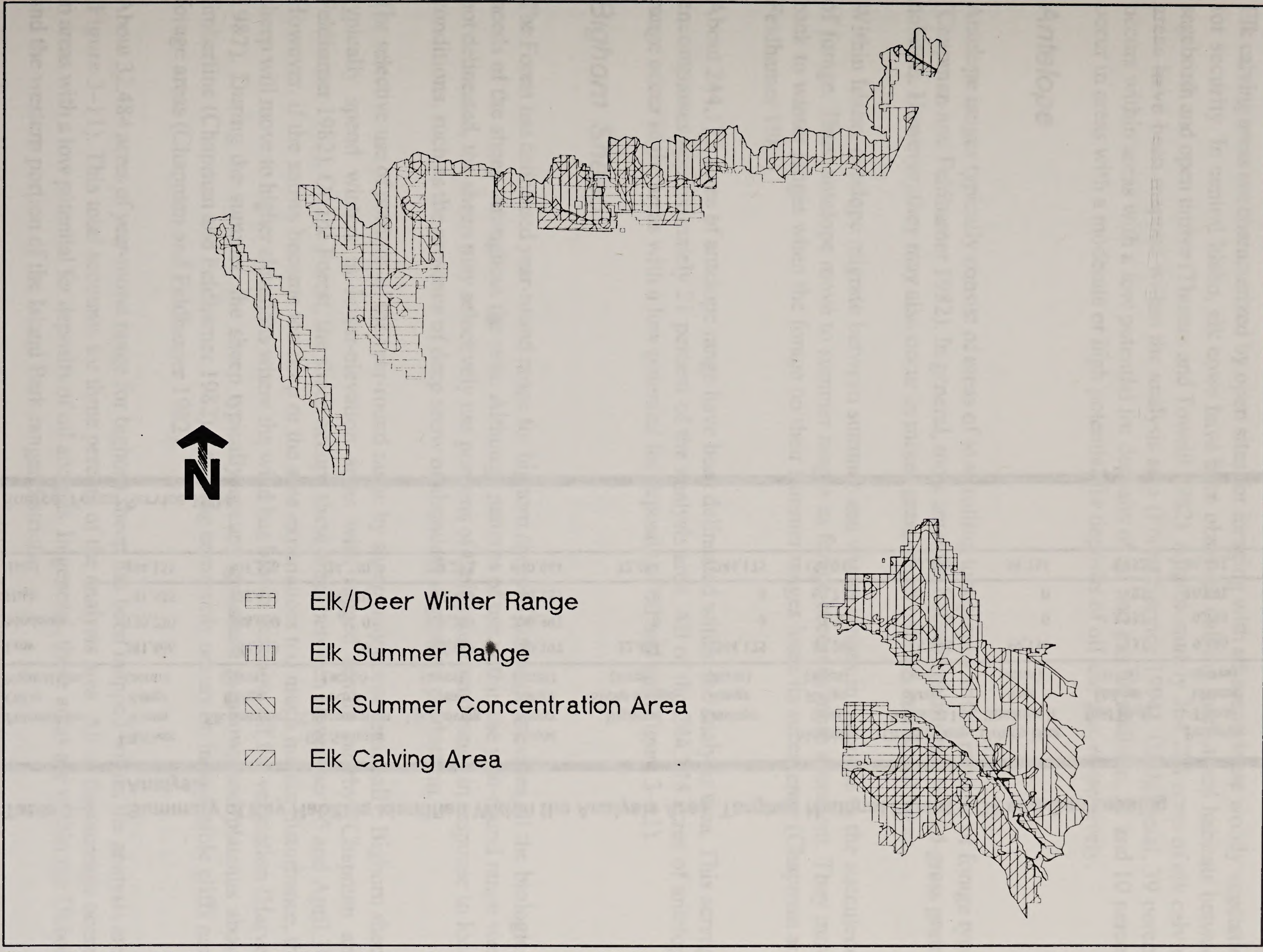

Figure 3–10 Distribution of Elk and Deer Seasonal Ranges Within the Analysis Area

Table 3–7 Summary of Key Habitats Identified Within the Analysis Area, Targhee National Forest's Oil and Gas Leasing Analysis

Potential for Oil or Natural Gas	Elk/Deer Winter Range (acres)	Elk Summer Range (acres)	Elk Summer Concentration Area (acres)	Elk Calving Area (acres)	Moose Winter Range (acres)	Bighorn Sheep Range (acres)	Antelope Range (acres)	Mountain Goat Range (acres)	Grizzly Bear Situation I Area (acres)	Grizzly Bear Situation II Area (acres)	Bald Eagle Habitat (acres)	Peregrine Falcon Habitat (acres)
Low	281,866	384,413	0	103,160	280,197	32,484	244,175	87,295	14,295	59,734	133	9,146
Moderate	170,730	288,660	0	135,209	250,592	0	0	2,501	0	0	3,232	6,744
High	41,555	128,453	24,720	25,919	80,155	0	0	60,215	0	0	87	10,591
Total	494,151	801,526	24,720	264,288	610,944	32,484	244,175	150,011	14,295	59,734	3,452	26,481

Source: Forest Service 1994.

Elk calving areas are characterized by open sites for foraging with adjacent dense woody vegetation for security. In central Idaho, elk cows have been observed calving in ecotonal habitats between sagebrush and open timber (Thomas and Toweill 1982). Approximately 264,288 acres of elk calving areas have been mapped within the analysis area (Forest Service 1994). Of this total, 39 percent occurs within areas with a low potential for deposits of oil and gas. In addition, 51 and 10 percent occur in areas with a moderate or high potential for deposits of oil and gas, respectively.

Antelope

Antelope ranges typically consist of areas of low, rolling topography with a mixture of forage types (Chapman and Feldhamer 1982). In general, most antelope occur in shortgrass to mid-grass prairie habitats. However, they may also occur in mixed grass-shrub habitats and desert areas.

Within Idaho, antelope migrate between summer and winter ranges in response to the succulence of forage. Thus, antelope move to summer ranges as forage becomes more succulent. They move back to winter ranges when the forage on their summer ranges loses its succulence (Chapman and Feldhamer 1982).

About 244,175 acres of antelope range have been delineated within the analysis area. This acreage encompasses approximately 21 percent of the analysis area. All of the 244,175 acres of antelope range occur in the areas with a low potential for deposits of oil and gas (Figure 3–11).

Bighorn Sheep

The Forest has delineated year-round range for bighorn sheep. This range provides all the biological needs of the sheep throughout the year. Although patterns of use within the year-round range were not delineated, the sheep may selectively use portions of their year-round range in response to local conditions, such as the presence of deep snow or abundant vegetative production.

The selective use of portions of the year-round range by sheep may occur seasonally. Bighorn sheep typically spend winters in lower-elevation areas with rugged terrain nearby (Chapman and Feldhamer 1982). On the Forest, the sheep occupy these areas between November 15 and April 30. However, if the snows become too deep or the area experiences too much human disturbance, the sheep will move to higher elevations where the wind has blown the snow off the vegetation (Harvey 1987). During the summer, the sheep typically occupy grassland meadows and plateaus above timberline (Chapman and Feldhamer 1982). Lambing commonly occurs on inaccessible cliffs near forage areas (Chapman and Feldhamer 1982).

About 32,484 acres of year-round range for bighorn sheep has been mapped within the analysis area (Figure 3–11). This total accounts for three percent of the analysis area. All of this acreage occurs in areas with a low potential for deposits of oil and gas. In general, these areas are within the Dubois and the western portion of the Island Park ranger districts.

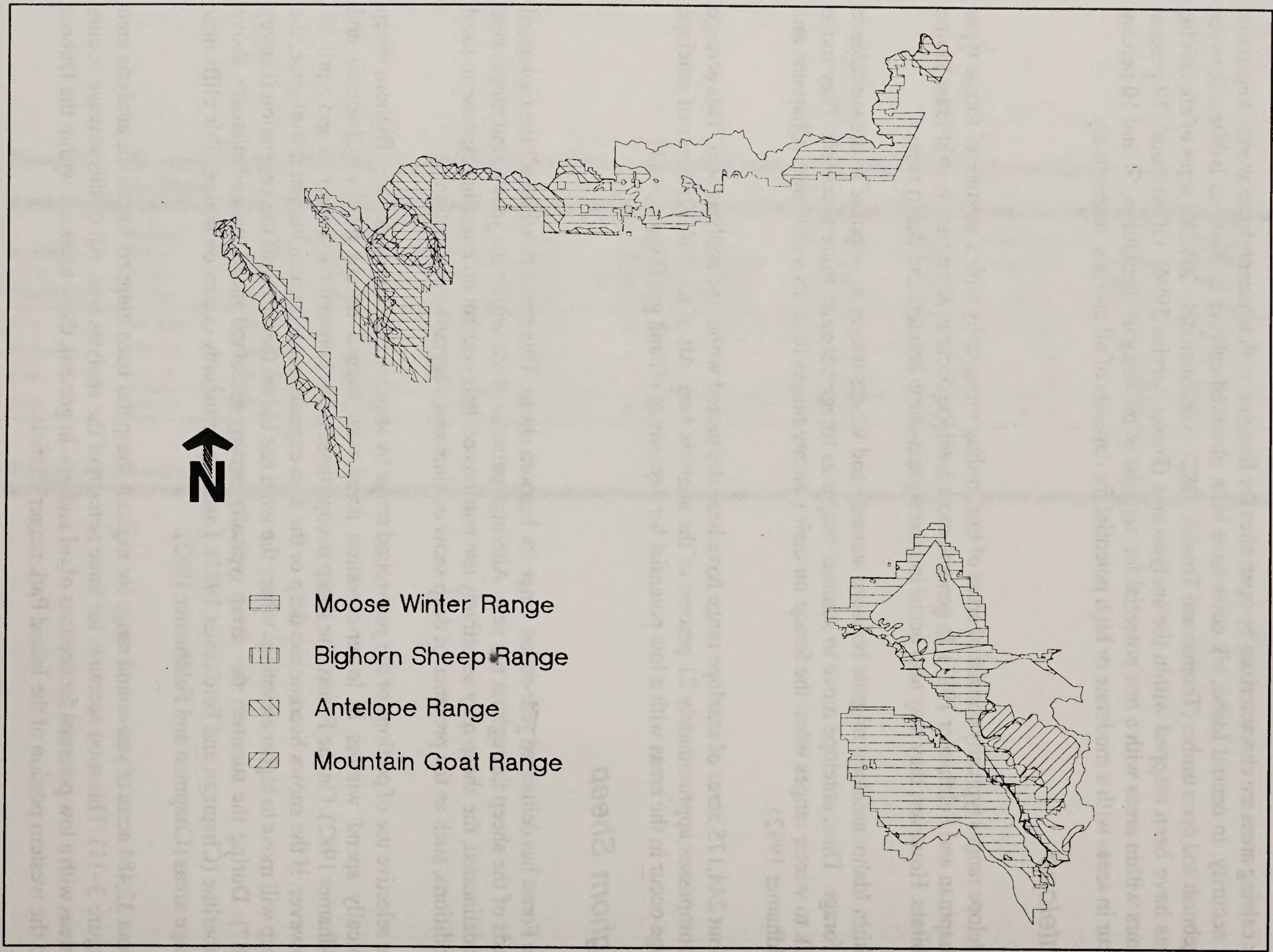

Figure 3–11 **Distribution of Antelope, Bighorn Sheep, and Mountain Goat Ranges Within the Analysis Area**

Mountain Goat

Year-round ranges for mountain goats also occur within the analysis area. In general, these areas provide all the biological needs of the goats throughout the year. Although patterns of use within the year-round range were not determined, the goats probably use portions of their year-round range selectively in response to local conditions, such as the presence of deep snow, succulence of vegetation, or the availability of water.

About 150,011 acres (14 percent) of the analysis area have been delineated as year-round range for mountain goats. Forty percent of these 150,011 acres occurs in the area of with a high potential for deposits of oil and natural gas. Two percent of the year-round range occurs in the areas with a moderate potential for deposits of oil and gas. Most of the range (58 percent) occurs in the areas with a low potential for deposits of oil and gas.

Fisheries

This section addresses:

Issue 9 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on fisheries and aquatic habitat.

There are approximately 964 miles of fishable cold-water streams on the Forest. This represents about 28 percent of the total stream mileage present. The streams range from high elevation, forested streams to lower elevation, rangeland streams. Streams within the east side of the analysis area form the headwaters of three major drainages: the Henry's Fork of the Snake River, South Fork of the Snake River, and the Teton River. Streams on the west side of the analysis area drain to Mud Lake or disappear into the Snake River Plain aquifer (the Sinks drainages). The Sinks drainages include the Birch, Camas, Beaver, and Medicine Lodge creeks. The most important fisheries are located in the Henry's Fork and the South Fork of the Snake River, attracting anglers from throughout the country (Forest Service 1992).

Of the 746 named drainages on the Forest, 102 have been classified by State and Federal wildlife agencies as Class I, II III, or IV trout streams (Forest Service 1992). Of these 102 streams, approximately 67 occur in the analysis area or are close enough to possibly be influenced by streams in the analysis area. Eleven of the 67 steams are classified as Class I trout streams. These are streams with the highest-valued fishery resource. Fourteen and 40 streams are classified as Class II and Class III trout streams, respectively. Class II streams have a high-priority fishery resource. Class III streams have a substantial fishery resource. Only two streams are considered Class IV streams. These are streams with a limited fishery resources.

There are approximately 22,900 acres of lakes, ponds, and reservoirs on the Forest. Most of this acreage occurs within the analysis area or is immediately downstream of tributaries that occur within the analysis area. For example, Henry's Lake, which is not located in the Forest or analysis area, is located downstream of tributaries present in the analysis area.

At least 21 species of fish may inhabit drainages present in the analysis area or drainages immediately downstream of the analysis area (Table 3–8). Species native to the area include Yellowstone cutthroat trout, finespotted cutthroat trout, mountain whitefish, sucker, dace, and sculpin. Introduced species include rainbow, brook, brown, and lake trout; kokanee salmon; and coho salmon (Thurow et al. 1988; Simpson and Wallace 1982). Native cutthroat trout is a Management Indicator Species (MIS) for the Forest.

Native Cutthroat Trout

The native cutthroat trout in the analysis area are the subspecies Yellowstone cutthroat trout and the undescribed finespotted Snake River cutthroat trout (Behnke 1992). The Yellowstone subspecies is indigenous to the upper Snake River and the Sinks drainages (Varley and Gresswell 1988). The Snake River finespotted subspecies has a limited distribution, existing only in the Snake River from below Jackson Lake in Wyoming downstream to near the Palisades Dam in Idaho (Thurow et al. 1988). Finespotted cutthroat has been designated a sensitive species by the Regional Forester and the Idaho Department of Fish and Game (IDFG) has listed all cutthroat as species of special concern.

Cutthroat in streams and lakes within the analysis area use three lifestyles. They are stream-migratory, nonmigratory, and lake-migratory. Stream-migratory populations use tributary streams, such as in the South Fork Snake River, to spawn. These stocks migrate from the mainstem to the tributaries in early spring. After emergence, juveniles remain in their natal streams for 1-3 years before migrating back to the mainstem. Non-migratory populations include individuals that disperse locally within the stream to spawn. The South Fork, Henry's Fork, Teton River, Willow Creek, and Sinks headwaters contain populations exhibiting this lifestyle. Finally, lake-migratory populations, such as Henry's Lake cutthroat, reside in the lake and ascend the lake tributaries to spawn. Duck and Targhee creeks are the most important headwater tributaries containing populations exhibiting this lifestyle.

In the Greater Yellowstone Area, Yellowstone cutthroat trout presently exist in only 10 percent of historical stream habitats and 85 percent of lake habitats (Varley and Gresswell 1988). The introduction of non-native fishes (such as rainbow and brook trout), environmental degradation, and over-fishing have all contributed to a reduction in numbers and distribution.

Only remnant migratory and isolated nonmigratory populations exist in the Henry's Fork (Thurow et al. 1988). Recent surveys in Warm River (a major tributary to Henry's Fork) indicate that less than one percent of the observed fish were cutthroat (Griffith 1991). Creel surveys on the Henry's Fork by the IDFG also show that native cutthroat occurred in only one percent of the creels checked.

Table 3–8 Species of Fish Occurring or Potentially Occurring in the Analysis Area

Common Name	Henrys Fork	South Fork	Teton River	Willow Creek	Mud Lake
	Presence In Drainage[1]				
Finespotted cutthroat trout		+			
Yellowstone cutthroat trout	+	+	+	+	+
Brown trout	+	+		+	+
Brook trout	+		+	+	+
Rainbow trout	+		+	+	+
Bull trout					?
Mountain whitefish	+		+		
Longnose dace	+	+	+	+	+
Speckled dace	+	+	+	+	+
Utah chub	+	+	+	+	+
Common carp				+	
Mountain sucker		+	+	+	
Utah sucker	+	+	+	+	+
Bluehead sucker	?	+	?	+	
Redside shiner	+	+	+	+	+
Mottled sculpin	+	+	+	+	
Piute sculpin	+	+	+	+	
Shorthead sculpin					+
Kokanee	+				
Coho salmon	+				
Lake trout		+			

Notes:
1. A "+" means the species is present in the drainage, a "?" means the species may be present in the drainage.

Source: Forest Service 1992.

There are viable populations of both migratory and nonmigratory cutthroat trout in the South Fork Snake River drainage. However, Thurow et al. (1988) report that only two of six tributaries consistently produce large numbers of migratory stock recruits to the South Fork.

Management Concerns

Both Federal and State agencies have stocked exotic fishes in waters of the Forest. These introductions threatened indigenous cutthroat trout through hybridization and displacement (Thurow et al. 1988). Rainbow trout have been the most widely introduced species, followed by brook and brown trout. The most notable example of displacement occurred in the Henry's Fork, where most rainbow show evidence of hybridization with cutthroat, and native cutthroat have been virtually eliminated (Griffith 1988).

Island Park and Palisades reservoirs are both widely-fluctuating, irrigation reservoirs. They provide important flat-water fishing opportunities for rainbow, cutthroat, and lake trout; coho salmon; and kokanee salmon. Severe drawdowns during the drought of 1987–1992 have flushed significant numbers of fish out of the reservoirs. The problems associated with the drought and lack of hatchery fish have contributed to the decline in fishery conditions in the reservoirs (IDFG 1991).

Management of the reservoirs has contributed to fish resource problems downstream in both the Henry's Fork and the South Fork Snake rivers. Significant dewatering of side channels on the South Fork has resulted in major losses of juvenile salmonids. Dewatering of critical bank habitat below Island Park Reservoir has also contributed to a decline in fish populations in the Henry's Fork. Essential overwintering habitat occurring along the stream margins here are exposed when water-releases are reduced in winter. Another problem associated with irrigation involves the loss of fish to diversion canals. The IDFG has an active screening program in place to reduce these losses.

Cutthroat trout occupy headwater stream areas, especially when other trout species are present in the same river system (Clova and Mason 1976). Optimal trout habitat is characterized by clear cold water, rocky substrate, and an approximately 1:1 pool-riffle ratio with areas of slow deep water, a relatively stable flow regime, well-vegetated stream banks, and abundant instream cover. Marginal trout streams and streams affected by land management activities may be deficient in one or more of the above stream features (Raleigh and Duff 1981).

Threatened, Endangered or Sensitive Species

This section addresses:

Issue 1 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on threatened, endangered, candidate, or sensitive species of plants and animals.

Threatened or Endangered Species

Grizzly Bear

The grizzly bear is classified as a federally-threatened species with occupied habitat on the Forest. Grizzlies are typically wide ranging and generally select habitats away from human disturbances. Typically, habitats used during the late fall and spring include low-elevation riparian areas, snow chutes, and meadows. During the summer, mixed shrub fields, seeps, grasslands, timbered hillsides, parks, and old burns are used. In early fall and winter grizzlies move to high-elevation habitats such as alpine forests and alpine slab rock areas (Reel et al. 1989).

In general, grizzlies enter hibernation in November and do not emerge until March. Hibernation, typically occurs in caves or excavated dens. These dens are generally located above 6,500 feet (Spahr et al. 1991). It is in the dens that cubs are born, generally in January (Reel et al. 1989).

Grizzlies typically feed on forbs, sedges, grasses, roots, berries, and pine nuts. However, they also may feed on fish, ground squirrels, rodents, ungulates, carrion, and insects (Reel et al. 1989). Grizzlies within the Yellowstone ecosystem typically feed on white bark pine nuts during the fall. In addition, areas in which large numbers of fish occur (particularly spawning runs) are also used by grizzlies (Spahr et al. 1991).

Grizzly Bear Situation I Areas

Grizzly bear situation I areas contain grizzly bear population centers. These areas are key to the survival of the bears and encompass locations where both seasonal and year-long activities occur under natural and free-ranging conditions. Also, the habitat components needed for the survival and recovery of the species or segments of its populations occur in these areas (Forest Service 1989).

Grizzly bear situation I areas encompass 14,295 acres in the northern portion of the analysis area (Figure 3–12). This accounts for approximately one percent of the total analysis area. All of the grizzly bear situation I area present within the analysis area occurs in areas with a low potential for deposits of oil and gas.

Grizzly Bear Situation II Areas

Grizzly bear situation II areas are those areas where distinct grizzly bear populations and highly suitable habitat do not exist. However, areas of habitat may occur and grizzly bears may occur occasionally. In contrast to situation I areas, situation II areas are not critical to the recovery or survival of the species. However, the status of these areas is subject to review and may be changed according to the status of grizzly bear populations (Forest Service 1989).

About 59,734 acres of the analysis area are defined as grizzly bear situation II areas. This encompasses approximately 5 percent of the total analysis area. All of the situation II areas within the analysis area adjoin the situation I area in the northern portion of the area with a low potential for deposits of oil and gas (Figure 3–12).

Rocky Mountain Gray Wolf

In August 1987, the U.S. Fish and Wildlife Service (FWS) finalized the recovery plan for the wolf. This plan guides efforts the FWS believes will lead to the removal of the wolf from the endangered species list. The FWS will consider de-listing the wolf when at least 10 breeding pairs inhabit each of three recovery areas for a minimum of three years (FWS 1987). The three recovery areas delineated by the FWS are the Northwest Montana, Yellowstone, and Central Idaho Recovery Areas (Figure 3–13). The Yellowstone Recovery Area encompasses a small portion of the analysis area.

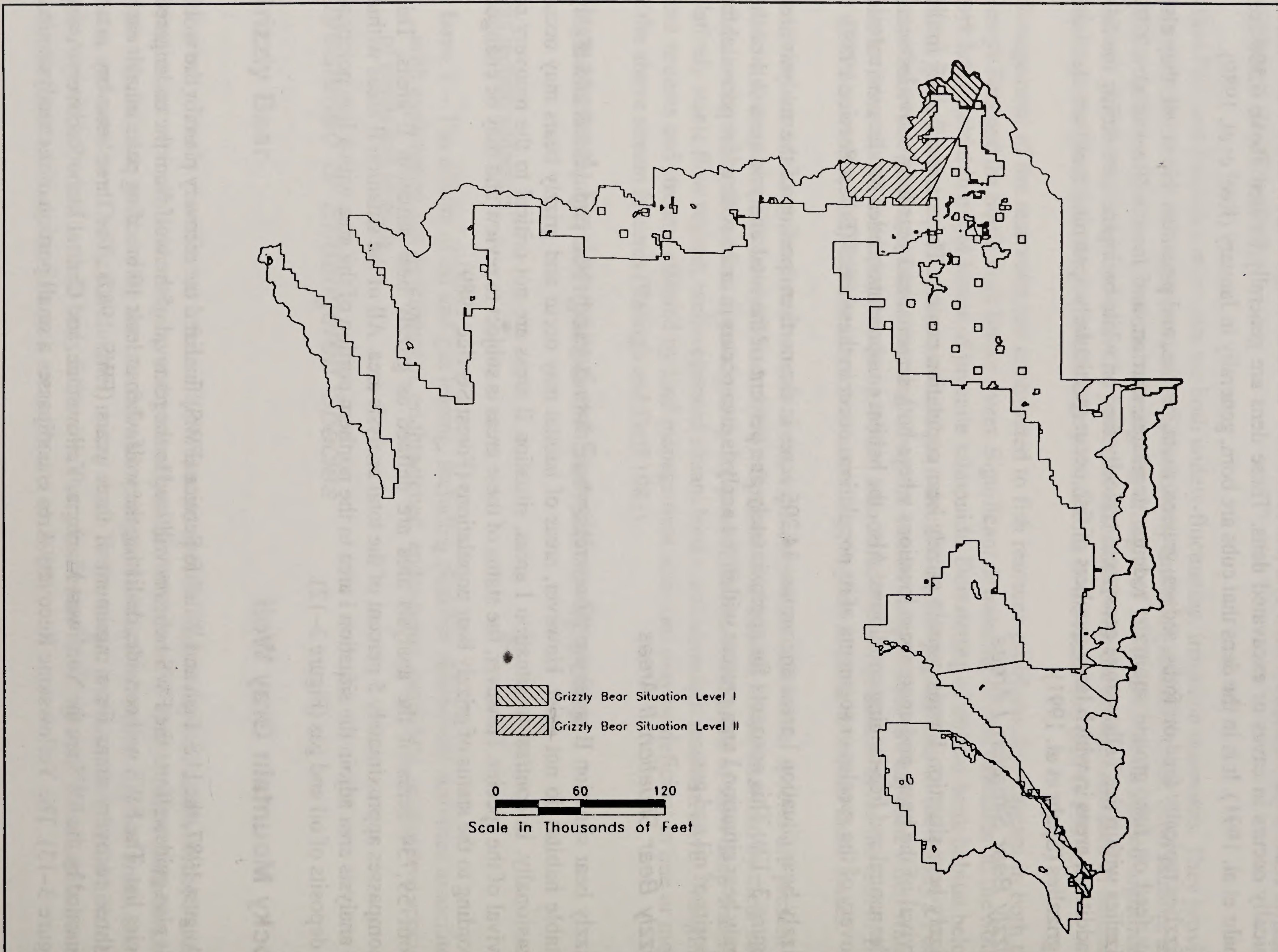

Figure 3–12 Distribution of Grizzly Bear Situation I and II Areas Within the Analysis Area

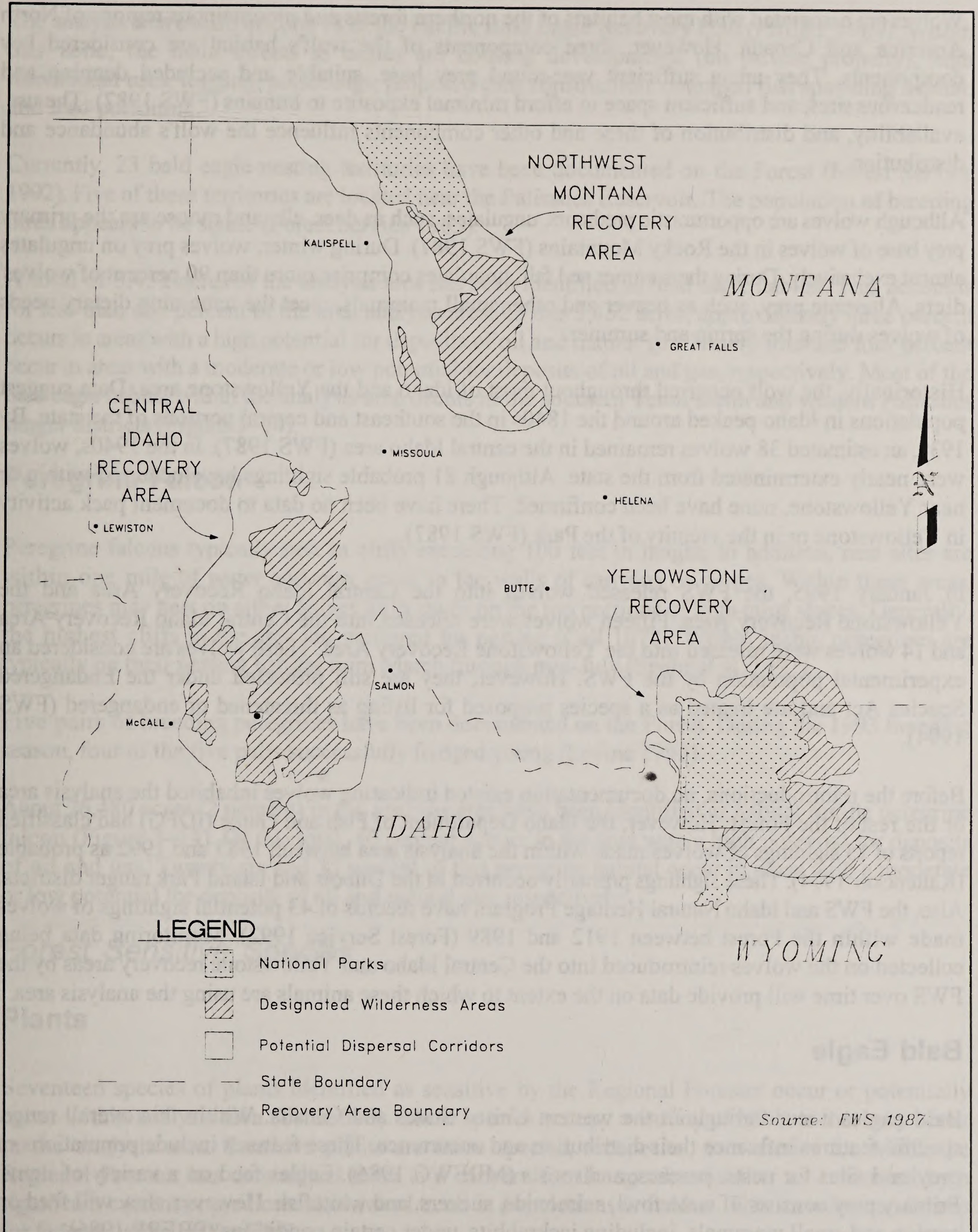

Figure 3–13 Location of Recovery Areas for Gray Wolves

Wolves are associated with most habitats of the northern forests and mountainous regions of North America and Canada. However, three components of the wolf's habitat are considered key components. They are a sufficient year-round prey base, suitable and secluded denning and rendezvous sites, and sufficient space to afford minimal exposure to humans (FWS 1987). The use, availability, and distribution of these and other components influence the wolf's abundance and distribution.

Although wolves are opportunistic predators, ungulates, such as deer, elk, and moose are the primary prey base of wolves in the Rocky Mountains (FWS 1987). During winter, wolves prey on ungulates almost exclusively. During the summer and fall, ungulates comprise more than 90 percent of wolves' diets. Alternate prey, such as beaver and other small mammals, meet the remaining dietary needs of wolves during the spring and summer.

Historically, the wolf occurred throughout most of Idaho and the Yellowstone area. Data suggest populations in Idaho peaked around the 1840s in the southeast and central portions of the state. By 1939, an estimated 38 wolves remained in the central Idaho area (FWS 1987). In the 1940s, wolves were nearly exterminated from the state. Although 81 probable sightings have occurred within or near Yellowstone, none have been confirmed. There have been no data to document pack activity in Yellowstone or in the vicinity of the Park (FWS 1987).

In January 1995, the FWS released wolves into the Central Idaho Recovery Area and the Yellowstone Recovery Area. Fifteen wolves were released into the Central Idaho Recovery Area and 14 wolves were released into the Yellowstone Recovery Area. These wolves are considered an experimental population by the FWS. However, they are still protected under the Endangered Species Act and are treated as a species proposed for listing as threatened or endangered (FWS 1994).

Before the reintroductions, no documentation existed indicating wolves inhabited the analysis area or the rest of the Forest. However, the Idaho Department of Fish and Game (IDFG) had classified reports of 15 sightings of wolves made within the analysis area between 1983 and 1992 as probable (Kaltencker 1994). These sightings primarily occurred in the Dubois and Island Park ranger districts. Also, the FWS and Idaho Natural Heritage Program have records of 43 potential sightings of wolves made within the Forest between 1912 and 1989 (Forest Service 1992). Monitoring data being collected on the wolves reintroduced into the Central Idaho and Yellowstone recovery areas by the FWS over time will provide data on the extent to which these animals are using the analysis area.

Bald Eagle

Bald eagles occur throughout the western United States and Canada. Within this overall range, specific features influence their distribution and occurrence. These features include populations of prey and sites for nests, perches, and roosts (MBEWG 1986). Eagles feed on a variety of items. Primary prey consists of waterfowl, salmonids, suckers, and whitefish. However, they will feed on carrion and small mammals, including jackrabbits, under certain conditions (PBERP 1986).

The analysis area occurs in Zone 18 of the Pacific Bald Eagle Recovery Plan (PBERP 1986). Within this zone, the main threats to eagles are housing developments (on private property), high recreational uses, logging, poisonings, proposed dam construction, degraded fish spawning habitat, and lead poisoning.

Currently, 23 bald eagle nesting territories have been documented on the Forest (Forest Service 1992). Five of these territories are located near the Palisades Reservoir. The population of breeding birds appears to be stable (Forest Service 1985).

A total of 3,452 acres of the analysis area has been identified as bald eagle habitat. This accounts for less than one percent of the total analysis area. Of this 3,452 acres, approximately three percent occurs in areas with a high potential for deposits of oil and natural gas. Ninety-four and four percent occur in areas with a moderate or low potential for deposits of oil and gas, respectively. Most of the bald eagle habitat within the analysis area occurs in the southern Teton Basin and western Palisades ranger districts (Figure 3–14).

Peregrine Falcon

Peregrine falcons typically nest in cliffs exceeding 100 feet in height. In addition, nest sites are within one mile of water and may occur in the walls of canyons or gorges. Within these areas, peregrines may nest on either ledges or in caves on the top portions of high talus slopes. Generally, the highest cliffs in the area are preferred for nesting (Call 1978). Within Idaho, peregrines are typically on their nesting habitat from March through mid-July (Spahr et al. 1991).

Five pairs of breeding peregrines have been documented on the Forest. During the 1993 breeding season, four of the five pairs successfully fledged young (Levine 1993).

About 26,480 acres (2 percent) in the analysis area have been identified as habitat for the peregrine falcon (Figure 3–14). Of this total, 40 percent occurs in the area with a high potential for deposits of oil and gas. Twenty-six and 35 percent of this peregrine habitat occur in areas with a moderate or low potential for deposits of oil and natural gas, respectively.

Forest Sensitive Species

Plants

Seventeen species of plants identified as sensitive by the Regional Forester occur or potentially occur within analysis area (Table 3–9). These species occupy a variety of habitats that may occur in the analysis area. Sensitive plants are those species, subspecies, or varieties for which the Regional Forester has determined there is a concern for the species viability as evidenced by a significant current or predicted downward trend in populations or habitat. This includes candidates for federal listing by the FWS.

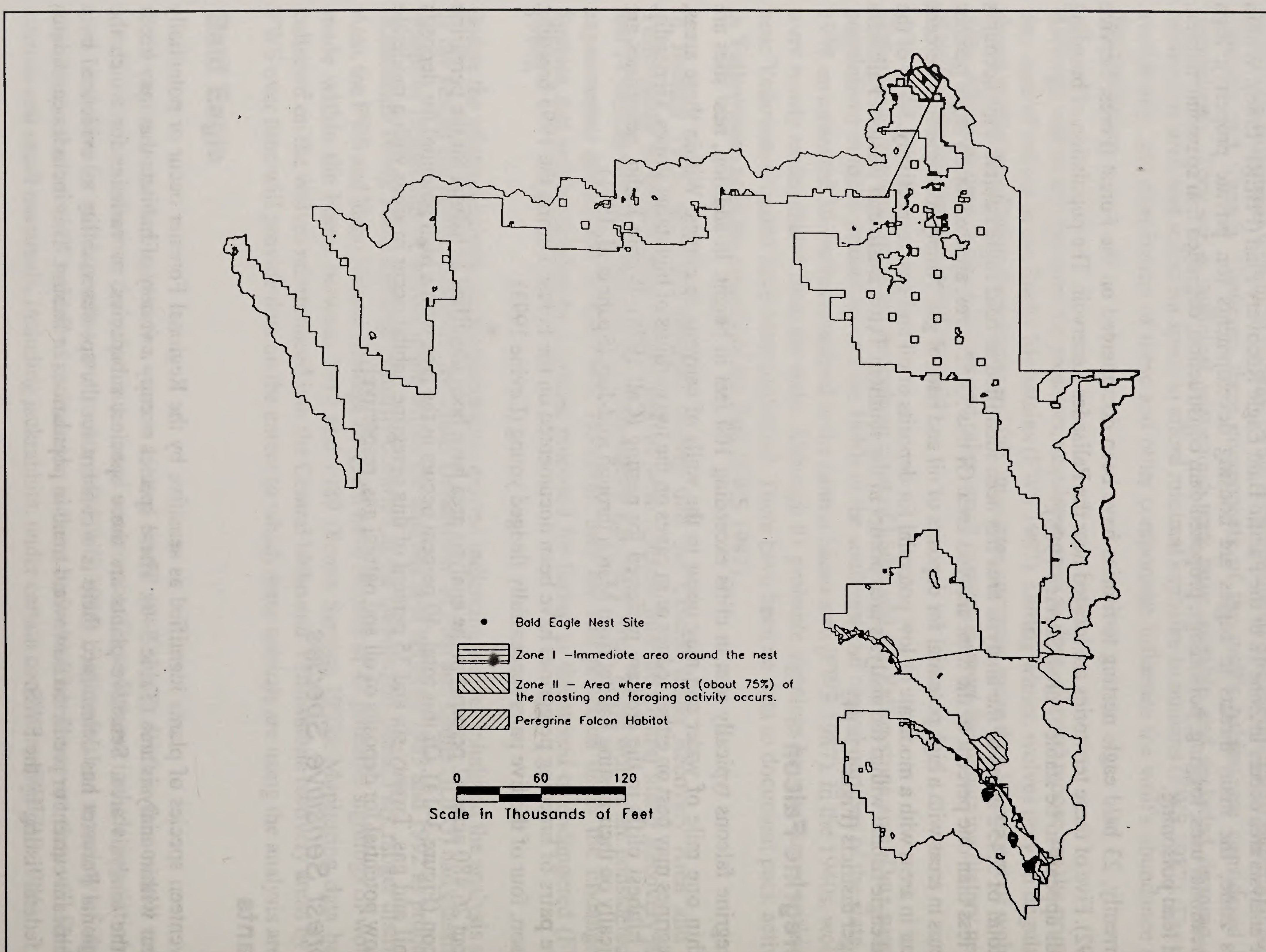

Figure 3–14 Distribution of Bald Eagle and Peregrine Falcon Habitats Within the Analysis Area

Table 3–9 Sensitive Plants Occurring or Potentially Occurring Within the Analysis Area

Common Name	Habitat Requirements
Pink agoseris	perennially wet montane meadows of which the soil is saturated through the growing season; mid-montane to subalpine
Plains milkvetch	barren knolls, stony hilltops, and gullied bluffs and badlands made of limestone, shale, or sandstone in sagebrush communities; elevations between 5340-6590 feet
Bronze sedge	moist meadows, streambanks, edges of cultivated fields, and wet places in humid regions; low elevations to montane
Buxbaum's sedge	sunny or slightly shady swamps, meadows, peat bogs, marshes, and other wet places; elevations between 7400-9500 feet
Centennial rabbitbrush	common on Beaverhead Conglomerate rock outcrops, slump gravels, and relatively stable talus of SE to SW exposures; elevation 8800-9800 feet
Yellow spring-beauty	moist mountain meadows where grasses have not established a thick turf; open exposures in lodgepole pine communities; elevations between 5500-10000 feet
Douglas biscuitroot	open, grassy, or rocky ridges and summits or in moist alpine and subalpine meadows in calcareous or dolomitic substrates; elevation above 9000 feet; associated with forb-grass communities
Ibapah biscuitroot	greasewood-sagebrush, sagebrush-grass, and pinyon-juniper communities
American silverberry	gravelly benches and scabland; along watercourses with willow and poplar; elevations between 6000-8000 feet
Giant helleborine	wet places on seepage slopes and at the base of cliffs along springs, streambanks, and rivers; wet places in desert areas and in thermal sites; elevation between 2900-4100 feet
Four-parted gentian	high elevation meadows and streambanks above 9800 feet
Arctic poppy	rocky ledges and cliffs on near vertical quartzite rock and rocky summits and ridges associated with grasses; strictly alpine in Idaho
Alkali primrose	wet, alkaline meadows in the large, intermontane valleys; found from low saturated soil to the hummocks in grass-sagebrush communities; elevation between 6294-6720 feet
Hoary willow	bogs, swampy places, and meadows
Nodding saxifrage	rocky places along stream banks, gravelly meadows and in glacial detritis; found over 10000 feet in elevation
Pine needlegrass	dry, often rocky, benchlands and foothill slopes, shale barrens in sagebrush, mountain brush, pinyon-juniper, and ponderosa pine communities; elevation between 6560-12000 feet
Green needlegrass	does especially well on clay soils; found along roads, in grass and sagebrush communities; dry areas; elevation between 4500-7050 feet

Wildlife

Fourteen species of wildlife identified as sensitive species by the Regional Forester occur or potentially occur within the analysis area. Each of these species is discussed below.

Northern Goshawk

Goshawks occur in a variety of habitats, depending upon the time of year. During the breeding season, they are primarily associated with dense northern forests. During the non-breeding season, use of habitats is more varied and may include coniferous forests, riparian areas, and sagebrush shrublands (Johnsgard 1986).

Nest sites are generally in mature coniferous, mixed hardwood, and deciduous forests with a closed canopy and a high density of large trees. Also, nests are generally used repeatedly, some may even be used intermittently for decades (Reynolds et al. 1992). Typically, nest trees are in the oldest stands of an area. The diameter at breast height (dbh) of nest trees varies from 8 to 20 inches. Of secondary importance for nest tree location is slope. Most nests are on moderate to flat slopes (0 to 30 percent). There is also some preference for nesting near water (Fowler 1988). Nesting pairs are typically at the nest site from early March through late September (Forest Service 1992).

Foraging habitat for nesting goshawks usually consists of woodlands with large, mature trees. However, goshawks are characteristically opportunistic foragers and may use deep forests as well as forest edges. Goshawks forage in the ground-shrub, shrub-canopy, and canopy zones of the forest. However, because of the goshawk's large body size and wing span, it seldom uses young dense forests for foraging (Reynolds et al. 1992). Although common prey species include both birds and small mammals, birds make up the largest portion of the diet (Fowler 1988).

Available information indicates nesting densities and home ranges vary, depending upon the quality of habitat (Fowler 1988). Densities of nesting pairs range from 2.4 to 11 pairs of birds per 62 square miles. Results of studies suggest that home ranges often approach 5000 acres (Fowler 1988).

The occurrence of goshawks in the Forest and the analysis area has been documented. Thirty-four goshawk nesting sites or clusters were identified on the Forest between 1980 and 1990. An additional six nesting sites were identified between 1990 and 1992 (Forest Service 1992). Twenty-two historic, active, or alternate nest sites have been located within the analysis area. Available information indicates most goshawks probably occur within suitable habitats in the areas with a low or moderate potential for deposits of oil and natural gas.

North American Lynx

Substantial populations of lynx probably do not exist in Idaho (IDFG 1991), primarily because Idaho is on the southern edge of the lynx's range. The lynx is commonly associated with the boreal forests of Alaska and Canada (Koehler and Brittell 1990). Within Idaho, lynx may occur in suitable habitats at elevations above 4,000 feet (Koehler and Brittell 1990).

Areas inhabited by the lynx characteristically experience deep snows and very cold temperatures. Optimal habitat for the lynx consists of early successional stands of forest with an understory that has a high density of shrubs and seedlings and stands of mature forest nearby (Spahr et al. 1991). The mature forests provide important habitat for denning, security, and travel corridors.

Specific habitat types utilized in Idaho have not been documented. However, in northwestern Montana, lynx were most often found in dense lodgepole pine habitat types. Sightings in Douglas-fir habitat types were infrequent and they did not use large clearcuts or meadows (Koehler et al. 1979). In north-central Washington, lynx are primarily associated with the lodgepole pine and Englemann spruce-subalpine fir forest types (Koehler 1990). They predominately use mature stands of Englemann spruce, subalpine fir, and lodgepole pine with large amounts of down timber (40 downfall logs/160 linear ft.) and a north-northeast aspect for denning (Koehler 1990).

Lynx are almost exclusively carnivorous and depend on the snowshoe hare as their primary food source (Chapman and Feldhamer 1982). Studies of diet indicate the snowshoe hare accounts for 100 percent of a lynx's diet when the hare is abundant. In contrast, when the hare is scarce, it accounts for 43 percent of the lynx's diet.

In general, lynx are solitary, wide-ranging animals that associate only for reproducing and rearing young. Home ranges varying in size from 5 to 94 square miles have been recorded. Koehler (1990) determined home ranges for lynx in Washington to be approximately 24 square miles for females and 43 square miles for males. Overall, he found a density of 2.6 lynx per 62 square miles. In Montana, Koehler et al. (1979) recorded home ranges of 22 square miles for male lynx.

No records documenting the occurrence of lynx (historical or present) in the analysis area or the Forest were located for this analysis. However, habitat suitable for the lynx (lodgepole pine and Englemann spruce-subalpine fir forest at elevations above 4,000 feet) does occur within the analysis area. Thus, the lynx's presence cannot be entirely discounted. If the lynx occurs in the analysis area, its distribution is probably extremely limited.

Wolverine

Wolverines inhabit high-elevation tundra and coniferous forests in summer and mid- to low-elevation areas during winter. Riparian areas in lower elevations may provide important winter habitat. Also, areas that have snow on the ground during the winter are preferred (Chapman and Feldhamer 1982). Wolverines hunt in small meadows, timbered thickets, and riparian areas, but avoid large meadows and clearcuts (Spahr et al. 1991).

Since 1985, the IDFG has been trying to document the occurrence and distribution wolverines in Idaho through questionnaires, a poster campaign, and field surveys. Confirmed reports of wolverines (sightings documented with a photograph or carcass) indicate at least three areas in Idaho contain wolverines (Groves 1988). They are the Selkirk Mountains, Lochsa and Kelly Creek drainages, and the Sawtooth–Smoky Mountains Complex. Field surveys have confirmed the presence of wolverines in the Sawtooth–Smoky Mountains Complex (Bachman et al. 1990, Copeland and Harris 1993). None of these three areas occurs within the analysis area for this oil and gas leasing analysis.

Overall, wolverines appear to occupy large, mountainous, essentially roadless areas in Idaho (Grover 1988). Preliminary data from telemetric relocations indicate wolverines are closely associated with high-elevation cirque basins, particularly rock skree or boulder slopes (Copeland and Harris 1993). Also, during the winter wolverines prefer stands of spruce-fir along stream bottoms. These patterns of habitat use are consistent with those described by Hornocker and Hash (1981). In Montana, they determined wolverines move to higher inaccessible habitats during the summer when human activities increase on their range.

The occurrence of wolverines within the analysis area has been confirmed; they were photographed in Pasture and Pete Creek drainages in the Centennial Mountains. Probable reports of wolverines (high-probability sightings or tracks that were not documented with a photograph or carcass) have been recorded in the general area (Groves 1988). Additionally, 15 probable reports of observations of wolverines occurred within the analysis area (Kaltenecker 1994). All of these observations occurred within the areas with a low potential for deposits of oil and natural gas.

Fisher

Fishers use a variety of habitats. They inhabit both lowland forests and mature/old-growth spruce-fir forests that have an extensive canopy (Allen 1983). They also show some preference for moister areas (Chapman and Feldhamer 1982). During the summer, a dense understory of shrubs, young conifers, or herbaceous cover is important for denning, security, and travel corridors (Spahr et al. 1991). In Montana, Hornocker and Hash (1981) found fishers most often associated with mature and intermediate stands of subalpine fir forest. Areas of particularly high use are edge habitats around cliffs, slides, blowdowns, basins, swamps, and meadows.

Two factors have been identified that may limit the range of fishers. They are large clearings and snow. Although fishers will make limited use of small clearings for foraging, they will not venture far into large openings. Thus, an abundance of large meadows, clear-cuts, or grasslands may limit the fishers range. Thick, soft snow may also limit the range of fishers because it reduces their mobility during winter (Allen 1983).

The density of prey is probably the most important factor influencing the fisher's selection of habitat. The fisher primarily preys on porcupines, snowshoe hares, and grouse (Allen 1983). The fishers is the only species that consistently preys upon porcupines (Chapman and Feldhamer 1982). However, it also feeds on insects, carrion, reptiles, nuts, and berries (Spahr et al. 1991).

The size of home ranges of fishers vary between the sexes and influence the overall densities of their populations. For males, home ranges vary from 6.5 to 15 square miles. The home ranges of females range from 1.5 to 5.8 square miles. Although the ranges of males and females may overlap, there is little overlap between like sexes. Densities of fishers may be as low as one animal per 77 square miles. However, in preferred habitats, densities maybe as high as one fisher per 1 to 3 square miles (Spahr et al. 1991).

Two observations of fishers made between 1978 and 1990 (Kaltenecker 1994) document the occurrence of fishers within the analysis area. One sighting was in the area with a high potential for deposits of oil and gas (Palisades Ranger District). The second sighting occurred in the area with a low potential for deposits of oil and gas (Island Park Ranger District). Although no other observations have been documented for the analysis area, the fisher probably occurs within the area in suitable habitat.

Western Big-Eared Bat

The western big-eared bat occurs in a wide variety of habitats. These primarily include juniper/pine, shrub/steppe grasslands, deciduous, and mixed coniferous forests. They also may be found at elevations ranging from sea level to 10,000 feet. Moths are the primary component of the bat's diet (Spahr et al. 1991).

The bats hibernate from October to February in a variety of places. The hibernacula they use include caves, old mine shafts, rocky outcrops, and abandoned buildings. Breeding occurs in the hibernaculm. Gestation varies from 56 to 100 days. However, while in hibernation any human disturbance will cause the bat to abandon the roost (Spahr et al. 1991).

No observations documenting the occurrence of the western big-eared bat in the analysis area have been reported (Kaltenecker 1994). The portion of the Forest in Wyoming was surveyed specifically for western big-eared bats. However, none were located. Although no observations have been recorded, the bat may occur within the analysis area in suitable habitats.

Spotted Bat

Spotted bats typically are associated with a wide variety of habitats. However, the primary habitats include open ponderosa pine, desert scrub, pinyon-juniper, and open pasture lands (Spahr et al. 1991). Roosts are generally located in steep limestone or sandstone cliff faces. Spotted bats are thought to forage on moths by using echolocation. Foraging is generally done at night. This species is typically a solitary forager (Spahr et al. 1991). In addition, this species is thought to be migratory. They probably migrate south of the Forest for winter hibernation (Spahr et al. 1991).

No observations documenting the occurrence of the spotted bat in the analysis area have been reported (Kaltenecker 1994). As with the western big-eared bat, the portion of the Forest in Wyoming was surveyed specifically for spotted bats and none were located. Although no observations have been recorded, the bat may occur within the analysis area in suitable habitats.

Boreal Owl

Boreal owls are the most common forest owl in the northern forests of Canada, Alaska, Scandinavia, and Russia. Idaho, however, is at the southern edge of the boreal owl's range (Hayward et al. 1987). Because of Idaho's location within the owl's range, densities of the bird in Idaho are not high and populations fluctuate in relation to immigration and prey cycles.

Within central Idaho, high-elevation spruce-fir forests are the primary habitat for boreal owls. Old forests with a high density of large trees (≥ 12 dbh), an open understory, and a multi-layered canopy comprise nesting habitat. Nests may be found in abandoned woodpecker cavities in mixed coniferous forests, aspen, Douglas-fir, and spruce-fir forests (Hayward 1989).

The boreal owl's home range and densities vary seasonally and annually depending upon the dispersion of suitable nesting, roosting, and foraging habitat (Hayward 1989). Although not a migrant, owls do move from higher to lower elevations during the winter (Spahr et al. 1991). In summer, mean home range size is about 2900 acres whereas during winter it increases to about 3600 acres. Densities are generally low with 0.08 to 1.5 pairs per 250 acres (Hayward 1989).

The occurrence of boreal owls within the analysis area has been documented. This documentation consists of two observations of the owl in the Island Park Ranger District (Kaltenecker 1994). Thus, the boreal owl probably occurs within the analysis area in suitable habitat.

Trumpeter Swan

Trumpeter swans occur in open water habitats of the Rocky Mountains. Due to near extermination of the species in the 1900s, only two populations of swans exist presently. They are the Pacific Coast and the Rocky Mountain populations. The Rocky Mountain population occurs within the analysis area and winters in the Greater Yellowstone area (Spahr et al 1991).

Wintering habitat consists of waters that remain open during the winter. In addition, these areas must support extensive aquatic vegetation. Within the Intermountain Region, these areas are typically associated with geothermal activity, springs, and outflows from dams (Spahr et al. 1991).

Trumpeter swans typically inhabit the Forest year-round. During winter, the swans move into open water along the Henry's Fork. Because this area also is preferred by migrant swans from Canada, the winter carrying capacity of the Henry's Fork has been exceeded. Consequently, 431 swans were captured during recent winters (1990–91 and 1991–92) and relocated to other areas in Idaho, Oregon, and Utah.

Within the analysis area, ten wintering areas for trumpeter swans have been identified as well as 6 swan nesting sites (Kaltenecker 1994). Most of the swans' occurrences are in the Island Park Ranger District portion of the analysis area. However, several wintering sites also have been documented in the Palisades Reservoir area.

Common Loon

Loons are associated with lakes greater than 10 acres (4 ha) in size at elevations ranging from 5900 feet and 7900 feet. In general, these lakes must be ice-free at least four months of the year and provide an adequate source of food. Additionally, the waters must be clear to provide visibility of prey species and of adequate depth to provide diving escape cover (Ritter 1989).

Loon nests typically occur in marshy areas with gently sloping shorelines and deep water directly off the shoreline. Although islands are not needed for nesting, loons do show some preference for islands (Ritter 1989). Loons typically arrive on nesting lakes at ice-off and begin nesting within one or two weeks of arrival. In most years, ice-off occurs in May (Spahr et al. 1991). Eggs hatch in early to mid-June. Chicks spend the first few weeks in a nursery area. These areas are typically in shallow water with some aquatic vegetation and small forage fish.

Loons feed on a variety of species of fish. They include yellow perch and minnows. In addition, they will feed on amphibians, crayfish, leeches, aquatic insects, and vegetation. Loons forage almost exclusively underwater relying on sight to locate prey (Spahr et al 1991).

Loons begin their fall migration in September and October. Although they have been observed in Wyoming during the winter, it is thought that these birds are either late fall or early spring migrants. Wintering grounds for the loons are along the Pacific, Atlantic, and Gulf coasts (Ritter 1989).

The occurrence of nesting loons within the Forest and the analysis area has been documented. Within the Wyoming portion of the Forest, nesting by loons has been documented on five lakes (Ritter 1989). Although the Idaho Natural Heritage Program has no records of loons nesting in the analysis area (Kaltenecker 1994), the Forest Service has records of nesting at the Palisades Reservoir and the Island Park reservoir (Forest Service 1992). However, none of the nests successfully fledged young.

Harlequin Duck

Harlequin ducks are associated with low-gradient second to fourth order streams. These streams typically support a high quality of water and limited human disturbance. Also harlequin ducks appear to be closely tied with riffle and run stream types with cobble or boulder substrates (Genter 1993). Habitat requirements include streams with gradients of less than 3 percent, streamside shrub cover greater than 50 percent, and a minimum of three loafing sites per 33 feet of stream (Forest Service 1992).

In Montana, harlequin ducks migrate into breeding areas in late March and early April. Nests are typically found in hollow snags, on cliff sites, in log jams, and on islands behind woody vegetation (Genter 1993). Eggs are generally laid around mid-May. Incubation periods are generally 28 days. Therefore, the chicks hatch in mid-June. The young fledge in six weeks and typically leave the area in mid-August and September (Spahr et al. 1991).

Harlequin ducks feed on benthic aquatic insects, including stoneflies, mayflies, caddisflies, and dipterans. However, they also may feed on crustaceans, mollusks, and fish. Feeding occurs by either dabbling or diving (Spahr et al. 1991).

Within Idaho, the population of harlequin ducks is estimated to be less than 50 pairs (Genter 1993). However, the harlequin duck probably breeds in the southern portion of the analysis area (Stephens and Sturts 1991). The single observation documented for the analysis area occurred in the Palisades Ranger District in 1990 (Kaltenecker 1994).

Flammulated Owl

Flammulated owls occupy a variety of habitats. They inhabit ponderosa pine mixed with oak and pinyon and pine forests mixed with spruce-fir. They also may be found in aspen and second-growth ponderosa pine (Spahr et al. 1991).

Preferred habitat for the flammulated owl varies between nesting and roosting sites. Prime nesting habitat consists of mature to old-stage ponderosa pine and Douglas-fir with open canopies, and low densities of trees (Moore and Frederick 1991). Northern flicker cavities in large diameter dead trees (>20 inches dbh) provide nesting habitat. Roosting sites have higher densities of trees and canopy cover than that typically associated with nesting areas (Moore and Frederick 1991).

Foraging preferences also influence the owl's selection of habitats. Flammulated owls prey primarily on flying insects. Because they catch insects while flying, flammulated owls usually avoid young dense forest stands due to difficulty in maneuvering (Spahr et al. 1991).

The occurrence of flammulated owls within the analysis area has been documented. Three observations in the Palisades Ranger District were recorded before 1990 (Kaltenecker 1994). Although no observations of the owl have been recorded since 1990, flammulated owls may still occur within the analysis area in suitable habitat.

Three-toed Woodpecker

Three-toed woodpeckers occur in northern forests containing spruce, grand fir, ponderosa pine, tamarack, and lodgepole pine at elevations above 4,500 feet. They have been recorded at elevations up to 9000 feet. This species depends on snags for breeding, feeding, and roosting (Spahr et al. 1991).

In general, nest cavities of the three-toed woodpecker are found in both live and dead trees. However, dead trees are preferred. Nests have been found in spruce, tamarack, pine, cedar, and aspen. Typically, nest cavities are placed from 3 to 50 feet above the ground in trees with a 7- to 9-inch dbh. Breeding begins in May and June, and incubation lasts 12 to 14 days (Spahr et al. 1991).

These woodpeckers forage by scaling off bark and probing for wood-boring insects. These types of insects comprise 75 percent of the woodpecker's diet. Additionally, three-toed woodpeckers are major predators on spruce bark beetles and may help control epidemics of the beetle.

Densities of the woodpecker vary with the density of snags. In general, the density of this species is low. In burned areas, increases in the density of the three-toed woodpecker have been recorded

3 to 5 years after a fire, as fire-killed trees provide abundant sources of prey items (Spahr et al. 1991).

Three-toed woodpeckers may breed in the analysis area (Stephens and Sturts 1991). However, Kaltenecker (1994) has received no records of observations documenting their occurrence in the analysis area. Nevertheless, its occurrence cannot be discounted and it may occur in the area within suitable habitat.

Great Gray Owl

Idaho is on the southern edge of the great gray owl's range. The analysis area lies within its breeding range (Spahr et al. 1991). Great grays occur infrequently throughout their range (Spahr et al. 1991).

Great gray owls inhabit mixed coniferous and hardwood forests near small clearings and openings (Spahr et al. 1991). The lodgepole pine/Douglas-fir/aspen zone and ponderosa pine forests are the primary habitats used by great gray owls. Semi-open areas near dense coniferous forests are optimal habitat.

Great gray owls use the forest for nesting and roosting and use the openings for foraging. They nest in the broken tops of snags, abandoned raptor nests, or platforms of dwarf mistletoe debris (Spahr et al. 1991). The owls forage mostly from low perches where they listen and look for prey species. Voles and pocket gophers make up the primary prey species throughout the year (Spahr et al. 1991).

Although the Idaho Natural Heritage Program has no records documenting the occurrence of great gray owls in the analysis area (Kaltenecker 1994), the Forest has determined the owls breed in the analysis area. In conjunction with surveys for northern goshawks conducted on the Forest, four great gray owls were observed nesting in abandoned goshawk nests. Preliminary studies indicate great gray owls may be closely tied to goshawks in their nesting habitat. Therefore, where goshawk nests occur, great gray owls also may occur, as well as in additional areas of suitable habitat (Patla 1991).

Spotted Frog

The spotted frog is associated with permanent cold water areas, such as the marshy edges of ponds, lakes, and streams (Spahr et al. 1991). However, during the breeding season they also may be found near springs that support emergent vegetation or in algae-grown overflow pools of streams (Spahr et al. 1991). Although generally associated with permanent water, after the breeding season spotted frogs may be found in mixed conifer and subalpine forests, grasslands, and sagebrush areas (Spahr et al. 1991).

Spotted frogs are active during the warmer seasons and hibernate during winter. Breeding occurs from late February to early July and begins as soon as the winter thaw permits (Spahr et al. 1991). Deposited eggs hatch in 3 to 21 days, depending upon water temperature. Some tadpoles metamorphose by fall, whereas others overwinter as tadpoles and metamorphose the following spring (Spahr et al. 1991). Hibernation is thought to take place in holes near springs or near water that is constantly renewed and unfrozen (Spahr et al. 1991).

The spotted frog probably occurs in the analysis area within suitable habitat. Clark et al. (1993) found spotted frogs at 42 percent of the sites they sampled during surveys conducted in the Forest in 1992. At all the sites where they occurred, the spotted frog was abundant. Within the Forest, the spotted frog was a wetlands habitat generalist. The spotted frog was evenly distributed on the three wetland types recorded during the surveys. These wetland types included riverine, lacustrine, and palustrine. Although the frogs occurred in each type, they were most often associated with palustrine elements of riverine habitats (Clark et al. 1993).

Transportation System

This section addresses:

Issue 5 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on transportation and the need for additional roads being built within the Forest.

Currently, there are more than 2,203 miles of roadways in the five ranger districts that comprise the Targhee National Forest. About 9, 21, and 70 percent of these roads are classified as arterial, collector, and local roads, respectively. Arterial roads are typically two-laned and paved or have a good gravel surface and can handle unrestricted traffic at moderate speeds. Collectors branch from arterial and are medium standard roads that are stable enough for most traffic during the normal season of use. Local roads are small single lane roads. They provide access for specific purposes, require slow vehicle speeds, and allow limited passing. Local roads are closed to vehicular traffic much of the time.

Roads within the Forest are maintained according to five maintenance levels (detailed descriptions of these maintenance levels are in the glossary). Generally, roads maintained at level 5 are considered to be well suited to providing the access and transportation needs of all Forest users with a high degree of comfort and convenience. Maintenance levels decline progressively to Level 1 which is assigned to roads that are closed to vehicular traffic and require only basic custodial maintenance to minimize damage to adjacent resources.

The total number of road miles within the Forest has increased by approximately 17 percent since 1981. However, this is not an absolute increase for all roadway maintenance levels. Roads maintained at levels 1, 2, and 5 have increased, while roads at levels 3 and 4 have decreased overall. Approximately 63 percent of the roads within the Forest are in maintenance levels 1 and 2. Only 37 percent of the roads on the Forest are maintained for standard passenger automobile traffic (levels 3 through 5).

Access to the analysis area is provided via state and federal highways, county roads, and the Forest Development Roads (Figure 3–15). Major highway access is provided from Pocatello and Idaho Falls via Interstate 15. Interstate 15 and State Highway 28 provide major access to the Dubois District in the northern part of the Forest. U.S. Highway 20 provides access from Idaho Falls northeast to St. Anthony and the Island Park District of the Forest. U.S. Highway 26 and State Highway 31 access the Palisades District.

With the exception of Interstate 15, all the major highways providing access to the Forest are 2-lane paved roads. Interstate 15 is a four-lane divided highway. In addition, U.S. Highway 20 near Ashton has a climbing lane.

The major highways providing access to the Forest experience varying levels of use. Average daily traffic counts (ADTs) collected by the Idaho State Highways Department (Gillespie 1994) suggest the heaviest traffic occurs on the highways between Idaho Falls and the northeast part of the analysis area (Figure 3–16). These are the main routes in the general analysis area used to access Yellowstone National Park via West Yellowstone, Montana. State Highway 33 and U.S. Highway 26 also provide access to the south entrance of Yellowstone via Jackson, Wyoming and Grand Teton National Park.

Within the analysis area, the density of roads comprising the Forest's transportation system varies inversely with the potential for deposits of oil and natural gas (Figure 3–17). The highest density of roads exists in portions of the analysis area with a low potential for deposits of oil and gas. Conversely, the lowest density of roads occurs in the portion of the analysis area with the highest potential for deposits of oil and gas. The presence of roadless areas, such as the Palisades Roadless Area, accounts for the comparatively low density of roads within the high potential portion of the analysis area. The basis for the densities of roads shown on Figure 3–17 is shown on Table 3–10.

Recreation

This section addresses:

Issue 6 – the effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on recreational opportunities and the recreational experience.

The Forest provides a diversity of recreational opportunities, including camping, hiking, fishing, picnicking, hunting, water sports, and winter sports. The easy accessibility of the Forest, wide range of land and water resources, and close proximity to Yellowstone and Grand Teton national parks attract visitors who engage in a wide variety of recreational activities. The most popular recreational activities on the Forest are driving for pleasure, camping in family campgrounds, and visiting the backcountry or undeveloped areas of the Forest.

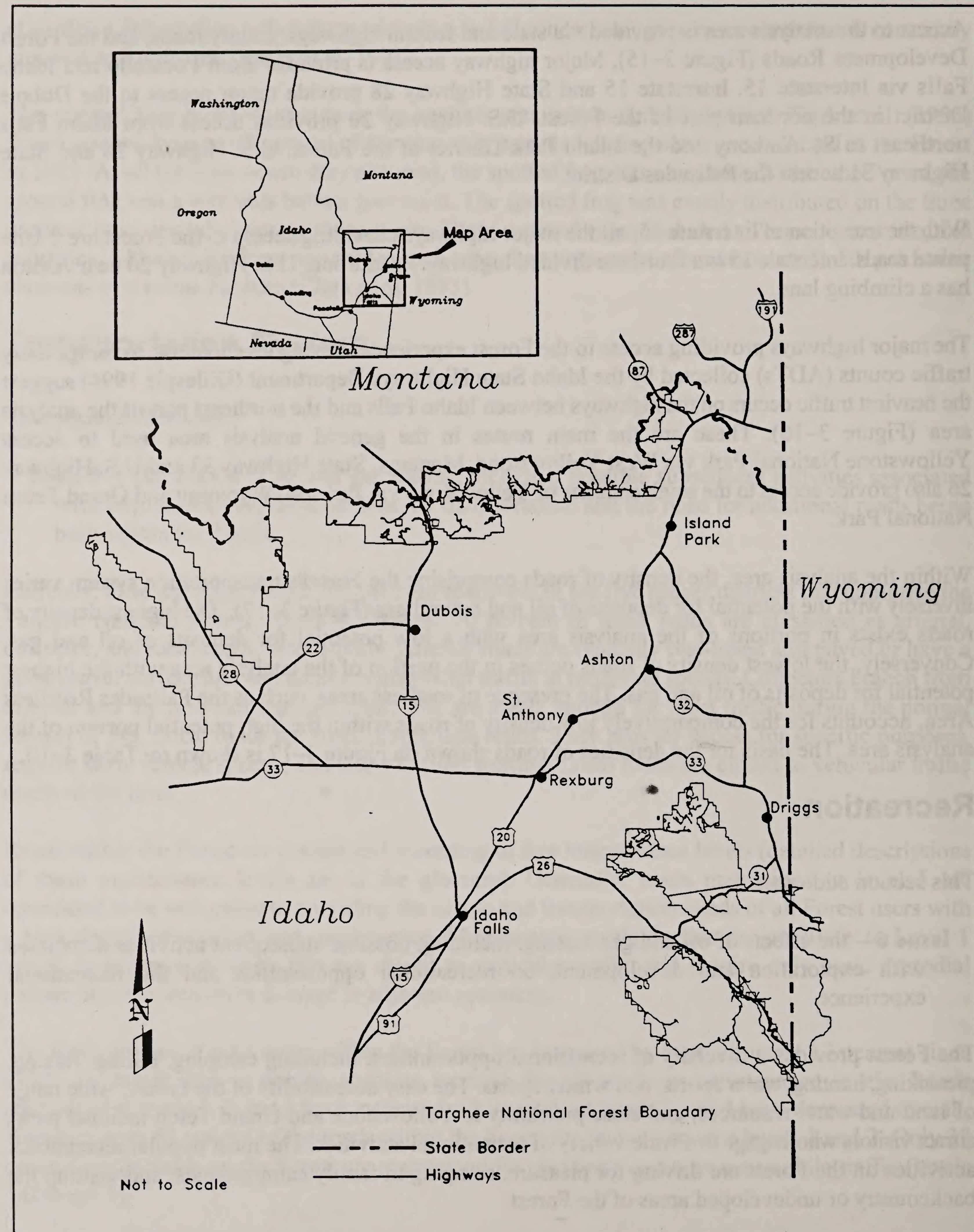

Figure 3–15 Major Federal, State, and Forest Arterials within the Analysis Area

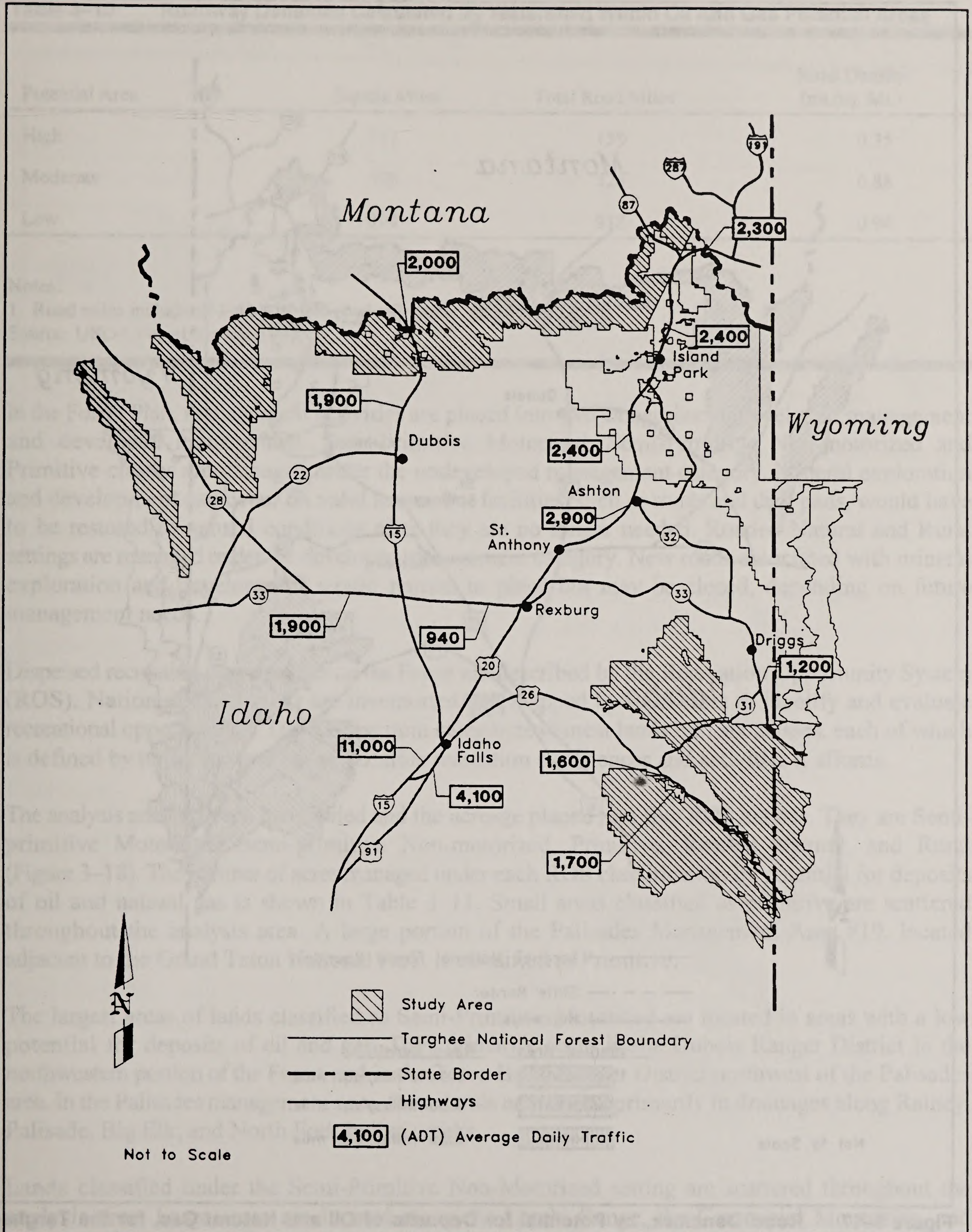

Figure 3–16 Average Daily Traffic (ADT) at Selected Locations within the Analysis Area

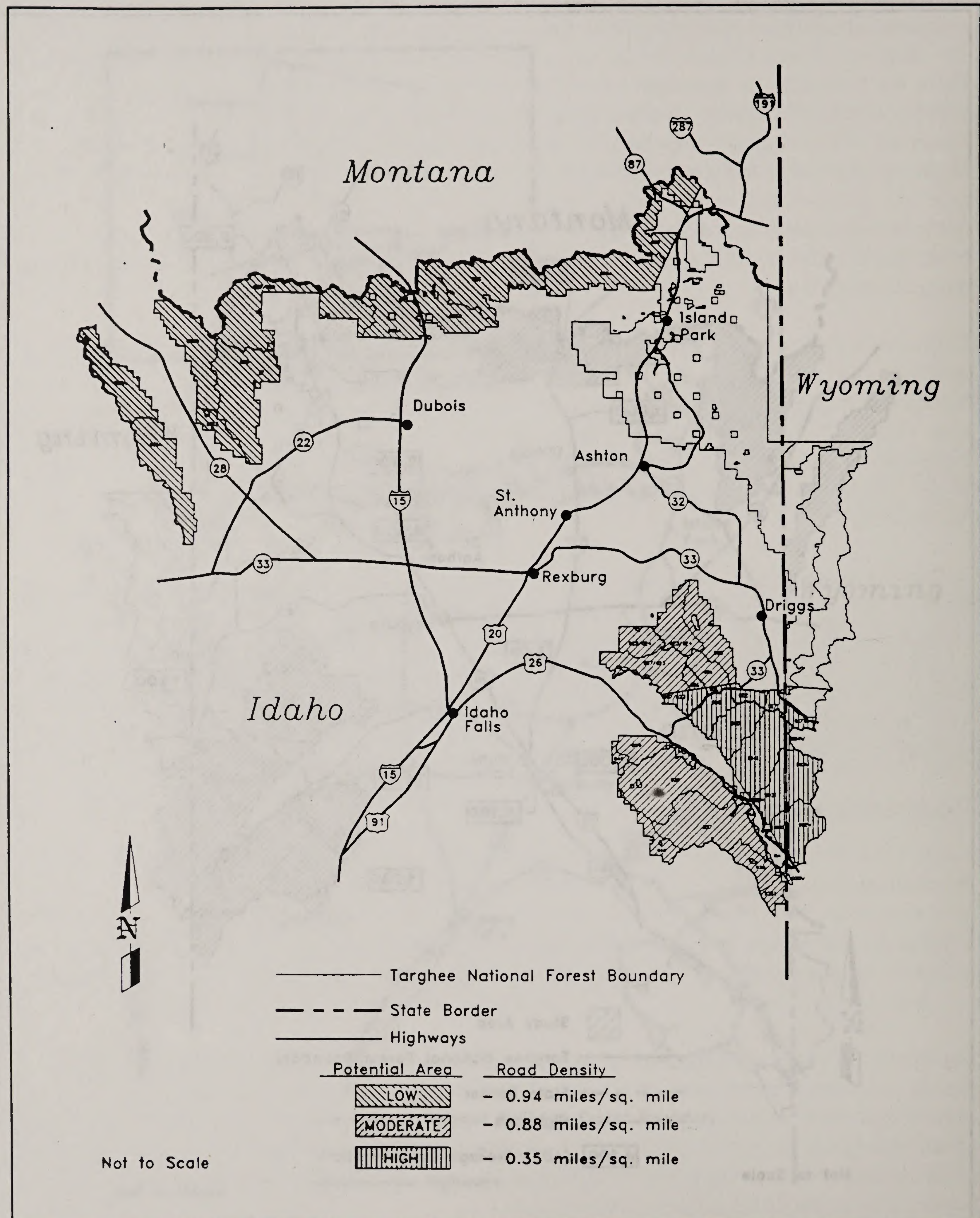

Figure 3–17 Road Densities, by Potential for Deposits of Oil and Natural Gas, for the Targhee National Forest's Oil and Gas Leasing Analysis

Table 3–10 Roadway Densities Calculated By Watershed Within Oil And Gas Potential Areas

Potential Area	Square Miles	Total Road Miles[1]	Road Density (mi./sq. Mi.)
High	451	159	0.35
Moderate	598	526	0.88
Low	998	938	0.94

Notes:
1. Road miles include all Forest system road miles plus "ghost" road miles.
Source: USDA Forest Service 1993.

In the Forest Plan, management activities are placed into two categories: undeveloped management and developed management. Semi-Primitive Motorized, Semi-Primitive Non-motorized and Primitive classes are managed under the undeveloped management category. Mineral exploration and development can occur on valid leases, but facilities, such as roads and drill pads, would have to be restored to natural conditions after they are no longer needed. Roaded Natural and Rural settings are managed under the developed management category. New roads associated with mineral exploration and development would remain in place but may be closed, depending on future management needs.

Dispersed recreation opportunities on the Forest are described by the Recreation Opportunity System (ROS). National Forest lands are inventoried and mapped by ROS class to identify and evaluate recreational opportunities. The ROS system categorizes Forest lands into six classes, each of which is defined by its setting and by the possible recreation experiences and activities it affords.

The analysis area has been inventoried and the acreage placed into five ROS classes. They are Semi-primitive Motorized, Semi-primitive Non-motorized, Primitive, Roaded Natural, and Rural (Figure 3–18). The number of acres managed under each ROS classification by potential for deposits of oil and natural gas is shown in Table 3–11. Small areas classified as primitive are scattered throughout the analysis area. A large portion of the Palisades Management Area #19, located adjacent to the Grand Teton National Park, is classified as Primitive.

The largest areas of lands classified as Semi-Primitive Motorized are located in areas with a low potential for deposits of oil and gas. They primarily occur in the Dubois Ranger District in the northwestern portion of the Forest and in the Teton Basin Ranger District northwest of the Palisades area. In the Palisades management area, these lands are located primarily in drainages along Rainey, Palisade, Big Elk, and North Fork Indian creeks.

Lands classified under the Semi-Primitive Non-Motorized setting are scattered throughout the analysis area. Large areas are located along the Lemhi Range, the Centennial Mountains, and

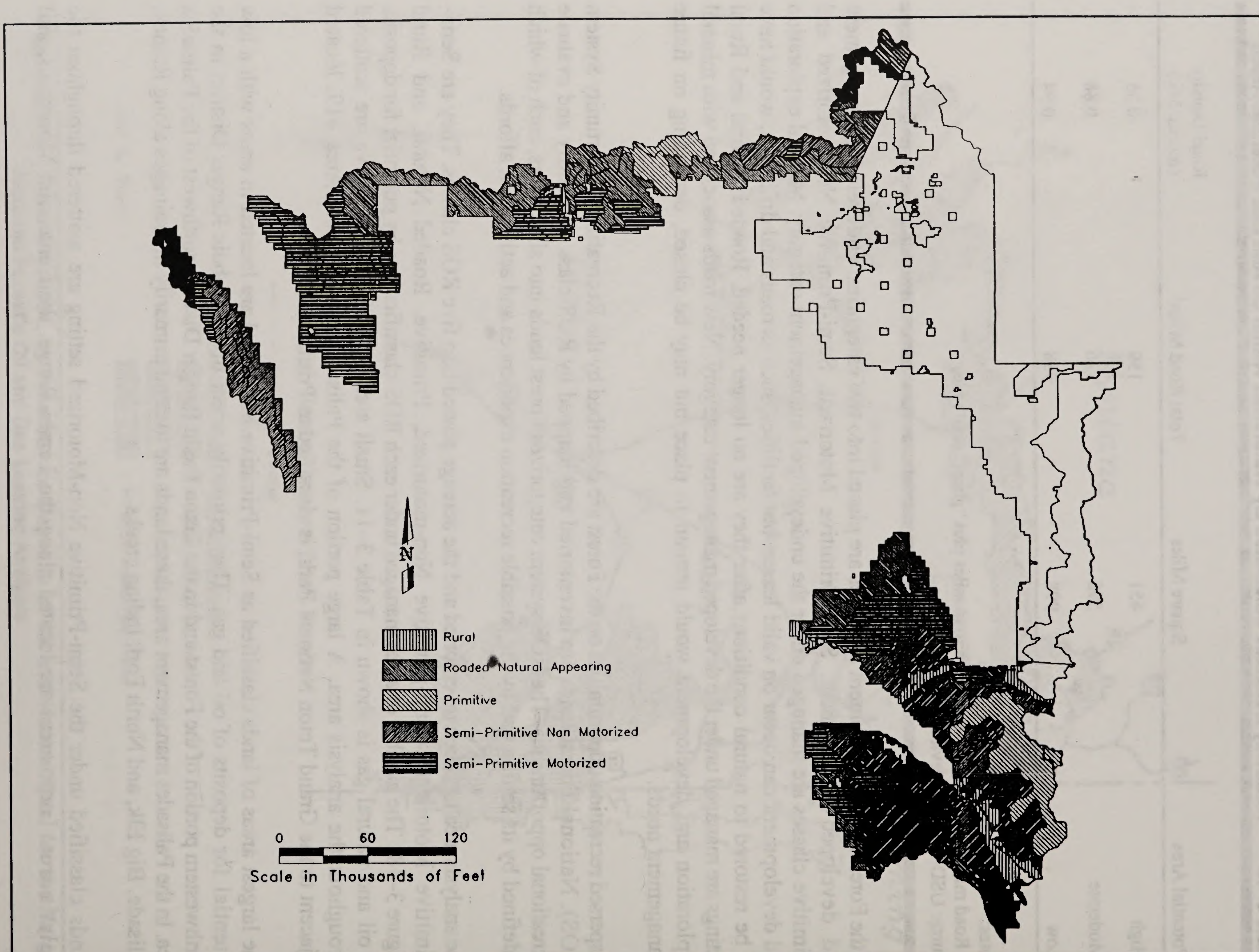

Figure 3–18 **Distribution of Recreation Opportunity Spectrum Classes Within the Analysis Area**

Table 3–11 Distribution of Recreation Opportunity Spectrum (ROS) Classes By Potential for Deposits of Oil and Natural Gas

ROS Class	Potential For Deposits of Oil and Natural Gas: Low (acres)	Moderate (acres)	High (acres)	Total[1] (acres)
Semi-primitive Motorized	232,718	114,866	16,871	364,455
Semi-primitive Non-motorized	100,802	140,360	97,187	338,349
Primitive	36,963	0	66,231	103,194
Roaded Natural	169,019	79,173	7,730	255,922
Rural	2,962	16,154	19,746	38,862
Total	542,464	350,553	207,765	1,100,782

Notes:
1. The total number of acres is less than 1,102,828 because of rounding conventions.

adjacent to the east and west sides of Palisades Reservoir. Most of the western portion of the Palisades management area is managed under this class.

Areas classified as Roaded Natural are located primarily along the margins of Forest lands. The Palisades area has a very limited acreage of land managed under this class, primarily along the northern boundary.

The Rural class is very limited in the analysis area, occupying about 4 percent. As with the Roaded Natural areas, areas classified as Rural primarily occur along margins of the Forest. In the Palisades area, Rural-classed areas are located along State Highways 31 and 33, and along the Palisades Reservoir.

In addition to the general ROS classes, several features present in the analysis area offer specific recreational values. The 202,600 acre Palisades Management Area #19 consists primarily of the Palisades Roadless Area in Idaho and the Wilderness Study Area in Wyoming. This area lies east of the Palisades Reservoir and east and north of the Snake River. It is bounded on the northwest by Pine Creek and Little Pine Creek, on the northeast by Trail Creek, and on the east by the Bridger Teton National Forest (BTNF). Dispersed recreation use occurs year-round; however the heaviest use occurs during the big-game hunting season each fall. Other activities include hiking, snowmobiling, cross-country skiing, and horseback riding. There are over 100 miles of trails within the area administered by Targhee NF and 80 miles in the portion administered by BTNF. The Palisades National Recreation Trail is located in the Targhee portion of the area. Developed recreation sites in the area consist of several campgrounds.

Rivers and streams in the Forest have been evaluated to determine eligibility for Wild and Scenic River designation. Within the analysis area, several streams have been identified as tentatively eligible or eligible for further consideration for study as a wild, scenic, or recreational river. These streams are summarized in Table 3–12.

The Palisades Lake trail has been designated a National Recreation Trail. This trail is located within Palisades Management Area #19. It starts at the Palisades Campground, and follows Palisades Creek to Palisades Lake. The trail is 7.9 miles long.

Visual Resources

This section addresses:

Issue 8 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on the Forest's visual resources.

In general, viewsheds within the analysis area present landscapes of a uniform green and forested canopy. Closer views reveal a diversity of vegetation interspersed with grassy openings and rock outcrops that create a mosaic of texture, size and color. The general area is essentially natural appearing, and undeveloped and pristine in character.

Visual resources in the analysis area have been inventoried and mapped with the National Forest Visual Management System. The system was developed to inventory and manage the visual resources of National Forest lands. The visual management inventory consists of three steps: landscape character type, variety class, and sensitivity levels. These steps are combined and interpreted to develop Visual Quality Objectives (VQOs). The lands in the analysis area are managed for the VQOs of Partial Retention, Retention, Modification, and Maximum Modification (Figure 3–19). Table 3–13 summarizes VQOs by potential for deposits of oil and natural gas.

Under Retention, activities that alter the landscape are not visually evident to the casual forest visitor. Activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. This objective should be met either during or immediately after oil and gas exploration and development.

Under Partial Retention, activities that alter the landscape may be evident, but must be visually subordinate to the characteristic landscape, and not recognizable as an unnatural occurrence. This objective must be met soon after project completion as possible or within a maximum of one year.

The Modification category allows activities that alter the landscape to dominate the original character of the landscape. However, these activities must borrow from naturally established form, line, color, or texture, so that they eventually appear as a natural occurrence. The intent of this VQO should be accomplished the first year, if possible, or within a maximum of five years.

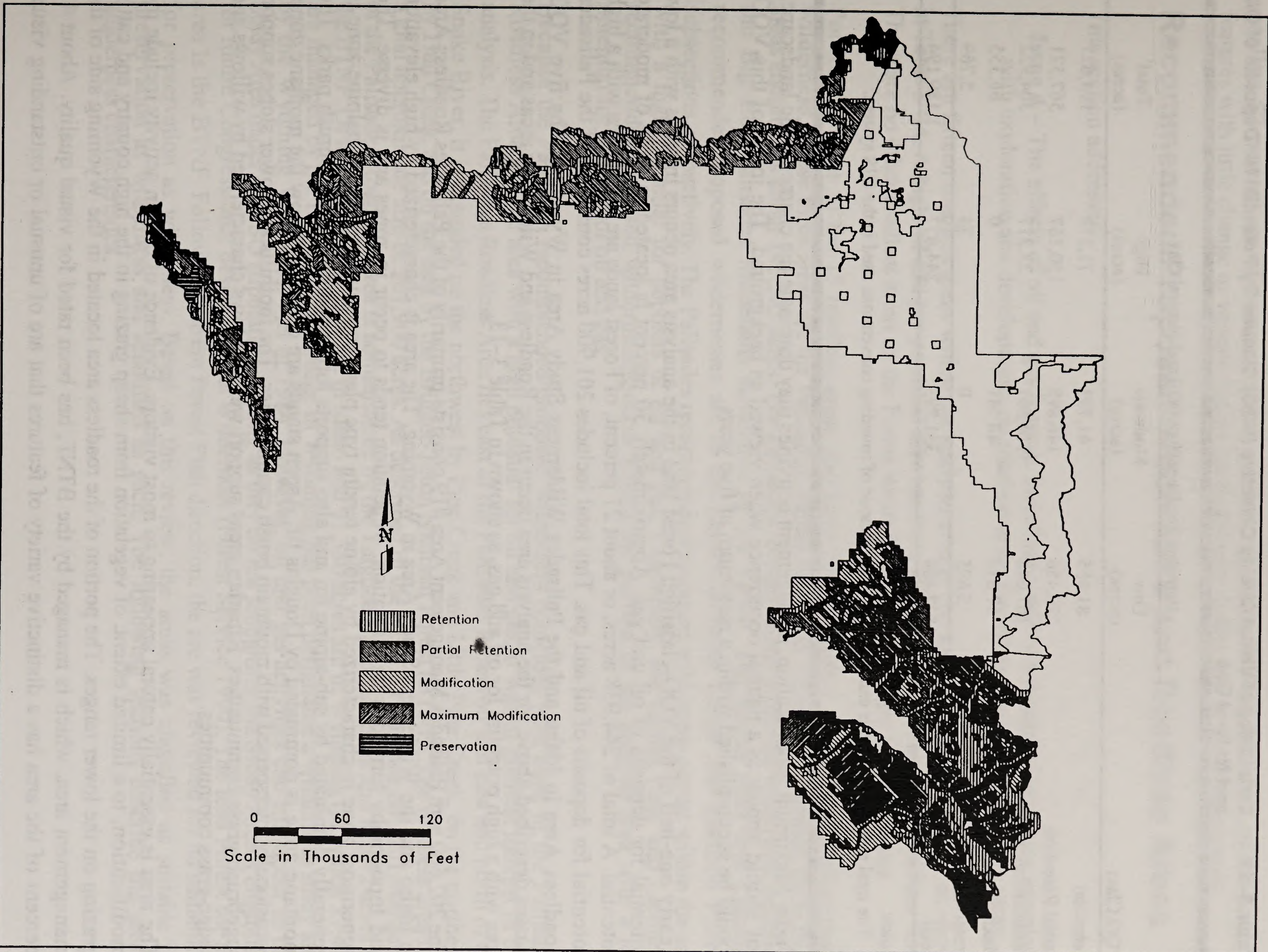

Figure 3–19 **Distribution of Visual Quality Objectives Within the Analysis Area**

Table 3–13 **Distribution of Visual Quality Objective (VQO) Classes By Potential for Deposits of Oil and Natural Gas**

	Potential For Deposits of Oil and Natural Gas			
VQO Class	Low (acres)	Moderate (acres)	High (acres)	Total[1] (acres)
Retention	81,455	41,793	71,379	194,627
Partial Retention	270,456	146,898	150,167	567,521
Modification	167,044	114,661	23,217	304,922
Maximum Modification	17,814	48,541	0	66,355
Preservation	5,695	0	74	5,769
Total	542,464	351,893	244,837	1,139,194

Notes:
1. The total number of acres is exceeds 1,102,828 because of rounding conventions used in the GIS system.

Under Maximum Modification, management activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background. The intent of this VQO should be accomplished within a maximum of five years.

Nearly one-half of the VQO-classified Forest land in the analysis area occurs in areas with a low potential for deposits of oil and gas. Approximately 30 percent is located in areas of moderate potential. A total of 244,938 acres, or about 21 percent, of Forest lands are in the area with a high potential for deposits of oil and gas. This total includes 201,900 acres consisting of the Palisades Roadless Area in Idaho and the Palisades Wilderness Study Area in Wyoming. The five VQO classes described above for the analysis area occur in the Roadless and Wilderness areas and in the area with a high potential for oil and gas, as shown in Table 3–13.

The 202,600 acre Palisades Management Area #19 consists primarily of the Palisades Roadless Area in Idaho and the Wilderness Study Area in Wyoming. The area is characterized by high elevation and topography formed from glaciation. Vegetation tends to occur in zones and is diverse. The uppermost zone is characterized by alpine tundra type plant communities. The subalpine zone is generally dominated by sub-alpine fir, and also supports forb meadows and sagebrush parks. The montane zone is dominated by Douglas fir. Aspen stands are common below the montane zone, occasionally interspersed with mountain brush communities. The foothills and lower slopes support sagebrush-grass communities. Riparian areas support wet meadows characterized by willows and sedge-grass communities.

The area is essentially natural appearing to most visitors. Evidence of human activity include the modification, to a limited extent, of vegetation from sheep grazing in the high country and cattle grazing on the lower ranges. The portion of the roadless area located in the Wyoming side of the management area, which is managed by the BTNF, has been rated for visual quality. About 45 percent of the area has a distinctive variety of features that are of unusual or outstanding visual quality; 52 percent are of common visual quality; and the remaining 3 percent of the area has features with little change or variety that do not fit into the distinctive or common classes.

Recommended/Proposed Wilderness and Roadless Areas

This section addresses:

Issue 4 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on roadless areas and other potential wilderness areas.

There are fifteen roadless areas within the analysis area in the Targhee National Forest, as shown in Table 3–14. A high oil and gas potential area has been identified in the Palisades Roadless Area. There are no other roadless areas on the Forest located in high oil and gas potential areas.

Portions of three of the 15 roadless areas also have been classified as recommended/proposed wilderness. These three areas are the Palisades, Italian Peak, and Lionhead. Together, these three areas encompass about 145,563 acres. The Palisades recommended/proposed wilderness occurs in the Big Hole/Palisades Mountains subsection of the Forest. The Italian Peak and Lionhead recommended/proposed wildernesses are in the Lemhi/Medicine Lodge and Madison Plateau subsections, respectively. The Palisades recommended/proposed wilderness occurs within the area with a high potential for deposits of oil and gas. Conversely, the Italian Peak and Lionhead recommended/proposed wildernesses occur within the portion of the analysis area with a low potential for deposits of oil and gas.

Because the Palisades recommended/proposed wilderness coincides with most of the Palisades Roadless Area and the area with a high potential for oil and gas, it was of greatest interest in this analysis. The Palisades Roadless Area lies east of the Palisades Reservoir and east and north of the Snake River. It is bounded on the northwest by Pine Creek and Little Pine Creek, on the northeast by Trail Creek, and on the east by the Bridger-Teton National Forest (BTNF). The roadless area has a total approximate size of 201,900 acres. As described in the DEIS for Targhee NF, 201,900 acres of the Palisades Roadless Area is administered by the Targhee National Forest and 81,872 acres by the BTNF. Of these acres, 110,520 are in Idaho and 91,380 acres are in Wyoming (of which 37,412 are managed by the BTNF). The acreage in Wyoming has been designated a wilderness study area by the Wyoming Wilderness Act of 1984. However, oil and gas activities can still occur in this Study Area under an NSO stipulation, as long as they do not jeopardize the Study Area's eligibility for future Congressional designation as Wilderness (Forest Service 1990). The lead Forest for the area is the BTNF. Following current Forest Plan direction, the are was reviewed for its suitability for preservation as wilderness. Based on this review, the areas was classified as suitable for preservation as wilderness and identified as such. The following sections describe the area's wilderness characteristics.

Table 3–14 Distribution of Roadless Areas Present in the Analysis Area by Type of Management and Potential for Deposits of Oil and Natural Gas

Roadless Area Number	Roadless Area Name	Potential for Oil and Gas	Type of Management[1]	Size (acres)
15601	Diamond Peak	Low	ROS	94,320
15945	Italian Peak	Low	ROS	146,300
15961	Garfield Mountain	Low	NW	47,330
15962	Mount Jefferson	Low	ROS	71,054
15603	Raynolds Pass	Low	NW	6,200
15963	Lionhead	Low	ROS	16,437
15611	Garns Mountain	Moderate	ROS	96,727
15613	Palisades	High	ROS	201,900
15614	Bald Mountain	Moderate	ROS	13,000
15615	Bear Creek	Moderate	ROS	92,800
15616	Poker Peak	Moderate	ROS	18,600
15160	Pole Creek	Moderate	NW	2,100
15161	Caribou City	Moderate	ROS	11,319
Total				818,087

Notes:
1. NW = nonwilderness (available for a full range of resource activities) and ROS = undeveloped areas (Recreation Opportunity Spectrum categories I, II, and III) that are identified for roadless management and will be evaluated for possible wilderness recommendation.

Wilderness Characteristics

Natural Integrity

The physical setting of the roadless area is rugged. The area is characterized by high elevation, alpine glacier-formed topography. Drainages are well defined with deep canyons. The area is predominantly timbered with a mixture of Douglas fir, Englemann spruce, and subalpine fir on north-facing slopes. The flatter bench type lands are predominantly covered with lodgepole pine. Alpine meadows are interspersed through the high elevation lands. Open hillsides on south and west exposures support grasses, forbs, low-growing shrubs and scattered conifers.

Effects of human activity include the modification, to a limited extent, of vegetation from sheep grazing in the high country and cattle grazing on the lower ranges. The portion of the roadless area managed by the BTNF has been rated for visual quality. About 45 percent of the area has a distinctive variety of features that are of unusual or outstanding visual quality; 52 percent are of common visual quality; and the remaining 3 percent of the area has features with little change or variety that do not fit into the distinctive or common classes.

Apparent Naturalness

The Palisades Roadless Area is essentially natural appearing to most visitors. The area is noted for its rugged terrain and watershed values, along with prime habitat for elk, deer, and other big game species. Numerous streams flow from the crest of the Snake River Range into the Snake River drainage system. Much of the country is too rugged and unstable to lend itself to intense development activities.

Solitude

There is a very high potential for a sense of solitude in the area due to its large size and its topographic and vegetative screening. These features contribute to a sense of being secluded, inaccessible, and out of the way. Travel into the area is difficult as there are no roads into the interior of the roadless area. Access is provided by approximately 80 miles of trails within the portion of the area administered by the BTNF and over 80 miles of trails on the Targhee portion.

Primitive Recreation

There are good opportunities to experience solitude and a sense of remoteness that will enhance primitive recreation experiences throughout the roadless area. The more remote, essentially unmodified areas of the Palisades provide exceptional opportunities to experience isolation from the sight and sound of humans, independence and closeness to nature. Interaction between users is low.

Most recreational activities associated with an undeveloped setting can be enjoyed in the area. Recreation use consists primarily of big-game hunting in the fall. Other activities are fishing, horseback riding, backpacking, cross--country skiing, snowmobiling, snowshoeing, and camping.

Special Features

Features within the roadless area that are distinctive to visitors include spectacular views of mountain peaks interspersed with alpine meadows. Among the attractions offered by the area are a blue pool fed by a cold water spring near the head of Coburn Creek, the upper and lower Palisades Lakes, and Waterfall Canyon in the central portion of the roadless area. The Palisades Lake Trail has been designated a National Recreation Trail. It starts at the Palisades Campground, and follows Palisades Creek to Palisades Lake. The trail is 7.9 miles long.

Manageability/Boundaries

The manageability of a roadless area depends on size and shape. The entire area is large enough for a viable wilderness if the areas on both Targhee and Bridger-Teton forests are combined.

Cultural Resources

This section addresses:

Issue 15 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on cultural resources.

Cultural resources are historic and traditional cultural properties that reflect our nation's heritage. Federal regulations define such properties to include prehistoric and historic sites, buildings, structures, districts, and objects included in, or eligible for inclusion in the National Register of Historic Places (NRHP) as well as artifacts, records, and remains related to such properties. Traditional cultural properties are rooted in the history of a community and may be eligible for inclusion in the NRHP because of their association with the cultural practices or beliefs that are important in maintaining the cultural identity of the community.

Prehistoric Overview

The prehistoric chronology of the general region encompassing the analysis area consists of four periods. They area a poorly-defined pre-Paleoindian period pre-dating about 12,000 Before Present (BP); a series of Paleoindian traditions, ca. 12,000-7,000 BP; an Archaic tradition, ca. 7,000-1,000 BP; and a late period beginning from 1,000 to 700 years ago. These periods are variously referred to as Numic, Basin Archaic, Late Prehistoric, Protohistoric, or by local phase names. The latter period ends with Euroamerican settlement and the removal of native populations to reservations.

The distinguishing or diagnostic features of these cultural periods, as in the nearby Great Basin and Northern Plains culture areas, are based on hafted biface technology, essentially specific traits of weapons systems. Pre-Paleoindian assemblages lacked hafted biface projectile technologies, and are often described as non-diagnostic early components. The Paleoindian traditions are characterized by relatively large, well-made, lanceolate points. These stemmed and unstemmed lanceolate points are often isolated surface finds, but many have been found in association with the remains of large game animals, including extinct forms of mammoth, bison, camel, and horse. The earliest recognized markers of the Archaic are the appearance of a wide range of point forms, frequently described as "cruder" or "less finely flaked" than their Paleoindian predecessors, and made from a wider range of local materials. Slightly later phases of the Archaic are marked by the appearance of side-notched point forms, such as Northern or Bitterroot Side-Notched, and stemmed, indented base point forms. In theory, the "Archaic" should also be marked by a reduced emphasis on big-game and evidence of a more diversified subsistence base. In practice, the contrast in hafted bifaces is often more easily defined than other changes in subsistence or technology. A pre-Numic Formative or Late Prehistoric period marked by the appearance of ceramics and small point forms, as recognized in the Great Basin and Northern Plains, is not specifically identified in this region. The final prehistoric period is distinguished by the appearance of small, triangular Desert side-notched points and Intermountain or Numic ceramics. This is roughly equivalent to a post-Formative, or late phase of the Late Prehistoric in neighboring culture areas.

By the time of the earliest documented European incursions into this region, the Northern Shoshone and Northern Paiute, or Bannock, were firmly established in this area. The Northern Shoshone and Bannock that did not maintain horse herds (a practice that necessitated larger, more permanent groups), led a largely mobile existence centered on family groups moving among resource areas, and seasonally gathered into larger camps for camas harvests or cooperative hunts. Steward (1938) included these groups with his Great Basin Shoshone, and many subsequent investigators have viewed the Numic (Shoshonean) "expansion" as originating in the Great Basin (cf. Bettinger and Baumhoff 1982). Swanson (1972) challenged this position, and proposed that this area might represent a mountain adaptation with great time depth, and that the historic Shoshonean subsistence patterns may have spread from here to the Great Basin.

Historic Overview

The analysis area was crossed by early transportation corridors between the Snake River and Yellowstone River drainages. Targhee and Monida passes were regionally important crossing points. Several traditional trails crossed through this area, including some of the trails followed by the fleeing Nez Percé in 1877. The general area was within the range of the Rocky Mountain fur trade, and was crossed by some early western expeditions, including Lewis and Clark, but was not within the main corridors of westward expansion.

Euroamerican settlement of this region was not tied to the early placer mining booms or to the major waves of homesteading. Nonetheless, by the late 1800s, ranchers and agriculturalists were spreading into the region. The geology of the area does not contain rich, available deposits of minerals, and the generally rugged terrain makes transportation difficult and costly. Precious metal mining booms were not common in the region, but some later mining booms, focusing on base metals such as lead and zinc, or rare ores such as cobalt, occurred. This included a local mining boom in the Birch Creek Valley in the 1880s, associated with or made possible by the expansion of the Utah and Northern Railroad into the region.

In the late 1800s, much of the Rocky Mountain west remained undeveloped, but the rapid, often devastating development of industrial mining and railroads helped to draw public attention to the protection of natural resources. Yellowstone became the Nation's first national park in the 1870s, and in 1891 the Yellowstone Forest Reserve was the first to be set aside as a result of the Forest Reserve Act. The Henry's Lake Forest Reserve was established in 1905, about the time that the administration of the forest reserves was transferred from the General Land Office to the Forest

Service. The Targhee National Forest was initially created through the merging of the latter two forest reserves in 1908.

Over the years, administrative and management structures, including ranger stations, fire towers, and public facilities, including campgrounds, have been built in various parts of the forests. Much of this construction was undertaken or improved by the Civilian Conservation Corps and the Works Projects Administration in the 1930s. Many of these structures, road and drainage improvements, or associated work camp remains can still be found on Forest lands.

Known Resources

The management areas encompassing the analysis area contain 726 recorded cultural resource sites. Of this total, 667 (92 percent) were recorded as prehistoric sites of unknown age or affiliation, and 21 (3 percent) have an historical Euroamerican component. Only 118 of the 726 resources (16 percent) have been evaluated for eligibility for the National Register (including two that are listed on the Register) either individually or as part of a National Register district. Fifty-four prehistoric components, ranging from Paleoindian to Protohistoric, have been identified. Often sites that have temporally diagnostic materials have two or more components. More than half of the identified components pertain to the Archaic periods. Prehistoric sites that have identifiable components and cultural features, and that exhibit the potential for in situ materials are generally recommended to be eligible for the National Register. Other classes of prehistoric sites that are likely to be recommended as eligible without additional investigations are well preserved rock art sites, lithic quarries, and sites that may contain human burials or have significant ritual associations.

Several historic themes have been identified for the recorded historical sites. They include eight farming/ranching sites (one farm/ranch site is also associated with mining), three logging sites, two federal administrative sites, two mining sites, and two road or trail sites. Five sites do not have coded themes, and consist of cultural material scatters with no associated features or structures. One of the Federal administrative sites is coded as a dump area, while the other includes a cabin and some sheds associated with a trail or road. Most of the farm/ranch sites date from the turn-of-the-century, and have associated building, structure, or equipment remnants that reflect their function. One of the road/trail sites dating from the early 1900s is coded as consisting predominantly of historical inscriptions. These historical sites have early dates ranging from 1880 to 1930. The sites with 1920 to 1930 dates are logging and mining sites.

Prehistoric sites are not coded directly in terms of theme or site type, and, as noted above, only about 8 percent have yielded evidence of age or cultural affiliation. A few generalizations can be derived from coding for artifact types, lithic tool types, features, and estimated site depth. Fifty-six sites had their principal artifact type coded as isolated artifacts, and 489 were coded as lithic scatters. Most of those coded as isolated artifacts were further coded as having lithic tools or small quantities of lithic debitage. Although several sites yielded projectile points or other diagnostic lithic artifacts, most of the coded lithic tools were utilized flakes, scrapers, or bifaces. No ceramics codes were found in this data-set. Few prehistoric cultural features were coded. These included pictographs at seven sites, rock alignments at four sites, hearths at three sites, and a single site with a stone circle.

For the 1983 database of 475 resources, McDonald (1983:IV.1-2) observed that 90 percent of the recorded resources were located on slopes of less than 30° and were within 2,500 feet of a permanent water source. More recently, Willingham (1994) has observed that the more current database of over 800 resources meets a more tightly defined set of criteria, particularly if certain classes of sites are filtered out of the analysis. He found that most prehistoric sites were situated on slopes of less than 5°, were within 100 meters (328 feet) of permanent water, were found in sage or open meadow vegetation, and tended to be on southeast facing slopes. The correlation was stronger if rock art, cave, and rockshelter sites (often found on steep slopes) were removed from the sample.

Socio-Economics

This section addresses:

Issue 12 – The effects of the Federal leasing decision on the opportunities to explore for and develop oil and gas resources within the analysis area.

Socioeconomic impacts (beneficial or adverse) resulting from potential oil and gas exploration and development would occur in several political jurisdictions (Figure 3–20). Potentially-involved jurisdictions include: 1) counties within the two state-area which include Forest land; 2) communities located near potential oil and gas activities; and 3) regional or local urban centers which would provide needed goods and services for the oil and gas industry.

Social Setting

The analysis area is regarded as exceptionally scenic, with panoramic views, numerous recreational opportunities, and abundant fish and wildlife. Recreational use at developed sites amounted to 590,000 visitor days in 1984. Developed areas receiving the heaviest use are near Island Park and the Palisades Reservoir. Dispersed recreation occurs Forest-wide including fishing, hunting, hiking, and off-road vehicle use. The Island Park area receives heavy snowmobiling use during the winter. Cross-country skiing is growing in popularity.

Communities near the Forest and the seven counties that encompass the analysis area (Bonneville, Clark, Fremont, Jefferson, Madison, and Teton in Idaho and Teton, Wyoming) would be immediately affected should leasing of oil and gas mineral rights lead to exploration and development. As such, these communities and counties form the geographic focus and overall analysis area, or "zone of influence," for socioeconomic investigations. As shown on Table 3–15, Bonneville, Clark, and Fremont are by far the largest of these counties with areas of approximately 1.2 million acres each. Predominant land uses in the area are agricultural, forest land, and rangeland.

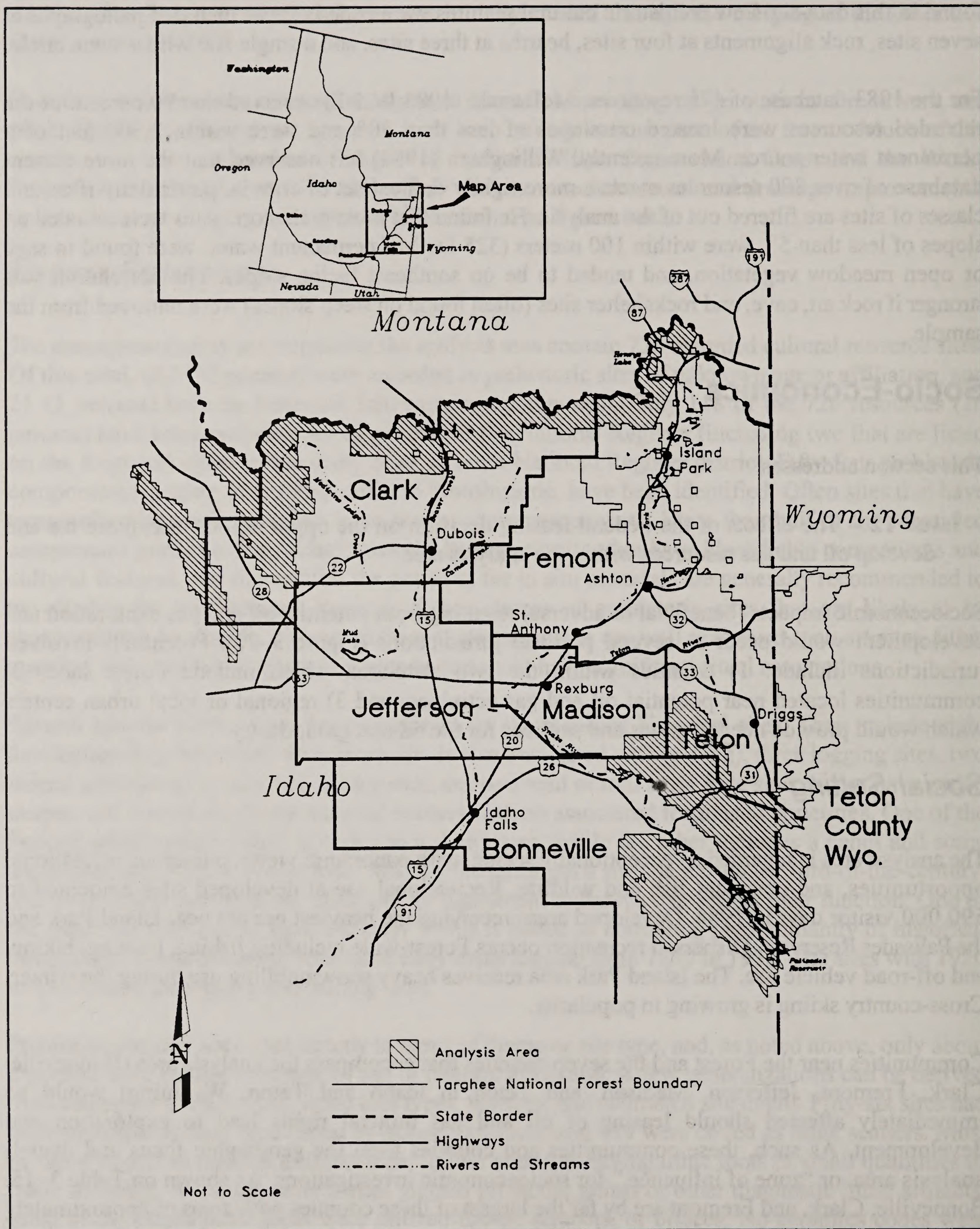

Figure 3–20 Location of the Socioeconomics Analysis Area for the Targhee National Forest's Oil and Gas Leasing Analysis

Table 3–15 Summary of Land Uses, by County, for Idaho Portion of the Socio-economic Analysis Area, 1990

	County					
Land Use	Bonneville (acres)	Clark (acres)	Fremont (acres)	Jefferson (acres)	Madison (acres)	Teton (acres)
Urban Land	12,800	300	1,100	1,700	1,000	0
Agricultural	354,300	83,200	210,200	268,400	206,300	120,200
Rangeland	337,100	857,600	397,500	190,800	26,400	62,000
Forest	395,200	174,300	547,900	1,000	53,000	95,100
Water	26,600	700	19,200	8,100	3,200	1,000
Wetland	19,100	0	0	15,800	0	15,500
Barren Land	66,400	5,200	44,600	224,000	16,000	0
Tundra	0	0	0	0	0	0
Perennial Snow	0	0	0	0	0	0
Total	1,211,500	1,121,300	1,220,500	709,800	305,900	293,800

Sources: IDC 1992a,b,c,d,e,f

The exception is Jefferson County where 31 percent of the total area is barren. Urban land use is very small in all counties and reflects the absence of large population centers within the analysis area.

For Teton County, Wyoming, 1990 land use data were available for three broad classifications: public land (2,294,621 acres or 93.6 percent), private land (74,907 acres or 3.1 percent), and surface water (81,523 acres or 3.3 percent). Public land includes:

- ➢ National Park Service 1,046,487 acres
- ➢ U.S. Forest Service 1,218,983 acres
- ➢ U.S. Fish and Wildlife 16,001 acres
- ➢ Bureau of Land Management 9,738 acres
- ➢ Wyoming Game and Fish Dept. 3,397 acres
- ➢ School Districts and Colleges 15 acres

Demographics

Population

The seven-county analysis area experienced a cumulative increase in population of 11.7 percent between 1980 and 1990. Population growth is primarily attributable to a rise in employment within the retail trade, agriculture, forestry, and fisheries sectors. In Teton County, Wyoming, the population increase is primarily due to ski industry growth in Jackson.

As shown on Table 3–16, county population increases between 1980 and 1990 ranged from 21.4 percent in Madison County to 1.2 percent in Fremont County. Clark County, the least populated of the seven counties, decreased by 4.5 percent (36 people).

Five of the seven largest urban centers within each county gained population from 1980 to 1990 (Table 3–17). Two towns, St. Anthony, Idaho and Jackson, Wyoming, decreased in population. Growth in the two largest towns, Idaho Falls and Rexburg, was similar to their respective county-wide percentages. Rapid growth in Teton County, Wyoming and the slight decline in Jackson, its principal town, indicates that most growth is occurring outside the Jackson corporate limits.

Area population is generally young, white, and married. In 1990, the median age of residents ranged from 20.0 in Madison County to 33.5 in Teton County, Wyoming. Ethnic minorities comprise a high of 9.7 percent in Clark County to a low of 1.6 percent in Teton County, Wyoming (U.S. Dep. of Comm., 1990). Males outnumber females in all counties except Madison. In 1990, the average number of persons per household ranged from a low of 2.4 in Teton County, Wyoming to 3.8 in Madison County (Table 3–18).

Within the analysis area, the percentage increase in housing units has recently exceeded the percentage increase in population growth. Housing units increased 15.5 percent from 1980 to 1990 while population increased 11.7 percent over the same period (Table 3–18). The percentage increase in housing units ranged from 7.2 percent in Jefferson County to 56 percent in Teton County, Wyoming.

Housing

Within the analysis area, more than two-thirds of residences are single family units (Table 3–19). Mobile homes account for another 14 percent. Multiple family units comprise the balance (18 percent). The vacancy rate for owner-occupied units ranges from 1.3 percent (Madison County) to 3.8 percent (Teton County, Idaho). For rental units, the vacancy rate ranges from 2.8 percent (Madison County) to 17.4 percent (Teton County, Wyoming).

Within the principal urban centers, 1990 housing statistics are as follows:

1. Idaho Falls (Bonneville County) has 16,845 housing units of which 710 (4.2 percent) are mobile homes. The vacancy rate for all housing units is 4.9 percent. Owner-occupied units comprise 64.8 percent of all occupied housing.

2. Dubois (Clark County) contains 205 housing units of which 84 (41 percent) are mobile homes. The vacancy rate for all housing units is 22.5 percent. Owner-occupied units comprise 74.2 percent of all occupied housing.

Table 3–16 Populations for the Counties Comprising the Socio-economic Analysis Area for the Targhee National Forest's Oil and Gas Leasing Analysis, 1970–1990

	1970	1980	1990	Population Change 1970-1980	Population Change 1980-1990
Idaho					
Bonneville	51,250	65,971	72,207	+28.7%	+9.5%
Clark	741	798	762	+7.7%	-4.5%
Fremont	8,710	10,806	10,937	+24.1%	1.2%
Jefferson	11,619	15,316	16,543	+31.8%	+8.0%
Madison	13,452	19,502	23,674	+45.0%	21.4%
Teton	2,351	2,907	3,439	+23.65%	18.3%
Wyoming					
Teton	4,823	8,896	11,172	+84.5%	+25.6%

Sources: IDC 1992a,b,c,d,e,f; Wyo. Dep. of Admin. and Inf. 1991.

Table 3–17 Populations of Major Cities Within the Socio-economic Analysis Area for the Targhee National Forest's Oil and Gas Leasing Analysis, 1980–1990

Location	1980	1990	Change 1980–1990 (percent)
Idaho			
Bonneville County			
Idaho Falls	39,739	43,929	+10.5
Iona	1,072	1,049	-2.1
Clark County			
Dubois	413	420	+1.7
Spencer	29	11	-62.1
Fremont County			
St. Anthony	3,212	3,010	-6.3
Ashton	1,219	1,114	-8.6
Jefferson County			
Rigby	2,624	2,681	+2.2
Menan	605	601	-0.7
Madison County			
Rexburg	11,559	14,302	+23.7
Sugar City	1,022	1,275	+24.8
Teton County			
Driggs	727	846	+16.4
Victor	323	292	-9.6
Wyoming			
Teton County			
Jackson	4,511	4,472	-0.8

Sources: IDC 1992a,b,c,d,e,f; Wyo. Dep. of Admin. and Inf. 1991; U.S. Dep. of Comm. 1990

3. St. Anthony (Fremont County) has 1,135 housing units of which 137 (12 percent) are mobile homes. The vacancy rate for all housing units is 9.3 percent. Owner-occupied units comprise 70.1 percent of all occupied housing.

4. Rigby (Jefferson County) contains 969 housing units of which 81 (8.4 percent) are mobile homes. The vacancy rate for all housing units is 6.4 percent. Owner-occupied units comprise 71.6 percent of all occupied housing.

Table 3–18 **Number of Housing Units In the Counties Comprising the Socio-economics Analysis Area for the Targhee National Forest's Oil and Gas Leasing Analysis, 1980–1990**

Location	1980	1990	Housing Unit Change 1980-1990	Personal Household 1990
Idaho				
Bonneville	23,492	26,049	+10.9%	2.94
Clark County	445	502	+12.8%	2.67
Fremont County	5,376	5,961	+10.9%	3.12
Jefferson County	4,994	5,353	+7.2%	3.38
Madison County	5,537	6,133	+10.8%	3.84
Teton County	1,245	1,645	+32.1%	3.03
Wyoming				
Teton County	4,539	7,060	+56.0%	2.43
Total	45,628	52,703	15.5%	

Sources: IDC 1992a,b,c,d,e,f; Wyo. Dep. of Admin. and Inf. 1991; U.S. Dep. of Comm. 1990.

5. Rexburg (Madison County) has 3,554 housing units of which 353 (9.9 percent) are mobile homes. The vacancy rate for all housing units is 3.8 percent. Owner-occupied units comprise 40.4 percent of all occupied housing.

6. Driggs (Teton County, Idaho) contains 384 housing units of which 58 (15 percent) are mobile homes. The vacancy rate 18.8 percent. Owner-occupied units represent 59.6 percent of all occupied housing.

7. In 1980, Jackson (Teton County, Wyoming) had 2,074 housing units of which 248 (12 percent) were mobile homes. The vacancy rate for all units was 8.1 percent. Owner- occupied units comprised 49 percent of all occupied housing.

Personal Income

Per capita income levels vary among the seven counties (Table 3–20). The highest 1990 per capita income level was in Teton County, Wyoming. The lowest level was in Madison County. Clark County had the highest percentage increase in per capita income from 1980 to 1990. The lowest percentage increase was in Madison County.

Table 3–19 **Characteristics of Age and Housing Within the Socio-economics Analysis Area for the Targhee National Forest's Oil and Gas Leasing Analysis**

Location	White (percent)	Ethnic Minorities (percent)	Median Age (years)	Housing Single Family (percent)	Housing Mobile Homes/Trailers (percent)	Housing Units Vacancy Homeowner (percent)	Housing Units Rental Vacancy Rate (percent)	Male (No.)	Female (No.)
Idaho									
Bonneville	96	4	28.7	71	10	1.9	6.2	36,330	35,877
Clark	90.3	9.7	32.9	55	42	1.7	9.8	418	344
Fremont	94	6	28.1	78	18	2.0	8.9	5,562	5,375
Jefferson	94.5	5.5	26.4	73	22	2.0	4.1	8,400	8,143
Madison	96	4	20	54	14	1.3	2.8	11,219	12,455
Teton	97.7	2.3	30.2	79	16	3.8	10.6	1,811	1,628
Wyoming									
Teton	98.4	1.6	33.5	55%	14%	1.5	17.4	5,833	5,339

Source: IDC 1992a,b,c,d,e,f; Wyo. Dep. of Admin. and Inf. 1991; U.S. Dep. of Comm. 1990

Table 3–20 Median Household Income and Per Capita Income for the Counties Within the Socio-economic Analysis Area for the Targhee National Forest's Oil and Gas Leasing Analysis, 1980–1990

Location	Median Household Income		Per Capita Income		Percent Change in Median Household Income 1980-1990	Percent Change in Per Capita Income 1980-1990
	1980	1990	1980	1990		
Idaho						
Bannock	$17,458	$26,275	$6,692	$10,976	+50.1	+64.0
Bingham	$15,357	$25,158	$5,155	$9,474	+63.8	+83.8
Bonneville	$18,167	$30,462	$6,568	$12,123	+67.7	+84.6
Clark	$11,463	$24,583	$4,591	$10,608	+114.5	+131.1
Fremont	$13,204	$23,498	$4,724	$8,674	+78.0	+83.6
Jefferson	$14,176	$24,421	$4,577	$9,055	+72.3	+97.8
Madison	$13,039	$23,000	$4,098	$7,385	+76.4	+80.2
Teton	$11,565	$22,799	$4,297	$8,983	+97.1	+109.0
Wyoming						
Teton	$18,442	$31,586	$7,518	$17,234	+71.3	+129.2

Sources: IDC 1992a,b,c,d,e,f; Wyo. Dep. of Admin. and Inf. 1991; U.S. Dep. of Comm. 1990

Median household income levels for the seven counties are also shown in Table 3–20. In 1990, the highest level was in Teton County, Wyoming and the lowest was in Teton County, Idaho. The percentage increase in median household income from 1980 to 1990 ranged from 114.5 percent in Clark County to 67.7 percent in Bonneville County.

For the largest communities within each analysis area county, per capita income ranged from $6,559 in Rexburg to $13,107 in Idaho Falls in 1990. In terms of median household income, Idaho Falls had the highest level ($29,887) and Rexburg had the lowest ($19,183).

Economic Activities

Gas and Oil Production

The economic base of the seven county analysis area consists mainly of the service, agriculture, forestry and fisheries sectors (Table 3–21). The mining sector, which includes oil and gas, contributes minimally to the economy. Bonneville County contains the largest number of employees within the mining sector (38 or 0.12 percent of total employment). Madison and Teton (Idaho) Counties have no mining sector employees. A total of 80 people are employed in mining within the analysis area (0.13 percent of total employment).

Currently, there are no oil and gas leases on the Forest. If leasing is approved, annual Forest income from leases would be $1.50 per acre. If oil is found, a royalty of 12.5 to 25 percent (depending on production) will be charged. Gas royalties vary from 12.5 to 16.66 percent.

Employment

Within the analysis area, four sectors (forestry, agriculture, and fisheries; retail; education; and construction) constitute more than half of total employment (Table 3–21). For the principal communities of each of the six Idaho counties, the major economic sectors are as follows:

1. Driggs: Retail trade and personal services each comprise approximately 20 percent of total employment. There are no mining jobs.

2. Dubois: The agricultural, forestry and fisheries sector represents 28 percent of total employment with retail trade second (17 percent). There is no mining employment.
3. Idaho Falls: Retail trade and personal services each comprise about 18.5 percent of total employment. Mining represents less than 1 percent.

4. Rexburg: Educational services represents the highest percentage of total employment (30 percent) with retail trade second (21 percent). There are no mining jobs.

Table 3–21 Employment Sectors Present Within the Socio-economic Analysis Area for the Targhee National Forest's Oil and Gas Leasing Analysis

		Portion of Total Number of People Employed In:					
County	Number of People Employed	Forestry, Agriculture, & Fisheries (percent)	Retail (percent)	Education (percent)	Construction (percent)	Mining (percent)	Other (percent)
Bonneville	32,016	4.1	18.0	7.7	7.5	0.1	61.6
Clark	416	46.0	10.8	8.9	7.2	0.7	26.4
Fremont	4,317	22.6	10.1	9.9	5.6	0.2	51.6
Jefferson	6,589	15.4	14.7	10.7	8.6	0.2	50.4
Madison	8,592	11.3	18.7	24.6	4.1	0.0	41.3
Teton, ID	1,596	24.7	14.0	8.4	13.2	0.0	39.7
Teton, WY	6,633	6.0	22.1	3.4	15.1	0.2	53.2
Average		18.5	15.5	10.5	8.7	0.2	46.6

Source: U.S. Dep. of Comm. 1990

5. Rigby: The highest percentage of total employment is in the retail trade sector (15 percent). Construction is second (13.5 percent). There is no mining employment.

6. St. Anthony: Educational services represents 13.5 percent of total employment. Manufacturing is second (13 percent). Mining represents less than one percent.

Employment figures were not available for Jackson, Wyoming.

Unemployment Rates

Unemployment is generally below the national average for the seven county analysis area. The average 1990 unemployment rate for these counties is 4.8 percent ranging from 7.1 percent in Fremont County to 2.0 percent in Teton County, Wyoming (Table 3–22). Percentage rates for the principal communities are as follows: Driggs, 6.5; Dubois, 1.7; Idaho Falls, 5.0; Rexburg, 8.7; Rigby, 6.1; St. Anthony, 8.2; and Jackson, Wyoming, 5.2.

Health Care

Health care services in the analysis area are concentrated in Bonneville, Madison, and Teton (Wyoming) counties. The largest concentration of physicians and hospital care is in Idaho Falls (Bonneville County). As of 1990, 147 physicians were practicing there with a local patient:doctor ratio of 491:1. A 286-bed regional hospital is located in Idaho Falls. Madison County has 18 physicians and a patient:doctor ratio of 1,315:1. Rexburg has a 50-bed hospital. The other four Idaho counties have from zero to four physicians, with patient:doctor ratios ranging from 1,719:1 in Teton County to 4,135:1 in Jefferson County. Clark County has no physicians. Physician figures are not available for Teton County, Wyoming, but Jackson has a 43-bed hospital (WDAI, 1991).

Table 3–22 Unemployment Rates in the Socio-economic Analysis Area for the Targhee National Forest's Oil and Gas Leasing Analysis, 1990

Location	Total Civil Labor Force	Number Employed	Number Unemployed	Unemployment Rate (percent)
Idaho				
Bonneville	33,619	32,016	1,603	4.8
Clark	424	416	8	1.9
Fremont	4,647	4,317	330	7.1
Jefferson	6,840	6,589	251	3.7
Madison	9,227	8,592	635	6.9
Teton	1,654	1,596	58	3.5
Wyoming				
Teton County	6,765	6,633	132	2.0
Total	63,176	60,159	3,017	4.8

Source: U.S. Dep. of Comm. 1990

Chapter 4

Environmental Consequences

Chapter 4 — Environmental Consequences

This chapter evaluates the potential consequences of implementing each of the five alternatives. The impacts for each resource are presented below in the same order as in the Affected Environment (Chapter 3).

Using the information contained in Chapter 2, the reasonably foreseeable development scenario (Appendix A), committed mitigation measures (Appendix F), and Chapter 3, the types of effects that each alternative could have on the resources were identified and quantified to the extent possible. Impacts can be beneficial (positive) or adverse (negative), and result from the action directly or indirectly. Effects can be permanent, long-lasting (long term), or temporary (short term). In the analysis documented in this chapter, long-term effects are defined as those that would substantially remain for the life of the project or beyond. Short-term effects are defined as those changes to the environment during construction that would generally revert to preconstruction conditions at or within a few years (no more than three years) of the end of construction.

The following analysis addresses three overall types of effects. They are direct, indirect, and cumulative effects. Direct effects are those effects caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action but occur later in time or farther in distance. However, they are still reasonably foreseeable. Cumulative effects result from incremental impacts of the action when added to other past, present, or reasonably foreseeable future actions, regardless of what person or agency undertakes those actions.

Although all three types of effects are discussed in this chapter, direct and indirect effects are not specifically identified or disclosed separately. However, cumulative effects are addressed separately. Additionally, the cumulative effects analysis presented in this chapter is based upon projects that are presently occurring or that may reasonably occur in the near future. Timber sales are the only ground-disturbing activities presently identifiable. According to the Forest's Timber Schedule, a maximum of 37 million board-feet (mmbf) of timber may be harvested on the Forest over the next ten years. The surface disturbance associated with this harvest is projected to be about 11,460 acres.

About 6,620 acres of timber sales would occur within or adjoining the analysis area (Table 4–1). About 98 percent of this harvest would occur on Forest lands having either low or moderate potential for deposits of oil or natural gas. Only a very small portion of the projected timber sales would occur on lands with a high potential for oil and gas. Approximately 85 percent of the projected sales would occur on the Dubois and Island Park Ranger Districts. Future sales in the Island Park District are partially affected by litigation and Grizzly Bear Recovery Guidelines and some or all of the proposed timber sales may be dropped. In total, ground-disturbing activities from timber sales in the areas with a moderate or high potential for oil and gas would be about 3.3 mmbf of timber harvested from 1,030 acres.

Table 4–1 Distribution of Timber Sale Acreages Used in the Cumulative Effects Analysis

	Ranger District				
Potential for deposits of oil and gas	Dubois (acres)	Island Park (acres)	Teton Basin (acres)	Palisades (acres)	Total (acres)
High				100	100
Moderate			100	830	930
Low	4,730	860			5,590
Total	4,730	860	100	930	6,620

Physiography and Geology

This section provides a description of the effects to physiography and geology that could result from leasing all or part of the analysis area for the exploration and development of oil and natural gas. This description focuses primarily on analyses related to the following issue:

Issue 11 – The interaction of oil and gas leasing, including possible subsequent activities associated with exploration and development, with geologic hazards (e.g. steep slopes and earthquakes).

The degree of potential impacts to geologic hazards from oil and gas development would depend on the types and locations of disturbance necessary to construct facilities. The three major types of land disturbance associated with well field development would be the construction of well pads, access roads, and pipelines. Construction of these components would result in the removal of soil (including topsoil), reduced soil productivity, compaction of soil, losses of soil and rock in areas of steep sidehill cuts, and acceleration of mass wasting (slope failure) in unstable areas. These disturbances could increase surface water runoff, accelerate erosion losses, interfere with drainage systems, increase landslide activity, and compound impacts to steep or unstable slopes from a major seismic event.

Exploration-related disturbances would be short term (10 to 18 months) because the well pads and access roads are used only long enough to determine the viability of the site for long-term production. Unproductive wells and their access roads would be reclaimed within three years. However, disturbances associated with the developed field would be long term because the field would be in service for more than three years.

Alternative 1 — No Leasing

Under Alternative 1, no new leases would be offered for oil and natural gas. Because no leases currently exist and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct, indirect, or cumulative effects to physiography or geology.

Effects Common to All Action Alternatives

Geologic hazard impacts are site specific. They depend on the type of activity (construction of well pad, road, or pipeline) and the soil type, slope, and geologic hazards present at a specific site. Impacts from exploratory drilling include disturbances at the well site and along the temporary access road. There would be additional impacts if a discovery is made. These include impacts from the construction of additional wells, roads, and ancillary facilities.

Unstable soils are particularly sensitive to the construction of well pads and roads. The potential for slope failures increases for major excavations requiring extensive cut-and-fill operations. If well pads are located on more gently-sloping surfaces, the number and length of cuts and fills would be greatly reduced resulting in less potential for erosion and mass wasting. Geologic hazard impacts would increase where construction on steeper slopes requires cuts and fills.

Because the Forest lies within a high seismic risk zone, there is an increased potential for slope failure in areas disturbed by oil and gas activities. Slope failures during a seismic event could be particularly severe if soils were weighted down by snow cover or lubricated by snowmelt or recent rainfall.

The specific potential for geologic hazards and acceleration of mass wasting cannot be accurately predicted at a precise location until the APD stage. Figures 3-2 and 3-3 show the locations of moderate to high potential for mass movement of soils and slopes greater than 40 percent. These are the locations in the analysis area where the geologic hazards could be substantial. The areas not included in the geologic hazards area would be the most likely locations where wells could be placed. However, the mitigation measures listed in Appendix F may still apply to locations with slight slopes.

Effects Specific to Alternative 2

Under this alternative, the NSO stipulation is applied to more than 531,000 acres of the lands within the Forest because of greater than 40 percent slopes and unstable soils. This stipulation ensures that lands with the greatest hazards for erosion and slope instability will not be disturbed by drilling activities and production facilities. However, it does not preclude the construction of access roads or pipelines across steep slopes or unstable soils within NSO areas.

With partial implementation of the RFD scenario expected under this alternative, only about 99 acres would be physically disturbed. The projected exploration is likely to occur in the areas with a low or moderate potential for deposits of oil or gas. However, exploration and subsequent development of the six-well field in the area with a high potential for oil or gas is not expected to occur. Too much of the high potential area would be covered by an NSO stipulation to allow development of the field, even if exploratory activities would find oil or gas. Because field development would be questionable, oil and gas companies are not expected to invest much time or money in exploration in the high potential area. Thus, only three wells are likely to be drilled under this alternative. Because all three wells would be unproductive, the wells and their associated roads would be reclaimed within three years.

The disturbance for the three exploratory wells would be 99 acres, including 87 acres for access roads. The mitigation measures for road construction listed in Appendix F would need to be employed where roads were constructed across slopes greater than 40 percent and unstable soils in NSO areas. Mitigation employed to minimize impacts would include following contours for road construction, limiting width to 12 feet, cuts and fills of 1.5:1 for slopes less than 50 percent and 0.75:1 for slopes greater than 50 percent, and clearing will be from the top of the cut to the toe of the fill.

Effects Specific to Alternative 3

Under this alternative, the areas with an NSO stipulation would be the same as described under Alternative 2. Like Alternative 2, the full implementation of the reasonable foreseeable development scenario is not likely to occur under Alternative 3. Thus, the potential geologic hazards associated with access roads through these areas would be similar to those associated with Alternative 2.

Effects Specific to Alternative 4

Under this alternative, only 40,924 acres with steep slopes or unstable soils would have an NSO stipulation. A large enough portion of the high oil and gas potential area would be open for leasing to facilitate full implementation of the reasonable foreseeable development scenario with CSU or TL stipulations. . The portions of the analysis area assigned both CSU and TL stipulations and a CSU stipulation only (Figure 2–4) would include about 437,000 acres with slopes greater than 40 percent and nearly 2800 acres with unstable soils. In addition to the ability to move facilities up to 0.5 mile from their proposed locations provided by SLT, the CSU stipulation would ensure additional measures are taken to minimize the potential for erosion or mass wasting and facilitate reclamation of disturbances.

Under Alternative 4, a full implementation of the RFD could occur. Oil and gas companies would invest the time and money for exploration and development. In addition to the three unsuccessful exploratory wells in the low and moderate oil and gas potential areas, seven exploratory wells would be drilled in the high potential area of the Big Hole Mountains, and one would be successful. Five more wells would be drilled to attain a development of a six-well field long with roads, ancillary facilities, and pipelines. Although the CSU stipulation provides some additional assurance that disturbances associated with well pads, roads, pipelines, and ancillary facilities would be constructed and maintained as well as practicable, the stipulation cannot ensure steep slopes or unstable soils are avoided. In contrast, the NSO stipulation present under alternatives 2 and 3 would ensure that at least well pads and tank batteries would not be constructed on steep slopes. The mitigation described in Appendix F pertinent to the construction of wells pads, roads and pipelines on and near steep slopes would have to be carefully implemented and monitored to minimize erosion and mass failure impacts. For example, the pad would be tiered rather than one large clearing. Also, minimal vegetation would be removed and the vegetation surrounding the pad would be scalloped. Pipelines would be constructed along the road right-of-way. However , geologic hazard impacts could be more extensive under this alternative than with either alternatives 2 or 3. Wells pads, ancillary facilities, roads and pipelines constructed on steep slopes would be more susceptible to mass failure during seismic events or annual runoff, soil erosion and increased sedimentation into streams.

Effects Specific to Alternative 5

Under this alternative, the entire analysis area would be open to leasing and subject only to the SLT. Facilities could be moved up to 200 meters to avoid steep slopes and other geologic hazards and the mitigation of impacts would be based solely on existing Federal laws. However, it is doubtful that these minimal restrictions would protect the extensive areas of steep slopes found throughout the Forest. Of all the alternatives considered, Alternative 5 is the least restrictive and has the greatest potential for extensive soil and geologic hazard impacts.

Cumulative Effects

The cumulative effects on geologic hazards of any of the proposed actions combined with other potential ground-disturbing activities within the analysis area has not been identified as a significant issue. Timber sales, livestock grazing, and recreational activities are the most-likely actions that may occur within the analysis area in conjunction with oil and gas exploration and development.

All timber sale lands are designated with an NSO stipulation under Alternative 2. Thus, there would be no drilling in timber sale areas. Timber sale Management Area 16 adjoins an area open to surface occupancy with timing limitations north of Palisades Reservoir. However, it appears unlikely that access roads or pipelines from the area with a moderate potential for oil and gas would need to pass through Management Area 16. Thus, cumulative impacts for geologic hazards from oil and gas leasing plus timber sales appears unlikely under Alternative 2.

Because the lands open to surface occupancy for Alternative 3 are essentially the same as for Alternative 2, cumulative impacts for geologic hazards from oil and gas leasing plus timber sales also appears unlikely with Alternative 3.

Some areas with a high, moderate, or low potential for deposits of oil and gas that are open to leasing with a CSU stipulation under Alternative 4 lie within proposed timber sale areas. This includes 1,030 acres of high and moderate potential areas and 5,590 acres of low potential areas. Thus, the possibility exists for cumulative impacts to geologic hazards in these areas, including increased potential for erosion and mass wasting.

The areas open to leasing with a CSU stipulation under Alternative 4 that lie within proposed timber sale areas would be open to development with SLT under Alternative 5. The acreages of proposed timber sale areas on which oil and gas development could take place are the same as under Alternative 4. However, the possibility for cumulative impacts to geologic hazards (e.g. increased potential for erosion and mass wasting) under Alternative 5 would be greater, because there would be no CSU stipulation placed on development.

Potential oil and gas activities that may occur under the action alternatives are unlikely to generate substantive cumulative effects to soils when considered with livestock grazing or recreational activities. Most of the oil and gas activities associated with the RFD scenario would involve only short-term disturbances, because the wells would not be productive, which would be reclaimed within three years. This situation is particularly apparent with Alternatives 2 and 3 where field development would be questionable. While drilling is occurring, some localized, short-term cumulative effects to geologic hazards may occur under each alternative if the situations with the individual wells, access roads, and other facilities displace livestock or recreationists into areas where they presently do not concentrate.

Soils

This section provides a description of the effects to soils that could result from the leasing and subsequent exploration and development of oil and gas wells, access roads, processing facilities, and pipelines. This analysis focuses primarily on the following issue:

> **Issue 10** – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on soils, water, and air quality.

The degree of potential impacts to soils from oil and gas development would depend on the types and locations of disturbance necessary to construct facilities. The three major types of land disturbance associated with the RFD scenario would be the construction of well pads, access roads, pipelines, and ancillary facilities. Construction of these project components would result in the removal of soil (including topsoil), reduced soil productivity, compaction of soil, loss of soil and rock in areas of steep sidehill cuts, and acceleration of mass wasting (slope failure) in unstable areas. These disturbances could increase surface water runoff, accelerate losses to erosion, interfere with drainage systems, and increase landslide activity.

Exploration-related disturbances are short term (10 to 18 months) because the well pads and access roads are used only long enough to determine the viability of the site for long-term production.

However, developed field disturbances are long term because the average producing well will be in service for 12 to 35 years.

Alternative 1 - No Leasing

Under this alternative, no new leases would be offered for oil and natural gas. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct or indirect impacts to soils.

Effects Common to All Action Alternatives

Under Alternatives 2 and 3, full implementation of the RFD is not expected to occur. Because too much of the high potential area is covered by an NSO stipulation and field development would be questionable, oil and gas companies are not expected to invest the time or money in exploration in the area with a high potential for oil or gas. Three unsuccessful exploratory wells are likely to be drilled in the low and moderate potential areas, and would be reclaimed within three years. Total disturbance would be 99 acres. Under Alternatives 4 and 5, all activities comprising the RFD scenario could occur. Thus, as many as 15 wells and 65 miles of roads could be constructed. A total of 433 acres of ground disturbance would occur if the RFD scenario is fully implemented. However, the 230-acre disturbance associated with the six unsuccessful exploratory wells would be reclaimed within three years. The remaining 203 acres would be a long-term disturbance.

Soil impacts are site specific. They depend on the type of activity (construction of well pads, roads, or pipelines) and the slopes and type of soils slope present at a specific site. Impacts from exploratory drilling include disturbances at the well site and along the temporary access road. There would be additional impacts if a discovery is made. These include impacts from construction of additional roads, a pipeline, and gas processing plants.

Unstable soils are particularly sensitive to well pad and road construction. The potential for the failure of slopes increases for major excavations requiring extensive cut-and-fill operations. During construction, some small soil losses would occur prior to implementation of reclamation. Some areas may require follow-up reclamation efforts until the site is stabilized. Soil impacts would generally be lower where best management practices are followed and where reclamation, revegetation, and erosion control measures are successfully implemented.

If well pads are located on more gently sloping surfaces, the number and length of cuts and fills would be greatly reduced resulting in less erosion. Conversely, effects on soils would increase where construction on steeper slopes requires cuts and fills.

Construction of new access roads would result in increased stream sedimentation. Surface water quality would be affected by the number and location of roads as well as construction and maintenance practices. Bare soil exposure could result in varying degrees of continued erosion loss depending on the type of binding material used. In addition, road construction and use could potentially activate areas susceptible to mass wasting.

Access road impacts would be greatest where extensive sidehill cuts were constructed. Additional access road impacts could include additional off-road vehicle disturbance resulting from new access. Unsurfaced access roads may rut in wet weather or where constructed in wet areas. Road construction and maintenance could reduce infiltration rates on road surfaces, disrupt natural drainage by concentrating subsurface and overland flow, and channelize runoff resulting in gully erosion. Proper engineering design of access roads will be needed to minimize these impacts.

Excavation of pipeline trenches would alter soil profiles, bringing rocky sub-soils and large boulders to the surface increasing the difficulty of revegetation and rehabilitation. The number and length of cuts and fills would be reduced where pipeline routes crossed more gently sloping areas. Implementation of erosion control and revegetation measures from the beginning of construction would reduce erosion. In addition, accelerated soil erosion and productivity losses would be temporary, ending when rights-of-way are stabilized in two to five years.

Potential soil losses and acceleration of mass wasting cannot be accurately predicted until the APD stage. However, impacts would be greatest on the 2,778 acres of unstable soils and the 478,000 acres of steep slopes within the analysis area. Accordingly, these are the areas where the impact of oil and gas development and production is analyzed. Once the specific land types and slopes affected are known, soil displacement and losses at specific locations can be predicted.

Effects Specific to Alternative 2

Under this alternative, the NSO stipulation is applied to more than 531,000 acres of the lands within the Forest because of greater than 40 percent slopes and unstable soils. This stipulation ensures that lands with the greatest hazards for erosion and slope instability will not be disturbed by drilling activities and production facilities. However, it does not preclude the construction of access roads or pipelines across steep slopes or unstable soils within NSO areas.

Full implementation of the reasonably foreseeable development scenario is not expected to occur under this alternative. The projected exploration is likely to occur in the areas with a low or moderate potential for deposits of oil or gas. However, exploration and subsequent development of the six-well field in the area with a high potential for oil or gas is not expected to occur. Too much of the high potential area would be covered by an NSO stipulation to allow development of the field, even if exploratory activities would find oil or gas. Because field development would be questionable, oil and gas companies are not expected to invest much time or money in exploration in the high potential area. Thus, only three wells are likely to be drilled under this alternative. Because all three wells would be unproductive, the wells and their associated roads would be reclaimed within three years.

The disturbance for the three exploratory wells would be 99 acres, including 87 acres for access roads. The mitigation measures for road construction listed in Appendix F would need to be employed where roads were constructed across slopes greater than 40 percent and unstable soils in NSO areas. Mitigation employed to minimize impacts would include following contours for road construction, limiting width to 12 feet, cuts and fills of 1.5:1 for slopes less than 50 percent and 0.75:1 for slopes greater than 50 percent, and clearing will be from the top of the cut to the toe of the fill.

Effects Specific to Alternative 3

Under this alternative, the areas with an NSO stipulation would be the same as described under Alternative 2. Like Alternative 2, the full implementation of the reasonable foreseeable development scenario is not likely to occur under Alternative 3. Thus, the potential effects on soils associated with access roads through these areas would be similar to those associated with Alternative 2.

Effects Specific to Alternative 4

Under this alternative, only 40,924 acres with steep slopes or unstable soils would have an NSO stipulation. A large enough portion of the high oil and gas potential area would be open for leasing to facilitate full implementation of the reasonable foreseeable development scenario with CSU or TL stipulations. The portions of the analysis area assigned both CSU and TL stipulations and a CSU stipulation only (Figure 2–4) would include about 437,000 acres with slopes greater than 40 percent and nearly 2800 acres with unstable soils. In addition to the ability to move facilities up to 200 meters from their proposed locations provided by SLT, the CSU stipulation would ensure additional measures are taken to minimize the potential for erosion or mass wasting and facilitate reclamation of disturbances.

Under Alternative 4, a full implementation of the RFD could occur. Oil and gas companies would invest the time and money for exploration and development. In addition to the three unsuccessful exploratory wells in the low and moderate oil and gas potential areas, seven exploratory wells would be drilled in the high potential area of the Big Hole Mountains, and one would be successful. Five more wells would be drilled to attain a development of a six-well field long with roads, ancillary facilities, and pipelines. Although the CSU stipulation provides some additional assurance that disturbances associated with well pads, roads, pipelines, and ancillary facilities would be constructed and maintained as well as practicable, the stipulation cannot ensure steep slopes or unstable soils are avoided. In contrast, the NSO stipulation present under alternatives 2 and 3 would ensure that at least well pads and tank batteries would not be constructed on steep slopes. The mitigation described in Appendix F pertinent to the construction of wells pads, roads and pipelines on and near steep slopes would have to be carefully implemented and monitored to minimize erosion and mass failure impacts. For example, the pad would be tiered rather than one large clearing. Also, minimal vegetation would be removed and the vegetation surrounding the pad would be scalloped. Pipelines would be constructed along the road right-of-way. However, impacts to soils could be more extensive under this alternative than with either alternatives 2 or 3. Wells pads, ancillary facilities, roads and pipelines constructed on steep slopes and unstable soils would be more susceptible to mass failure during seismic events or annual runoff, soil erosion and increased sedimentation into streams.

Effects Specific to Alternative 5

Under this alternative, the entire analysis area would be open to leasing and subject only to the SLT. Facilities could be moved up to 200 meters to avoid steep slopes and unstable soils and the mitigation of impacts would be based solely on existing Federal laws. However, it is doubtful that these minimal restrictions would protect the soils on extensive areas of steep slopes found throughout the Forest. Of all the alternatives considered, Alternative 5 is the least restrictive and has the greatest potential for extensive soil and geologic hazard impacts.

Cumulative Effects

The cumulative effects on soils resulting from any of the leasing alternatives combined with other potential ground-disturbing activities within the analysis area have not been identified as a significant issue. Timber sales, livestock grazing, and recreational activities are the most-likely actions that may occur within the analysis area in conjunction with oil and gas exploration and development.

All timber sale lands are designated with an NSO stipulation under Alternative 2. Thus, there would be no drilling in timber sale areas. Timber sale Management Area 16 adjoins an area open to surface occupancy with timing limitations north of Palisades Reservoir. However, it appears unlikely that access roads or pipelines from the area with a moderate potential for oil and gas would need to pass through Management Area 16. Thus, cumulative impacts for soils from oil and gas leasing plus timber sales appears unlikely under Alternative 2.

Because the lands open to surface occupancy for Alternative 3 are essentially the same as for Alternative 2, cumulative impacts for soils from oil and gas leasing plus timber sales also appears unlikely with Alternative 3.

Some areas with a high, moderate, or low potential for deposits of oil and gas that are open to leasing with a CSU stipulation under Alternative 4 lie within proposed timber sale areas. This includes 1,030 acres of high and moderate potential areas and 5,590 acres of low potential areas. Thus, the possibility exists for cumulative impacts to soils in these areas, including increased erosion, reduced soil productivity, and increased soil compaction.

The same areas open to leasing with a CSU stipulation under Alternative 4 that lie within proposed timber sale areas would be open to development with SLT under Alternative 5. The acreages of proposed timber sale areas on which oil and gas development could take place are the same as under Alternative 4. However, the possibility for cumulative impacts to soils (e.g. increased erosion, reduced soil productivity, and increased compaction) under Alternative 5 would be greater, because there would be no CSU stipulation placed on development.

Potential oil and gas activities that may occur under the action alternatives are unlikely to generate substantive cumulative effects to soils when considered with livestock grazing or recreational activities. Most of the oil and gas activities associated with the RFD scenario would involve only short-term disturbances, because the wells would not be productive, which would be reclaimed within three years. This situation is particularly apparent with Alternatives 2 and 3 where field development would be questionable. While drilling is occurring, some localized, short-term cumulative effects to soils may occur under each alternative if the situations with the individual wells, access roads, and other facilities displace livestock or recreationists into areas where they presently do not concentrate.

Water Resources

This section provides a description of the effects to water resources that could result from leasing all or part of the analysis area for the exploration and development of oil and natural gas. This description focuses on analyses related to the following issue:

Issue 10 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on soils, water, and air quality.

Surface Water

A variety of activities comprising the RFD scenario could generate impacts to surface water resources in the analysis area. The construction and maintenance of access roads, well pads, tank batteries, and pipelines could affect surface hydrology. Additionally, the use of water for drilling, disposal of wastewater, spills of hydrocarbons during transport, and activities associated with reclamation may affect water quality. These activities could result in increased stream sedimentation, chemical pollution loading, or discharges of hydrocarbons directly into streams.

Under Alternatives 2 and 3, full implementation of the RFD scenario is not likely to occur. Because too much of the high potential area is covered by an NSO stipulation, oil and gas companies are not likely to invest much time or money in exploration in the area with a high potential for oil or gas. Three unsuccessful exploratory wells are likely be drilled in the low and moderate potential areas, and would be reclaimed within three years. Total disturbance would be 99 acres. Under Alternatives 4 and 5, all activities comprising the RFD scenario could occur. Thus, as many as 15 wells and 65 miles of roads could be constructed. A total of 433 acres of ground disturbance would occur if the RFD scenario is fully implemented. However, the 230-acre disturbance associated with the six unsuccessful exploratory wells would be reclaimed within three years. The remaining 203 acres would be a long-term disturbance.

A variety of data are needed to determine specific impacts to surface water. These data include the locations of well pads, access roads, pipelines, and ancillary facilities; a detailed description of the operations, including timing; and the characteristics of local watersheds and surface water features (e.g. annual discharge, peak flows, sediment load, water quality, and sediment yield). Without this information, impacts to specific watersheds and streams cannot be determined. Thus, the specific impacts of the activities comprising the RFD scenario would be determined at the Application for Permit to Drill (APD) and field development stages when the specific locations of these activities are known. Accordingly, this discussion will focus on general effects which may occur at any stream adjacent to oil and gas exploration, construction, and production activities.

Alternative 1 — No Leasing

Under Alternative 1, no new leases would be offered within the analysis area for oil and natural gas. Because no leases exist currently and no future leases would be offered, the oil and gas activities comprising the RFD scenario would not occur within the analysis area. Thus, implementation of this alternative would not result in any direct, indirect, or cumulative impacts to surface water resources.

Effects Common to All Action Alternatives

Under Alternatives 2 and 3, only three exploratory wells would be constructed. To access these wells, about 18 miles of roads would be built. These activities would all occur in the low and moderate potential areas. None of this construction would occur in the high potential area for oil and gas deposits. On the other hand, the scenario under Alternatives 4 and 5 would not only include the same level of exploration in the low and moderate potential area, but also more exploration and subsequent production in the high potential area. Seven exploratory wells would be drilled. Of these seven, one would be productive and lead to another five successful wells for a six-well field. Therefore, a total of 15 wells would be drilled under Alternatives 4 and 5. The field development would include roads, batteries, and pipelines. Therefore, the effects to water resources common to all alternatives would only be well pad and road construction and drilling in the exploration phase. The exploratory effects would be short-term (three years) for all alternatives because the unproductive exploratory wells and associated roads would be reclaimed within three years.

The general locations of wells and roads would probably differ among Alternatives 2 and 3 and Alternatives 4 and 5 and this level of differentiation was not possible for this analysis. One exploratory wells would be drilled somewhere in the northern portion of the analysis, and two would be drilled in either the northern portion of the Big Hole Mountains east of the Snake River or in the Caribou Mountains west of the Snake River. Under Alternatives 4 and 5, an additional seven exploratory wells would be drilled in the high potential area in the central portion of the Big Hole Mountains. There is no justifiable way to predict where these facilities would be constructed within these portions of the analysis area before lessees submit APDs or a Surface Use Plan of Operations (SUPO). Detailed potential effects, such as increased sedimentation in specific streams located near project facilities, cannot be determined or disclosed here.

Surface waters may experience a variety of potential effects from oil and gas leasing and exploration. They include increased sediment yield from disturbed areas; modified rates of discharge (timing and amounts); increased consumptive use of water; contamination of intermittent or perennial streams from reserve pits that fail; and the aggregation, degradation, or side-cutting of stream channels.

Construction of facilities would create a potential for increased erosion and transport of sediment into streams. This potential would result primarily from the clearing of vegetation and disturbance of soils for well pads and roads. To quantitatively assess the potential incremental increase in erosion due to these activities, site-specific information would be required for the exact areas where these facilities would be constructed, including stream discharge, precipitation, runoff, soil type, vegetative cover, and local topography. In general, if the incremental increase of sediment is small relative to the current load, any adverse effects would be minimal. However, if the incremental increase of sediment is large relative to the current load, the resulting sedimentation could substantially affect surface water, particularly the morphology of stream channels, quality of water, and quality of aquatic habitats. Overall though, the use of Best Management Practices (BMPs) and committed mitigation measures (described in Appendix F) would probably reduce impacts to surface water to an acceptable level.

The amount of sediment loading that would occur depends on several factors. They include the:

- proximity of roads and other facilities to stream channels,
- angle of the slope traversed by roads near streams,
- slope of the road near crossings of streams,
- predisposition of soils in a given area to erosion or mass slope failure,
- techniques employed in the construction of roads relative to the control of erosion,
- type of stream crossings (e.g. various culverts or bridges), and
- the care and skill of the crews doing the construction.

If reasonable care is taken and appropriate measures to control erosion are implemented, impacts from sediment loading should be minor and short term.

At locations where roads would cross streams, impacts to surface water could be minimized by good engineering practices. At stream crossings, roads would be constructed perpendicular to streams where possible. Culverts would be constructed to adequately allow large flows (at least Q50 - 50 year flow) under roads. In case of storm event flow, roads and culverts should be constructed to adequately handle the overflow without degradation of the road embankment. At any locations where roads would have to closely parallel streams, they should be constructed so as not to encroach upon stream channels. Roads will have sediment traps below all relief culverts within 200 feet of streams. Impacts would be minor if reasonable care and short-term and long-term erosion control measures, such as silt fences (short term), are implemented.

Although construction-related disturbances could adversely affect surface waters, accidental spills of pollutants into a stream would have the greatest potential for impacts. Sources of these spills during the exploratory phase include the accidental failure of reserve pits or sludge ponds (used to contain or treat water for oil drilling) and accidents involving trucks transporting materials to or from well sites.

Streamflows could be temporarily modified by withdrawals of water for drilling wells and watering of roads. Withdrawals for these activities would result in localized effects on stream flow, adverse impacts to fisheries, and minor fluctuations in the amount of water available for other uses. However, minimum instream flows as claimed in the Snake River Basin Adjudication need to be maintained. All consumptive water uses are controlled by state agencies (Idaho and Wyoming) through the appropriation of water rights. Water currently appropriated for irrigation would most likely be purchased for use during project construction and operation. Thus, no change in surface water consumption would be expected but the location of its use could change.

Effects Specific to Alternative 2

It is expected that three exploratory would be drilled and approximately 18 miles of roads would be constructed under this alternative. One exploratory well and one six-mile road would be constructed in the low potential area in the northern portion of the analysis area. Two wells and two six-mile roads would be built in the moderate potential area. However, none of these wells would be productive. Therefore, the major effects to surface water resources under this alternative would be road construction and usage.

The effects to water resources described previously would occur under this alternative. This alternative would cause the least impacts to surface waters for the following reasons. First, the disturbance would be minimal and the probability of well pad construction near a stream would be low. Also, the incidence of stream crossings would also be low under the RFD for this alternative. The mitigation described in the previous section would keep impacts to an acceptable level. Finally, any effects to water resources would be short term because all facilities would be reclaimed within three years.

Effects Specific to Alternative 3

Under this alternative, the same RFD scenario would occur. Therefore, the effects to water resources would be similar to Alternative 2.

Effects Specific to Alternative 4

Under this alternative, the full RFD scenario would occur. In addition to the short-term impacts described for the exploratory activities of Alternative 2 and 3, an additional seven exploratory wells would be drilled and the attendant six-mile access roads would be constructed. All these additional exploratory activities would occur with a CSU/TL stipulation in the high potential area in the central portion of the Big Hole Mountains. Exploration would probably not occur in the southern portion of the Big Hole Mountains because of an NSO stipulation. The CSU stipulation assumes that a well could be located as much as one-half mile from the proposed location, and the targeted reservoir could still be reached by directional drilling techniques. As a result, the well pads could be located far enough away from water resources to lessen any potential impacts.

Impacts to water resources during exploratory activities would be greater under this alternative than Alternatives 2 and 3 for the following reasons. First, seven more wells and six-mile roads would be constructed in a smaller area. The probability of more stream crossings would be higher. Although more streams would be affected, the mitigation measures employed during road construction and maintenance would still keep impacts to streams at an acceptable level.

Additional impacts could occur after the exploratory phase. After the successful completion of one exploration well, a six-well field would be developed. Based on one successful exploratory well, five more production wells would be completed to establish a six-well filed. Tank batteries, roads, and pipelines would then be constructed. Gathering pipelines would be constructed to transport either oil or natural gas to the central tank batteries. A transportation pipeline would be constructed to transport natural gas off the Forest, and additional roads would be constructed to transport oil off the Forest by truck. The pipelines would probably be built within or adjacent to the road right-of-ways. The greatest potential for impact would be associated with an accidental spill of hydrocarbons into a stream from an oil truck accident. If a spill were to occur, there would be significant pollution for some distance downstream. Therefore, an adequate spill protection plan is needed. The U.S. Environmental Protection Agency (EPA) requires that these measures be documented in a Spill Prevention and Control and Countermeasure Plan (SPCCP) in accordance with 40 CFR, Part 112. The SPCCP should address, in detail, the immediate availability of spill containment and cleanup resources and site design specifications to contain a spill.

Effects Specific to Alternative 5

Under this alternative, the entire analysis area would be open to leasing and subject only to the SLT. Facilities could be moved up to 200 meters to avoid water resources and the mitigation of impacts would be based solely on existing Federal laws. Like Alternative 4, full implementation of the RFD scenario would occur under this alternative. The entire high potential area would be available for leasing and subsequent development. Although the SLT only provides for facilities to be moved 200 meters rather than the one-half mile distance under the CSU stipulation, sufficient acreage should be available to place well pads sufficient distance from water resources. Therefore, the impacts to water resources would be similar to Alternative 4.

Cumulative Effects

Cumulative effects in the analysis area would occur if oil and gas leasing and other projects increase levels of impacts to surface waters, such as sedimentation, above current levels. Levels of impacts present in the analysis area now are the result of past and current activities. Timber sales, livestock grazing, and recreational activities are the most-likely actions that may occur within the analysis area in conjunction with oil and gas exploration and development.

As described above, with the use of BMPs and the provisions available under SLT and applicable stipulations, the overall direct and indirect effects of implementing any of the action alternatives should be minor. This same situation would apply to the timber sales comprising the foreseeable future projects identified for the analysis area. Therefore, individually, the projects would not generate adverse effects of substantial concern.

Together, oil and gas leasing and the proposed timber sales are not expected to generate meaningful cumulative effects to surface water. This conclusion is primarily based on two considerations. First, all of the projects would not occur within the same watershed or adjoining watersheds. Thus, instead of being concentrated in a single watershed or drainage, the effects of the projects would be spread physically throughout the analysis area. Second, the projects are not scheduled to occur simultaneously. Because the activities comprising the projects would start at different times and would occur over many years, the activities and operations associated with the projects would be in different stages of disturbance and reclamation. Essentially, there would be insufficient temporal and spacial overlap among oil and gas activities and the timber sales to generate cumulative effects with any reasonably-detectable consequence.

Potential oil and gas activities that may occur under the action alternatives are unlikely to generate substantive cumulative effects to surface water when considered with livestock grazing or recreational activities. Most of the oil and gas activities associated with the RFD scenario would involve only short-term disturbances, because the wells would not be productive, which would be reclaimed within three years. This situation is particularly apparent with Alternatives 2 and 3 where field development would be questionable. While drilling is occurring, some localized, short-term cumulative effects to surface water may occur under each alternative if the situations with the individual wells, access roads, and other facilities displace livestock or recreationists into areas where they presently do not concentrate. However, use of BMPs would minimize the potential for adverse cumulative effects.

Ground Water

Alternative 1 — No Leasing

Under Alternative 1, no new leases would be offered within the analysis area for oil and natural gas. Because no leases exist currently and no future leases would be offered, the oil and gas activities comprising the RFD scenario would not occur within the analysis area. Thus, implementation of this alternative would not result in any direct, indirect, or cumulative impacts to ground water resources.

Effects Common to All Action Alternatives

The general locations of wells, roads, pipelines, and ancillary facilities would probably differ among Alternatives 2 and 3 and Alternatives 4 and 5 and this level of differentiation was not possible for this analysis. There is no justifiable way to predict where these facilities would be constructed within the 1 million-acre analysis area before lessees submit APDs or a Surface Use Plan of Operations (SUPO). The effects of Alternatives 4 and 5 would be long-term because of a full-field development scenario, while the effects of Alternatives 2 and 3 would be short-term during the exploratory phase.

The drilling and development of oil and gas wells can impact ground water resources if standard preventive measures are not applied. If pits are left unlined, the drilling fluids and produced water contained in them could percolate into shallow aquifers. Additionally, drilling fluids and saline produced water could impact fresh water aquifers if drilling muds are not used and borings are not properly cased and cemented. Prior to casing and during drilling, drilling muds are used to form a "mud cake" on the walls of the well bore to minimize loss of drilling fluids.

Activities from developed oil and gas fields also can impact the ground water resource. Leaks from piping and storage tanks and spills during petroleum transfer operations can reach the water table if the ground water is shallow, if enough petroleum leaks, and if surface materials are sufficiently permeable. Malfunctioning petroleum delivery equipment also can leak petroleum, which may reach the water table if the equipment is not repaired quickly.

Industry standards for equipment, maintenance, and training should be sufficient to minimize the impact on ground water by oil and gas field operations. Assuming field operations meet industry standards, only minor impacts are anticipated for all action alternatives. However, depending upon the actual location of the developed field, a monitoring program for ground water may be desirable to assess the long-term impacts of the field on the ground water resource. This would involve the collection of baseline data adequate to characterize the water level and water quality seasonally, prior to drilling.

Potential impacts could be more numerous under Alternatives 4 and 5 because more wells would be drilled. Additionally, the long-term effect of six production wells could result in damaged or worn casing. However, industry standards for maintenance should minimize these potential impacts.

Cumulative Effects

Cumulative effects in the analysis area would occur if oil and gas leasing and other projects increase levels of impacts to ground water above current levels. Levels of impacts present in the analysis area now are the combined result of past and current activities. Timber sales, livestock grazing, and recreational activities are the most-likely actions that may occur within the analysis area in conjunction with oil and gas exploration and development.

As described above, with the use of BMPs, the provisions available under SLT and applicable stipulations, and the Onshore Orders, the overall direct and indirect effects on ground water of implementing any of the action alternatives would be minor. This same situation would apply to the timber sales comprising the foreseeable future projects identified for the analysis area. Therefore, individually, the projects would not generate adverse effects of substantial concern.

As was the case with the projects individually, the combined effects of oil and gas leasing and the proposed timber sales are not expected to generate meaningful cumulative effects to ground water. This conclusion is primarily based on two considerations. First, all the projects would not involve the same ground water resources. Thus, instead of being concentrated in a single aquifer, the effects of the projects would be spread physically throughout the analysis area. Second, the projects are not scheduled to occur simultaneously. Because the activities comprising the projects would start at different times and would occur over many years, the activities and operations associated with the projects would be in different stages of development.

Potential oil and gas activities that may occur under the action alternatives are unlikely to generate cumulative effects to ground water when considered with livestock grazing or recreational activities. Most of the oil and gas activities associated with the RFD scenario would involve only short-term disturbances, because the wells would not be productive, which would be reclaimed within three years. This situation is particularly apparent with Alternatives 2 and 3 where field development would be questionable. Also, the effects of livestock grazing or recreational activities are surface-related activities that would have no substantive effects on ground water. Thus, the potential for adverse cumulative effects would be minimal.

Air Quality

This section provides a description of the effects to air quality that could result from leasing all or part of the analysis area for the exploration and development of oil and natural gas. This description focuses on analyses related to the following issue:

Issue 10 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on soils, water, and air quality.

Alternative 1 — No Leasing

Under Alternative 1, no leases would be offered for oil and natural gas. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct or indirect effects on the quality of air in and near the analysis area.

Effects Common to All Action Alternatives - Exploration Phase

Implementation of alternatives 2 through 5 would result in similar effects on air quality during the exploration phase. Under each of these alternatives, exploration activities would occur. Under Alternatives 2 and 3, only three exploratory wells would be drilled. Under Alternatives 4 and 5, 10 exploratory wells would be drilled. None of these wells would be drilled simultaneously so the effects of each well would be similar.

Overall, minor impacts to air quality in the local area would occur during the drilling phases. During investigative and drilling operations, vehicles traveling to the drill sites would generate fugitive dust. Additionally, the vehicles and diesel engines powering the drill rigs would release nitrogen oxides (NO_x) to the atmosphere. The effects of these emissions of dust and would be short term, lasting approximately two months at any one location. After a well is completed and production begins, the only long-term effects on air quality would be fugitive dust generated from vehicular traffic and minor levels of vehicular exhaust gases. The following sections provide additional description of these effects.

The analysis area consists largely of steep and inaccessible terrain. Consequently, the RFD scenario assumes geophysical investigations would be conducted primarily using helicopters. With this assumption, the only notable impacts on the quality of air would be minor levels of emissions from the helicopters' engines.

Once the decision would be made to drill, the surface disturbance would be about four acres for the well pad. An access road with a mean length and overall disturbance of six miles and 29 acres, respectively, would be constructed for each exploratory well. Approximately 30 vehicles would travel to and from the drill site each day. Drilling rigs would probably be powered by three 700-horsepower diesel-fueled engines (Horsburgh, 1994). Drilling would occur around the clock for a maximum of eight weeks. It is assumed that only one well would be drilled at a time.

During drilling, diesel engines would emit NO_X, carbon monoxide (CO), and particulates. Overall, emissions of NO_X would be about 4.5 times greater than CO (EPA 1985) and ten times greater than particulates. Therefore, NO_X was the primary pollutant of concern in this evaluation.

To assess the effects of emissions of NO_X on Yellowstone and Grand Teton National Parks (the closest Class I airsheds), an analysis of dispersion was completed using the EPA's SCREEN2 model, version 92245 (EPA 1992). The SCREEN2 model computes the absolutely highest levels of pollutant that would be expected at a given location under the least favorable atmospheric conditions for dispersion of pollutants. If the results of the screening model show no significant increases over ambient levels, then it can be assumed that pollutant levels would always be at, and in almost all cases, below the calculated level.

Uncontrolled emissions of NO_X from the three 700-HP diesel engines would be 14 grams per horsepower-hour or 1,554 pounds per day (EPA 1985). Assuming drilling lasts the maximum of eight weeks, uncontrolled emissions would be 43.5 tons for the drilling phase for each well. Reasonable control technology can be applied to these engines to reduce emissions by 40 to 70 percent (EPA 1985). Using the 40 percent emissions control technology, total emissions of NOx would be 26.1 tons for the eight-week drilling operation. For 70 percent control efficiency, total emissions would be reduced to 13.1 tons. For this evaluation, pollutant concentrations were computed with the assumption that the control technology on the diesel engines would reduce emissions by 40 percent.

Because wells could be drilled at any location within available portions of the analysis area, the SCREEN2 model was run using the closest points to the two parks where drilling could occur. These points were 12.5 miles from Yellowstone in the northern portion of the analysis area and 14.5 miles from Grand Teton National Park in the southern portion of the analysis area. Emissions from drilling operations 12.5 miles from Yellowstone could increase the annual mean NO_X concentration in ambient air at the western border of Yellowstone by 0.66 $\mu g/m^3$. Drilling 14.5 miles from Grand Teton National Park in the southern portion of the analysis area could increase the annual mean NO_X concentration in the Park by 0.57 $\mu g/m^3$. Because any other potential wells would be farther away from the parks, drilling at these locations would result in even lower ambient concentrations of NO_X.

These increases in ambient air NO_X concentrations are minor. This conclusion is based primarily on three considerations. First, an assumption of the model is that the required meteorological conditions (wind velocity and atmospheric stability) would exist for 10 percent of the time in any given year. Given all the possible combinations of wind, speed, and atmospheric stability, this assumption is very conservative. Furthermore, a model assumption is that the terrain between the drilling rigs and the parks is flat. In reality, the complex terrain of the area would highly disrupt the smooth transport of pollutants to the parks. Finally, emissions from each drill rig would only contribute to minor air quality degradation at the parks for the short term (only during the period of drilling).

Effects of Alternatives 4 and 5 - the Production Phase

this seems low for # of assumed wells.

During the production phase, effects would consist of emissions from vehicles and road dust generated by production vehicles. These emissions would persist for the lifetime of production. Approximately 30 vehicles, ranging in size from pickup trucks to oil tankers, would travel an average of 20 miles on access roads daily to and from the developed field. The following equation (EPA 1985) was used to calculate the PM_{10} generated per vehicle mile when the area would be free of snow cover:

30 x 20 = 600 miles/day

MAY 1 - NOV 30 - 214 days

600 lbs/day

x 4.56

27.36 lbs/day

x 214

5,855.04 lbs/yr

2.9 tons/yr.

$$E = (5.9)(k)\left(\frac{s}{12}\right)\left(\frac{W}{3}\right)^{0.7}\left(\sqrt{\frac{w}{4}}\right)\left(\frac{(210-p)}{210}\right)$$

where:

E = lbs of PM_{10} per vehicle mile traveled
k = particle size multiplier; k = 0.36 for PM_{10} (EPA 1985)
s = road silt content (%); s = 28.5 for a rural road (EPA 1985)
S = mean vehicle speed (miles/hour); S = 25
W = vehicle weight (tons); W = 5
w = number of wheels; w = 6
p = number of days in March through October when precipitation exceeds 0.01 inches; assumption that ground is snow covered from November through March and no fugitive dust is generated; p = 60 (NOAA 1979).

vast difference!

The annual amount of PM_{10} in road dust would be 574 tons per year. Watering of the roads on days when precipitation does not occur would reduce annual emissions by 50 percent to 287 tons per year.

Tailpipe emissions would consist of CO and NO_X from mainly diesel-fueled vehicles. The average emission rate for heavy duty diesel-fueled vehicles is 17 grams per mile of CO and 8 grams per mile of NO_X (EPA 1985b). Therefore, the annual emissions from the production-related vehicles would be:

CO = 17 g/mile x 1200 miles/day x 365 days = 8.2 tons per year

NO_X = 8 g/mile x 1200 miles/day x 365 days = 3.8 tons per year.

These levels of emissions would occur over the life of production (long term). However, they would result in only minor impacts to the local air quality.

Cumulative Effects

Cumulative impacts to air resources could occur as a result of the proposed action in conjunction with the projected timber harvest plan for the Forest. The plan projects a harvest of approximately 37 mmbf of timber during the planning period for an average harvest of 3.7 mmbf per year.

Based on a commonly accepted formula for traffic generated associated with timber harvest activities, about 4,440 trips per year would result from the implementation of the timber harvest plans. Although the location of construction of new roads is impossible to determine at this time, it is estimated that the length of each trip on Forest roads would be 20 miles. Based on an average dust generation of 4.56 lbs per vehicle mile traveled, the timber harvest traffic would generate a lot difference from what was used to calculate dust from O&G

approximately 200 tons per year of PM_{10} (4.56 lbs/mile x 4,440 trips x 20 miles/trip). This production of PM_{10} would be approximately 35 percent of the annual PM_{10} in road dust generated by oil and gas activities. Gaseous vehicle tailpipe emissions would be a similar ratio.

Over 85 percent of the timber harvest would occur on Forest lands having low potential for the discovery of oil or gas. Only 1.5 percent of the projected timber sales would occur on lands with a high oil and gas potential. Because the production phase of oil and gas activities would be the only activity to have cumulative impacts with timber production, cumulative impacts to air quality for the two activities would be insignificant because the majority of the vehicles associated with the two industries would be separated a sufficient distance so as not to adversely affect any one area of the Forest.

Vegetation

This section provides a description of the effects to vegetation that could result from leasing all or part of the analysis area for the exploration and development of oil and natural gas. This description focuses on the following issues:

Issue 3 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on the Forest's ecological integrity and biological diversity.

Issue 7 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on wetlands and riparian areas.

Issue 14 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on rangeland resources and grazing operations.

Implementation of the oil and gas activities comprising the RFD scenario would result in a variety of effects on vegetation in the analysis area. These effects include the loss of vegetation from the construction of well pads, roads, pipelines, and ancillary facilities; loss of soil; loss of the seed bank in soil; loss of mature (climax) communities; deposition of dust; loss of soil microorganisms (e.g. mycorrhiza and nematodes); introduction and opportunities for weeds; compaction of soils; and loss of woody material. If construction were to occur solely in forested vegetation, up to 433 acres of timber would be cut and 135 acres would be removed from production over the long term.

The effects of oil and gas leasing on rangeland resources and grazing would be negligible. If all construction were to occur within rangeland areas, a maximum of 433 acres would be disturbed. However, these 433 acres would not be located within a single grazing allotment nor would they all be disturbed simultaneously. Considering the overall size of the analysis area and the likely distribution of the RFD scenario's disturbances in time and space within the analysis area, the short-term loss of about 298 acres and the long-term loss of 135 acres from production would be inconsequential.

Although the RFD scenario's activities probably would affect all vegetation types involved, their potential effects on wetlands and riparian areas are of primary concern.

Wetlands and Riparian Areas

Alternative 1 — No Leasing

Under Alternative 1, no leases would be offered for oil and natural gas. Accordingly, no wells would be drilled and no roads, tank batteries, or pipelines would be constructed. Thus, vegetation within the analysis area, including wetlands and riparian areas would experience no direct or indirect effects from the implementation of Alternative 1.

Effects Common To All Action Alternatives

Under all action alternatives, wetlands and riparian areas could be removed for the construction of roads, bridges, and pipelines. Additionally, the construction of roads, bridges, pipelines, and well pads near wetlands or riparian areas could alter the hydrology that supports wetlands or riparian areas. Although at least some adverse effects to wetlands and riparian areas are possible under each action alternative, the type and degree of effects would vary by alternative.

Although unlikely, if all roads and pipelines described in the RFD scenario are constructed within wetlands or riparian areas, a maximum of 365 acres would be disturbed. Of this total, 262 acres would consist of short-term effects associated with roads to exploratory well sites because they would be reclaimed within three years of construction. The remaining 103 acres would be long-term losses of vegetation to roads and pipelines associated with a producing field of wells.

The specific degree of these potential effects would depend upon the specific types and locations of disturbances necessary to construct the facilities proposed by the lessees under the RFD scenario. However, one can safely assume that the construction of linear facilities, such as roads and pipelines, also would involve vegetation types other than wetlands or riparian areas. Thus, the degree of impacts would probably be substantially less than the maximum short- and long-term effects described above.

Effects Specific to Alternative 2

Under this alternative, activities in wetlands and riparian areas would be limited by stipulations to the standard lease terms (Table 2–1). About 228 acres of wetlands and riparian areas present within recommended/proposed wilderness areas and Special Management Areas would be protected by the No Lease Stipulation applied to these areas (Table 2–4). An NSO stipulation would cover the remaining 10,566 acres of wetlands and riparian areas present within the analysis area.

The NSO stipulation would restrict disturbances to wetlands and riparian habitats to those associated with the construction and operation of transportation facilities, including roads and pipelines. No wells or tank batteries could be constructed in these habitats. The primary effects to wetlands and riparian areas from the construction and operation of transportation facilities would include the loss of vegetation, the loss hydric soils, and the potential alteration of the hydrologic regime supporting these habitats. The primary consequence of these effects would be an increase in erosion and sedimentation. Other effects may include compaction of wetland soils, a higher risk of contamination from accidental spills from vehicles, possible mechanical damage to roadside vegetation, and an increase in the accumulation of dust on vegetation bordering the roads.

With implementation of the committed mitigation measures (Appendix F), few of the 99 acres of disturbance that would occur under Alternative 2 would involve wetlands or riparian areas. The only construction of roads or pipelines the Forest Service would approve in wetlands or riparian areas would be limited crossings. Thus, direct and indirect effects would be limited to locations where roads or pipelines cross wetlands or riparian areas because no other acceptable means exist for getting around the wetlands or riparian areas.

To ensure adverse effects on wetlands and riparian areas are fully minimized, the Forest Service also would use buffer zones and apply a goal of no net loss of wetlands. The widths of the buffer zones, in which disturbances would be limited substantially, would vary depending upon the type of water present and location within the analysis area (Table 4–2). The goal of no net loss of wetlands would be accomplished through restoration of affected wetlands and, possibly, the creation of replacement wetlands. With these mitigations and the mitigation measures in Appendix F, wetlands and riparian areas would experience minor adverse effects from the implementation of Alternative 2.

Table 4–2 Mitigative Buffer Zones for Wetlands and Riparian Areas

	Subsection	
Type of Water	Centennial Mts. (feet)	Lemhi/Medicine Lodge, Caribou Mts., Big Hole/Palisades Mts. (feet)
Fish-bearing Stream Reaches	200	300
Perennial Non-fish-bearing Stream Reaches	75	150
Lakes	200	300
Reservoirs, Ponds, Wetlands > 1 acre	75	150
Intermittent Streams, Wetlands < 1 acre	75	100

Effects Specific to Alternative 3

Under this alternative, activities in wetlands and riparian areas would be limited by stipulations to the standard lease terms (Table 2–1). About 101 acres of wetlands and riparian areas present within recommended/proposed wilderness areas would be protected by the No Lease Stipulation applied to these areas (Table 2–5). Additionally, about 10,088 acres of wetlands and riparian areas are coincidental with Special Management Areas and other resource areas, such as slopes greater than 40 percent and lakes and streams, that have an NSO stipulation. Consequently, these acres would be covered by the same NSO stipulation (Table 2–5). As discussed under Alternative 2, the NSO stipulation would restrict disturbances to wetlands and riparian habitats to those associated with the construction and operation of transportation facilities, including roads and pipelines. No wells or tank batteries could be constructed in these habitats. Finally, a CSU stipulation would cover the remaining 605 acres of wetlands and riparian areas present within the analysis area.

With implementation of the committed mitigation measures (Appendix F), few of the 99 acres of disturbance that would occur under this alternative would involve wetlands or riparian areas. The only construction of roads or pipelines the Forest Service would approve in wetlands or riparian areas would be limited crossings. Additionally, the disturbances would not be concentrated. Rather, they would be distributed in various portions of the areas with a low or moderate potential for oil and gas. Thus, direct and indirect effects would be limited to dispersed locations where roads or pipelines cross wetlands or riparian areas because no other acceptable means exist for getting around the wetlands or riparian areas.

To ensure adverse effects on wetlands and riparian areas are fully minimized, the Forest Service also would use the buffer zones and goal of no net loss of wetlands as described under Alternative 2. With these mitigations and the mitigation measures in Appendix F, wetlands and riparian areas would experience only minor adverse effects from the implementation of Alternative 3.

Effects Specific to Alternative 4

Activities in wetlands and riparian areas under this alternative also would be limited by stipulations to the standard lease terms (Table 2–1). In contrast to Alternatives 1, 2, and 3, none of the riparian habitat would be subject to a No Lease stipulation applied to another resource area (Table 2–6). However, about 9,522 acres of wetlands and riparian areas would coincide with other resource areas assigned an NSO stipulation. As a result of this overlap, these 9,522 acres of wetlands and riparian areas would be covered by the NSO stipulation. Finally, a CSU stipulation would limit activities in the remaining 1,272 acres (Table 2–6).

The NSO stipulation would restrict disturbances to riparian habitat to those associated with the construction and operation of transportation facilities, including roads and pipelines. No wells or tank batteries could be constructed in riparian areas. The primary effects to wetlands and riparian areas from the construction and operation of transportation facilities would include the loss of vegetation, the loss hydric soils, and the potential alteration of the hydrologic regime supporting these habitats. The primary consequence of these effects would be an increase in erosion and sedimentation. Other effects may include compaction of wetland soils, a higher risk of contamination from accidental spills from vehicles, possible mechanical damage to roadside vegetation, and an increase in the accumulation of dust on vegetation bordering the roads.

The CSU stipulation would also limit the oil and gas activities that could occur in or near wetlands and riparian areas beyond the protections offered by Standard Lease Terms. However, the degree of protection against adverse effects would not be as great as that offered by the NSO or NL stipulations.

With implementation of the various stipulations and committed mitigation measures (Appendix F), few of the 433 acres of disturbance that would occur under Alternative 4 would involve wetlands or riparian areas. Overall in wetlands and riparian areas, the Forest Service would approve only limited crossings by roads or pipelines where no other acceptable means exist for getting around the wetlands or riparian areas and actual losses of wetlands and riparian habitat would be minimal. Direct and indirect effects would be limited to acreage and locations where roads or pipelines cross wetlands or riparian areas.

To ensure adverse effects on wetlands and riparian areas are fully minimized, the Forest Service also would apply the same buffer zones and goal of no net loss of wetlands as described under Alternative 2. The widths of the buffer zones, in which disturbances would be limited substantially, would vary depending upon the type of water present and location within the analysis area (Table 4–2). The goal of no net loss of wetlands would be accomplished through restoration of affected wetlands and, possibly, the creation of replacement wetlands. With these mitigations and the mitigation measures in Appendix F, wetlands and riparian areas would experience only minor adverse effects from the implementation of Alternative 4. Although minor, the effects probably would be greater than under Alternatives 2 or 3 because the number of crossings would be larger due to the larger number of miles of road and pipeline that would be constructed under this alternative.

Effects Specific to Alternative 5

Under this alternative, activities in wetlands and riparian areas would be limited only by the Standard Lease Terms. All activities included in the RFD scenario theoretically could occur in wetlands and riparian areas. Thus, the RFD scenario's 433 acres of disturbance could involve any of the 10,794 acres of wetlands and riparian areas present in the analysis area (Table 2–7).

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Under Alternative 5, the entire analysis area would be open for leasing for oil and gas exploration and development. Because Standard Lease Terms only provide for moving facilities up to 200 meters, only direct effects to wetlands or riparian areas under 40 acres in size could be avoided. Areas larger than 40 acres could experience direct effects (loss of vegetation to clearing for construction) depending upon the facilities' locations proposed by the lessee. Thus, wetlands and riparian areas under 40 acres in size would be subject only to the indirect effects described earlier and areas larger than 40 acres could experience the direct effects of vegetation removal as well as the same indirect effects. Under this alternative, depending upon the ultimate proposals by the lessees, wetlands and riparian areas would be subject to potentially-greater effects than would occur under the other alternatives.

Even with implementation of the committed mitigation measures (Appendix F), unacceptable disturbances could occur wetlands or riparian areas. The Forest Service's ability to ensure only minimal effects occur would be very limited under this alternative relative to the other four alternatives. To ensure adverse effects on wetlands and riparian areas are fully minimized, the Forest Service also would apply the same buffer zones and goal of no net loss of wetlands as described under Alternative 2. The widths of the buffer zones, in which disturbances would be limited substantially, would vary depending upon the type of water present and location within the analysis area (Table 4–2). The goal of no net loss of wetlands would be accomplished through restoration of affected wetlands and, possibly, the creation of replacement wetlands. With these mitigations and the mitigation measures in Appendix F, wetlands and riparian areas are expected to experience only minor adverse effects from the implementation of Alternative 5. Although minor, the effects potentially would be greater than under any of the other alternatives because the number of crossings would be larger and the wells and other facilities could be located closer to wetlands and riparian areas.

Cumulative Effects

Cumulative effects in the analysis area would occur if oil and gas leasing and other projects increase levels of impacts to wetlands and riparian areas above current levels. Levels of impacts present in the analysis area now are the result of past and current activities.

As described above and in the surface water resources section, with the use of the committed mitigation measures (Appendix F) and the provisions available under SLT and applicable stipulations, the overall direct and indirect effects of implementing any of the action alternatives would be minor. This same situation would apply to the timber sales comprising the foreseeable future projects identified for the analysis area. Therefore, individually, the projects would not generate adverse effects of substantial concern.

Together, oil and gas leasing and the proposed timber sales are not expected to generate meaningful cumulative effects to wetlands or riparian areas. This conclusion is primarily based on three considerations. First, the harvest of timber cannot occur within wetlands or riparian areas. Thus, any disturbances to these areas would be limited to disturbances associated with the construction of roads. Second, all the projects would not occur within the same watershed or adjoining watersheds. Thus, instead of being concentrated in a single watershed or drainage, the effects of the projects would be spread physically throughout the analysis area. Finally, the projects are not scheduled to occur simultaneously. Because the activities comprising the projects would start at different times and would occur over many years, the activities and operations associated with the projects would be in different stages of disturbance and reclamation. Essentially, there would be insufficient temporal and spacial overlap among oil and gas activities and the timber sales to generate cumulative effects with any reasonably-detectable consequence.

Although the oil and gas activities projected under each alternative are not expected to generate more than minimal cumulative effects when considered with the harvest of timber, when considered in combination with livestock grazing in particular and recreational activities in general, the effects may be greater. Many of the wetlands and riparian areas occur within livestock grazing allotments or areas used more heavily by recreationists. Over the years, these activities have adversely affected wetlands and riparian areas. As a result, many riparian areas within the analysis area do not meet the Desired Vegetation Condition for riparian habitat. If the oil and gas activities (primarily roads and pipelines) occur within the same drainages that have been heavily grazed or used by recreationists, the cumulative effects could be substantial. This situation would be especially true if the oil and gas activities disturb riparian areas that have not been grazed too heavily. The overall cumulative effects of each action alternative still would be small because the effects due to oil and gas activities would be minor relative to the adverse effects caused by livestock grazing or some recreational activities.

Wildlife

This section provides a description of the effects to wildlife that could result from leasing all or part of the analysis area for the exploration and development of oil and natural gas. This description focusses on analyses related to the following issue:

Issue 2 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on species of wildlife and their habitats (particularly key habitats).

Alternative 1 — No Leasing

Under Alternative 1, no new leases would be offered for oil and natural gas. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct or indirect impacts to wildlife or their habitats.

Effects Common to All Action Alternatives

Under all action alternatives, at least a portion of the RFD scenario would be implemented. Thus, the construction of wells, roads, pipelines, and ancillary facilities would physically remove or convert to another vegetation type as many as 433 acres of wildlife habitats, depending upon the alternative. Additionally, habitats immediately adjoining these disturbed areas would experience indirect impacts primarily from increased human activity and disturbance, such as noise, dust, and sedimentation, that may displace some animals temporarily.

For most species present in the analysis area, the effects of implementing the RFD scenario would be too small to be meaningful. Overall, the analysis area's populations of reptiles, amphibians, birds, and mammals and the habitats they inhabit are numerous, diverse, and widespread. Most also have high rates of mortality and natality. Considering these characteristics, the removal of as many as 433 acres would affect a comparatively minute amount of habitat and few individuals.

The instances where meaningful adverse effects could occur involve species where key seasonal habitats have been designated. These species include elk, deer, and moose. The key habitats involved include elk and deer winter range, elk summer range, elk summer concentration areas, elk calving range, and moose winter range. The rest of this discussion focuses on these species and habitats.

Under all action alternatives, implementation of the RFD scenario may result in direct and indirect effects to elk, deer, and moose and their key habitats. Direct effects would stem primarily from the physical elimination or conversion of key habitats for the construction of wells, roads, pipelines, and associated facilities. Potential indirect effects include the fragmentation of remaining habitats, the effective loss of physically-intact habitats adjoining construction sites during periods of intense human activity, and the loss of individuals through poaching and collisions with vehicles.

Of the indirect effects mentioned, the effective loss of physically-undisturbed habitats around construction sites is of greatest concern because of the amount of habitat potentially involved. Intense activity often drives sensitive animals from habitats adjoining the activity. This situation is particularly evident with elk. Johnson et al. (1990) determined that elk moved from 0.5 to 2.5 miles away from gas wells during their construction. However, once the wells were completed and the level of human activity decreased, the elk moved back into the well field. Elk exhibit similar patterns of this behavior with the construction of roads (Lyons et al. 1985). Thus, the use of roads during the productive phase would not measurably affect elk.

If the construction of wells, roads, and associated facilities occurs within key elk ranges during the time they are occupied by the animals, the effective loss of habitat could increase substantially. For example, if the drilling of a well displaced elk from all habitat within 2.5 miles of the well pad, the effective loss of habitat around that well would exceed 10,000 acres during drilling. This loss would be substantially higher than that solely associated with the 4-acre physical disturbance. A similar situation would occur with the construction of roads and their use during the drilling of wells.

In general, most of the direct and indirect effects would be short term in nature. With full implementation of the RFD scenario, the physical disturbances associated with nine of the ten exploratory wells (298 acres) would be reclaimed within three years of their occurrence. Additionally, most, if not all, of the indirect effects would be limited to the two- to three-month period during which exploratory activities would occur. After reclamation and the discontinuation of human activity, only fragmentation of habitats may extend into the long term (if disturbances involved the slower-growing shrubland or forested habitats).

During the production phase of the project, all action alternatives would result in similar effects. These effects would essentially consist of a relatively low level of activity associated with the trucking of oil and maintenance activities at the wells. However, these roads would also be open for public use. Thus, if the new roads are constructed into previously isolated areas, substantial adverse effects on wildlife could occur, depending upon the specific locations of the roads. The effects could include increased stress on the animals from vehicular traffic, intentional or unintentional harassment, poaching, and road kills. These effects would be long term because they would continue throughout the productive life of the field.

For all four action alternatives, implementation of the RFD scenario would generate impacts. However, the specific effects that would occur depend upon the degree to which the RFD scenario is implemented and the specific types and locations of disturbances ultimately proposed by the lessees.

Effects Specific to Alternative 2

Under alternative 2, activities in key wildlife habitats would be limited by stipulations to the SLT (Table 2–1). About 63,842 acres of wildlife seasonal habitats present within recommended/proposed wilderness areas and Special Management Areas would be protected by the No Lease Stipulation applied to these areas, in addition to the TL stipulation applied to seasonal wildlife resources Table 2–4). The timing limitations would close key habitats to activities during specific periods (Table 4–3).

Table 4–3 Restrictions Included in the Timing Limitation Stipulation for Wildlife Resources

Key Habitat	Period During Which Oil and Gas Activities are Prohibited
Elk/Deer Winter Range	November 30 – April 1
Elk Summer Range	April 1 – November 30
Elk Summer Concentration Area	June 15 – August 15
Elk Calving Area	May 15 – July 15
Moose Winter Range	November 15 – April 30

Due to overlaps with other resources areas and their associated stipulations, 515,370 acres of wildlife seasonal habitats would be covered by an NSO stipulation in addition to the TL stipulation (Table 2–4). The NSO stipulation would restrict disturbances to wildlife seasonal habitats to those associated with the construction and operation of transportation facilities, including roads and pipelines. No wells or tank batteries can be constructed in areas with an NSO stipulation. Thus, in the areas where the NSO stipulation also applies, the primary effects to wildlife seasonal habitats and the species that use them would include direct and indirect losses of habitats and increased fragmentation of habitats, stress on animals, harassment, poaching, and road kills associated with new roads and pipelines.

The primary stipulation to the Standard Lease Terms protecting the remaining 504,642 acres of wildlife seasonal habitats would be the TL stipulation. However, about 4,262 acres of wildlife seasonal habitats also overlap with other resource areas that have an associated CSU stipulation (Table 2–4). Although species of wildlife occurring in these areas may experience some additional benefits from these CSU stipulations, the beneficial effects from these overlapping CSU stipulations would be negligible.

With partial implementation of the RFD scenario expected under this alternative, only about 99 acres of seasonal wildlife habitat may be physically-removed. This loss would affect less than one percent of elk and deer winter range, elk summer range, elk concentration areas, elk caving areas, or moose winter range. Additionally, these 99 acres would not be concentrated in a single area, but would be dispersed between the areas with a low or moderate potential for oil and gas. Thus, the physical loss of these 99 acres would result in only minor impacts to elk, deer, and moose.

Although the 99 acres of physical disturbance could occur under this alternative, substantial displacement of animals from physically-undisturbed habitats adjoining the oil and gas activities is not expected. The timing limitations implemented with this alternative would prohibit the construction of well pads and tank batteries and the initiation of drilling during periods in which the animals are present on the seasonal habitats. However, if a drilling rig is in place and operating before the key time period begins, drilling would be allowed to continue into that time period. Because the construction of well pads and tank batteries and the initiation of drilling would only occur when the animals are absent from these habitats, the animals would not be displaced from adjoining habitat that is not physically disturbed. Limited displacement would occur if drilling continues into the key time period and the ultimate effects of this displacement would depend on the specific conditions present that year, such as climatic conditions, number of animals involved, and length of disturbance.

Effects Specific to Alternative 3

Under this alternative, activities in key wildlife habitats would be limited by stipulations to the Standard Lease Terms (Table 2–1). About 58,512 acres of wildlife seasonal habitats present within recommended/proposed wilderness areas would be protected by the No Lease Stipulation applied to these areas, in addition to the TL stipulation applied to seasonal wildlife resources (Table 2–5). Because no leasing would occur within this acreage, wildlife resources would experience no effects in these areas.

Due to overlaps with other resource areas and their associated stipulations, about 469,889 acres of wildlife seasonal habitats would be covered by an NSO stipulation in addition to the TL stipulation (Table 2–5). The NSO stipulation would restrict disturbances to wildlife seasonal habitats to those disturbances associated with the construction and operation of transportation facilities, including roads and pipelines. No wells or tank batteries can be constructed in areas with an NSO stipulation. Thus, in areas where the NSO stipulation also applies, the primary potential effects to wildlife seasonal habitats and the species that use them would include direct and indirect losses of habitats and increased fragmentation of habitats, stress on animals, harassment, poaching, and road kills associated with new roads or pipelines.

The primary stipulation to the Standard Lease Terms protecting the remaining 555,453 acres of wildlife seasonal habitats would be the TL stipulation. However, about 448,765 acres of wildlife seasonal habitats also overlap with other resource areas that have an associated CSU stipulation (Table 2–5). Although species of wildlife occurring in these areas may experience some additional benefits from these CSU stipulations, the beneficial effects from these overlapping CSU stipulations would be negligible.

As with alternative 2, only partial implementation of the RFD scenario is expected under this alternative. Only about 99 acres of seasonal wildlife habitats may be physically removed. This loss would affect less than one percent of elk and deer winter range, elk summer range, elk concentration areas, elk caving areas, or moose winter range. Additionally, these 99 acres are unlikely to be concentrated in a single area, but would be dispersed between the areas with a low or moderate potential for oil and gas. Thus, the physical loss of these 99 acres would result in only minor impacts to elk, deer, and moose.

Overall, implementation of this alternative would result in a level of impact to wildlife similar to that which would occur if alternative 2 was implemented. This situation is primarily the result of alternatives 2 and 3 having the same stipulations being applied to similar acreages of key seasonal habitats within the analysis area and having the same limited level of implementation of the RFD scenario.

Effects Specific to Alternative 4

Under this alternative, activities in seasonal wildlife habitats would be limited by stipulations to the Standard Lease Terms (Table 2–1). Unlike under alternatives 2 and 3, none of the seasonal wildlife habitats coincide with other resource areas assigned an NL stipulation. However, about 71,794 acres of seasonal wildlife habitats overlap with other resource areas assigned an NSO stipulation (Table 2–6). Thus, within this acreage, only roads and pipelines could be constructed. No wells or tank batteries can be constructed in areas with an NSO stipulation.

The primary stipulation to the Standard Lease Terms protecting the remaining 1,012,059 acres of wildlife seasonal habitats would be the TL stipulation. However, about 740,569 acres of wildlife seasonal habitats also overlap with other resource areas that have an associated CSU stipulation (Table 2–6). Although species of wildlife occurring in these areas may experience some additional benefits from these CSU stipulations, the beneficial effects from these overlapping CSU stipulations would be minor.

Unlike under alternatives 2 and 3, full implementation of the RFD scenario is expected under this alternative. Thus, about 433 acres of seasonal habitats are likely to be physically removed or disturbed. The disturbance of 99 acres for the drilling of three wildcat wells and construction of their access roads in the areas with a low or moderate potential for oil and gas would have minimal effects on seasonal wildlife habitats and the species inhabiting them.

Effects Specific to Alternative 5

Under this alternative, activities in seasonal wildlife habitats would be limited only by the SLT. Thus, unlike under the other alternatives, no timing limitations would be imposed to protect seasonal habitats. Instead, the limits of protection to seasonal wildlife habitats under this alternative involve moving proposed facilities up to 200 meters and delaying construction of facilities for up to 60 days.

Implementation of alternative 5 could have the greatest adverse effects on wildlife and their seasonal habitats. This determination is based on the conclusion that SLT provide inadequate protection to seasonal habitats. Most of the seasonal habitats present in the analysis area could not be adequately avoided because the 200-meter limitation on moving oil and gas facilities would be insufficient to avoid most of these seasonal habitats. . Also, most of the periods in which these seasonal habitats are occupied are greater than 60 days (see Table 4–3). Thus, SLT cannot ensure that the RFD's 433 acres of disturbances would occur primarily when seasonal habitats are unoccupied. The timing limitations associated with alternatives 2, 3, and 4 provide a greater level of this protection.

As a result, this alternative is the only alternative where construction could occur within key habitats during their period of use. As described in the impacts common to all alternatives, intense levels of human activity may displace animals from adjoining, physically-undisturbed habitats. In the case of elk, animals may be displaced from 0.5 to 2.5 miles from the activity. If construction activities were to occur within key habitats during their periods of use, a much larger acreage would be rendered unusable than would occur under the other alternatives.

Cumulative Effects

Cumulative effects in the analysis area would occur if oil and gas leasing and other projects increase levels of impacts to key wildlife habitats above current levels. Levels of impacts present in the analysis area now are the result of past and current activities.

As described above and in the wetlands and riparian areas section, with the use of the committed mitigation measures (Appendix F) and the provisions available under SLT and applicable stipulations, the overall direct and indirect effects of implementing any of the action alternatives would be minor. This same situation would apply to the timber sales comprising the foreseeable future projects identified for the analysis area. Therefore, individually, the projects would not generate adverse effects of substantial concern.

Additional ground-disturbing projects projected to occur within the analysis area are limited to timber sales. Almost all of the projected sales would occur on lands having either moderate or low potential for oil and gas development. In these areas, a total of 6,620 acres may be disturbed. Depending upon the specific locations and timing of these disturbances and the species involved, the effects could be measurable if all the disturbances occur within a single key habitat, such as the very limited bighorn sheep range, particularly if the disturbance occurs within a single watershed. However, they are unlikely to be meaningful in the overall context.

Within the portion of the analysis area supporting a high potential for oil and gas development, only 100 acres of timber harvest are planned. Thus, under Alternatives 4 and 5, as many as about 434 acres may be disturbed within the area with a high potential for oil and gas through the combination of oil and gas activities and the harvest of timber. Although the areas of planned harvest occur outside the areas open for drilling under Alternatives 2 and 3, some habitats could be affected by both oil and gas development and timber sales under Alternatives 4 and 5. Considering the amount of key wildlife habitats available within the area with a high potential for oil and gas and the likely timing of activities, the disturbance of 434 acres (even if it all occurred simultaneously) probably would not result in measurable cumulative effects to the wildlife resource in this area. Thus, because the overall disturbance attributed to oil and gas leasing in the analysis area is relatively small, leasing and the subsequent development activities under any of the action alternatives are unlikely to cause substantial cumulative effects to wildlife.

Oil and gas activities projected under each alternative may generate some cumulative effects on wildlife when considered in combination with livestock grazing and recreational activities. Many of the key wildlife habitats occur within livestock grazing allotments or areas used more heavily by recreationists. Over the years, these activities have affected these habitats and the species' use of them. If the oil and gas activities (primarily roads and pipelines) occur within the same drainages that have been heavily grazed or used by recreationists, the cumulative effects could be noticeable. This situation would be especially true if the oil and gas activities disturb habitats within a drainage that have not been grazed too heavily and other portions of the same drainage have been heavily grazed. The overall cumulative effects of each action alternative still would be relatively small because the effects due to oil and gas activities would be minor relative to the adverse effects caused by livestock grazing or some recreational activities.

Fisheries

This section provides a description of the effects to fisheries that could result from leasing all or part of the analysis area for the exploration and development of oil and natural gas. This description focusses on analyses related to the following issue:

Issue 9 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on fisheries and aquatic habitat.

A variety of activities comprising the RFD scenario could generate impacts to fisheries and aquatic habitat via their effects on surface water resources in the analysis area. The construction and maintenance of access roads, well pads, tank batteries, and pipelines could affect surface hydrology. Additionally, the use of water for drilling, disposal of wastewater, spills of hydrocarbons during transport, and activities associated with reclamation may affect water quality. These activities could result in increased stream sedimentation, chemical pollution loading, or discharges of hydrocarbons directly into streams.

A variety of data are needed to determine specific impacts to fisheries and aquatic habitats. These data include the locations of well pads, access roads, pipelines, and ancillary facilities; a detailed description of the operations, including timing; the characteristics of local watersheds and surface water features (e.g. annual discharge, peak flows, sediment load, water quality, and sediment yield); and the characteristics of the local fisheries. Without all of this information, impacts to fisheries and aquatic habitats cannot be determined. Thus, the specific impacts of the activities comprising the RFD scenario would be determined at the Application for Permit to Drill (APD) and field development stages when the specific locations of these activities are known. Accordingly, this discussion will focus on general effects which may occur at any stream adjacent to oil and gas exploration, construction, and production activities.

Alternative 1 — No Leasing

Under Alternative 1, no new leases would be offered for oil and natural gas. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct, indirect, or cumulative impacts to fisheries or aquatic habitats.

Effects Common to All Action Alternatives

The most important potential sources of impacts from oil and gas exploration and development activities that may affect fisheries resources are: 1) the input of sediment into lakes and streams from the drilling process or construction and use of drill pads, access roads, and ancillary facilities; 2) the contamination of streams from drilling fluids; and 3) contamination of streams from accidental petroleum (or similar pollutant) spills. Additional source of potential impacts include: the removal of riparian (streamside) vegetation, the withdrawal of stream-water for drilling, and increased fishing pressure from improved access to remote areas. Each of these sources is discussed below.

Increase in Stream Sediment

Increases in stream sediment probably have the greatest potential for impacts to the fish resource from oil and gas operations. Increases in stream sediment would result from earthwork for well pads, roads (especially at stream crossings), pipelines, and processing plants. Increased stream sediment, primarily from road construction and drilling activities, can be mitigated, but not completely eliminated. Excessive sediment in streams can reduce salmonid spawning success by filling spaces between gravel (Meehan 1991). Filling these spaces can also reduce the abundance or diversity of macroinvertebrates that make up their primary food source.

The amount of sediment loading that would occur depends on several factors. These factors include: 1) the proximity of roads to the stream channels; 2) the angle of the slope crossed by the streamside road; 3) the slope of the road near stream crossings; 4) the tendency of soils in a given area to erosion; 5) erosion control measures used in road construction; 6) the type of stream crossing structure used, such as culverts and bridges; and 7) the care and skill of the equipment operators doing the construction. Construction activities' effects should be minor and temporary if care is taken, reasonable BMPs for erosion control are used, the committed mitigation measures in Appendix F are implemented, the number of stream crossings is limited, and erosion-control measures are implemented during maintenance of facilities.

Stream crossing structures should be bridges or open bottomed box culverts, if possible. If round culverts are used, they must be designed to facilitate fish passage, e.g. squashed, baffled. Design should include adequate sizing to eliminate an increase in water velocity or debris accumulation. Care must also be taken during installation to place the bottom of the culvert below the stream substrate to ensure sufficient water depth and eliminate elevated outlets. There may be a need to consult with a fisheries biologist where native populations exist to determine the need for barriers to keep the strains pure.

Oil or Similar Pollutant Spills

The second greatest potential for adverse effects on fish from oil and gas exploration and development operations would be a spill of oil or similar pollutant directly into an aquatic environment. If a spill were to occur, substantial short- and long-term damage could result for some distance downstream.

Petroleum compounds (oil, diesel fuel, and gasoline) are the most likely environmental contaminants that would be associated with oil and gas operations. Transportation accidents would be the most probable method of aquatic contamination, either from a tanker truck rollover or a pipeline failure at a stream crossing. Also, a loss of oils at the drilling site could be a source of contamination.

Oils can interfere with respiration in fish and other aquatic fauna. It can also coat rocks and other substrates, destroying algae, benthic invertebrates, and even possibly fish. In addition to the direct mortalities attributed to petroleum compounds, these pollutants may be incorporated into sediments of the stream or lake substrates. The persistence of unweathered oil within the sediment could have a long-term effect on the structure of the benthic community and, in turn, the fishery. Fortunately, application of stipulations, mitigation, and BMPs lessen the already low potential for these types of accidents. Also, emergency contingency plans are generally required as part of a plan of operations. These plans provide procedures for containing, cleaning up, and mitigating potential spills.

Stream-water Contamination from the Drilling Process

Water produced at the drilling site can be highly saline and has the potential to contaminate surface and ground waters. However, it can be assumed that an aquatic system able to support a fishery will have adequate dilution even in the remote chance that the solution reaches surface waters. BMPs will significantly reduce any chance of saline or other chemical contamination leaking from the drill site.

Removal of Riparian Vegetation

The potential exists for disturbance of riparian vegetation because of oil and gas exploration and road building (this is discussed earlier in this chapter). Streamside vegetation is essential in stabilizing stream banks and stabilizing temperatures. It also provides cover for aquatic life and contributes organic debris into the aquatic food chain. Additionally, riparian vegetation filters sediment that would otherwise enter the stream or lake. Losses of substantial amounts of riparian vegetation would have long-term adverse effects on fisheries and aquatic habitats. If the removal of riparian vegetation is limited to the immediate location of stream crossings, the effects of this removal would be minimized.

Withdrawal of Stream Water

The withdrawal of water for drilling operations can have an adverse effect on the fishery, especially if the flows are already near critically low discharge for the fish. Reduced stream discharge results in reduction of available habitat for fish and other aquatic life. Many spawning beds (redds) occur in shallow gravel areas of streams and, if flows are decreased significantly at critical periods, the redds can be dewatered. The potential for this adverse effect can be essentially eliminated by avoiding the withdrawal of water from streams with low flows. In any case, minimum instream flows as determined by the Forest Service need to be maintained.

Increased Fishing Pressure

how about the decrease in pressure else where?

There is a high likelihood that, if access roads were developed into previously inaccessible areas of the analysis area, there would be an increase in fishing pressure on the fish resource in those locations. Intensive fishing pressure can exert negative influences on fish populations. As with all the potential impacts, the amount of increase would have to be evaluated on a site-specific basis.

Effects Specific to Alternatives 2 and 3

Based on available information, the implementation of Alternative 2 or 3 would have the smallest potential for adverse effects to fish and aquatic habitats. The primary reason for this conclusion is the application of NL and NSO stipulations for riparian areas, unstable soils, slopes greater than 40 percent, lakes, and streams (Table 2–1). These stipulations would minimize the potential for most of the impacts of concern. In riparian areas, the NSO stipulation would reduce the potential for the removal or disturbance of riparian vegetation. In turn, the potential for possible increases in stream temperatures and sediment would be lower. Similarly, the NSO stipulation for unstable soils and slopes greater than 40 percent would reduce the potential for sediment inputs to the streams. The NL stipulation for the recommended/proposed wilderness areas and the special management areas would even further reduce the potential effects to the Snake River because they would restrict full implementation of the RFD scenario. Also, the mitigation measures developed for other resources (Appendix F) would help minimize the potential for adverse effects to fisheries.

Effects Specific to Alternative 4

Based on the available information, Alternative 4 would likely have a greater potential for adverse effects on the aquatic environment than would exist under alternatives 2 or 3. In contrast to alternatives 2 and 3, riparian areas, unstable soils, and slopes greater than 40 percent would be protected by CSU stipulations instead of an NSO stipulation. Thus, more of the riparian areas would be available for removal or disturbance compared to Alternatives 2 and 3. Similarly, using a CSU stipulation instead of an NSO stipulation for unstable soils and slopes greater than 40 percent would increase the potential for sediment inputs to the streams compared to Alternatives 2 and 3. Thus, more of the analysis area overall would be available for disturbances associated with more of the activities comprising the RFD scenario under Alternative 4 than would be under alternatives 2 or 3.

Effects Specific to Alternative 5

Overall, implementation of Alternative 5 would have the greatest potential for impacts to fish and aquatic habitat of all the action alternatives. The reason for this conclusion is that, under this alternative, all lands within the analysis would be available for leasing with no special stipulations. All activities in the analysis area would be limited only by the SLT and current laws and regulations. As a result, the limits of protection for riparian areas, unstable soils, and slopes greater than 40 percent under this alternative involve moving proposed facilities up to 200 meters and delaying construction of facilities for up to 60 days. Because these limitations are less restrictive than the special stipulations associated with alternatives 2, 3, and 4, the potential for short-term and long-term effects on fisheries and aquatic habitats is highest under this alternative.

Cumulative Effects

To determine cumulative effects for fisheries, the effects of oil and gas activities together with all other past, present, and planned actions within the analysis area were examined. Other activities that have degraded or are degrading the fisheries resources in the analysis area include: livestock grazing, timber harvest, mining, recreational uses (e.g. fishing), and introduction of nonnative fish species. Ongoing activities, including livestock grazing and recreational uses likely would continue to influence the aquatic habitats within the analysis area. Also, the proposed timber sales would affect the drainages where they occur.

Due to the implementation of oil and gas leasing stipulations, mitigation measures (identified in Appendix F), and BMPs that would be established for each specific site, it is highly unlikely that sediment entering the streams would be enough to eliminate a fish population, but some decline in population densities could result if the incremental increases in sediment from oil and gas activities combine with other cumulative projects to result in levels of sediment approaching the critical levels tolerable for fish. However, the direct and indirect effects of oil and gas development are not expected result in substantial cumulative effects because disturbances associated with oil and gas activities and the timber sales would vary in time and space within the analysis area.

Threatened, Endangered, or Sensitive Species

This section provides a description of the effects to wildlife that could result from leasing all or part of the analysis area for the exploration and development of oil and natural gas. This description focuses on analyses related to the following issue:

Issue 1 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on threatened, endangered, candidate, or sensitive species of plants and animals.

A variety of activities comprising the RFD scenario could generate impacts to species of plants or wildlife listed as threatened, endangered, or sensitive or candidates for such listing if they occur at the sites of disturbance. In particular, the construction of access roads, well pads, tank batteries, and pipelines could directly affect populations of species or their habitats.

A variety of data are needed to determine specific impacts to threatened, endangered, candidate, or sensitive species. These data include the locations of well pads, access roads, pipelines, and ancillary facilities and the presence or absence of threatened, endangered, candidate, or sensitive species at the site. Without this information, impacts specific to these species cannot be determined. Thus, the specific impacts of the activities comprising the RFD scenario would be determined at the Application for Permit to Drill (APD) and field development stages when the locations of these activities are known.

Alternative 1 — No Leasing

Under Alternative 1, no new leases would be offered for oil and natural gas. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct, indirect, or cumulative effects to threatened, endangered, candidate, or sensitive species of plants or animals.

Effects Common to All Action Alternatives

Under all action alternatives, except Alternative 5, a Lease Notice (LN) would be attached to any lease offered for lands located in the analysis area. This Notice would inform the lessee that threatened, endangered, or candidate species of plants or animals may occur on the lease. It would indicate that appropriate surveys would be required for these species of plants or animals when the species themselves or potentially-suitable habitat for the species occur on the lease. Finally, it would state that the potential effects of proposed activities would be reviewed by the FWS and that the activities could not be approved without the consent of the FWS.

Under the Endangered Species Act, the Forest Service must ensure the activities comprising the RFD scenario do not jeopardize the continued existence of any species listed as threatened or endangered or proposed for listing as threatened or endangered. Additionally, the Forest Service must acquire the FWS's concurrence that a particular activity on the Forest will not jeopardize a listed or proposed species. This requirement exists regardless of any other stipulation attached to a lease or permit. Assuming that the locations of activities comprising the RFD scenario have been identified, the appropriate surveys and analysis have been completed, and the Forest Service and FWS have agreed to a “no jeopardy” determination for those activities, the overall effects of any of the alternatives on listed or proposed species would be minor.

Stipulations specifically developed to address sensitive species vary by action alternative. Under Alternative 2, an LN would be attached to any lease offered to inform the lessee of the Forest Service’s regulations regarding the protection of sensitive species (see Forest Service Manual 2670). Under alternatives 3 and 4, a CSU stipulation would be attached. This stipulation would require activities to be located and operations conducted in a manner that would minimize the effects on sensitive species and would not result in a downward trend toward listing. Beyond the LN, no special stipulations for sensitive species would be applied under Alternative 5.

Specifics about populations of sensitive species (e.g. population size, dynamics, and distribution) present in the analysis area have not yet been determined. However, the general habitats in which the sensitive species occur are distributed throughout the 1.1 million-acre analysis area. Accordingly, potentially-suitable habitats for the sensitive species described in Chapter 3 probably occur throughout the analysis area.

Components of the RFD scenario may affect one or more sensitive species. The extent and duration of these effects would depend upon the species involved, the timing of oil and gas activities, and the proximity of these activities to habitats occupied by the species. Effects could include the direct and indirect loss of habitat, a decrease in the effectiveness and security of physically-undisturbed habitats immediately adjoining the activities, and the loss of individuals from a population. These effects could have both short-term and long-term consequences to the species using those habitats and could influence the trend towards the need for listing as threatened or endangered.

The specific effects of the RFD scenario's activities cannot be determined until the locations of the activities have been proposed by lessees. However, the LN, CSU stipulation, and subsequent review of the results of surveys and analyses would ensure that no activities would proceed that would result in a trend toward listing as threatened or endangered for any sensitive species present or potentially present in the analysis area.

Transportation System

This section provides a description of the effects to the transportation system that could result from the leasing and subsequent exploration and development of oil and natural gas. The description focuses on analyses related to the following issue:

Issue 5 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on transportation and the need for additional roads being built within the Forest.

The following discussion presents a description of the potential transportation-related environmental consequences associated with each of the oil and gas leasing alternatives. However, specific locations for the wells, roads, pipelines and ancillary facilities comprising the RFD scenario are not defined. Thus, effects to specific roads could not be determined and the scope of the analyses focused on overall increases in roadway miles, roadway density per square mile of Forest land, increases in traffic, and required improvements and upgrading of facility requirements.

Alternative 1 — No Leasing

Under this alternative, no leases would be offered for oil and natural gas. Accordingly, no wells would be drilled and no roads, tank batteries, or pipelines would be constructed. Thus, transportation systems within the analysis area would experience no direct or indirect effects from the implementation of Alternative 1.

Effects Common to All Alternatives

In general, oil and gas leasing activities allowable under any of the action alternatives may result in three levels of impacts on transportation and circulation within the Forest. These potential effects include: (1) an increase in the Forest's actual roadway mileage due to the construction of new access roads leading to a potential increase in the overall density of roads in the Forest, (2) a need for improving or upgrading existing roadway facilities; and (3) an increase in vehicular traffic (including truck traffic) on the Forest's arterial and collector roads. The level at which these effects are anticipated to occur varies by alternative, as described in the following sections.

Effects Specific to Alternative 2

Under this alternative, about half of the analysis area would not be subject drilling because of NSO and NL stipulations (Table 2–3). Areas open to drilling occur primarily in the portions of the analysis area with a low or moderate potential for oil and natural gas (Figure 2–2). Because most of the area with a high potential for oil and gas would be covered by NL and NSO stipulations, no field development is anticipated. Major peripheral access to these areas would be provided by a variety of state highways and forest roads.

In areas designated with the NSO leasing stipulation, leases would be issued but surface occupancy would not be allowed. It is unlikely that there would be any direct or indirect effects on the transportation system as a result of this stipulation. While technically the NSO stipulation allows the construction of linear features including roads, it is unlikely that areas given this stipulation would be utilized under this alternative. Exploratory drilling would probably only occur in the CSU and TL stipulation areas, and there is adequate Forest and non-forest access to these areas in place. Road construction in the NSO stipulation areas would not provide access to areas with less restrictive stipulations. In areas where the NSO stipulation applies, exploration, development, and production of oil and gas resources probably would be foregone. Although the possibility of exploiting oil and gas resources by directional drilling from off-site locations exists, in most cases it is not technically feasible to do so.

Under this alternative, about 18 miles of new road would be constructed for exploration access in the low and moderate potential areas. Exploration in these two areas would be concentrated in portions of the analysis areas with CSU and TL stipulations.

A comparison was conducted of existing road densities to projected road densities, including the additional miles of road resulting from oil and gas exploration. As discussed in the Affected Environment, the density of roads in the portion of the analysis area with a moderate potential for oil and gas (Caribou Mountains and Big Hole Mountains/Palisades subsections of the Forest) is 0.88 miles of road per square mile of land area. In the low potential area, the density of roads is 0.94 miles of road per square mile of land area.

With new roads constructed for exploration as described above, the overall density of roads would change slightly. A two percent increase in density would occur in the area with a moderate potential for oil and gas for a density of 0.90 miles of road per square mile of land area. A 0.6 percent increase would occur in the areas with a low potential for oil and gas.

As described in the RFD scenario, roads leading to the three non-producing wells would be reclaimed within three years. Therefore, all 18 miles of road would be reclaimed and no new roads to wells would be left in place. As a result, roadway densities in the areas with a moderate or low potential for deposits of oil and gas would return to present levels and the effects of the temporary increase would be short term as well. Increased traffic generation on a short-term basis would also occur as a result of the exploration phase. Based on the projected exploration scenario and an estimated trip generation rate of 30 trips per well (Horsburgh 1994), approximately 60 trips per day would be generated in the area with a moderate potential for oil and gas. In the low potential area, an estimated 30 additional trips per day would occur. It was assumed that the origin and destination of these trips would be the Evanston and Rock Springs areas of Wyoming. Following this assumption, traffic would probably flow north and enter Idaho and the Forest on U.S. 26. This increase in traffic would be primarily related to the construction of exploration wells, and would cease after the exploration phase. Trip generation rates associated with each potential area were estimated independent of one another to provide a conservative (i.e. worst case) estimate of expected traffic generation. If all of the exploration activities occur simultaneously, it is likely that some trips would be combined, resulting in a reduction of overall trip generation.

This additional traffic equates to a 5 percent maximum increase over the existing ADT on U.S. 26 at the Palisades Dam. This increase would have an negligible effect on traffic conditions due to the short-term duration of this traffic, although some peak period delays in traffic may result during peak construction periods. Some short-term effects also may be experienced at various intersections and local or collector roads due to increased traffic.

Effects Specific to Alternative 3

Similar to Alternative 2, about half of the analysis area under this alternative would not be subject drilling because of NSO and NL stipulations (Table 2–3). Areas open to drilling occur primarily in the portions of the analysis area with a low or moderate potential for oil and natural gas (Figure 2–4). Because most of the area with a high potential for oil and gas would be covered by NL and NSO stipulations, no field development is anticipated.

The effects of implementing this alternative on transportation would be the same as those described for Alternative 2. As with Alternative 2, no field development is expected to occur. Instead, three wildcat wells are expected to be drilled and all are expected to be unproductive. The 18 miles of new roads constructed to access these wells and the wells themselves would be reclaimed within three years. Thus, the same minor, short-term increases in the density of roads and ADT would occur with the implementation of this alternative.

Effects Specific to Alternative 4

Under Alternative 4, most of the analysis area would be subject to a CSU stipulation, a TL stipulation, or a combination of CSU and TL stipulations. Some acreage also would be restricted by an NSO stipulation. Most notably, this alternative differs from the previous two by assuming the RFD scenario's exploration and development activities projected for the high potential area would occur in addition to those exploration activities discussed under alternatives 2 and 3.

Within the area of the Forest designated as having a high potential for oil and gas field development, exploration would require the construction of approximately 42 miles of additional access roads, based on an estimate of six miles of additional road per well. In the area designated as having a moderate potential for oil and gas reserves, approximately 12 miles of new road would be required for exploration access. Also, it is projected that about six miles of additional road would be needed for exploration in the low potential area. However, as stated in the RFD scenario, all roads to the nine non-productive exploratory wells would be reclaimed within three years of well completion.

A comparison was conducted of existing road densities within each of the potential areas to projected road densities including the additional road miles resulting from oil and gas exploration was conducted. Existing road density data is presented in the Affected Environment section. In the high potential area, there are approximately 159 miles of road. This results in 0.35 miles of road per square mile of land area. This number is derived from a compilation of road density information calculated by watershed. In the moderate and low potential areas, existing densities of roads are 0.88 and 0.94 miles of road per square mile of land area, respectively.

With new roads constructed for exploration as described above, a 26 percent total increase in road miles would occur in the high potential area, resulting in a density of 0.45. A two percent increase would occur in the moderate potential area for a density of 0.90, and a 0.6 percent increase in the low potential area would result in a negligible change in overall density. These conservative estimates assume new densities calculated at buildout of the exploratory roads.

The RFD scenario indicates the roads to non-productive exploratory wells would be reclaimed within three years of the completion of exploratory activities. Consequently, all but 6 of the 42 miles of exploratory roads would be reclaimed. As a result, roadway densities in the areas with a moderate or low potential for deposits of oil and gas would return to present levels and the effects of the temporary increase would be short-term as well. Within the area with high potential for oil and gas, the increase in roadway density would be long term.

Increased traffic generation on a short-term basis would also occur as a result of the exploration phase. Based on the projected exploration scenario, a total of about 210 trips per day would be generated during exploration in the high potential area, based on an estimated trip generation rate of 30 trips per well (Horsburgh 1994). It is assumed that the origin and destination of these trips would be the Evanston and Rock Springs areas of Wyoming. Following this assumption, it is likely that the traffic would flow north and enter Idaho and the Forest on U.S. 26. In the moderate potential area, approximately 60 trips per day would be generated. In the low potential area it is estimated that about 30 additional trips per day would occur. This increase in traffic would be primarily related to the construction of exploration wells, and would cease after the exploration phase. Trip generation rates associated with each potential area were estimated independent of one another to provide a conservative (i.e. worst case) estimate of expected traffic generation. If all of the exploration activities occur simultaneously, it is likely that some trips would be combined, resulting in a reduction of overall trip generation.

This additional traffic equates to a 12 percent maximum increase over the existing ADT on U.S. 26 at the Palisades Dam. This increase would have an negligible effect on traffic conditions due to the short-term duration of this traffic, although some peak period delays in traffic may result during peak construction periods. Some short-term effects also may be experienced at various intersections and local or collector roads due to increased traffic.

Considering the development phase, one exploratory well located in the high potential area would produce sufficient quantities of oil and gas to warrant the development of a six well field. This field would require approximately six miles of new roads to access these development wells. Well development would require additional construction related traffic. However, these additional trips would occur on a short-term basis only. The only long-term trip generation expected to occur as a result of the development scenario is related to the transportation of crude oil product to refineries in Northern Utah. It is estimated that approximately three trucks per day would make round trips to the central tank battery area. This estimate is based on the anticipated field production of 700 barrels per day and standard oil tanker capacity of 10,000 gallons or 238 barrels. This additional traffic would probably travel southwest on U.S. 26 to Interstate 15 and south to Utah. The effect of these additional trips on the transportation network would be minor.

With a 30 percent short-term increase in road miles as a result of the exploration and development phase in the high potential area, a temporary density of 0.46 would occur. However, most of these roads (75 percent) would be reclaimed within three years. Thus, the long-term increase in project-related traffic accounts for only a minor increase in overall ADT on area roads, and is considered negligible.

Effects Specific to Alternative 5

Under this alternative, federal minerals within the analysis area would be available for lease with no specific protections beyond those provided by SLT. Thus, exploration and development for oil and gas could take place most anywhere. Following the projected development scenario, approximately ten exploratory wells would be drilled over a period of 15 years.

Implementation of this alternative would result in effects to the Forest transportation that would be the same as those described for Alternative 4 above. Although the locations of the new roads may be somewhat different from those under Alternative 4, the overall effects on the density of roads and ADT would be the same. Thus, only minor increases in the density of roads and ADT would occur over the short term and negligible increases in the density of roads and ADT would occur over the long term.

Cumulative Effects

Cumulative impacts on the Forest transportation system could potentially occur as a result of the proposed action alternatives in conjunction with the ten-year projections for timber harvest for the Forest. Although details regarding site specific impacts on transportation as a direct result of this harvest plan are not available, some assumptions can be made to provide an indication of the level of cumulative effects that may be expected. Cumulative impacts on the Forest transportation system include an increase in new permanent and temporary road construction needed to access a particular timber stand and subsequent increase in roadway density, and an increase in traffic generation (specifically heavy truck traffic) on Forest and State roadways as a result of timber haul operations.

The ten-year projections for timber harvest include the harvest of approximately 21 mmbf of timber from within the analysis area during the period. This number equates to an annual harvest rate of approximately 2.1 mmbf. Although existing Forest roads would be utilized to the extent possible, new roads would be constructed to access individual timber stands throughout the Forest. Projections suggest about five miles of new roads would be constructed to provide access into at least ten different timber sales. Temporary roads would also be constructed to provide access within a timber stand. The required length of these new roads would vary in each timber stand, and the overall increase in roadway miles as a result of the timber harvest plan cannot be project at this time. However, an increase in roadway densities in certain watersheds would result and this increase would be compounded with the addition of oil and gas leasing activities. Additionally, the majority of harvesting is projected to occur in the areas designated as having a low potential for oil and gas discoveries, which according to the roadway density calculations presented earlier, have the highest existing road densities on the Forest.

Based on a commonly accepted formula for traffic generation associated with timber harvest activities, about 1,260 trips per year would be generated as a result of implementation of the ten-year timber harvest projections. These trips would probably be distributed to State Highways 15, 20, 26, 28, 31, 32 and 33 and throughout a variety of Forest Development Roads. The length of these trips as well as their distribution would also vary with mill site locations.

When compared to the potential oil and gas leasing activities, the number of trips would vary substantially. About one percent of these trips would originate from the high potential area and 14 percent from the moderate potential area. In contrast, about 85 percent of the total number of trips would originate from the low potential area.

Even when the projections for increases in the density of roads and ADT from oil and gas activities and timber harvests are considered together, the cumulative effects are negligible. None of the alternatives would result in substantial or unacceptable cumulative effects to the Forest's transportation system. Instead the combination of oil and gas activities as projected in the RFD scenario under each alternative and the projected timber harvests would generate minor cumulative effects. For comparison purposes, the greatest effects would occur if Alternatives 4 or 5 were implemented. Alternatives 2 and 3 would contribute to cumulative effects on the Forest transportation system to a lesser extent. Alternative 1 would not contribute to cumulative impacts.

Recreation

This section provides a description of the effects to recreation that could result from the leasing and subsequent exploration and development of oil and natural gas. The description focuses on analyses related to the following issue:

> **Issue 6** – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on recreational opportunities and the recreational experience.

Impacts to recreation resources from the exploration, development and production of oil and gas in the analysis area would result from changes to the Recreation Opportunity Spectrum (ROS) available on Forest lands, effects to developed recreation sites, or effects on the quality of the recreation experience.

Alternative 1 — No Leasing

Under this alternative, no new leases for oil and natural gas would be offered in the analysis area. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct, indirect, or cumulative effects to recreation.

Effects Common to All Action Alternatives

Under all action alternatives, at least some construction of roads and drilling of wells for exploration would occur. Activities associated with exploration include the construction of roads and well pads, which is accomplished using dozers, scrapers, and motorgraders. Exploratory drilling operations for a wildcat well can be expected to take between 10 to 18 months. Drilling activities typically take place around the clock, 7 days a week. Depending upon the height of the substructures, a rig mast may typically rise to a height of 160 feet, and would be lighted at night for safety and for around the clock work. Also during this time period, noise from diesel engines would be evident. In addition to the disturbances created by exploration activities on the site, there would be traffic associated with moving equipment. Transporting a drill rig and associated equipment to a site can require 30 to 40 truckloads of equipment over public highways, local and Forest roads. These activities would potentially conflict with recreation uses, as they change the land use on the affected acreage and would be visually and audibly intrusive to the recreation experience. The impacts to recreation resources would be greater from exploration activities than from any other phase of the proposed oil and gas activities.

Under alternatives 4 and 5, it is expected that at least one of the seven exploratory wells drilled in the high potential area will encounter hydrocarbons in sufficient quantities to warrant field development. In this case, permanent facilities would be required at the site. The exploration facilities would be removed from the six unsuccessful locations and the sites reclaimed within three years. Thus, the effects of these exploratory facilities (roads and wells) would be short term and eliminated after the facilities are reclaimed.

The development and production phase would consist of the well field and the associated roads and transmission pipelines. The total disturbance on the Forest from field development would be 135 acres. The permanent facilities would not be as intrusive as the exploration activities, but the impact to any nearby recreation resources would be long term.

In addition, there is potential under each action alternative for oil and gas activities to convert a portion of Semi-primitive Motorized and Non-motorized settings to Roaded Natural as a result of the construction of access roads on Forest lands. In general, those alternatives that permit the construction of surface facilities on Forest lands allow drill rigs to be moved to avoid any adverse impact to a resource, which would mitigate impacts to any developed recreation sites.

Effects Specific to Alternative 2

Under Alternative 2, activities in Semi-primitive Motorized and Non-motorized Recreation areas would be limited by stipulations to the SLT. Although only the Standard Lease Terms were assigned to these resource areas specifically, motorized and non-motorized recreational areas coincide with other resources areas that have been assigned more restrictive stipulations. As a result, about 44,535 and 5,709 acres of motorized (ROS III) and non-motorized (ROS II) recreational areas, respectively, are present within recommended/proposed wilderness areas and Special Management Areas, which have been assigned as NL (Table 2–4). In addition, about 147,394 and 214,909 acres of motorized and non-motorized recreational areas, respectively, coincide with other resource areas to which an NSO stipulation has been applied. Developed sites and Special Use Permit Sites also would be under an NSO stipulation (Table 2–4). With this stipulation, neither exploration nor production facilities would be constructed on these areas. Therefore, any wells proposed for leases with the NSO stipulation would have to be directionally drilled from sites located outside the NSO area. However, the linear transportation facilities, such as roads and pipelines, could still be constructed in areas with an NSO stipulation.

In addition to the lands with an NL stipulation or NSO stipulation, there are several other areas with other stipulations that would affect recreation resources. These stipulations include a TL stipulation for wildlife that encompasses 172,332 acres of ROS III and 116,771 acres of ROS II. About 706 acres of ROS II classed lands are located on lands with a CSU stipulation.

If the access roads and exploratory wells were to be located on lands leased under the TL or CSU and TL stipulations, the management objectives for recreation uses of the area may not be met. However, in areas under the CSU and CSU and TL stipulations, well sites may be moved up to ½-mile from the proposed drill site to protect the resource. This flexibility, along with other mitigation measures would allow management objectives for the area to be achieved.

With partial implementation of the RFD scenario expected under this alternative, only about 99 acres of ROS II or ROS III areas may be physically-removed. This loss would affect less than one percent of these areas. Additionally, these 99 acres would not be concentrated in a single area, but would be dispersed between the areas with a low or moderate potential for oil and gas. Thus, the physical loss of these 99 acres would result in only minor impacts to recreationists.

Furthermore, the disturbance associated with the 99 acres of exploratory activities would be short term. All 99 acres of disturbance would be reclaimed within three years of its occurrence. Thus, the effects of the activities on recreationists would be short term as well.

Alternative 2 would probably result in the least impact of the action alternatives to recreation resources on Forest lands from the proposed oil and gas activities. This conclusion is primarily based on the consideration that most of the ROS II and ROS III areas would be subject to NL and NSO stipulations. Basically, expansive areas with a NL or NSO stipulation, such as would exist under this alternative, would effectively be closed to exploration and production because accessing the interior portions of such expanses using directional drilling is technically infeasible.

Effects Specific to Alternative 3

Under this alternative, activities in most of the analysis area would be limited by stipulations to the SLT. At a minimum, activities in recreational resource areas would be subject to an NSO stipulation or CSU stipulation (Table 2–1). However, about 43,224 acres of ROS III and 3,838 acres of ROS II areas are present within recommended/proposed wilderness areas and would be protected by NL or an NSO stipulation in addition to the recreation areas' designated NSO or CSU stipulations.

Due to overlaps with other resources areas and their associated stipulations, 138,673 acres of ROS III areas and 204,550 acres of ROS II areas would be covered by an NSO stipulation in addition to the CSU stipulation (Table 2–5). The NSO stipulation would restrict disturbances to wildlife seasonal habitats to those associated with the construction and operation of transportation facilities, including roads and pipelines. No wells or tank batteries can be constructed in areas with an NSO stipulation. Thus, in the areas where the NSO stipulation also applies, the primary effects to wildlife seasonal habitats and the species that use them would include direct and indirect losses of habitats and increased fragmentation of habitats, stress on animals, harassment, poaching, and road kills associated with new roads and pipelines.

With partial implementation of the RFD scenario expected under this alternative, only about 99 acres of ROS II or ROS III areas may be physically-removed. This loss would affect less than one percent of these areas. Additionally, these 99 acres would not be concentrated in a single area, but would be dispersed between the areas with a low or moderate potential for oil and gas. Thus, the physical loss of these 99 acres would result in only minor impacts to recreationists.

Overall, implementation of this alternative would result in a level of impact to recreation similar to that which would occur if alternative 2 was implemented. This situation is primarily the result of alternatives 2 and 3 having the similar stipulations being applied to similar acreages of recreational resource areas within the analysis area and having the same limited level of implementation of the RFD scenario.

Effects Specific to Alternative 4

Under this alternative, more of the analysis area would be available for leasing with stipulations that are less restrictive than those included in Alternatives 2 and 3. Instead of being limited by substantial areas with NL and NSO stipulations, activities on 225,261 acres of Semi-primitive Motorized Recreation (ROS III) and 251,762 acres of Semi-primitive Non-motorized Recreation (ROS II) areas would be restricted by a combination of CSU and TL stipulations (Table 2–6). In addition, 1,198 acres of developed sites and 299 acres of Special Use Permit Sites also would available with CSU and TL stipulations.

In addition to the lands with the combined CSU and TL stipulations, several other combinations of stipulations would be applied to areas that coincide with recreation resources. About 93,777 acres of ROS III class lands and 71,025 acres of ROS II class lands coincide with wildlife seasonal habitats. Consequently, they also would be subject to a TL stipulation. Another 410 acres of ROS III and 3,626 acres of ROS II would have to be leased with a CSU stipulation.

Unlike under alternatives 2 and 3, full implementation of the RFD scenario is expected under this alternative. Thus, about 433 acres of ROS II or ROS III areas are likely to be physically removed or disturbed. The disturbance of 99 acres for the drilling of three wildcat wells and construction of their access roads in the areas with a low or moderate potential for oil and gas would have minimal effects on recreation. The remaining 334 acres would involve long-term effects on recreation. However, the specific types of recreation and degree to which recreationists are affected by the oil and gas activities would depend upon where the development field is located.

Effects Specific to Alternative 5

Under this alternative, oil and gas activities throughout the analysis area would limited only by existing regulations and the SLT. Thus, no special stipulations would be applied under this alternative. Under SLT, the primary means for controlling major impacts to recreational resources would be moving proposed facilities up to 200 meters from their proposed locations and delaying the construction of those facilities for up to 60 days.

Alternative 5 would result in the greatest potential impacts to recreational resources in the analysis area. This conclusion is based on the consideration that the RFD scenario would be fully implemented and all lands within the analysis area would be available for all of the activities projected by the RFD scenario. Without the NL and NSO stipulations, the potential for conflicts between recreational resources and oil and gas activities is highest with this alternative.

Cumulative Effects

Cumulative effects in the analysis area would occur if oil and gas leasing and other projects increase levels of impacts to recreation above current levels. Levels of impacts present in the analysis area now are the result of past and current activities. Timber sales, livestock grazing, and other recreational activities are the most-likely actions that may occur within the analysis area in conjunction with oil and gas exploration and development.

Cumulative impacts on the Forest transportation system could potentially occur as a result of the proposed action alternatives in conjunction with the ten-year projections for timber harvest for the Forest. Although details regarding site specific impacts on recreation as a direct result of this harvest plan are not available, some assumptions can be made to provide an indication of the level of cumulative effects that may be expected. The logging activities could convert portions of Semi-primitive Motorized and Non-motorized settings to Roaded Natural. Oil and gas exploration, development, and production activities would disturb considerably fewer acres of Forest lands than the projected timber activities. However, in combination with existing or planned timber harvest and associated access road construction, there is increased potential for changing the ROS settings of Forest lands.

The ten-year projections for timber harvest include the harvest of approximately 21 mmbf of timber from within the analysis area during the period. This number equates to an annual harvest rate of approximately 2.1 mmbf. Although existing Forest roads would be utilized to the extent possible, new roads would be constructed to access individual timber stands throughout the Forest. Projections suggest about five miles of new roads would be constructed to provide access into at least ten different timber sales. Temporary roads would also be constructed to provide access within a timber stand.

Timber sales are the primary ground-disturbing activities existing or planned in the analysis area. In the Palisades Roadless Area, which roughly coincides with the boundaries of the area with a high potential for deposits of oil and natural gas, there are about 930 acres of projected timber harvest. The long-term cumulative impacts to recreation resources from these activities in addition to any of the alternatives would not exceed 1,264 acres in the high oil and gas potential area.

There has been logging in three of the six roadless areas in the moderate oil and gas potential area and a timber harvest planned in one roadless area. No development has taken place that would affect wilderness characteristics in two roadless areas. There are no other resource development projects in the remainder of the moderate oil and gas potential area. There are about 100 acres of existing or projected timber harvest in the areas of moderate oil and gas potential. Thus, the long-term cumulative impacts to recreation resources from these activities in addition to any of the alternatives would not exceed 200 acres.

In the low oil and gas potential area, there is some existing development and plans for future development in one of the roadless areas. There are no developments yet planned for two of the areas or timber sales planned for one of the roadless areas. No development has taken place that would affect wilderness characteristics in two roadless areas. There are no other resource development projects in the remainder of the low oil and gas potential area. There are about 5,580 acres of existing or projected timber harvest in the areas of low oil and gas potential. The long-term cumulative impacts to recreation resources from these activities in addition to any of the alternatives would not exceed 5,679 acres.

Potential oil and gas activities that may occur under the action alternatives are unlikely to generate substantive cumulative effects to recreation when considered with livestock grazing. Most of the oil and gas activities associated with the RFD scenario would involve only short-term disturbances, because the wells would not be productive, which would be reclaimed within three years. This situation is particularly apparent with Alternatives 2 and 3 where field development would be questionable. While drilling is occurring, some localized, short-term cumulative effects to recreational resources may occur under each alternative if the individual wells, access roads, and other facilities are located in areas or immediately adjoining areas where the effects of livestock grazing or recreational activities are already apparent.

Visual Resources

This section provides a description of the effects to visual resources that could result from the leasing and subsequent exploration and development of oil and natural gas. The description focuses on analyses related to the following issue:

> **Issue 8** – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on the Forest's visual resources.

Impacts to visual resources from the exploration, development and production of oil and gas in the analysis area would result from changes to the Visual Quality Objective (VQO) of Forest lands, effects on the quality of the scenery, and effects on the landscape as experienced from sensitive viewpoints, including travel routes and popular use areas.

Alternative 1 - No Action

Under this alternative, no new leases would be offered for oil and natural gas. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct or indirect impacts to visual resources. The visual resource would continue to exist in its present condition.

Effects Common to All Action Alternatives

The assessment of potential impacts to visual resources was based on the RFD scenario (Appendix A). The RFD scenario projects that exploration and development activities would occur between 1995 and 2010. Exploration would consist of geophysical investigations and drilling of ten exploratory wells, and would focus in the southern part of the analysis area near the Palisades Reservoir. The RFD is similar for each action alternative. Therefore, the impacts to visual resources discussed for each alternative focuses on the location where leasing and subsequent exploration and production would be allowed or denied.

The acres of disturbance associated with each phase of the exploration and development scenarios would be the same for each action alternative. Total surface disturbance for exploration activities could affect a maximum of 331 acres. Development and production activities could result in an additional 102 acres of disturbance.

Oil and gas activities would be located in the foreground, middleground, and background distance zones as seen by visitor from area roads, trails, and use areas such as the Palisades Reservoir.

In general, exploration activities would probably have short-term negative impacts on visual resources. Exploratory drilling operations for a wildcat well would last for a few months. Depending upon the height of the substructures, a rig mast may rise to a height of 160 feet and would be lighted at night for safety and for around-the-clock work. The total disturbance in the analysis area from exploration drilling would be 331 acres. Finally, under the RFD scenario, the access roads and well pads for the nine exploratory wells that do not produce would be reclaimed within three years.

The development of the field for production would require permanent facilities, such as pumping units, flow regulators, tank batteries, generators, pipe racks, and tool sheds. None of these facilities would exceed 20 feet in height, and most would be less than 15 feet. Under the RFD scenario, the total disturbance in the analysis area from field development would be 135 acres. The permanent facilities would not be as intrusive as the exploration activities, but the impact to visual resources would be long term because the disturbance associated with these facilities would exist for more than three years.

The roads and transmission pipelines associated with permanent oil and gas facilities also would have visual impacts. The degree of effects would depend upon the specific locations of these facilities. For example, construction of roads and pipelines on steep slopes would result in cut slopes that could be seen from a long distance. The visibility of these cuts would be long term in nature. Also, depending on location, the installation of pipelines could create linear clearings in vegetation that tend to be very visible. As above, the effects of this type of installation would be long term.

Visual impacts to the analysis area from exploration activities, construction, and operation of oil and gas facilities could be substantial because most of the area, especially the Palisades Roadless Area, has a high level of visitor sensitivity to the visual landscape. The proposed oil and gas surface facilities and associated access roads would introduce new elements into the landscape and would alter the existing form, line, color, and texture that characterize the existing landscape. The changes may be evident to the casual observer, and could potentially reduce the scenic quality of the area.

In areas with the VQO of Retention, activities should only repeat the forms, lines, colors, and textures that characterize the landscape, and should not be evident. The Retention VQO is sensitive to the contrasts introduced by oil and gas facilities. The structures necessary for oil and gas exploration, development, and production could dominate the landscape, particularly in the foreground and middleground zones. Beyond 3-5 miles, in the background zone, the impacts to the landscape could be more easily mitigated.

Under Partial Retention, oil and gas activities should remain visually subordinate to the characteristic landscape. The facilities could create strong contrasts in the foreground zone, evident to the casual observer as dominant elements in the landscape. In order to meet the requirements of this VQO, the facilities must be consistent with the VQO within one year after implementation.

In areas with the VQOs of Modification and Maximum Modification, activities such as the oil and gas activities comprising the RFD scenario can alter the landscape and dominate the original character of the landscape. However, the activities should borrow from naturally-established form, line, color, or texture so that they can appear as a natural occurrence when viewed as background. In order to meet the requirements of these VQOs, the facilities must be consistent with the VQOs within one year, if possible, or within a maximum of five years after implementation.

Depending upon the proposals submitted by lessees, facilities could effectively convert a portion of areas with Retention and Partial Retention VQOs to other VQOs. The potential for this to occur cannot be fully determined until the APD stage when specific locations of the proposed facilities are known. In general, however, SLT and stipulations provide a means to lessen the effects of oil and gas facilities on visual resources by providing for the relocation of the facilities. Appendix G provides the Forest's overall guidelines for managing VQOs and determining what activities are consistent with the VQOs for the various classes designated on the Forest.

Effects Specific to Alternative 2

Under this alternative, oil and gas activities would be limited by stipulations in addition to the SLT. At a minimum, portions of the analysis area designated as Retention would be protected by an NSO stipulation. In contrast, portions designated as Partial Retention would not specifically receive any protection beyond that provided by existing regulations and the SLT. However, visual resources may experience protection greater than that specifically provided for visual resources under this alternative because of stipulations given to other resources which are located coincidentally with designated visual resources.

As a consequence of all the stipulations that would occur under Alternative 2 (Table 2–1), some of the Retention and Partial Retention VQOs would be covered by an NSO stipulation (124,081 acres of Partial Retention VQO and 87,910 acres of Retention VQO). Accordingly, no wells or production-related facilities could be constructed on this acreage. Disturbances that could affect visual resources in these areas would be limited to transportation facilities, such as roads and pipelines. However, flexibility to modify the location of and timing of construction for these facilities would be limited to what is provided by the SLT and existing regulations.

In addition to the areas with an NSO stipulation, 31,163 acres of Partial Retention VQO lands and 17,482 acres of Retention VQO lands are present within recommended/proposed wilderness areas and Special Management Areas and would be protected by a No Lease determination applied to these areas, in addition to the SLT and NSO stipulations applied to visual resources (Table 2–4). Additionally, about 228,887 acres of Partial Retention VQO lands would fall under a TL stipulation. Also, about 837 acres of lands designated with the Partial Retention VQO would coincide with lands that are also assigned a combination of CSU and TL stipulations. If the proposed facilities were to be sited on these lands, the potential exists that the VQOs would not be met if the sites were drilled in the foreground and middleground zones of landscapes as seen from viewpoints on area roads, trails, or other use areas and if moving facilities up to 200 meters would be insufficient to mitigate the effects.

With partial implementation of the RFD scenario expected under this alternative, only about 99 acres of areas with a VQO of Retention or Partial Retention may be physically-removed. This loss would affect less than one percent of these areas. Additionally, these 99 acres would be subjected to the mitigation measures in Appendix F and would not be concentrated in a single area, but would be dispersed between the areas with a low or moderate potential for oil and gas. Thus, the physical loss of these 99 acres would result in only minor impacts to visual resources.

Furthermore, the disturbance associated with the 99 acres of exploratory activities would be short term. All 99 acres of disturbance would be reclaimed within three years of its occurrence. Thus, the effects of the activities on people viewing the viewsheds would be short term as well.

Effects Specific to Alternative 3

Under this alternative, implementation of the RFD scenario's activities within areas designated with the Retention or Partial Retention VQOs would be limited by a CSU stipulation specifically assigned to these resources. This stipulation would require that proposed activities be designed or located in such a manner as to meet the objective of these VQOs within one year. However, due to overlaps with other resource areas and their associated stipulations, 54,374 acres with a Retention VQO and 155,038 acres with a Partial Retention VQO would be covered by more restrictive stipulations.

As a consequence of the various stipulations that would be applied should this alternative be implemented, 17,482 acres of land with the Partial Retention VQO and 31,162 acres with the Retention VQO would be covered with an NL stipulation in addition to the CSU stipulation. Also, 36,892 acres of land with the Retention VQO and 123,876 acres of land with the Partial Retention VQO would be covered with an NSO stipulation in addition to the CSU stipulation (Table 2–5). Here, in addition to having to meet the objectives of Retention and Partial Retention within one year, no wells or tank batteries could be constructed within these acreages. Because of this restriction on wells, it is unlikely that the other oil and gas-related disturbances associated with those wells (e.g.

roads and pipelines) would be constructed within these areas. As a result, the combination of the NSO and CSU stipulations would probably effectively eliminate any impacts to visual resources within these 160,768 acres.

Implementation of the RFD scenario's activities on another 282,841 acres of land with the Retention and Partial Retention VQOs would be limited only by the CSU stipulation and wildlife TL stipulation. Thus, any facilities constructed on this acreage would have to be designed or located to meet the objectives of these VQOs within one year. Assuming this stipulation is met, the effects of oil and gas activities on this acreage would be minimal and short term in nature.

Overall, the potential effects associated with the implementation of Alternative 3 would probably be similar to those that would occur under Alternative 2. The primary reason for this conclusion is that the CSU stipulation included with Alternative 3 applies to both the Retention and Partial Retention VQOs. The requirement to design or locate facilities to meet the objectives of Partial Retention within one year does not exist with Alternative 2 because only Standard Lease Terms apply. Thus, there is no way to ensure these objectives are met in the short term or long term within the Partial Retention VQO areas.

Effects Specific to Alternative 4

Similarly to Alternative 3, implementation of the RFD scenario's activities under this alternative within areas designated with the Retention or Partial Retention VQOs would be limited by a CSU stipulation, at a minimum. This stipulation would require that proposed activities be designed or located in such a manner as to meet the objective of these VQOs within one year. However, due to overlaps with other resource areas and their associated stipulations, 17,944 acres with a Retention VQO and 31,437 acres with a Partial Retention VQO also would be covered by the more restrictive NSO stipulation.

In contrast to Alternatives 2 and 3, however, less than 50,000 acres of lands designated with the Retention and Partial Retention VQOs would be subject to an NSO stipulation in addition to the CSU stipulation (Table 2–6). Consequently, most of the lands designated with one of these VQOs are covered under a CSU stipulation solely (5,625 acres) or a combination of CSU and TL stipulations (437,247 acres). Overall, wells and tank batteries would be excluded from a substantially smaller portion of the analysis area under this alternative than would occur under alternatives 2 or 3.

The overall effects of the implementation of Alternative 4 would probably be slightly higher than those that would occur under Alternative 2 or 3. This conclusion is primarily based on the consideration that the installation of wells would be excluded from a very small portion of the lands designated with a Retention or Partial Retention VQO. Thus, the probability of wells being drilled and supporting facilities constructed under these VQOs is greater with this alternative. However, although the potential for adverse effects is somewhat higher, any adverse effects incurred by visual resources under this alternative would be short term in nature because of the CSU stipulation.

Effects Specific to Alternative 5

Under this alternative, the entire analysis area would be leased under SLT. Thus, no additional special limitations would be applied. Protection of resources would be limited to provisions of existing regulations and the SLT, the most prominent of which are the ability to move facilities up to 200 meters from their proposed locations and delay construction for up to 60 days.

Alternative 5 would result in the greatest potential for direct and indirect impacts to visual resources in the analysis area. Because of the limits to modifying the design and location of the RFD scenario's components, adverse effects would be more difficult to avoid or minimize. Hence, substantial short-term and long-term impacts would be much more likely under this alternative than under any of the other four alternatives.

Cumulative Effects

Cumulative effects in the analysis area would occur if oil and gas leasing and other projects increase levels of impacts to visual resources above current levels. Levels of impacts present in the analysis area now are the result of past and current activities. Timber sales, livestock grazing, and recreational activities are the most-likely actions that may occur within the analysis area in conjunction with oil and gas exploration and development.

Timber sales are the only ground-disturbing development activity existing or planned in the analysis area. The logging activities included in the cumulative impacts analysis would convert a large portion of Retention and Partial Retention settings to other VQOs. In comparison, oil and gas exploration, development, and production activities would disturb considerably fewer acres than timber activities.

Together, the timber harvests and oil and gas activities comprising the RFD scenario could result in substantial impacts to visual resources in the analysis area. However, the actual extent of these effects cannot be determined until the site-specific locations of the activities are known. Although the locations of the oil and gas activities are not known, one can conclude that they are unlikely to contribute substantially to adverse cumulative impacts. The primary adverse effects would arise directly from the timber harvests. Hence, oil and gas leasing's contribution to the cumulative effects of all reasonably foreseeable future activities would be comparatively minor.

Potential oil and gas activities that may occur under the action alternatives are unlikely to generate substantive cumulative effects to visual resources when considered with livestock grazing or recreational activities. Most of the oil and gas activities associated with the RFD scenario would involve only short-term disturbances, because the wells would not be productive, which would be reclaimed within three years. This situation is particularly apparent with Alternatives 2 and 3 where field development would be questionable. While drilling is occurring, some localized, short-term cumulative effects to visual resources may occur under each alternative if the individual wells, access roads, and other facilities are located in areas or immediately adjoining areas where the visual effects of livestock grazing or recreational activities are already apparent.

Roadless Areas

This section provides a description of the effects to roadless areas that could result from the leasing and subsequent exploration and development of oil and natural gas. The description focuses on analyses related to the following issue:

Issue 4 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on roadless areas and other potential wilderness areas.

Disturbances associated with oil and gas activities can cause a variety of effects to roadless areas. The roadless character is related to the presence or absence of roads and human manipulation in the area. Oil and gas activities would disturb ground and vegetation and directly and indirectly affect the physical, biological, and social characteristics of an area. The quality of a roadless area also is affected by the size of the area and its proximity to other roadless or wilderness areas. Thus, the roadless characteristics of a roadless area change when the sights and sounds of human activities become apparent and when linear developments isolate undisturbed islands from the larger area.

Alternative 1 – No Leasing

Under Alternative 1, no new leases would be offered for oil and natural gas. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct or indirect effects to the analysis area's roadless resource.

Effects Common to All Action Alternatives

The effects to the roadless resource for all roadless areas in the analysis area are discussed in terms of the qualitative level of change that can be expected for each alternative. The potential impacts to the wilderness characteristics in roadless areas from each alternative are similar, differing primarily in the degree of impact.

There are 13 roadless areas within the analysis area. Six of these areas are in the areas with a low potential for oil and gas. Another six are primarily in areas with a moderate potential for oil and gas. The area with a high potential for oil and natural gas primarily contains one roadless area — the Palisades Roadless Area (RA).In addition, as discussed in Chapter 3, the Palisades recommended/ proposed wilderness occurs in the Big Hole/Palisades Mountains subsection of the Forest.

The specific effects of implementing the RFD scenario would depend upon several factors. They include the types of activities proposed within roadless areas, the amount of direct disturbance associated with the activities, and the amount of physically-undisturbed area adjoining the activities effectively lost because of the noise and activity. Depending upon local conditions, such as topography and vegetation, the area within which the roadless attributes would be effectively lost would be greater than that represented by the physical disturbance and could be substantial. Thus, at a minimum, the area where roadless attributes could be lost would be larger by some degree than the physical disturbance involved. However, because the specific locations of activities are not known, the rest of this analysis focuses on the physical disturbances to make a relative comparison among alternatives recognizing that the effective impact to the character of the roadless area would be greater for all action alternatives.

If the RFD scenario is fully implemented, the greatest potential for adverse effects to the roadless resource would occur in the area with a high potential for oil and gas. Most of the activities and physical disturbance would occur within this area. Thus, the Palisades RA and a small portion of the Garns Mountain RA adjacent to the Palisades RA may experience at least some adverse effects. Additionally, because of the loss of roadless attributes in the areas adjoining the physical disturbance, roadless areas may be adversely affected if the disturbance occurs outside, but near their boundaries.

Overall, the proposed exploration activities would result in only a negligible, short-term effect on the wilderness attributes of roadless areas in the areas with a low or moderate potential for oil and natural gas. If all of the disturbance identified in the RFD scenario for the low and moderate potential areas (99 acres) occurred within roadless areas, the overall disturbance would involve a very small portion of the total existing roadless acreage. Additionally, if the disturbance occurred within roadless areas that previously had or currently have roads, the effects on the areas' natural integrity, apparent naturalness, and feelings of remoteness would be less evident than if the disturbance occurred in roadless areas where no roads were previously constructed.

Within the area with a high potential for oil and gas, the potential for adverse effects to roadless areas would be substantially higher, particularly if all of the acreage that would be disturbed under a fully-implemented RFD scenario (334 acres) occurred within a roadless area where no roads were previously constructed (e.g. the Palisades RA). Because most of this acreage would be disturbed over the long term, the effects would continue for a longer period that those in the low or moderate potential areas. The effects to roadless area characteristics are described more fully in the following paragraphs.

If at least some of the oil and gas activities comprising the RFD scenario occur within one or more of the 13 roadless areas, implementation of any of the action alternatives would adversely affect the roadless areas' natural integrity. Depending upon the distribution of oil and gas activities within the roadless areas and potential areas (low, moderate, or high), the maximum acreage on which natural integrity could be affected would range from less than 1 percent of the roadless area (334 acres disturbed within the Palisades RA) to about 3 percent of the roadless area (66 acres disturbed within the Pole Creek RA). Natural integrity in the remainder of the roadless area would not be affected.

The effects would have both short-term components (nonproductive exploratory wells) and long-term components (the developed field and associated facilities).

If any of the oil and gas activities occur within any roadless area, they would adversely affect the apparent naturalness of the roadless area in those areas where the activities occur. Visitors encountering oil and gas activities in a roadless area would have no question that they are in an area that has been brought under management versus being left in a natural condition. The potential extent of this effect would be similar to that described for natural integrity. Also, apparent naturalness in the undisturbed portions of roadless areas would not be affected.

Additionally, implementation of any of the action alternatives would adversely affect the opportunities for solitude within at least portions of any roadless areas where oil and gas activities occur. The potential range of acreage involves would be similar to that described above for natural integrity. The sights and sounds of oil and gas activities would diminish the feelings of solitude and self-reliance sought by visitors undertaking a primitive recreation experience. Where unproductive exploratory wells are involved, the loss of solitude would be short term (reclamation would be accomplished within three years of the activity). If a field is developed within a roadless area, the effects on solitude would continue until the wells are depleted and removed (long term). Visitors seeking solitude and a primitive experience would generally choose not to visit the area for the duration of oil and gas activities. Opportunities for solitude and primitive recreation would not be affected in the undisturbed portions of the roadless areas not immediately adjoining the disturbances.

Finally, implementation of any of the action alternatives would adversely affect the feelings of remoteness within disturbed portions of any roadless area involved. If drilling occurs in one or more roadless areas, part of those areas would become roaded. The extension of roads into a roadless area diminishes the remote nature of the area. Additionally, the sights and sounds associated with drilling for and producing oil and gas also would diminish the quality of remoteness. The potential range of acreage involved would be similar to that described above for natural integrity. Opportunities for remoteness would not be affected in the undisturbed portions of the roadless areas not immediately adjoining the disturbances.

In contrast to the potential effects on natural integrity, apparent naturalness, solitude, and feelings of remoteness, none of the action alternatives would affect the manageability of any roadless area boundaries or the opportunity for the roadless area to be considered for inclusion in the National Wilderness Preservation System (NWPS). However, portions of the roadless areas that are affected would probably not be eligible for inclusion in the NWPS. Logical and manageable boundaries could still be identified for all the roadless areas around the oil and gas activities. Thus, the roadless characteristics would not be compromised for the rest of the area. Also, the undisturbed portions of any roadless area affected by oil and gas activities would still be eligible for consideration for inclusion in the NWPS.

Effects Specific to Alternative 2 and 3

Under these alternatives, most of the recommended/proposed wilderness areas have been assigned a NL stipulation, except for the Idaho portion of the Palisades recommended/proposed wilderness area and the Wilderness Study Areas, which specifically have been provided with an NSO stipulation to minimize adverse effects (Table 2–1). The NSO stipulation would not allow the construction of exploration or production facilities (well pads, drilling rigs, and tank batteries). Additionally, Special Management Areas have been provided with a NL or NSO stipulation to protect areas of unique cultural, botanical, or zoological resources.

In addition to the specific stipulations described above, portions of the roadless resource coincide with some other resources that have been given additional stipulations. About 58,511 acres of Wilderness Study or Recommended/Proposed Wilderness Areas coincide with resources given an NL determination and almost 135,000 acres coincide with resources assigned an NSO stipulation. As a result, neither exploration nor production facilities can be constructed on these acreages.

The interaction of all the various stipulations included with these alternatives (2 and 3) would affect the potential for oil and gas activities to occur in roadless or wilderness study areas and recommended/proposed wilderness areas. All recommended/proposed wilderness areas except for the Palisades would not be available for leasing. In contrast, the entire Palisades recommended/ proposed wilderness area, which covers most of the area with a high potential for oil and gas would be leased under an NSO stipulation.

In general, areas where the NSO stipulation applies, no exploratory or production wells could be drilled. However, the stipulation can be excepted or modified and does not exclude the construction of roads. Consequently, access roads could theoretically still be constructed in these areas. Any roads into these areas would compromise the roadless characteristics that are important to an RA's visitors.

Under the RFD scenario, two wells would be drilled in the areas with a moderate potential for oil and gas. These areas occur either south of the reservoir or on the west side of Teton Valley. Roadless areas cover almost all of the areas with this moderate potential.

The moderate potential areas are primarily under an NSO stipulation. Thus, unless the stipulation is excepted or modified, wells would need to be either directionally drilled from private lands outside the analysis area or from inclusions of private lands that are located throughout the northern portion of the areas. Most of the privately-owned inclusions are accessible from Forest roads that connect with existing local roads. Therefore, little construction of roads is likely and few adverse effects would occur in the roadless areas that occur within by the areas with a moderate potential for oil and gas.

Overall, Alternatives 2 and 3 would result in less impact to roadless resources in the analysis area than Alternatives 4 or 5. The inclusion of the NL and NSO stipulations are the primary reasons for this conclusion. Only about 1 percent of lands in the analysis area, including about 1 percent of roadless area acreage, would be available for surface oil and gas drilling activities under these alternatives.

Effects Specific to Alternative 4

Under this alternative, the Wilderness Study and Palisades Recommended Wilderness Areas specifically have been provided with a CSU stipulation to minimize adverse effects (Table 2–1). This stipulation would require that oil and gas activities be located so as to avoid or minimize impacts and that appropriate mitigation be included. Additionally, Special Management Areas and the recommended/proposed wilderness areas (Italian Peak and Lionhead) have been assigned an NSO stipulation.

Unlike under Alternatives 2 and 3, stipulations associated with other resources do not provide a similar level of protection to the roadless resource as was provided under those alternatives. No roadless or wilderness study areas or recommended/proposed wilderness areas are covered by a NL stipulation (Table 2–6). Because none of the roadless resources would be covered by a NL stipulation, all of the roadless areas would be available for leasing. As a result, at least some oil and gas facilities could be constructed throughout the analysis area and the 13 roadless areas.

Assuming all exploratory and production wells are drilled in roadless areas, as much as 433 acres of roadless areas could be physically disturbed. This disturbance would have both short-term and long-term effects as described under "Effects Common to All Action Alternatives" above. However, the CSU stipulation would apply and the lessees would have to locate their activities so as to avoid or minimize adverse effects to roadless areas. They also would have to provide for mitigation in their designs and reclamation plans.

Although implementation of Alternative 4 could result in a greater level of impact to the roadless resource within the analysis area, the specific degree of this impact cannot be determined until lessees have submitted APDs and SUPOs. However, the potential for substantial effects exists under this alternative because most of lands in the analysis area would be available for surface oil and gas activities. The stipulations included with this alternative would not provide the same degree of protection as those included with Alternatives 2 and 3.

Effects Specific to Alternative 5

Under this alternative, the entire analysis area, including 52,174 acres of Roadless and Wilderness Study Areas, 145,563 acres of recommended/proposed wilderness areas, and 5,331 acres in Special Management Areas would be leased under SLT only. No special limitations would be applied. The limits of protection for resources under this alternative involve moving proposed facilities up to 200 meters and delaying construction of facilities for up to 60 days.

Implementation of this alternative would result in the greatest potential for adverse effects to roadless resources in the analysis area. This determination is based on the conclusion that SLT provide inadequate protection to the roadless resource. All of the roadless areas present in the analysis area are greater than 200 meters across. Also, the periods within which visitors are present is greater than 60 days. Thus, SLT cannot ensure that the RFD's 433 acres of disturbances, if they occurred in roadless areas, would not adversely affect the natural integrity, apparent naturalness, solitude, or feeling of remoteness in any of the roadless areas. The NL, NSO, and CSU stipulations included with Alternatives 2, 3, and 4 provide a much higher level of protection. As a result, this is the only alternative where the activities comprising the RFD scenario could proceed with minimal protection for the roadless resource.

Cumulative Effects

Timber sales are the primary ground-disturbing development activity existing or planned in the analysis area. In the Palisades RA, which roughly coincides with the boundaries of the high oil and gas potential area, there are about 100 acres of projected timber harvest. The long-term cumulative impacts to roadless resources from these activities in addition to any of the alternatives would not exceed 434 acres in the high oil and gas potential area.

There has been logging in three of the six roadless areas in the moderate oil and gas potential area and a timber harvest planned in one roadless area. No development has taken place that would affect roadless characteristics in two roadless areas. There are no other resource development projects planned in the remainder of the moderate oil and gas potential area. There are about 930 acres of existing or projected timber harvest in the areas of moderate oil and gas potential. The long-term cumulative impacts to roadless resources from these activities in addition to any of the alternatives would not exceed 1,000 acres.

In the low oil and gas potential area, there is some existing development and plans for future development in one of the roadless areas. There are no developments yet planned for two of the areas and timber sales planned for one of the roadless areas. No development has taken place that would affect wilderness characteristics in two roadless areas. There are no other resource development projects planned for the remainder of the low oil and gas potential area. There are about 5,590 acres of existing or projected timber harvest in the areas of low oil and gas potential. The long-term cumulative impacts to roadless resources from these activities in addition to any of the alternatives would not exceed 5,623 acres.

Oil and gas exploration, development, and production activities would disturb considerably fewer acres of roadless area than timber activities, and thus, would contribute little to any cumulative effects on the roadless resource within the analysis area. However, in combination with existing or planned timber harvest and associated access road construction, the potential exists that, depending upon the final locations of all activities, the linear developments from oil and gas activities and the harvest of timber in a single roadless area would isolate undisturbed islands from the larger area and compromise the wilderness characteristics of the area.

Cultural Resources

This section provides a description of the effects to cultural resources that could result from leasing all or part of the analysis area for the exploration and development of oil and natural gas. This description focuses on analyses related to the following issue:

Issue 15 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on cultural resources.

A variety of activities comprising the RFD scenario could generate impacts to cultural resources if the resources occur at the sites of disturbance. In particular, the construction of access roads, well pads, tank batteries, and pipelines could directly affect cultural resources.

A variety of data are needed to determine specific impacts to cultural resources. These data include the locations of well pads, access roads, pipelines, and ancillary facilities and the presence or absence of cultural resources at the site. Without this information, impacts specific to these resources cannot be determined. Thus, the specific impacts of the activities comprising the RFD scenario would be determined at the Application for Permit to Drill (APD) and field development stages when the locations of these activities are known.

Alternative 1 — No Leasing

Under Alternative 1, no new leases would be offered for oil and natural gas. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct or indirect adverse effects to cultural resources. However, information that would become available should any cultural sites be discovered during implementation of the RFD scenario would be forgone at this time under this alternative.

Effects Common to All Action Alternatives

Under the National Historic Preservation Act, the Forest Service must ensure the activities comprising the RFD scenario do not adversely affect cultural resources eligible or potentially eligible for the National Register of Historic Places (NRHP). This requirement exists regardless of any other stipulation attached to a lease or permit. Assuming that the locations of activities comprising the RFD scenario have been identified, the appropriate surveys and analysis have been completed, and any required mitigation has been completed, the overall effects of any of the alternatives on cultural resources should be minor and any cultural resources present should be adequately protected.

Specifics about cultural resources (e.g. location, type of site, complexity of resources, importance to Native Americans, and eligibility for inclusion on the NRHP) present in the analysis area have not yet been determined. However, data from past surveys within the analysis area (as discussed in Chapter 3) indicate cultural resources are distributed throughout the 1.1 million-acre analysis area. Accordingly, potentially-suitable areas for cultural resources probably occur throughout the analysis area.

Because only a small portion of the analysis area has been formally inventoried for cultural resources, the presence of cultural resources at any specific location cannot be determined without an intensive pedestrian survey. Such surveys will be required under regulation 36 CFR Part 800. The surveys would occur after the submittal of an APD or SUPO and the locations of oil and gas activities are specifically proposed by lessees.

Components of the RFD scenario may affect cultural resources in several ways. The extent and duration of these effects would depend upon the cultural resources involved, the type of oil and gas activity involved, and the proximity of these activities to the cultural resources. Effects could include the direct loss of cultural resources through inadvertent physical disturbance. Indirectly, cultural resources could be lost through illegal collection and vandalism that could occur as a result of increased access associated with the new roads. These effects could have both short-term and long-term consequences depending upon the resources involved and their eligibility for inclusion on the NRHP.

If adverse effects to significant cultural resources cannot be avoided, they must be mitigated. Most often, this involves data recovery studies. These studies usually involve partially excavating the site using methods defined in a reviewed and approved research design. However, in some instances, direct adverse effects to sites cannot be entirely mitigated through the collection of data. In these cases (sites associated with significant events or persons or that embody distinctive characteristics), memoranda of agreement stipulating other types of mitigation measures must be developed and signed before the ground-disturbing activities can proceed.

As stated previously, the specific effects of the RFD scenario's activities cannot be determined until the specific locations of these activities have been proposed by lessees. However, the National Historic Preservation Act, 36 CFR Part 800, use of pedestrian surveys, and use of avoidance or appropriate mitigation would ensure that no oil and activities would proceed that would result in unacceptable effects to cultural resources present or potentially present in the analysis area.

Cumulative Effects

Full implementation of the RFD scenario is expected to cause only minor, if any, cumulative effects on cultural resources in the analysis area. The conclusion is based on the requirements of the National Historic Preservation Act, the regulations that implement it, and amount of disturbance predicted relative to the size of the analysis area. The Forest Service would either conduct directly or require the completion of appropriate pedestrian surveys before authorizing any of the ground-disturbing activities associated with oil and gas activities or the harvest of timber. In addition, any identified impacts would have to be avoided or adequately mitigated before the disturbance could occur. Also, the overall disturbance associated with the RFD scenario and projected harvests of timber (about 6,610 acres) would involve less than 0.5 percent of the analysis area. Thus, no cumulative adverse impacts are expected from any of the cumulative projects.

Socio-Economics

This section provides a description of the effects to socio-economics that could result from leasing all or part of the analysis area for the exploration and development of oil and natural gas. This description focuses on analyses related to the following issue:

Issue 13 – The effects of oil and gas leasing, including possible subsequent activities associated with exploration and development, on the local economy.

The decision to offer parcels of land for oil and gas leasing has few specific socioeconomics effects. If the leases are purchased, the initial lease purchase and annual rental fees received from lessees would go directly to the Federal Treasury and would not have any effects on the local economy. Even if a lease is issued, there is no guarantee that exploration, drilling, and production would ever occur. Accordingly, the only measurable effects to socioeconomics from any of the action alternatives would be exploration, drilling and subsequent production.

Alternative 1 — No Leasing

Under Alternative 1, no new leases would be offered for oil and natural gas. Because no leases exist currently and no future leases would be offered, no oil and gas activities would occur within the analysis area. Thus, implementation of this alternative would not result in any direct effects to socio-economics. Indirectly however, the potential benefits to the Federal Treasury and local economies that would occur if leases were sold and oil and gas were located and extracted would be forgone.

Effects Common to All Action Alternatives

Similar effects would occur with the implementation of any of the four action alternatives, primarily because all action alternatives would involve the same RFD scenario and oil and gas activities. Under all of these alternatives, activities would consist of geophysical investigations, drilling of a maximum of ten exploratory wells, and the development of one field. Based upon the RFD, the relatively low level of exploration and subsequent development would have minimal socio-economic effects on the local economy.

Although one exploratory well would probably be drilled in the northern portion of the analysis area, the probability of extracting hydrocarbons from this area is rated low. Therefore, any minor socio-economic effects would most likely occur in the southern portion of the analysis area. Here, nine exploratory wells would be drilled with a moderate or high probability of success. These nine wells would be drilled in the general vicinity of the Palisades Reservoir. Based on one significant discovery, a six-well field, including the exploration well, would be fully developed. Most of the drilling would occur in the high potential area north of the Palisades Reservoir in Bonneville County, but some activity could occur in both Madison and Teton Counties, Idaho.

Employment Levels

Assuming only one exploratory well is drilled at a time, no more than 30 workers would be needed. Typically, 20 to 30 workers would be needed for about six months to construct and drill a well. However, because special construction techniques would probably be required in the steep and remote terrain, less than 50 percent of the workers would be hired locally. Employment for 10-15 workers would have a minimal effect because the unemployment rates in the area already are low. Likewise, an influx of 10-15 specialized oil/gas workers would not have a noticeable effect on the local economies.

Under the RFD scenario, exploration could continue for five years. Once production begins after one successful exploratory well, the number of personnel required to operate a six-well field would drop to about 10 to 15. This number of people would remain fairly constant through the life of production, which is typically 15 years. These permanent residents would probably buy homes and bring families to the area, but would be absorbed into the local economies with minimal impact on housing, employment, schools, or medical facilities. Any adverse impact to local resources would be offset by the local taxes paid by the newcomers.

Equipment and Services

Because of the steep and remote terrain, special equipment for the exploration phase would probably need to be imported into the area, instead of being purchased locally. However, service industries in the analysis area would benefit slightly from the sales of equipment and supplies during the development phase of the oil/gas operations. These services that would be purchased locally might include gravel hauling, tires, gasoline, diesel fuel, and some limited vehicle parts and maintenance. The extent of the effect would be the contractors awareness of local services available, and the cost competitiveness of local merchants.

In addition, the local housing market would experience some minor, beneficial effects during exploration. The 10 to 15 non-local workers would probably reside in rental properties in Rexburg, Driggs, Idaho Falls, or St. Anthony. This small and temporary increase in population could easily be absorbed by any of these communities. Idaho Falls, Rexburg, and St. Anthony have housing vacancy rates of 3.8 to 9.3 percent. In Driggs, the vacancy rate is 18.8 percent.

Royalties

Royalties paid to the Federal Treasury on production on the new leases would be 12.5 percent (43 CFR 3103). Oil and gas prices are projected to steadily increase from 1995 to 2010 (Table 4–4).

Table 4–4 Projected Trend in the Prices of Oil and Natural Gas, 1995–2010

Year	Price: Barrel of Oil ($)	Price: CCF[1] of Natural Gas ($)
1995	$19.87	$2.12
2000	$20.19	$2.42
2005	$23.99	$2.89
2010	$26.98	$3.47

Notes:
1. CCF = one thousand cubic feet.

Source: Dep. Of Energy 1994.

Based upon the RFD, a six-well field would be in production by the year 2000. This field would produce 500 to 700 barrels and two million cubic feet of gas per day. Assuming mean prices of $23.99 per barrel for 700 barrels of oil per day and $2.89 per 1,000 cubic feet of gas for two million cubic feet per day, production revenues from 2000 to 2010 would be $82.4 million. These revenues would be subjected to the 12.5 percent royalty fee of $10.3 million. Approximately 50 percent, or $5.1 million, would returned to ~~Idaho~~ Wyom over the 10-year period.

Currently, no oil or gas is being produced on federal land in Idaho. However, Idaho's current directives are to incorporate any federal revenues from oil and gas royalties into the general state fund (Pittman 1994). Thus, any revenue generated from the production of oil or gas on the Forest would not necessarily be distributed to the counties or municipalities in the analysis area. Accordingly, the counties and municipalities would receive no measurable benefit from any royalties generated by production in the analysis area under any of the action alternatives.

In summary, the socio-economic effects (beneficial and adverse) of oil and gas leasing in the analysis area would be minor. No measurable direct or indirect effects would occur. The direct and indirect effects associated with employment by the oil and gas industry would be negligible. Additionally, the long-term benefits of royalties generated by any production would be minimal because they would go to the State's general fund.

Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources refers to the loss of production or use of a resource due to a land use decision that once executed, cannot be reversed, except perhaps in the extreme long term. An irretrievable commitment of resources applies to losses of production or use of renewable resources for a period of time. Both irreversible and irretrievable commitments of resources could occur with the implementation of the action alternatives.

The potential for an irreversible commitment of resources was identified in four resource areas. First, depending upon the specific location of the RFD scenario's components, adverse effects on recommended/proposed wilderness areas or roadless areas may include an irreversible commitment of resources. If roads, wells, pipelines, or ancillary facilities are constructed within one of the recommended/proposed wilderness areas or roadless areas present in the analysis area, the effects on the roadless attributes (natural integrity, apparent naturalness, and feeling of remoteness) may be recoverable only in the extreme long term, even if the facilities are obliterated and revegetated. This situation would be particularly evident if facilities are constructed in "true" roadless areas where no roads have ever been constructed, such as in the Palisades, Garns Mountain, Reynolds Pass, and Pole Creek RAs. In roadless areas where roads exist or previously existed (e.g. Diamond Peak, Italian Peak, and Garfield Mountain RAs), the effects may not be as substantial.

Second, although no irreversible commitment of cultural resources is expected, this commitment may occur if cultural sites are encountered and disturbed during oil and gas activities. Although data recovery studies can document cultural sites and record various data, the sites themselves are nonrenewable. Thus, once they are destroyed, they cannot be recovered.

Third, a substantial increase in erosion and instability would result in an irreversible and irretrievable commitment of soils resources. Although a potential exists for this commitment of soils resources, the probability of such a commitment occurring is minimal. The combination of stipulations, BMPs, and committed mitigation measures (Appendix F) identified in this document would substantially limit the potential for increased erosion and instability for all alternatives except Alternative 5. Implementation of Alternative 5 could increase the potential for erosion and instability. Thus, no notable potential for an irreversible or irretrievable commitment of soils resources is likely, unless Alternative 5 is implemented.

Finally, the issuance of a lease may involve the irreversible commitment of oil and natural gas. Once a lease is issued, access to the minerals potentially associated with that lease cannot be prohibited. Also, once the oil and gas have been located and extracted, they cannot be replaced.

In addition to irreversible commitments of resources, irretrievable commitments of resources also may occur (again depending upon the final location of wells, roads, pipelines, and ancillary facilities). Assuming the RFD scenario is fully implemented, 433 acres of vegetation and habitat for wildlife would be lost for at least some portion of the life of the project. Also, if any old-growth stands are removed for the construction of project facilities, the loss would be irretrievable. Neither loss is considered irreversible because the disturbed acreage would be returned to production once the disturbed areas are reclaimed at the end of the project.

No other irreversible or irretrievable commitments of resources were identified.

Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Long-term productivity is the capability of the Forest to provide resources into the future. None of the five alternatives considered in this analysis would cause more than minor effects on the analysis area's long-term productivity. At most, about 433 acres would be physically disturbed. This disturbance would probably decrease the long-term productivity of this acreage slightly. However, in the overall context of the analysis area, the decrease in long-term productivity associated with these 433 acres would be small.

Chapter 5

Consultation and Coordination

Chapter 5 — Consultation and Coordination

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Chapter 6

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Chapter 6 — List of Preparers

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Chapter 7

References Cited

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Algermissen, S. T. 1969. Seismic Risk Studies in the United States. U.S. Dept. of Commerce, ESSA, Coast & Geodetic Survey. 20pp.

Allen, A. W. 1983. Habitat Suitability Index Models: Fisher. U.S. Fish & Wildl. Serv. Off. Biol. Serv. Publ. FWS/OBS-82/10.45. 19pp.

Bachman, D., G. Gadwa, and C. Groves. 1990. A Winter Survey for Wolverines (Gulo gulo) on the Sawtooth and Challis National Forests, Idaho. Id. Dep. Fish and Game. Boise, Id.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6.

Bettinger, R. L., and M. A. Baumhoff. 1982. The Numic spread: Great Basin cultures in competition. American Antiquity 47:485–503.

Burt, W. H., and R. P. Grossenheider. 1976. A Field Guide to the Mammals. Houghton Mifflin Co., Boston, Mass.

Call, M. W. 1978. Nesting Habitats and Surveying Techniques for Common Western Raptors. U.S. Bur. Land Manage. Tech. Note No. TN-316. 115pp.

Case, J. C. 1986. Earthquakes and Related Geologic Hazards in Wyoming. Laramie, Wyo: Geol. Surv. of Wyo. Pub. Info. Circ. No. 26, 22pp.

Chapman, J. A., and G. A. Feldhamer. 1982. Wild Mammals of North America. John Hopkins Univ. Press, Baltimore, MD.

Clark, R. J., C. R. Peterson, and P. E. Bartlet. 1993. The Distribution, Relative Abundance, and Habitat Associations of Amphibians on the Targhee National Forest. Final Report to the Targhee National Forest.

Clova, G. J., and J. C. Mason. 1976. Interactive ecology of juvenile salmon and trout in streams. Tobard Fish. Res. Station, Manuscript Rep. 1391, Tobard, Can.

Copeland, J. P., and C. E. Harris. 1993. Progress Report Wolverine Ecology and Habitat Use in Central Idaho. Idaho Dept. Fish and Game. Boise, ID.

Cowardin, L. M., V. C. Francis, C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States, FWS/OBS-79/31. Washington, D.C.: Office of Biological Services, Fish and Wildlife Service, U.S. Department of the Interior. December 1979.

Druce, S. A., W. R. Glass, G. F. Ritz, and M. L. Smalley. 1990. Water Resources Data, Wyoming Water Year 1990. US Geological Survey Water-Data Report WY-90-1.

Druce, S. A., W. R. Glass, G. F. Ritz, and M. L. Smalley. 1991. Water Resources Data, Wyoming Water Year 1991. US Geological Survey Water-Data Report WY-91-1.

Druce, S. A., W. R. Glass, G. F. Ritz, and M. L. Smalley. 1992. Water Resources Data, Wyoming Water Year 1992. US Geological Survey Water-Data Report WY-92-1.

Fowler, C. 1988. Habitat Capability Model for the Northern Goshawk. USDA For. Serv., Tahoe Nat. For., Nevada City, Calif. 21pp.

Genter, D. L. 1993. Harlequin Duck Status Report-Montana. In Cassirer et al. 1993. Status of Harlequin Ducks in North America. Report of the Harlequin Duck Working Group. pp 31-34.

Gillespie, C. 1994. Personal communication. Idaho Transportation Department.

Griffith, J. S. 1991. Trout populations and summer habitat use of the Warm River, Targhee National Forest, Idaho. USDA For. Serv., St. Anthony, Id.

Groves, C. R. 1988. Distribution of Wolverines in Idaho as Determined by Mail Questionnaire. Northwest Science. Vol. 62, No. 4 181-185.

Harenberg, W. A., M. L. Jones, I. O'Dell, T. S. Brennan, A. K. Lehmann, and A. M. Tungate. 1992. Water Resources Data, Idaho Water Year 1992, Volume 1. Great Basin and Snake River Basin. US Geological Survey Water-Data Report ID-92-1.

Harenberg, W. A., M. L. Jones, I. O'Dell, T. S. Brennan, and A. K. Lehmann. 1990. Water Resources Data, Idaho Water Year 1990. US Geological Survey Water-Data Report ID-90-1.

Harenberg, W. A., M. L. Jones, I. O'Dell, T. S. Brennan, and A. K. Lehmann. 1991. Water Resources Data, Idaho Water Year 1991, Volume 1. Great Basin and Snake River Basin. US Geological Survey Water-Data Report ID-91-1.

Harvey, A. H. 1987. Interagency Conflict and Coordination in Wildlife Management: A Case Study. Master Thesis, Univ. of Mich., Ann Arbor, Mich.

Hayward, G. D. 1989. Habitat Use and Population Biology of Boreal Owls in the Northern Rocky Mountains, USA. Ph.D. Dissertation, Univ. of Id., Moscow, Id. 88pp.

Hayward, G. D., P. H. Hayward, and E. O. Garton. 1987. Movements and Home Range Use by Boreal Owls in Central Idaho. Pages 175-184 in R. W. Nero, C. R. Knapton, and R. J. Hamre, ed. Biology and Conservation of Northern Forest Owls: Symposium Proceedings. USDA For. Serv. Gen. Tech. Rep. RM-142.

Hornocker, M. G., and H. S. Hash. 1981. Ecology of the Wolverine in Northwestern Montana. Can. J. Zoo. Vol.59 1286-1301.

Horsburgh, C. 1992a. Oil and Gas Potential Report for the Targhee National Forest. Bur. of Land Manage., Idaho Falls, Id. 15pp.

Horsburgh, C. 1992b. Reasonable Foreseeable Development Scenario for the Targhee National Forest. Bur. of Land Manage., Idaho Falls, Id. 10pp.

Horsburgh, C. 1994. Personal communication. District Geologist, Bur. Of Land Manage., Idaho Falls, Id.

Idaho Department of Commerce. 1992a. Count Profiles of Idaho Bonneville. Id. Dep. of Commer., Boise, Id. 8pp.

Idaho Department of Commerce. 1992b. Count Profiles of Idaho Clark. Id. Dep. of Commer., Boise, Id. 8pp.

Idaho Department of Commerce. 1992c. Count Profiles of Idaho Fremont. Id. Dep. of Commer., Boise, Id. 8pp.

Idaho Department of Commerce. 1992d. Count Profiles of Idaho Jefferson. Id. Dep. of Commer., Boise, Id. 8pp.

Idaho Department of Commerce. 1992e. Count Profiles of Idaho Madison. Id. Dep. of Commer., Boise, Id. 8pp.

Idaho Department of Commerce. 1992f. Count Profiles of Idaho Teton. Id. Dep. of Commer., Boise, Id. 8pp.

Idaho Department of Fish and Game. 1991. Species Management Plan, 1991-1995. Furbearers. Id. Dep. of Fish and Game, Boise, Id. 7pp.

Idaho Department of Health and Welfare. 1992. Administrative Rules of the Idaho Department of Health and Welfare, Water Quality and Wastewater Treatment, IDAPA 16, Title 01, Chapter 02, Boise, Idaho.

Johnsgard, P. A. 1986. Birds of the Rocky Mountains. Colo. Assoc. Univ. Press, Boulder, Colo. 504pp.

Kaltenecker, J. 1994. Personal communication. Assistant Communication Manager, Idaho Conservation Center, Id. Dep. Game and Fish, Boise, Id.

Koehler, G. M. 1990. Population and Habitat Characteristics of Lynx and Snowshoe Hares in North Central Idaho. Can. J. Zool. Vol. 68: 845-851.

Koehler, G. M., and J. D. Brittell. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. J. Forestry 88:10-14.

Koehler, G. M., M. G. Hornocker, and H. S. Hash. 1979. Lynx Movements and Habitat Use in Montana. Can. Field-Nat. Vol.93(4): 441-442.

Leege, T. A. 1984. Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho. Idaho Dept. Fish and Game. Wildl. Bull. No.11. Boise, Id.

Levine, E. 1993. Peregrine Falcon Nest Site Monitoring on the Targhee, 1993. 1 September 1993 Memorandum to Timm Kaminski, USDA For. Serv., Boise, Id.

Lyon, L. J., and A. G. Christensen. 1992. A Partial Glossary of Elk Management Terms. USDA For. Serv. Intermountain Research Station, Ogden, Utah. Gen. Tech. Rep. INT-288.

McDonald, J. A. 1983. Targhee National Forest: Cultural Resources Overview. Version Three, September 30, 1983. Targhee Natl. For., St. Anthony, Id.

Montana Bald Eagle Working Group. 1986. Montana Bald Eagle Management Plan. Montana Bald Eagle Working Group. USDI, Bureau of Land Management, Billings, Mont.

Moore, T. L., and G. P. Frederick. 1991. Distribution and Habitat of Flammulated Owls (Otus flammeolus) in West-Central Idaho. Id. Dep. of Fish and Game, Boise, Id. 28pp.

National Oceanic and Atmospheric Administration. 1979. Climatic Atlas of the United States, National Oceanic and Atmospheric Administration, Environmental Data Service.

National Oceanic and Atmospheric Administration. 1992. Idaho Monthly Station Normals of Temperature, Precipitation, and Heating Degree Days, 1961-1990. National Climatic Data Center, Ashville, North Carolina.

Padgett, W. G., A. P. Youngblood, and A. H. Winward. 1989. Riparian Community Type Classification of Utah and Southeastern Idaho. Intermountain Region Report No. R4-Ecol-89-01.

Logan, UT: U.S. Department of Agriculture, Forest Service, Intermountain Region. December 1989.

Patla, S. 1991. Northern Goshawk Monitoring Project Report #2, 1990 Final Report, Targhee National Forest. Driggs, Idaho.

PBERP. 1986. Recovery Plan of the Pacific Bald Eagle. USDA Fish and Wildl. Serv., Portland, OR 160 pp.

Pitman, W. 1994. Personal communication. Petroleum Engineer, Id. Oil and Gas Conserv. Commission, Coeru d'Alene, Id.

Raleigh, R. F., and D. A. Duff. 1991. Trout stream habitat improvement: ecology and management. Pages 67–77 In W. King (ed.). Proc. of Wild Trout Symposium II. Yellowstone Natl. Park, Wyo. Sep. 24–25, 1979.

Ralphs, R. M. 1981. Elk Habitat Relationships for Central Idaho. USDA For. Serv. Challis National Forest, Challis, ID.

Reel, S., L. Schassberger, W. Ruediger. 1989. Caring for Our Natural Community: Region 1-Threatened, Endangered and Sensitive Species Program. USDA. For. Serv. Northern Region.

Reynolds, R. T., R. T. Graham, M. H. Rieser, R. L. Bassett, P. L. Kennedy, D. A. Boyce Jr., G. Goodwin, R. Smith, and E. L. Fisher. 1992. Management Recommendations of the Northern Goshawk in the Southwestern United States. USDA For. Serv., Rocky Mtn. For. and Range Exper. Sta. Gen Tech. Rep. RM-217, Fort Collins, Colo.

Ritter, S. A. 1989. Nongame Species Account, Common Loon (Gavia immer). Wyoming Game and Fish Department.

Rocky Mountain Regional Coordinating Committee. 1989. Uniform Format for Oil and Gas Lease Stipulations. Rocky Mt. Reg. Coord. Comm. 16pp.

Simpson, J. C. and R. L. Wallace. 1982. Fishes of Idaho. Univ. Press of Idaho, Moscow, Idaho.

Spahr, R., L. Armstrong, D. Atwood, and M, Rath. 1991. Threatened, Endangered, and Sensitive Species of the Intermountain Region. USDA For. Serv., Ogden, Utah.

Stebbins, R. C. 1966. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston, Mass.

Stephens, D., and S. Sturts. 1991. Idaho Bird Distribution. Mapping by Latilong. Idaho Dept. of Fish and Game, Boise, Id. 76pp.

Steward, J. 1938. Basin-Plateau Aboriginal Socio-political Groups. Bur. of Amer. Ethnology Bull. No. 120. Smithsonian

Stoddart, L. A., A. D. Smith, and T. W. Box. 1975. Range Management, third edition. New York, New York:. McGraw-Hill Book Company, 532 pp.

Swanson, Jr., E. H. 1972. Birch Creek: Human Ecology in the Cool Desert of the Northern Rocky Mountains, 9000 B.C.–A.D. 1850. Id. State Univ. Press, Pocatello, Id.

Thomas, J. W., and D. E. Toweill. 1982. Elk of North America: Ecology and Management. Wildlife Management Institute. Stackpole Books, Harrisburg, PA.

Thurow, R. F., Corsi, C. E., and V. K. Moore. 1988. Status, ecology, and management of cutthroat trout in the upper Snake River drainage, Idaho. Amer. Fish. Soc. Symposium 4:93–106

U.S. Department of Commerce, 1990. Bureau of the Census, Regional Census Center, Lakewood, Colo.

U.S. Department of Energy. 1994. 1994 Annual Energy Outlook and Projections to 2010. U.S. Dep. of Energy, Energy Inf. Admin., Washington D.C.

U.S. Environmental Protection Agency. 1976. Quality Criteria for Water, Washington, D.C.

U.S. Environmental Protection Agency. 1985a. AP-42, Compilation of Air Pollutant Emission Factors, Vol. I: Stationary Point and Area Sources, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

U.S. Environmental Protection Agency. 1985b. AP-42, Compilation of Air Pollutant Emission Factors, Vol. II: Mobile Sources, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

U.S. Environmental Protection Agency. 1992. SCREEN2 Model User's Guide, EPA-450/4-92-006, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

U.S. Fish and Wildlife Service. 1987. Northern Rocky Mountain Wolf Recovery Plan. U.S.D.I. Fish and Wildl. Serv., Denver, Colo. 119pp.

U.S. Fish and Wildlife Service. 1994. The Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho. Final Environmental Impact Statement. U.S. Fish and Wildlife Service, Helena, Mont.

USDA Forest Service. 1985a. Land Management Plan for the Targhee National Forest. Targhee Nat. For., St. Anthony, Id. 711pp.

USDA Forest Service. 1985b. Final Environmental Impact Statement for the Land Management Plan for the Targhee National Forest. Targhee Nat. For., St. Anthony, Id. 589pp.

USDA Forest Service. 1990. Bridger-Teton National Forest Land and Resource Management Plan. Bridger-Teton Nat. For., Jackson, Wyo.

USDA Forest Service. 1992. Analysis of the Management Situation. Targhee National Forest. Targhee Natl. For., St. Anthony, Id.

USDA Forest Service. 1994. Final Environmental Impact Statement, Grand Targhee Resort Master Development Plan. USDA. For. Serv. Targhee Nat. For., St. Anthony, Id.

USDA Forest Service. 1994. Geographical Information System Database for the Targhee National Forest. Targhee Nat. For., St. Anthony, Id..

Varley, J. D., and R. E. Gresswell. 1988. Ecology, status, and management of Yellowstone cutthroat trout. Amer. Fish. Soc. Symposium 4:93–106.

Willingham, C. G. 1994. Personal communication. Forest Archeologist, Targhee Natl. For., St. Anthony, Id.

Wyoming Department of Administration and Information, 1991. Wyoming Data Handbook 1991. Division of Economic Analysis, Cheyenne, Wyo.

Wyoming Department of Environmental Quality. 1980. Water Quality Rules and Regulations, Cheyenne, Wyoming.

Wyoming Department of Environmental Quality. 1994. Wyoming's 1993 Air Quality Summary of Ambient Air Monitoring Data, Cheyenne, Wyoming.

Yee, J. J. S., and W. R. Souza. 1987. Quality of Groundwater in Idaho. United States Geological Survey Water-Supply. Paper 2272.

Chapter 8

Glossary

Chapter 8 — Glossary

Acronyms and Abbreviations

ADT	Average Daily Traffic
APD	Application for Permit to Drill
AUM	Animal Unit Month
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CSU	Controlled Surface Use
d.b.h	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
EPA	Environmental Protection Agency
Forest Plan	Targhee National Forest's Land and Resource Management Plan
IGFD	Idaho Game and Fish Department
LN	Lease Notice
MIS	Management Indicator Species
NL	No Lease
NSO	No Surface Occupancy
ROS	Recreation Opportunity Spectrum
SLT	Standard Lease Terms
SUPO	Surface Use Plan of Operations
TL	Timing Limitations
VQO	Visual Quality Objective

Abandonment – termination of operations for production from a well. Permanent abandonment involves plugging the well and removing installations.

Acquired Lands – lands added to the National Forest system by purchase, transfer, or donation under authority of the Weeks Law or related acts. Also, lands obtained by the Forest Service by exchange for other acquired lands.

Airshed – a geographic area which, because of topography, meteorology, and climate, shares the same air.

Alluvium – clay, silt, sand, gravel, and other rock materials transported by flowing water.

Aquifer – a geological formation or structure that contains water in sufficient quantity to supply needs for water development.

Average Daily Traffic (ADT) – the average 24-hour volume of traffic, being the total volume of traffic during a stated period divided by the number of days in that period.

Best Management Practice – a practice or combination of practices that is determined by a State (or designated area-wide planning agency) after assessment of the problem, examination of alternative practices, and appropriate public participation, to be the most effective and practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

Big Game – those species of large mammals normally managed as a sport hunting resource.

Browse – twigs, leaves, and young shoots of trees and shrubs on which animals feed; in particular, those shrubs that are used by big game animals for food.

Character Type – large physiographic area of land which has common characteristics of landforms, rock formations, water forms, and vegetative patterns.

Controlled Surface Use – 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 No Surface Occupancy or Timing Lease stipulations.

Critical Habitat – habitat designated by the Secretary of the Interior as critical to the continued survival of threatened or endangered species.

Cultural Resource – remains of sites, structures, or objects used by humans in the past (historic or prehistoric).

Cumulative Effects or Impacts – the impact on the environment that 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 nonfederal) or person undertakes the actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Developed Recreation – recreation that requires facilities that, in turn, result in concentrated use of an area. Examples of developed recreational areas are campgrounds and ski areas.

Diameter at Breast Height (d.b.h.) – the diameter of a tree measured on the uphill side at 4.5 feet above the ground.

Directional Drilling – the intentional deviation of a well bore from vertical to reach subsurface areas off to one side of the drilling site.

Dispersed recreation – a general term referring to recreation use outside developed recreation site. This includes activities such as scenic driving, hunting, backpacking, and recreation in primitive environments.

Distance Zones – one of three categories used in the Visual Management System to divide a view into near and far components. The three categories are:

Background (bg) – area located from 3-5 miles to infinity from viewer.

Middleground (mg) – area located from ¼–½ mile to 3–5 miles from the viewer.

Foreground (fg) – the detailed landscape found within 0 to ¼–½ mile from the viewer.

Diversity – the distribution and abundance of different plant and animal communities and species within a given area.

Endangered Species – any species of animals or plant that is in danger of extinction throughout all or a significant part of its range. Plant or animal species identified by the Secretary of the Interior as endangered according to the Endangered Species Act.

Fault – a ground surface fracture or fracture zone along which there has been a displacement of one side with respect to the other.

Floodplain – the lowland and relatively flat area adjoining inland waters, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year (i.e. the "100-year floodplain").

Forage – all browse and nonwoody plants that are available to livestock or game animals and used for grazing or harvested for feeding.

Forb – any herbaceous plant other than true grasses, sedges, or rushes.

Habitat – the place where a plant or animal naturally or normally lives or grows.

Habitat Type – the aggregate of all areas that support or can support the same primary vegetation at climax.

Headwaters – the upper tributaries of a river.

Historic Site – a site associated with the history, tradition, or cultural heritage of national, state, or local interest and of enough significance to merit preservation or restoration.

Landform – an area defined by its particular combination of bedrock and soils, erosion processes, and climatic influences.

Landtype – a portion of the Forest mapped in the Forest Soil Resource Inventory that has a defined arrangement of specific landforms that reacts to management activities in generally predictable ways.

Leasable Minerals – minerals acquired only by lease, including coal, gas, oil, phosphate, sodium, potassium, oil shale, sulphur, geothermal steam.

Locatable Minerals – those hardrock minerals that can be obtained by filing a claim on Public Domain or National Forest System lands reserved from the Public Domain. In general, the locatable minerals are those hardrock minerals that are mined and processed for the recovery of metals, but may also include certain nonmetallic minerals and uncommon varieties of mineral materials.

Management Indicator Species – a species whose welfare is presumed to be an indicator of the welfare of other species using the same habitat and which can be used to assess the impacts of management action on a particular area.

Municipal Watershed – a watershed that provides water for human consumption, where Forest Service management could have a significant effect on the quality of water at the intake point and that provides water utilized by a community or any other water system that regularly serves (1) at least 25 people on at least 60 days in a year, or (2) at least 15 service connections. In addition to cities, this includes campgrounds, residential developments, and restaurants.

No Surface Occupancy – A fluid mineral leasing stipulation that prohibits occupancy of disturbance on all or part of the land surface to protect special values or uses. The stipulation does not apply to roads and other linear facilities (e.g. pipelines and powerlines) that typically extend beyond the lease boundary. Lessees may use the fluid minerals under leases restricted by this stipulation through the use of dirctional drilling from sites outside the NSO area.

Noxious Weeds – rapidly-spreading plants that cause a variety of major ecological impacts to both agriculture and wild lands.

Perennial Stream – a stream that flows year-round.

Prehistoric Site – an archaeological site associated with American Indians and usually occurring before contact with Europeans.

Primitive Recreation – those types of recreational activities associated with unroaded land, such as hiking, backpacking, and cross-country travel.

Range – land producing native forage for consumption by animals and lands that are revegetated naturally or artificially to provide forage that is managed like native vegetation.

Range Allotment – an area designated for use of a prescribed number and kind of livestock under one management plant.

Raptor – a bird of prey with sharp talons and strongly curved beaks (e.g. hawks, falcons, owls, and eagles).

Reclamation – returning disturbed lands to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

Recreation Opportunity Spectrum (ROS) Settings – a system of measuring the land's ability to meet the expectations of recreational users. Six recreation categories, from primitive (natural) to urban (highly modified) describe the activities, settings and experiences an area offers:

Primitive (ROS I) – area is characterized by essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

Semi-Primitive Non-Motorized (ROS II) – area is characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is not permitted.

Semi-Primitive Motorized (ROS III) – area is characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is permitted.

Roaded Natural (ROS IV) – area is characterized by predominantly natural-appearing environments with moderate evidences of the sights and sounds of man. Such evidence usually harmonize with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.

Rural (ROS V) – area is characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate densities are provided far away from developed sites. Facilities for intensified motorized use and parking are available.

Urban (ROS VI) – area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are to enhance specific recreational activities. Vegetation cover is often exotic and manicured. Sights and sounds of humans, on-site, are predominant. Large numbers of users can be expected, both on site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

Recreation Visitor Day (RVD) – equivalent to 1 person recreating for 12 hours or several people for a total of 12 hours.

Riparian – vegetation growing in close proximity to a watercourse, lake, or spring and often dependent on its roots reaching the water table.

Road Maintenance Levels – roads within the Forest's transportation system are maintained at one of five levels.

Level 1 – Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed one year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are “prohibit” and “eliminate”.

Roads receiving level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open to traffic. However, while being maintained at level 1, they are closed to vehicular traffic, but may be open and suitable for non-motorized uses.

Level 2 – Assigned to roads open for use by high-clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to (1) discourage or prohibit passenger cars or (2) accept or discourage high-clearance vehicles.

Level 3 – Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.

Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or process material. Appropriate traffic management strategies are either "encourage" or "accept". "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

Level 4 – Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. The most appropriate traffic management strategy is "encourage". However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

Level 5 – Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. The appropriate traffic management strategy is "encourage".

Sediment – earth material transported, suspended, or deposited by water.

Sensitivity Level – a particular degree or measure of viewer interest in the scenic qualities of the landscape.

Sensitivity Level 1 – the highest sensitivity level, referring to areas seen from travel routes and use areas with moderate to high use.

Sensitivity Level 2 – an average sensitivity level, referring to areas seen from travel routes and use areas with low to moderate use.

Sensitivity Level 3 – the lowest sensitivity level, referring to areas seen from travel routes and use with low use.

Species of Special Concern – a native species whose population is low and limited in distribution or has suffered significant reductions because of loss of habitat.

Tank Battery – a group of production tanks that store crude oil in the field.

Threatened Species – a species of plant or animal likely to become endangered throughout all or a significant part of its range within the foreseeable future.

Timing Limitation – Prohibits new operations or 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.

Understory – the trees and other woody species growing under a more-or-less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

Variety Class – a particular level of visual variety or diversity of landscape character. There are three variety classes; A, B, and C.

Variety Class A – distinctive

Variety Class B – common

Variety Class C – minimal

Visual Quality Objectives (VQOs) – categories of acceptable landscape alteration measured in degrees of deviation from a natural appearing landscape.

Maximum Modified – man's activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in background.

Modified – man's activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Partial Retention – man's activities may be evident but must remain subordinate to the characteristic landscape.

Retention – man's activities should not be evident to the casual forest visitor.

Watershed – the entire land areas that contributes water to a drainage system or stream.

Wetlands – areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances does or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonably-saturated soil conditions for growth and reproduction.

Wilderness – under the 1964 Wilderness Act, wilderness is undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation. It is protected and managed so as to preserve its natural conditions which (1) generally appear to have been affected primarily by the forces of nature with the imprints of man's activity substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and confined type of recreation; (3) has at least 5,000 acres or is of sufficient size to make practical its preservation, enjoyment, and use in unimpaired conditions; and (4) may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

Watershed – the entire landscape that contributes

Wetlands – areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances does or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

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Chapter 9

List of Agencies, Organizations, and Persons to Whom the DEIS Was Sent

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Federal

Department of Agriculture
Forest Service, Environmental Coordinator

Department of Interior
Bureau of Land Management, Idaho Falls District Office Idaho Falls, Idaho
Bureau of Land Management, Rock Springs District, Rock Springs, Wyoming
Bureau of Mines, Intermountain Field Operations Center Denver, Colorado
National Park Service, Rocky Mountain Regional Office Denver, Colorado
U.S. Fish and Wildlife Service Washington, D.C.

State

Idaho

Airport Planning and Development Boise, Idaho
Idaho Department of Environmental Quality, Idaho Falls, Idaho
Idaho Department of Parks and Recreation, Boise, Idaho
Idaho Department of State Lands, Cevr D'Alene, Idaho
Idaho Department of Water Resources, Boise, Idaho
Idaho Environmental Council, Idaho Falls, Idaho
Idaho Fish and Game Department, Idaho Falls, Idaho
Idaho Oil and Gas Conservation Commission
Idaho Transportation Department

Wyoming

Division of Parks and Cultural Resources, Cheyenne, Wyoming
The Geological Survey of Wyoming, Laramie, Wyoming
Public Service Commission, Cheyenne, Wyoming
Wyoming Game and Fish Department Headquarters, Cheyenne, Wyoming

County and Local

Clark County Commissioner Dubois, Idaho (Mr. Charles E. Wilson)
Jefferson County Commissioner, Ririe, Idaho (Mr. Kenneth Stromberg)

Organizations

Alliance for the Wild Rockies, Missoula, Montana
American Wildlands, Bozeman, Montana
Bidiversity Legal Foundation, Boulder, Colorado
Blueribbon Coalition, Idaho Falls, Idaho
Continental Divide Trail Society, Bethesda, Maryland
Eagle Rock Backcountry Horseman, Idaho Falls, Idaho
Fall Creek Basin Cattlemen's Association, Idaho Falls, Idaho
Greater Yellowstone Coalition, Bozeman, Montana
Henry's Fork Foundation, St. Anthony, Idaho
Idaho Alpine Club, Idaho Falls, Idaho
Idaho Alpine Club, Rigby, Idaho
Idaho Conservation League, Idaho Falls, Idaho
International Llama Association, Newdale, Idaho
Outdoors Unlimited Eagle, Idaho
Rocky Mountain Oil and Gas Association, Denver, Colorado
Sierra Club, Eastern Idaho Group, Pocatello, Idaho
Sierra Club, Northern Great Plains Region, Sheridan, Wyoming
The Wilderness Society, Northern Rockies Regional Office, Bozeman, Montana
Trout Unlimited, Upper Snake River Chapter, Idaho Falls, Idaho
Wildlife Management Institute, Washington, D.C.
Wyoming Outfitters Association, Gillette, Wyoming

Companies

Appropriate Systems Design
Celsius Energy Company
Dames and Moore
Double D Ranches
Great Plains Resources, Inc.
Hagenbarth Livestock
Moncrief Oil
Nielson and Associates, Inc.
Phillips Petroleum Company
Powers Elevation Company, Inc.
Sullivan Livestock Company
Utah Power and Light
Yellowstone Log Homes

Education

Ricks College Geology Department, Rexburg, Idaho

Individuals

Mr. and Mrs. Swede Andersen
Mr. Chip Bailey
Mr. Melvin A. Betty
Mr. Stephen B. Brumbach
Mr. Jim Burrows
Mr. Don C. Byers
Mr. Keith Cattabriga
Mr. Richard Curtis
Mr. and Mrs. J. L. Denison
Ms. Marilyn L. Dinger
Mr. Richard A. Egbert
Mr. L. J. Folkers
Mr. Brent Harshburger
Mr. Ron Heckman
Mr. Ron Hoodenpyle
Mr. Paul Hopperdietzel
Mr. Ronald J. Hover
Mr. Marv Hoyt
Ms. Julie Hopkins Hugo
Mr. Marc A. Kessler
Ms. Frances Mattson
Mr. and Mrs. E. F. McNeece
Mr. Merrill McNeel
Mr. Robert H. Meier
Mr. Nick Mickelsen
Mr. Lee Nellis
Mr. Ronald J. Peterson
Robert and Joy Quayle
Mr. David Richerson
Mr. Edward M. Salsburg
W. G. Smith
Mr. Will Snider
Ms. Carol Stuckey and Mr. Patrick Burke
Mr. Gene Taylor
Mr. Lionel P. Treepanier
Ms. Diane Verna
Mr. Charles Willis
Mr. Joseph Woolf
Mr. Gregory S. Young

Chapter 10

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Chapter 10 — Index

Appendix A

Reasonably Foreseeable Development Scenario

OIL AND GAS POTENTIAL REPORT

Prepared for the

TARGHEE NATIONAL FOREST

Prepared by: Charles Horsburgh, District Geologist

Signature: Charles A. Horsburgh Date: 2-3-92

Bureau of Land Management, Idaho Falls District

February 1992

INTRODUCTION

This report evaluates the oil and gas resource potential of the Targhee National Forest and describes a Reasonable Foreseeable Development Scenario based on that potential. The purpose of conducting the evaluation and providing the development scenario is to provide a reference source to be used in the update of the Targhee National Forest Land and Resource Management Plan. The report was prepared under the guidance provided in a Memorandum of Understanding between the Targhee National Forest and the Idaho Falls District of the Bureau of Land Management.

REGIONAL GEOLOGY

Physiography

The Targhee National Forest lies within two different physiographic provinces (See Figure 1). The Palisades, Teton Basin, Ashton, and the east half of the Island Park Ranger Districts, as well as those portions of the Targhee that are administered by the Caribou and Bridger Teton National Forests, lie within the Middle Rocky Mountain Physiographic Province. The west half of the Island Park Ranger District and the Dubois Ranger District, as well as that portion of the Targhee administered by the Salmon National Forest, lie in the Northern Rocky Mountain Physiographic Province.

The Northern Rocky Mountain province extends over most of northern and central Idaho and is characterized by high, massive mountains, and deep intermontane valleys. Most of the mountains in the Northern Rocky Mountain province have developed on the Idaho Batholith. However, those mountain ranges within the Targhee, the Henrys Lake Mountains, the Centennial Mountains, the southern end of the Beaverhead Range, and the southern end of the Lemhi Range, lie to the east of, and are not associated with the Idaho Batholith.

The Middle Rocky Mountain Province within the Targhee is characterized by two distinct landforms, the Yellowstone Plateau of volcanic origin, and the mountain ranges along the Wyoming border. Most of the Yellowstone Plateau lies to the east of the Targhee. The plateau's western edge is Big Bend Ridge, which forms the western edge of Island Park. Volcanic activity occurred on the Yellowstone Plateau during two episodes, one in the Paleogene Period (30 million years ago) and the other in the Pliocene-Pleistocene Period (4 million years ago).

The western edge of the Teton Range, the Snake River Range, and the Caribou Range represent the mountains of the Middle Rocky Mountain Province within the Targhee National Forest. These mountain ranges consist of complexly folded and faulted sedimentary rock units.

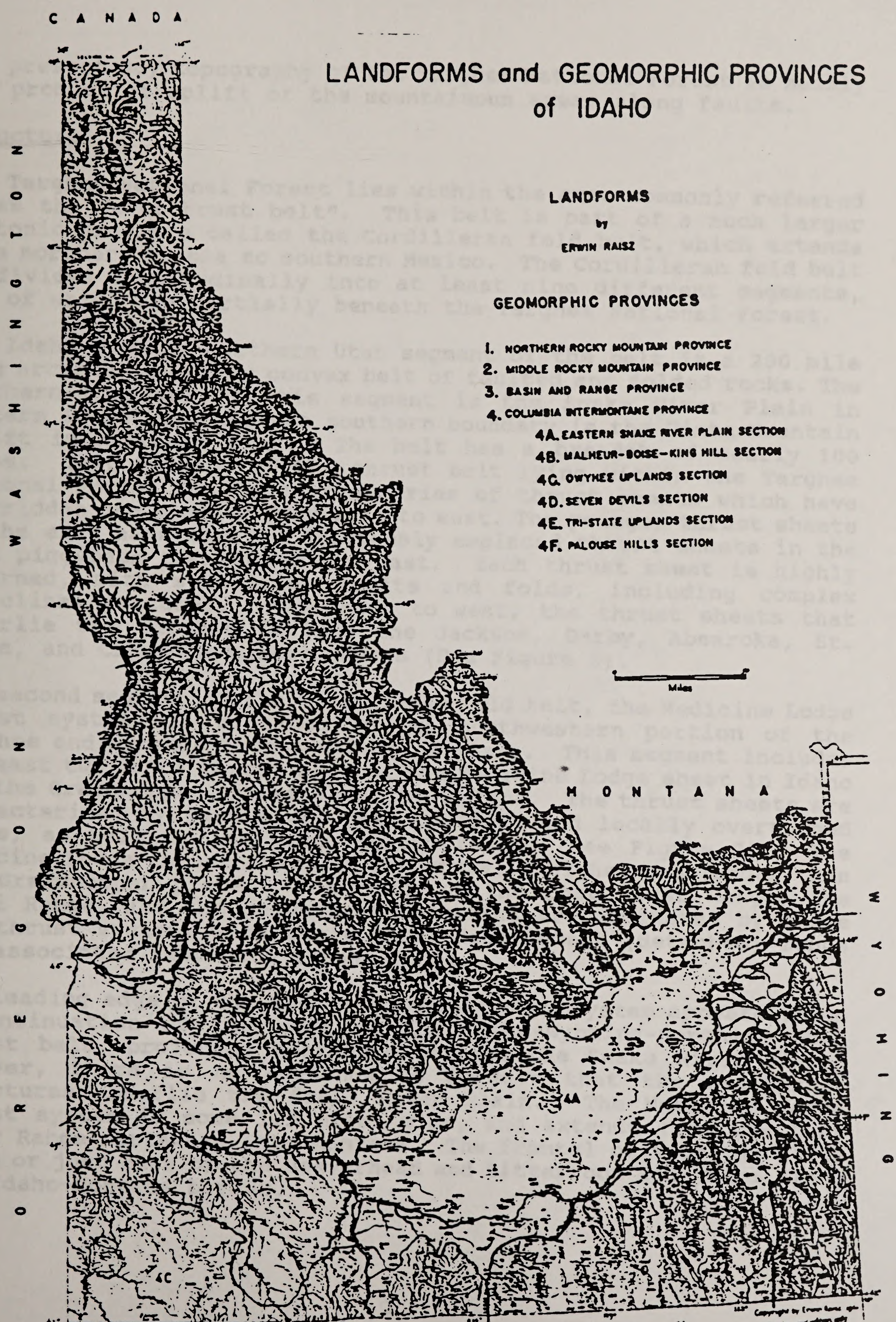


FIGURE 1
Physiographic Provinces of Idaho

The present day topography of the Targhee National Forest is mainly the product of uplift of the mountainous areas along faults.

Structure

The Targhee National Forest lies within the area commonly referred to as the "overthrust belt". This belt is part of a much larger tectonic province called the Cordilleran fold belt, which extends from northern Alaska to southern Mexico. The Cordilleran fold belt is divided longitudinally into at least nine different segments, two of which lie partially beneath the Targhee National Forest.

The Idaho-Wyoming-northern Utah segment of the belt is a 200 mile long arcuate, easterly convex belt of faulted and folded rocks. The northern boundary of this segment is the Snake River Plain in eastern Idaho, whereas the southern boundary is the Uinta Mountain uplift in northern Utah. The belt has a breadth of nearly 100 miles. That portion of the thrust belt lying within the Targhee National Forest consists of a series of thrust sheets which have overridden one another from west to east. The younger thrust sheets to the east have carried previously emplaced thrust sheets in the west piggyback fashion to the east. Each thrust sheet is highly deformed, with subsidiary faults and folds, including complex anticlinal features. From east to west, the thrust sheets that underlie the Targhee include the Jackson, Darby, Absaroka, St. Johns, and Crawford thrust sheets (See Figure 2).

The second segment of the Cordilleran fold belt, the Medicine Lodge thrust system, is situated in the northwestern portion of the Targhee and extends into southwest Montana. This segment includes at least two major thrust sheets, the Medicine Lodge sheet in Idaho and the Grasshopper thrust sheet in Montana. The thrust sheets are characterized by pervasive, open to tight and locally overturned folds, as well as imbricate thrust faults (See Figure 3). The Medicine Lodge thrust sheet is structurally higher and larger than the Grasshopper plate. The rocks of the Lost River Range, the Lemhi Range, and the Beaverhead Mountains are dominated by these two thrust systems with their basal decollement (detached) zones and associated imbricate thrust zones.

The leading edge of the Medicine Lodge thrust system appears to be a continuation of the edge of the Idaho-Wyoming-northern Utah thrust belt, projected northward beneath the Snake River Plain, however, there is no evidence to suggest that the overthrust structures underlie the Snake River Plain. The Medicine Lodge thrust system is some 125 miles wide, and extends from the Lost River Range northward into Montana. The frontal part of the plate is in or just east of the Beaverhead and Bitterroot Mountains along the Idaho-Montana border.

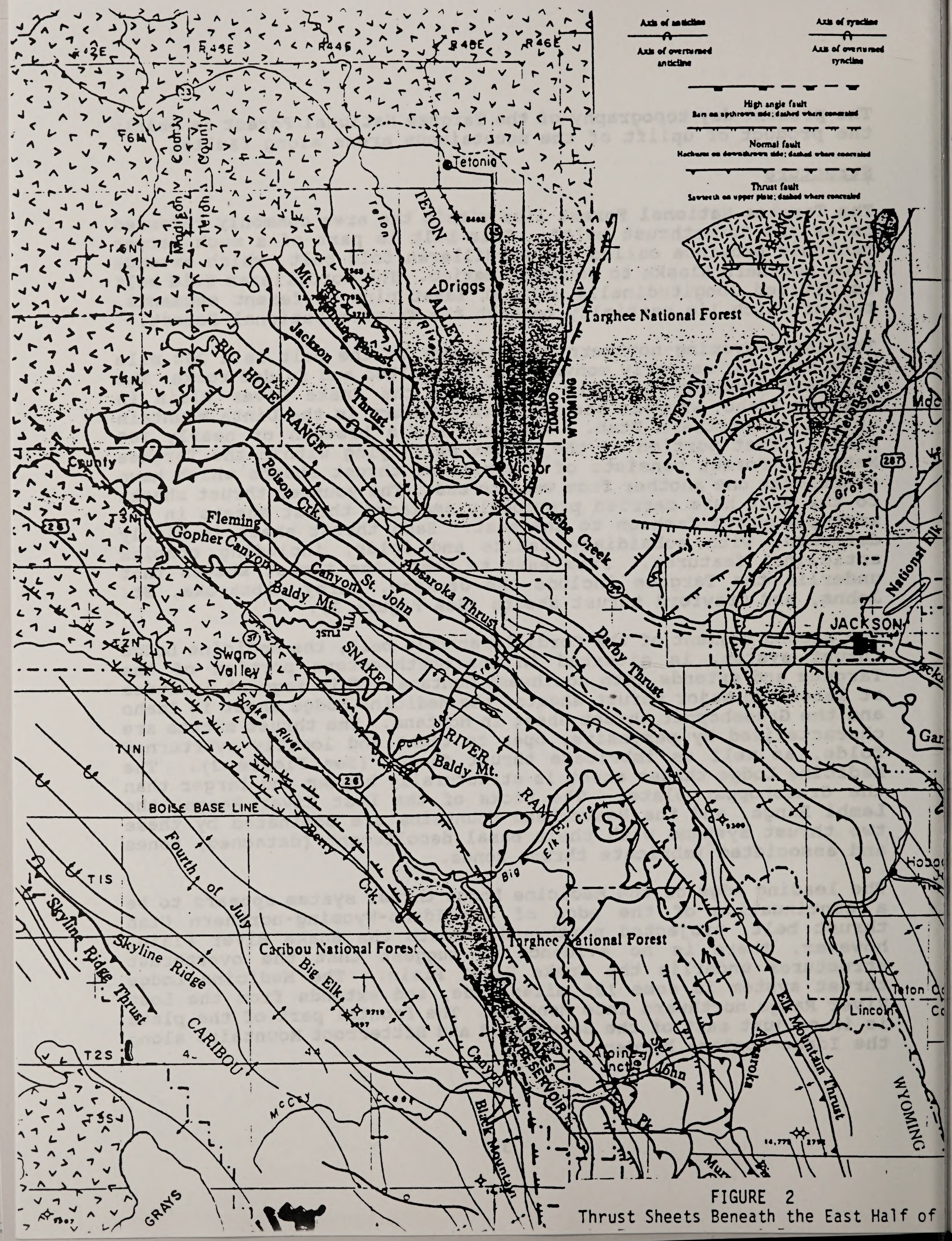


FIGURE 2
Thrust Sheets Beneath the East Half of

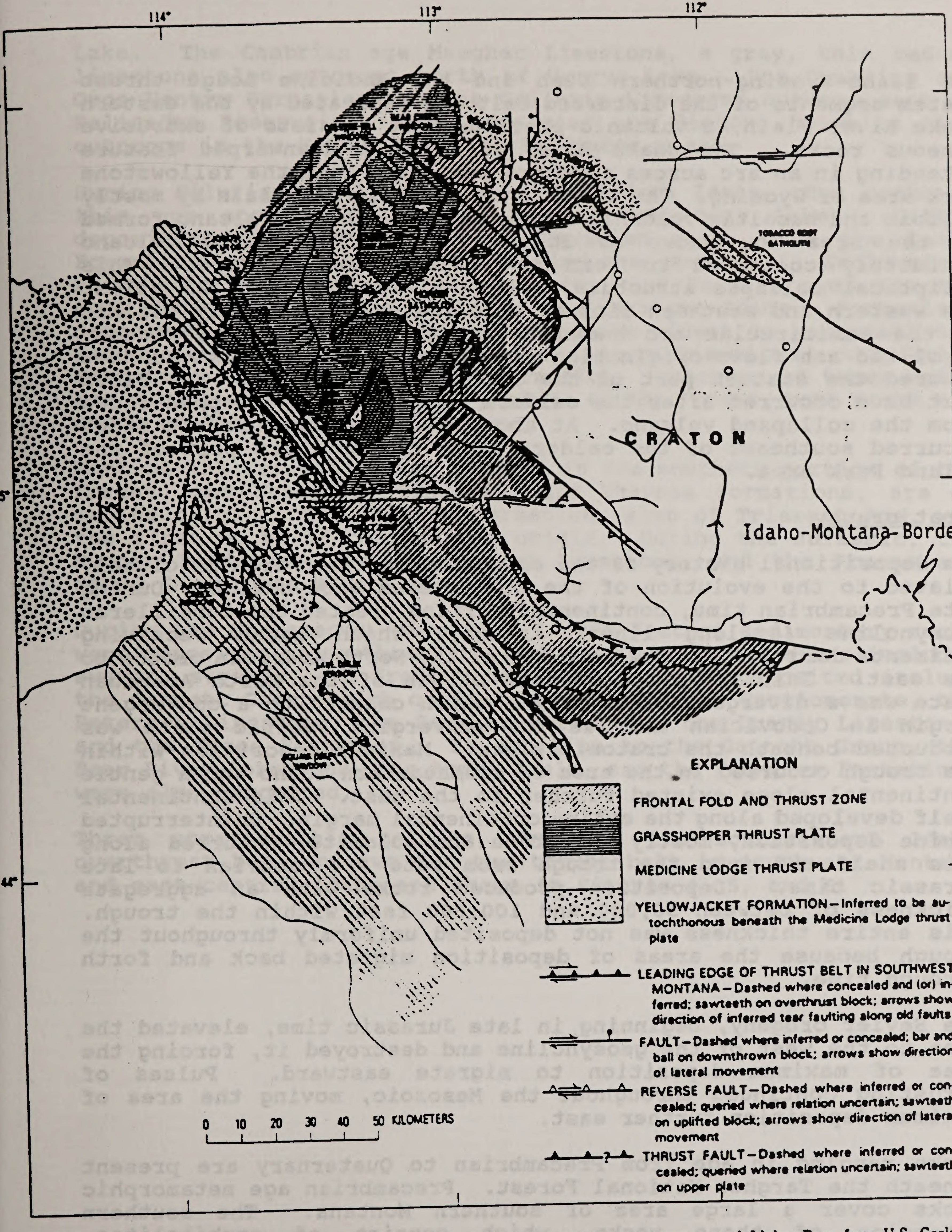


FIGURE 4.—Sketch map of the major parts of the thrust belt in southwest Montana and east-central Idaho. Base from U.S. Geological Survey 1:500,000 Idaho, 1968, and Montana, 1966.

FIGURE 3
Thrust Sheets in the Northwestern
Portion of the Targhee National Forest

The Idaho-Wyoming-northern Utah and the Medicine Lodge thrust system segments of the disturbed belt are separated by the eastern Snake River Plain, a volcanic province that consists of extrusive igneous rocks. The Snake River Plain is a downwarped feature extending in an arc across southern Idaho and into the Yellowstone Park area of Wyoming. The Snake River Plain is underlain by mostly silicic and basaltic volcanic rocks. A large shield volcano formed in the area now known as Island Park. The shield volcano ultimately collapsed to form the Island Park caldera. This elliptical collapse structure covers an area of 18 by 23 miles. The western and southern rims of this feature are clearly visible in the semicircular arc known as Thurmon and Big Bend Ridges. Rhyolitic ash flows originating from the Yellowstone Plateau have covered the eastern part of the Island Park caldera. The flows that have occurred after the caldera formed have overlapped flows from the collapsed volcano. At about the same time, basalt flows occurred southeast of the caldera along the southern part of the Island Park area.

Stratigraphy

The depositional history of the southeastern Idaho area is closely related to the evolution of the Cordilleran geosyncline. During late Precambrian time, continental rifting created the Cordilleran geosyncline (a long linear trough), which began receiving sediments derived from the interior of the North American craton to the east. Initially, the western margin of the North American plate was a divergent plate margin which changed to a convergent margin in Ordovician time as the converging Pacific plate was subducted beneath the cratonic plate. Maximum deposition within the trough occurred in the area of southeastern Idaho and a gentle continental slope existed further to the east. This continental shelf developed along the entire continental margin. Uninterrupted marine deposition, mostly limestone and dolomite, occurred along this shelf and into the trough from late Pre-cambrian to late Jurassic time. Deposition produced rocks with an aggregate thickness of between 50,000 and 100,000 feet within the trough. This entire thickness was not deposited uniformly throughout the trough because the areas of deposition migrated back and forth through time.

The Sevier orogeny, beginning in late Jurassic time, elevated the area to the west of the geosyncline and destroyed it, forcing the area of maximum deposition to migrate eastward. Pulses of thrusting continued throughout the Mesozoic, moving the area of maximum deposition further east.

Rocks ranging in age from Precambrian to Quaternary are present beneath the Targhee National Forest. Precambrian age metamorphic rocks cover a large area of southern Montana. The southern extension of these rocks, which consist of amphibolites, quartzites, and mica schists, is found in the area around Henrys

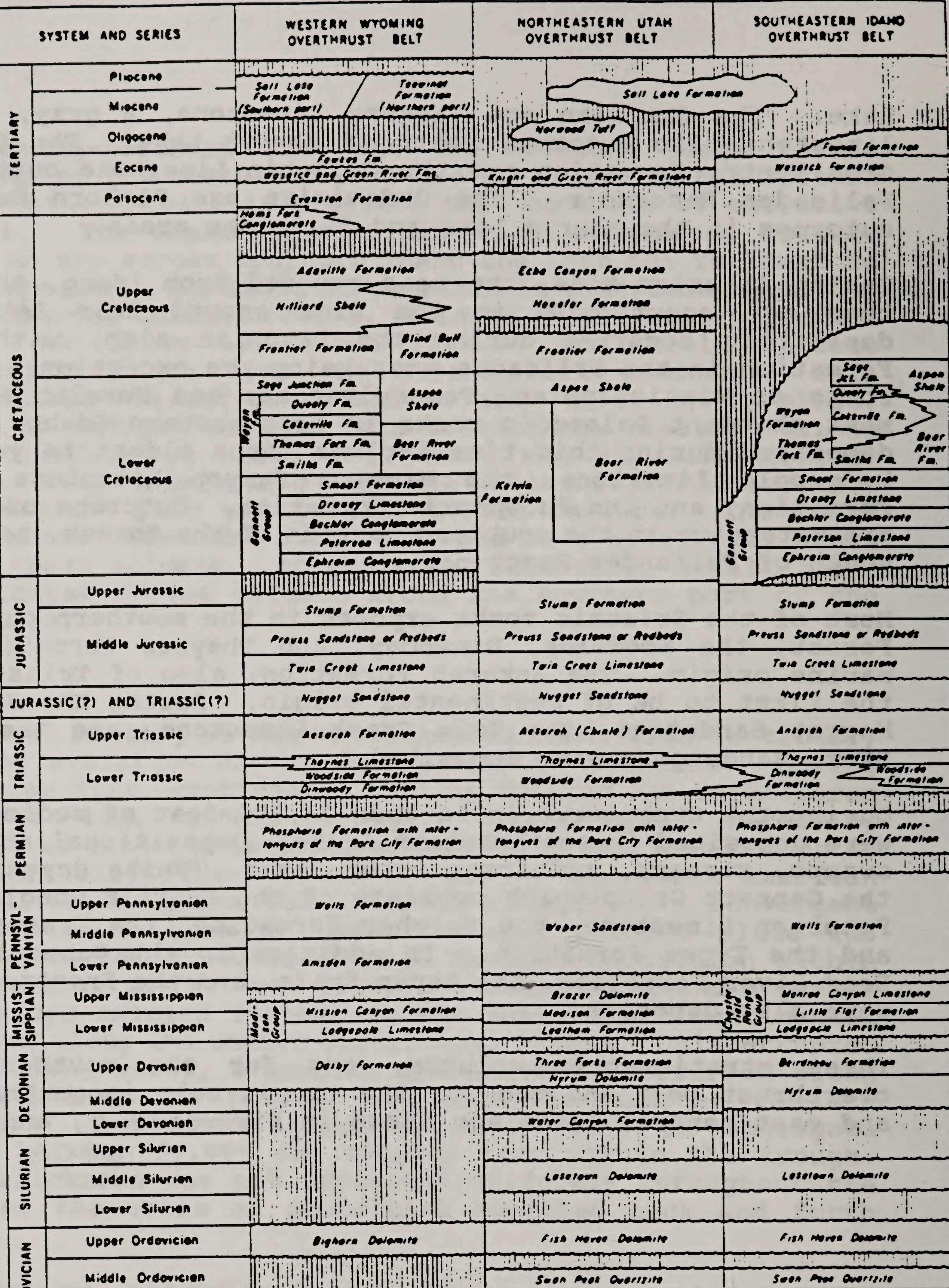
Lake. The Cambrian age Maegher Limestone, a gray, thin bedded limestone also outcrops north of Henrys Lake. The Cambrian age Gros Ventre Formation and the Gallatin Limestone outcrop east of Palisades Reservoir. The Ordovician age Bighorn Dolomite also outcrops in the Henrys Lake and Palisades areas.

During Silurian time, the seas receded from Idaho, thus rocks of this age occur only in the area around Bear Lake. Little deposition occurred during the Devonian also, with the Darby Formation in the Palisades area being the exception. Sedimentary rocks of Mississippian, Pennsylvanian, and Permian ages are the most abundant Paleozoic rocks in southeastern Idaho. Formations deposited during this time include (from oldest to youngest) the Lodgepole Limestone, the Mission Canyon Limestone, the Wells Formation, and the Phosphoria Formation. Outcrops of these units are extensive in the southern portion of the forest, both north and south of Palisades Reservoir.

Most of the Triassic rocks exposed in the southern portion of the Forest, the Woodside, Dinwoody, and Thaynes Formations, are of marine origin. The Ankareh Formation, also of Triassic Age, was the first to be of continental origin. During the Jurassic, the Nugget Sandstone, the Twin Creek Limestone, and the Pruess and Stump Sandstones were deposited.

During the Cretaceous, more than 14,000 feet of sedimentary rocks were deposited in southeastern Idaho. Depositional areas included swamps, streams, and fresh water lakes. Units deposited include the Gannett Group which consists of the Ephraim Conglomerate, the Peterson Limestone, the Belcher Formation, the Draney Limestone, and the Tygee Formation. In addition to the Gannett Group, the Bear River Formation, the Aspen Shale, and the Frontier Formations were also deposited.

Three stratigraphic columns, one for the southeastern Idaho overthrust belt and two for the thrust belt in southwest Montana and east-central Idaho are shown in Figures 4, 5, and 6.



CORRELATION CHART OF
STRATIGRAPHIC UNITS IN THE OVERTHRUST BELT

FIGURE 4
Stratigraphic Column for the
Southeastern Idaho Overthrust Belt

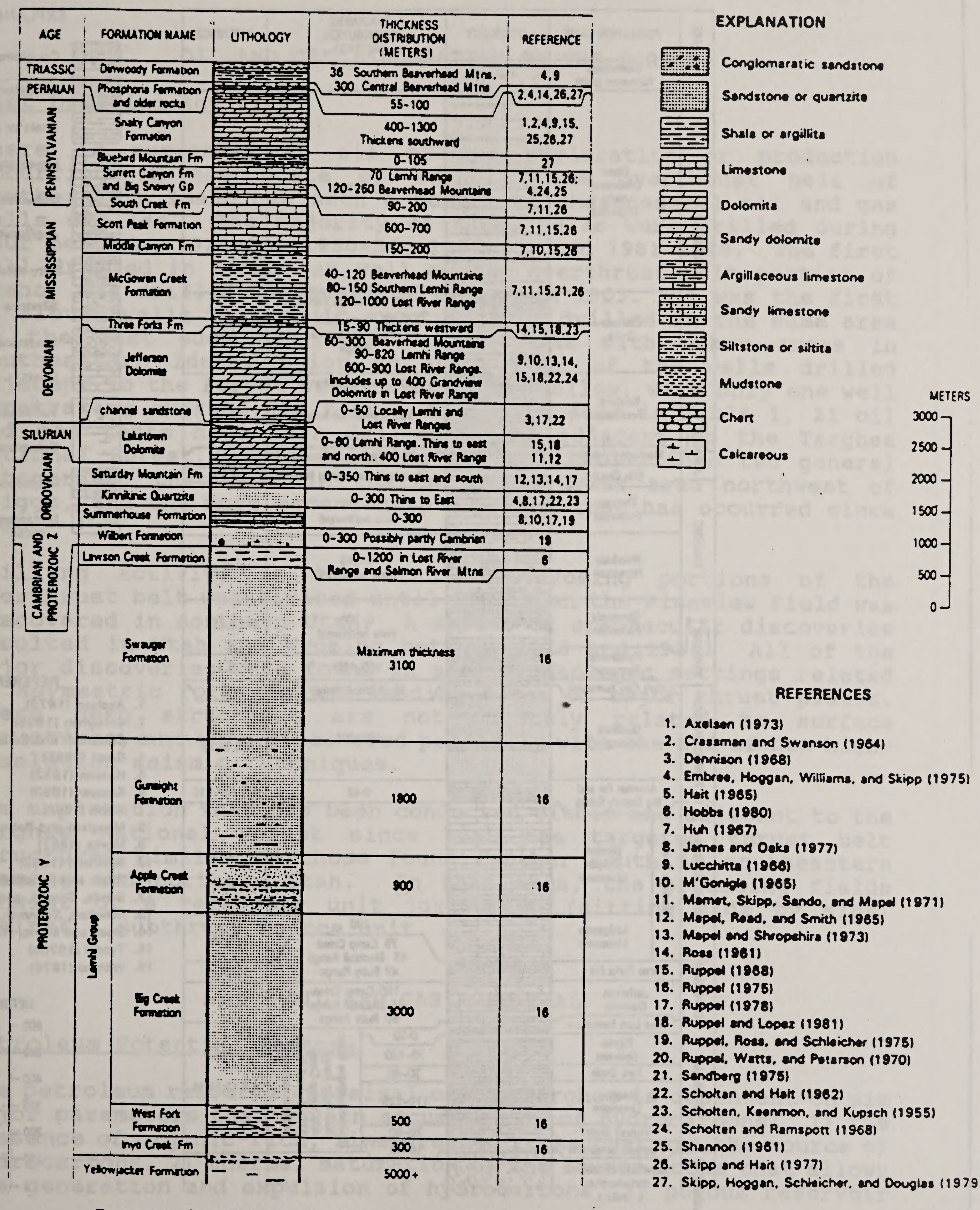


FIGURE 11.—Generalized stratigraphic column in the Medicine Lodge thrust plate, southwest Montana and east-central Idaho.

FIGURE 5
Stratigraphic Column for the Medicine Lodge Thrust Plate

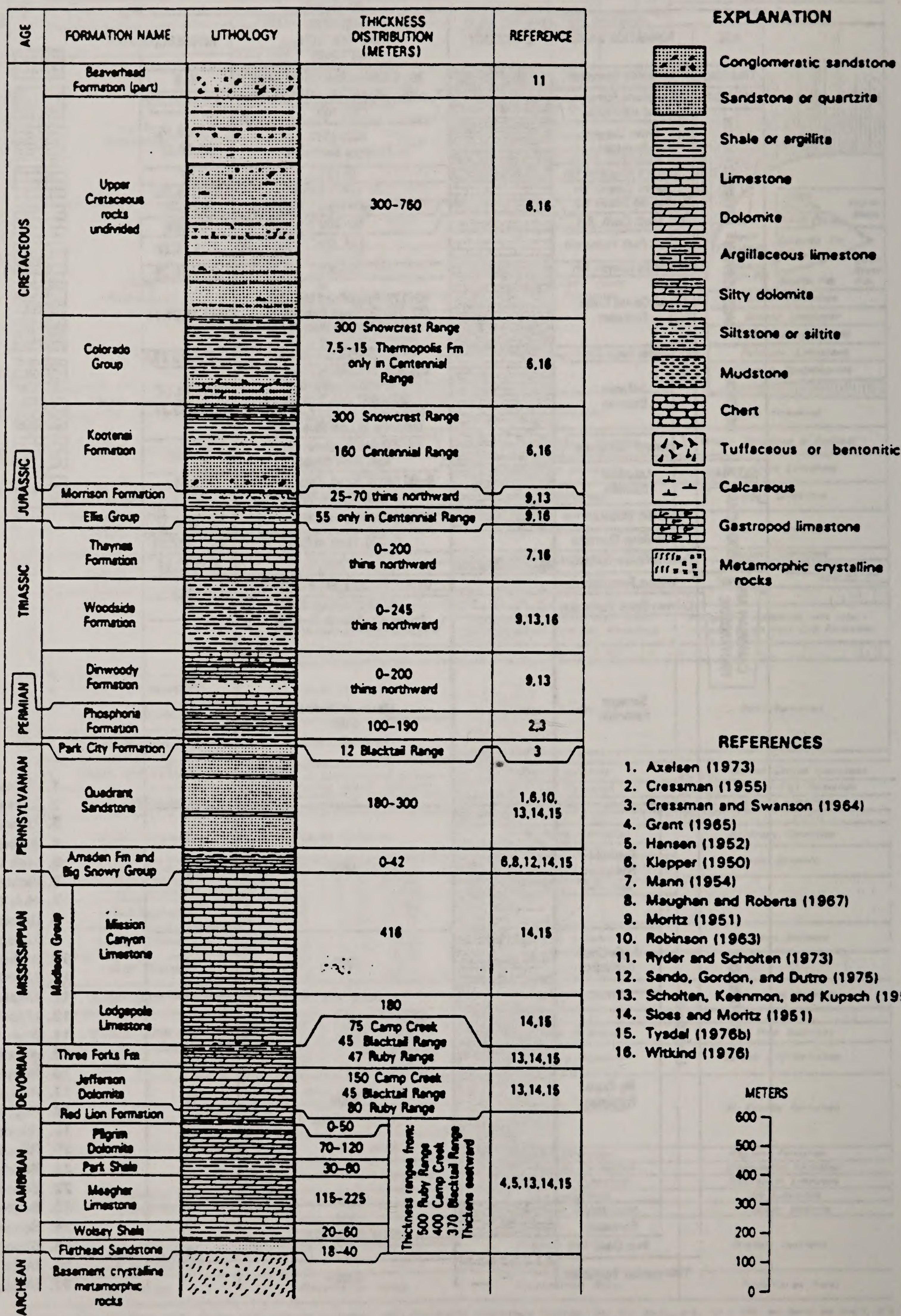


FIGURE 2.—Generalized stratigraphic column in southwest Montana, east of the thrust belt.

FIGURE 6
Stratigraphic Column for the Area Ea
of the Medicine Lodge Thrust Plate

OIL AND GAS EXPLORATION ON THE FOREST

Past Drilling Activity

There is currently no oil or gas exploration or production occurring in the State of Idaho. The overthrust belt of southeastern Idaho has seen a number of unsuccessful oil and gas wells drilled. The majority of these wells were drilled during four periods, 1925-30, 1950-56, 1963-66, and 1981-1988. The first well drilled in Idaho, as well as the overthrust belt portion of Idaho, was drilled northwest of Driggs in 1903. It was the first of eleven wells that would eventually be drilled in the same area on the west edge of Teton Valley. As with other areas in southeastern Idaho, prior to 1980, most of the wells drilled adjacent to the Forest were relatively shallow, with only one well penetrating over 10,000 feet. As can be seen in Table 1, 21 oil and gas tests have been drilled in or adjacent to the Targhee National Forest. This drilling can be divided into two general categories, that done in the Horseshoe Creek area northwest of Driggs, and the more recent deep drilling that has occurred since 1980.

Drilling activity in the Utah and Wyoming portions of the overthrust belt was limited until 1975 when the Pineview Field was discovered in northern Utah. A series of spectacular discoveries resulted in Utah and Wyoming between 1976 and 1984. All of the major discoveries were found in similar geologic settings related to asymmetric folds in the leading edges of major thrust plates. These deep structures are not directly related to surface structures, and were discovered primarily with the aid of new high-resolution seismic techniques.

The exploration that has been conducted within and adjacent to the Targhee National Forest since 1980 has targeted thrust belt structures similar to those found farther south in southeastern Wyoming and northern Utah. In that area, the producing fields consist of a reservoir unit juxtaposed (sitting side by side) against a subthrust source unit.

OIL AND GAS POTENTIAL

Petroleum Potential Factors

The petroleum resource appraisal of the Targhee is dependent on six major parameters that govern accumulation of hydrocarbons: 1) the presence of organic-rich, fine-grained rocks that are the source of hydrocarbons, 2) thermal maturation of the source rocks that allows the generation and expulsion of hydrocarbons, 3) porous reservoir rocks, 4) structural or stratigraphic traps such as folds, faults, or lensing of reservoir rocks, 5) tight, impermeable rocks over the traps that act as a seal to prevent the upward and lateral escape of hydrocarbons, and 6) the correct timing as to generation and migrations of hydrocarbons relative to the forming of the traps.

Table 1: Oil and Gas Drilling Activity On and Adjacent to the Targhee National Forest

Location Sec Twp Rge	Operator	Well Name	Total Depth	Date Completed
NESE 35 6N 44E	Fremont Oil and Gas	Breckenridge Ranch No. 1	660	1903
NENW 32 14N 36E	Monida Oil Company	Rose No. 1	1385	1926
NESE 32 5N 44E	Teton Valley Land and Leasing Co.	No. 1	269	1926
– 28 5N 44E	Teton Valley Land and Leasing Co.	No. 2	1325	1926
NWSE 28 5N 44E	Teton Valley Land and Leasing Co.	Bevans No. 3	1392	1926
– 28 5N 44E	Grand Teton Oil Co.	Dewey No. 1	950	1926
SWSE 33 5N 44E	Grand Teton Oil & Standard Exploration	Bevans No. 1	3304	1932
SESW 28 5N 44E	Phillips Petroleum Company	Horseshoe No. 1	12,720	1953
NESE 24 1N 44E	Edwin Allday	Government No. 1	5760	1966
SWNE 9 5N 45E	Cities Services Oil Co.	Hansen No. 1	8402	1974
NWNE 26 5N 44E	American Quasar of New Mexico	Cook No. 26-1	6565	1978
SWNW 34 5N 44E	Sunmark Exploration	Miner No. 1-34	3715	1978
NWNE 33 5N 44E	Supron Energy Corporation	Bevans No. 1	12,530	1980
SWNE 14 14N 35E	Exxon Corporation	Meyers Federal No. 1	Unknown	1981
SENW 16 12N 28E	Amoco Production Co.	Idaho State No. 1	6700	1981
NWSW 19 15N 27E	Amoco Production Co.	Milford Federal 19-1	9886	1983
SENW 25 12N 36E	Shell Western	22-25 Hagenbarth	13,460	1985
SWSE 4 2N 44E	The Anschutz Corp.	USA 0356 #15-4	11,707	1986
– 16 3N 45E	The Anschutz Corp.	Bagley Victor #15-16	13,694	1986
NENE 24 13N 34E	Shell Western	USA 1-24	15,285	1986
SWNW 20 2N 44E	The Anschutz Corp.	USA 0360 #5-20A	16,208	1988

Source Rocks

Table 2 lists the nine geologic formations that occur in the thrust belt that contain possible source rocks. These formations range in age from the Cretaceous Frontier Formation to the Ordovician Bighorn Dolomite. To date, most probable source rocks in the overthrust belt, for which documented and published data exist, are those of Cretaceous age (Frontier Formation, Aspen Shale, and Bear River Formation).

Table 2: Possible Source Rocks Beneath the Targhee National Forest

Geologic Age	Formation	Oil or Gas Source
Cretaceous	Frontier Formation	Oil
Cretaceous	Aspen Shale	Oil
Cretaceous	Bear River Formation	Oil & Gas
Jurassic	Twin Creek Limestone	Oil & Gas
Triassic	Thaynes Formation	Gas
Permian	Phosphoria Formation	Gas
Mississippian	Lodgepole Limestone	Gas
Devonian	Darby Formation	Gas
Ordovician	Bighorn Dolomite	Gas

Drilling conducted on the Targhee since 1985 has confirmed that the Aspen Shale, the Thaynes Formation, the Phosphoria Formation, the Darby Formation, and the Bighorn Dolomite underlie the Palisades area of the Forest.

The Thaynes Formation and the Lodgepole Limestone are thought to underlie the Targhee near the Montana border. The Phosphoria Formation is known to exist in the northern part of the Forest through recent drilling activity.

Reservoir Rocks

Table 3 lists the sixteen formations that contain reservoir rocks that produce oil or gas in anticlinal traps in the thrust belt. These formations represent eight different geologic systems, ranging in age from Cretaceous through Ordovician. Rocks in the Jurassic and Triassic Systems contain six reservoir formations that are productive of oil or gas, including the prolific Nugget Sandstone. Paleozoic rocks contain five productive reservoirs, ranging in age from the Permian Phosphoria Formation through the

Ordovician Bighorn Dolomite. These formations are the major gas and condensate (light, high gravity crude oil similar to natural gasoline) producers in the thrust belt.

Table 3: Possible Reservoir Rocks Beneath the Targhee National Forest

Geologic Age	Formation or Group	Oil or Gas
Cretaceous	Frontier Formation	Oil
Cretaceous	Aspen Shale	Oil
Cretaceous	Bear River Formation	Oil & Gas
Jurassic	Stump Formation	Oil
Jurassic	Pruess Sandstone	Oil & Gas
Jurassic	Twin Creek Limestone	Oil & Gas
Jurassic & Triassic	Nugget Sandstone	Oil & Gas
Triassic	Ankareh Formation	Oil & Gas
Triassic	Thaynes Formation	Gas
Triassic	Dinwoody Formation	Gas
Permian	Phosphoria Formation	Gas
Pennsylvanian	Weber Sandstone	Gas
Mississippian	Mission Canyon Ls.	Gas
Mississippian	Lodgepole Limestone	Gas
Devonian	Darby Formation	Gas
Ordovician	Bighorn Dolomite	Gas

Drilling conducted on the Targhee since 1985 confirms that the Aspen Shale, the Ankareh, Thaynes, Dinwoody, and Phosphoria Formations, the Weber Sandstone, the Mission Canyon Limestone, the Darby Formation, and the Bighorn Dolomite underlie the Palisades area of the Forest.

The Thaynes and Dinwoody Formations and the Mission Canyon and Lodgepole Limestones are thought to underlie the Targhee near the Montana border. The Phosphoria Formation is known to exist in the area through recent drilling.

Structures

As discussed earlier, a wedge of Paleozoic and Mesozoic sedimentary rocks was compressed from west to east into a zone about one-half of its original width, resulting in the thrust folds of the present Idaho-Wyoming-northern Utah thrust belt. Nearly all of the present oil and gas fields in the thrust belt have been trapped in asymmetric and overturned anticlinal folds in the hanging wall of the Absaroka thrust plate. Most of the folds have numerous, additional imbricate thrust faults included within their overall configuration. Vertical structural relief of the traps ranges from 500 to more that 4500 feet, and areal size ranges from about three to more than 50 miles. The greater the vertical relief and the area of the fold, the larger the amount of oil or gas it can trap.

Thermal Maturation

A factor used in determining the thermal maturation of source rocks is conodont biostratigraphy. Conodonts are the fossilized toothlike, phosphatic hard parts of enigmatic, soft-bodied organisms that lived in most marine environments during Paleozoic and Triassic times. Because of their mineralogic composition (carbonate apatite), lack of internal permeable canal structures such as fish teeth possess, and the imperviousness to most types of chemical alteration, they are generally preserved even in rocks that have been subjected to high-temperature metamorphism of hydrothermal solutions that destroyed other fossil remains. The only notable change that occurs in conodonts when they are subjected to increasing geothermal temperatures, most commonly caused by increasing depth of rock burial, is a series of progressive and irreversible color changes (Epstein, etal).

On the basis of color differences observed in the field and produced through high temperature experiments in the laboratory, Epstein, Epstein, and Harris (1977) proposed a scale of conodont color-alteration index (CAI) values, numbered 1 to 8, that readily tells the maximum temperatures to which rocks have been subjected. The observed conodont CAI values can then be related to the thermal maturation of the hydrocarbons contained in the rocks. CAI values of 1.5 to 3 indicate optimum maturation of hydrocarbons for oil or gas generation. CAI values above 4.5 to 5 indicate that the rocks have been subjected to temperatures which would cause a degradation or burning off of hydrocarbons that were contained in the rocks.

DELINEATION OF POTENTIAL AREAS

The following rating system has been used to determine the potential for occurrence and the certainty of occurrence for hydrocarbons within the Targhee National Forest. The rating system is based on the system presented in the Bureau of Land Management 3031 Manual. The rating system has the following two steps: 1) the delineation of areas based on the potential for the occurrence of oil or gas accumulations, and 2) the development of a certainty factor that these accumulations exist, based on the relative abundance and quality of data available.

Potential for Occurrence Ratings

High Potential-Geologic formations, including favorable source and reservoir rocks, and geologic structures favorable for the accumulation of hydrocarbons are known to exist.

Moderate Potential-Geologic formations, including favorable source or reservoir rocks, or geologic structures favorable for the accumulation of hydrocarbons are thought to exist.

Low Potential-Geologic formations, including favorable source or reservoir rocks, or geologic structures may or may not be present.

No Potential-Geologic formations, including source and reservoir rocks, and geologic structures favorable for hydrocarbon accumulation do not exist.

Certainty of Occurrence Ratings

C4-The available data provide abundant direct and indirect evidence to support or refute the possible existence of oil or gas resources.

C3-The available date provide direct evidence but are quantitatively minimal to support or refute the possible existence of oil or gas resources.

C2-The available date provide indirect evidence to support or refute the possible existence of oil or gas resources.

C1-The available data are insufficient and/or cannot be considered as direct or indirect evidence to support of refute the possible existence of oil or gas resources.

Based on all of the above factors, the following potentials have been developed for the Targhee National Forest (See Figure 7).

That portion of the Targhee National Forest north of Alpine, Wyoming and within the Palisades Ranger District east of the Snake River has high oil and gas potential because the area possesses geologic characteristics similar to producing areas in southwestern Wyoming and northern Utah. The Edwin Allday Government No. 1 well drilled south of Palisades Creek in 1966 encountered oil shows in porous and fractured Ordovician limestone in the interval between 1252 and 1375 feet. The Darby, St. Johns, and Absaroka thrust plates trend northwest beneath the area. Anschutz Corporation's

Mike Spencer Canyon well (USA 0356 #15-4) and the Grand Valley well (USA 0360 #5-20A) drilled through the St. Johns and Absaroka thrust plates. Cretaceous source rocks were found directly beneath the Absaroka thrust in the Mike Spencer Canyon well. Reservoir rocks that have produced hydrocarbons in southwestern Wyoming and northern Utah were also encountered in both wells. Geophysical work indicates that trapping structures are also present. According to Anschutz Corporation personnel, more drilling is needed to understand the geology and to find the correct sequence of source and reservoir rocks. In addition, favorable maturation histories are found throughout the area. The certainty of occurrence for this area is rated as C4.

The area of the Forest north of the Palisades on the west side of the Teton Valley, as well as that portion of the Forest south of Palisades Reservoir, have moderate oil and gas potential. Thrusting has occurred on the west side of Teton Valley, and a number of wells have been drilled. To date, however, most of these wells have been shallow tests. The highest potential in this area is for the discovery of reserves of methane gas associated with Cretaceous coal beds that underlie the area. Cretaceous rocks are known to underlie the Teton Valley and crop out on the west side of the valley in the northern part of the Snake Range. The Anschutz Corporation encountered methane gas in the Victor 15-16 well, however, hole problems prevented them from testing the quality or quantity of the gas. The certainty of occurrence for this area is rated as C3.

That portion of the Forest that is located south of Palisades Reservoir is also rated as having moderate potential. Several large anticlinal structures exist on the surface in this area, and potential source and reservoir rocks are known to outcrop in the area. However, the leading edges of thrust plates are not thought to underlie the area. There is, however, a lack of drill data in this area. The certainty of occurrence for this area is rated as C2.

That portion of the Forest along the Wyoming border from southeast of Driggs, Idaho to the Island Park area has no potential for oil and gas. The northern portion of this area is underlain by extrusive igneous rocks to considerable depth. Any sedimentary rocks that may lie at depth have probably been affected by the heat of the volcanic rocks and maturation levels would be high. The southern portion of this area consists of a relatively thin Paleozoic carbonate sequence underlain by extensive exposures of Precambrian metamorphic and igneous rocks which form the core of the Teton Range. The certainty that hydrocarbons do not exist in this portion of the Forest is rated as C3.

The remaining portions of the Targhee, from the Henry's Lake area west to that portion administered by the Salmon National Forest, has low potential. The northern portion of the Forest has an abundance of Mississippian and Devonian source rocks, however, Ordovician, Silurian, Devonian, Mississippian, and Pennsylvanian rocks in the are have consistent CAI values of 5, an indication of pervasive degradation of hydrocarbons. Drilling conducted by Shell Western in the Spencer area produced data to further understand the geologic structure of the area. The Federal drilling unit that the Hagenbarth well was a part of required the drilling of a well to test the Pennsylvanian age Quadrant Formation at an estimated drilling depth of 15,000 feet. Shell Western indicated that they expected a thin volcanic cap in the area overlying the sedimentary units. As the well was drilled, however, they were still in volcanics at 9765 feet, although they had drilled some unknown sedimentary units. The hole did penetrate the Phosphoria Formation and the Quadrant Sandstone. The Medicine Lodge thrust plate was drilled through at 12,900 feet, and the hole bottomed in unidentified Cretaceous sediments at 13,460 feet.

Shell Western's West Indian Creek well (USA 1-24) was spudded in the Beaverhead Conglomerate, which was 4860 feet thick at the location. The lithology in the remainder of the hole is uncertain, although it was thought that the Cretaceous age Kootenai Formation was drilled at 12,365 feet, the Permian age Phosphoria Formation was drilled at 14,170 feet, and the Pennsylvanian age Quadrant Sandstone was drilled at 14,418 feet. It is uncertain whether a thrust plate was encountered in the West Indian Creek well.

The certainty of oil or gas occurring in these low potential areas is rated at C2.

Oil and gas occurrence and potential reports prepared for the Dillon Resource Area Management Plan/EIS in Montana in 1990 rated the area immediately north of the Idaho-Montana border adjacent to the Targhee National Forest as having low development potential.

The Environmental Assessment for Oil and Gas Leasing on Lands Administered by the Bureau of Land Management's Pocatello and Medicine Lodge Resource Areas, and Cooperating Caribou National Forest prepared in 1988 rated the northern portion of the Targhee National Forest as having moderate potential. This potential was based on the data that was available at that time and the exploratory drilling that was ongoing. The interpretations of the completed drill data and the review of other recently published data has led to the reduction in the potential of this area from medium to low.

TARGHEE NATIONAL FOREST

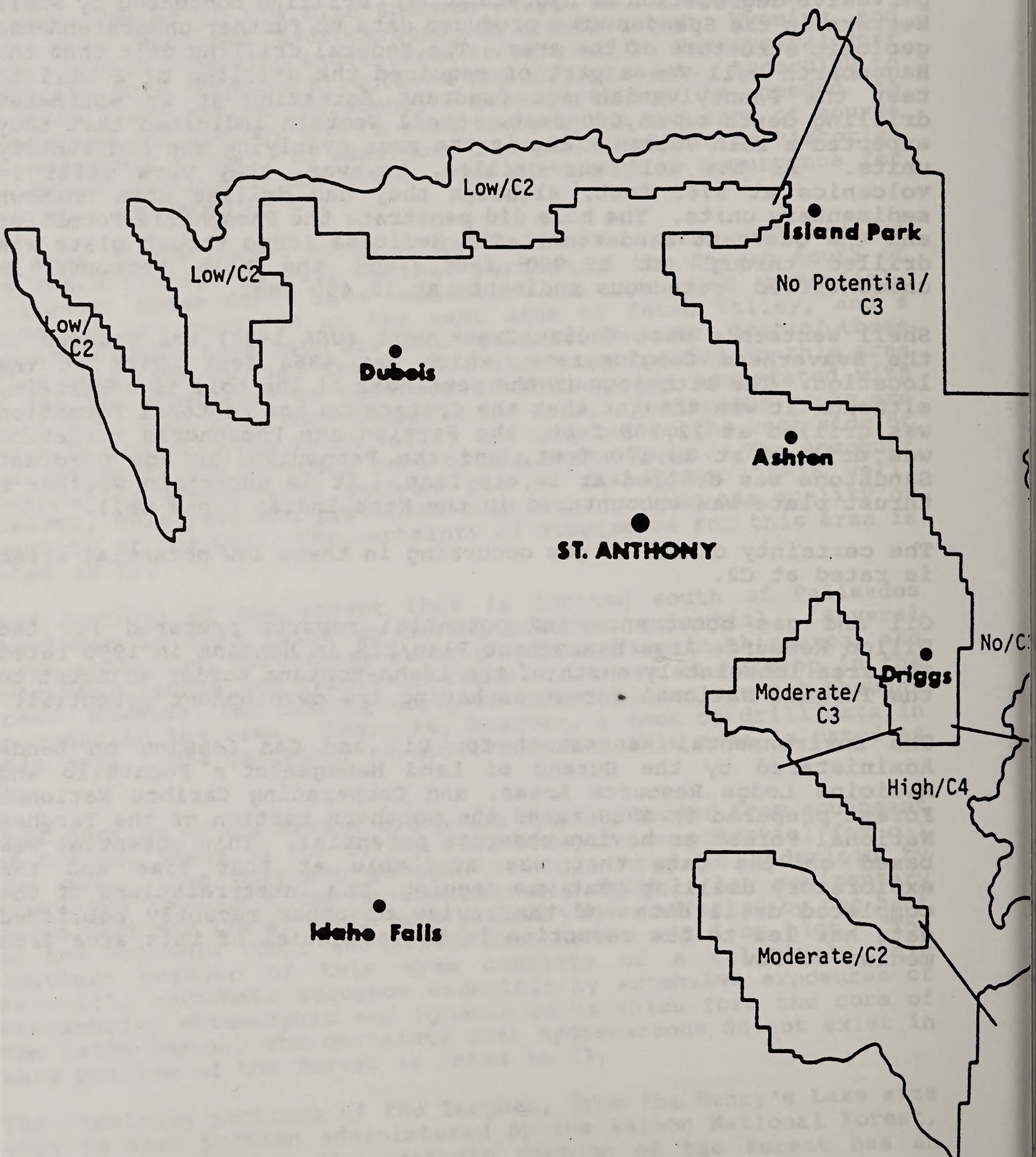


FIGURE 7
Oil and Gas Potential and Certainty
Ratings for the Targhee National Forest

REASONABLE FORESEEABLE DEVELOPMENT SCENARIO

Prepared for the

TARGHEE NATIONAL FOREST

Prepared by: Charles Horsburgh, District Geologist

Prepared By: Charles A. Horsburgh Date: 2-3-92

Bureau of Land Management, Idaho Falls District

February 1992

INTRODUCTION

The update of the Targhee National Forest Land and Resource Management Plan requires the development of a Reasonable Foreseeable Development Scenario for oil and gas activities that are anticipated to occur on the Forest. The scenario is based on the oil and gas potential of lands within the Forest as well as a forecast of the level and extent of industry interest in the area over the life of the Forest Plan. The projections contained in this report are for the 15-year period from 1992-2007.

This report was prepared under the guidance provided in a Memorandum of Understanding between the Targhee National Forest and the Idaho Falls District of the Bureau of Land Management. It is prepared in conjunction with the oil and gas potential report for the Targhee that precedes this report.

HISTORICAL DRILLING AND LEASING DATA

Table 1 contained in the Oil and Gas Potential Report for the Targhee National Forest lists twenty-one wells that have been drilled within or adjacent to the Forest. These wells can be grouped into three areas of the Forest: 1) those wells drilled in T. 5 N., R.44 E. to test structures along the boundary of the Forest, 2) those wells drilled in the northern portion of the Forest to test structures of the Medicine Lodge thrust system, and 3) those recent wells that have been drilled in the Palisades area to test structures in the Idaho-Wyoming-northern Utah segment of the overthrust belt.

By far, the wells with the greatest potential were those recent wells that have been drilled in the Palisades area of the Forest. A surge in leasing interest occurred on Federal lands in southeastern Idaho as well as throughout the western United States as a result of the oil embargo in the early 1970's and the resulting increase in the price of crude oil. In an attempt to increase domestic production, the oil and gas industry leased as much Federal land as was available, including the majority of lands within the Targhee National Forest. Oil and gas lease applications were even received for the Island Park area, an area with no potential for oil or gas. At the time, the leases were issued non-competitively under the Bureau of Land Management's (BLM) lottery system. During the same period, major discoveries of oil and gas were occurring in southwestern Wyoming and northern Utah in geologic structures identical to those found in the Palisades area of the Forest. The continued interest in the Palisades area resulted in four drilling permits being issued to the Anschutz Corporation. Two wells were drilled on the Targhee National Forest, one well was drilled on private lands south of Victor, Idaho, and one well, the Moose Gulch Well, was drilled in Wyoming immediately east of the Idaho border. At the same time, Gulf Oil Exploration and Production proposed a well in the head of the Rainy

Creek drainage. During the permitting process for the Gulf well, Gulf Oil was purchased by Chevron Oil, and all of Gulf's wildcat drilling proposals were put on hold in favor of infield development that was a higher priority to Chevron. As a result, the Gulf well was never drilled.

During the same time period, Shell Western Exploration and Production proposed and drilled a hole at Spencer, Idaho, immediately south of the Targhee National Forest boundary. They also drilled the West Indian Creek Well in the northern portion of the Forest near the Montana border. Both wells were located to test the leading edge structures in the Medicine Lodge thrust system.

Because of the costs and risks associated with drilling wildcat wells in untested areas such as Idaho, it was necessary for the owners of the leases to combine their leases into Federal units. The purpose of establishing these leasing units is to combine leased acreage into developable tracts, and to allow a combination of lessees to share the costs of drilling the wells that were required to be drilled under the terms of the unit agreement. The establishment of units, in affect, combines a series of individual smaller oil and gas leases into one large lease.

At the time the above mentioned wells were being drilled in 1986 through 1988, the price of oil began to decline dramatically. As a result of the high costs of drilling the wells and the continuing drop in the price of oil, the interest in the Targhee National Forest and southeastern Idaho has declined.

The Federal Onshore Oil and Gas Leasing Reform Act of 1987 now requires that BLM issue oil and gas leases on a competitive basis rather than the non-competitive basis that the leases were previously issued under. The 1987 Reform Act also gave specific statutory authority to the Forest Service for approving surface operations within the Forest. The Forest Service regulations implementing their authority were not finalized until 1990. The Forest Service had taken the position that no lease tracts within the Targhee National Forest would be made available for the competitive lease sales until the Forest Service regulations were finalized and additional environmental analysis was completed to comply with the National Environmental Policy Act (NEPA), which included the development of Reasonable Foreseeable Development Scenarios. As a result, no oil and gas leases have been issued on the Targhee since 1986. As of this date, thirteen non-competitive leases covering 27,890 acres are still in effect within the Targhee National Forest. These leases are in the Palisades area and along the Montana Border.

In 1988, the Idaho Falls District of the Bureau of Land Management prepared an Environmental Assessment (EA) which updated the Resource Management Plans (RMPs) for the Medicine Lodge and

Pocatello Resource areas as it related to oil and gas. The EA analyzed the adequacy of the stipulations that were to be attached to the oil and gas leases issued under the RMPs, and contained a Reasonable Foreseeable Development Scenario for lands within the Resource Areas. Lands within the Caribou National Forest were also covered in the EA, and the Reasonable Foreseeable Development Scenario included lands within the Caribou National Forest. Since completion of the EA in December of 1988, lands within the two BLM Resource Areas have been made available for leasing on quarterly lease sales held by the BLM. To date, no leases have been bid upon, and no competitive oil and gas leases have been issued for BLM lands in Idaho. No lands within the Caribou National Forest have been placed on the competitive lease sales because the Caribou National Forest has not completed and signed the Finding of No Significant Impact (FONSI) which is required to allow leasing on that Forest.

OIL AND GAS POTENTIAL

The oil and gas potential report that has been prepared for the Targhee National Forest concluded that the Palisades portion of the Forest has high potential for the discovery and development of oil or gas resources. The lands within the Forest west of Teton Valley and south of Palisades Reservoir have moderate potential, the lands in the western part of the Forest and those lands along the Montana border have low potential, and the remaining lands along the Wyoming border and those lands in the Island Park area have no potential for the discovery of oil or gas (See Figure 7).

PROJECTED FUTURE INTEREST IN THE TARGHEE NATIONAL FOREST

The projected activity level for oil and gas leasing and development within the Targhee National Forest over the next fifteen years is dependent on a number of factors. The first, and perhaps the most important factor, will be the availability of lands within the National Forest for leasing. Within the next 15 years, it seems certain that a wilderness bill for Forest Service lands within the state of Idaho will pass the Congress. As a result, the non-wilderness lands and those lands in further planning areas which are not made wilderness will be returned to multiple use management and industry will know which lands are available for leasing and under what conditions leases will be issued.

The Energy Information Administration projects that U.S. demand for petroleum products is expected to grow at an average rate of between 0.4 and 1.6 percent per year. Oil consumption is expected to rise between now and 2010 to meet the needs of the economic growth in the United States, however it's share of the total energy consumed is expected to continue to decline. Consumption of natural gas, on the other hand, is expected to show substantial increases, growing at annual rates of 0.5 to 0.8 percent.

Over the same period, U.S. oil production is expected to decline at an average rate of 2.6 percent per year, to a level of 4.4 million barrels by the year 2010. This decline is based on the fact that the production of Alaskan oil peaked in 1989, and has now begun to decline. In addition, environmental restrictions that affect leasing of offshore regions of the United States imposed by the Congress in 1990, will remain in affect until the year 2000. During the same time, petroleum imports of crude oil are forecast to increase from 7.2 million barrels per day in 1989 to between 10.8 and 17.7 million barrels per day in 2010. Imports would then account for between 57 and 74 percent of the U.S. petroleum demand. This contrasts with a 1989 import dependence level of 42 percent.

For the foreseeable future, domestic gas supplies are projected to be adequate to satisfy most domestic consumption requirements. The average wellhead price of natural gas is expected to remain fairly level throughout much of the 1990's, given the relative abundance of gas that is available. The stable gas prices projected for the rest of the decade are low in relation to oil prices, which will lead to correspondingly higher production of natural gas. Production in the Lower 48 States is projected to peak after 2000, with maximum production from the lower 48 States occurring between 2001 and 2005. Gas from foreign sources, mainly Canada, will become increasingly important, and by the year 2010, net imports may supply as much as 15 percent of the domestic consumption.

Given all of the above factors, it is probable that the petroleum industry will be reevaluating high and moderate potential areas on Federal lands throughout the western United States to find additional reserves of petroleum products. Industry representatives who have conducted past drilling operations in Idaho have stated that oil prices would have to remain above $30 per barrel to encourage industry to spend additional exploration dollars in Idaho.

In recent years, the number of wells drilled to recover methane gas from coal beds has increased dramatically in the western United States. Most of the coal producing sedimentary basins in the west have or are being evaluated for their methane production potential. The Teton Valley in eastern Idaho is underlain by many thousands of feet of Cretaceous age rocks which contain numerous coal beds. The coal beds crop out on the west side of Teton Valley within the Targhee National Forest. Anschutz Corporation's Victor Bagely Well encountered methane gas, however hole problems did not allow them to test the potential of the gas. The depth that the gas was encountered in the well is deeper than in those areas where methane gas is now being produced. As a result, those areas of the Forest west of Teton Valley that are known to be underlain by Cretaceous rocks have been assigned a moderate potential because of their methane gas potential, and are expected to receive industry interest in the future.

PROJECTED INDUSTRY ACTIVITY LEVEL

The following assumptions and scenarios are presented so a meaningful and reasoned analysis of the cumulative impacts resulting from future oil and gas activity on the Targhee National Forest over the next fifteen years can be conducted. The assumptions and scenarios are based on historical drilling activity within and adjacent to the Forest as well as the oil and gas potential of lands in the Forest.

Exploration and Development Assumptions

Geophysical exploration conducted prior to drilling operations will be conducted with helicopter support because of the steepness and inaccessibility of the terrain. As a result, there will be negligible surface disturbance associated with this activity.

Wildcat wells encountering limited reserves of oil or gas will not be economically producible.

Sour gas (H_2S) discoveries with sufficient reserves to warrant the investment in a sweetening plant will not be found within the Forest over the next 15 years.

Future exploratory drilling within the Forest will most likely be conducted in the high potential areas, although individual wildcat wells may be drilled in the moderate or low potential areas.

Future discoveries within the Targhee National Forest will probably involve fields that produce both oil and gas.

Ten exploratory wells will be drilled in the next 15 years in the Targhee National Forest. Seven of these wells will be drilled in the Palisades area. Two additional wells will be drilled on the west side of Teton Valley or south of Palisades Reservoir, and an additional well will be drilled in the northern part of the Forest.

The average disturbance for each well pad will be 4 acres.

The average road construction required to access each well will be 6 miles and will disturb 29.1 acres (4.85 acres per mile).

Exploratory drilling operations for a wildcat well will take from 10 to 18 months. A non-producing wildcat well would be reclaimed within three years.

Total acreage temporarily disturbed by exploration drilling operations within the Forest would be 331 acres.

One of the exploratory wells drilled in the high potential area of the Forest will encounter hydrocarbons in sufficient quantities to warrant field development.

Based on this discovery, a six well field would be developed, disturbing an additional 77.4 acres. The field would produce 500 to 700 barrels of oil per day and 2,000 mcf (mcf=1000 cubic feet) of gas per day.

Oil production would be piped to a central facility and then trucked from that facility to refineries in northern Utah. Produced gas would be transported off Forest via pipeline.

Exploratory and development wells would continue to have all service operations (cementing, logging, bits, testing, etc.) provided by established service organizations in Wyoming. The major economic benefit to local economies from drilling and development operations would continue to be local purchases such as fuel and paid wages.

Summary of Exploration and Development Scenarios

Exploration Scenario

-10 wells drilled on the Forest over the next 15 years
-Average disturbance per well pad-4 acres
-Access roads to the pads
    -18 to 20 foot running surface with gravel
    -With ditches and cut and fill, total disturbance-40 feet
    -Average length of road to each well site-6 miles
    -Total acreage disturbed by roads per well-29.1 acres
-Total disturbance per well-33.1 acres
-Total disturbance on the Forest from exploration drilling-331 acres

Development Scenario

-Assumption-Size of the field-960 acres
-Assumption-160 acre well spacing
-Total projected production wells-6 (one being the original discovery well)
-Disturbance for each well pad and road-4 acres per pad and one mile of new road to each new well (8.85 acres for wells 2 through 6 plus 33.1 acres for the original well-77.35 acres)

-Disturbance for pipelines from 6 wells to a central tank battery for oil collection-30 acres
-Disturbance for centrally located tank battery-8 acres
-Disturbance for gas pipelines from wells to Forest boundary-20 acres
-Total disturbance for field development-135.35 acres

REFERENCES

Armstrong, R. L., and S. S. Oriel, 1965, Tectonic Development of the Idaho-Wyoming Thrust Belt: American Association of Petroleum Geologists Bulletin, V. 19, pp. 1847-1866.

Blackstone, D. L., Jr., 1980, Tectonic Map of the Overthrust Belt, Wyoming, southeastern Idaho, and northeastern Utah, showing current oil and gas drilling and development: Wyoming Geological Survey Map 8A, 3rd edition.

Epstein, A. G., Epstein, J. B., and Harris, L. D., 1977, Conodont color alteration-an index to organic metamorphism: U. S. Geological Survey Professional Paper 995.

Leeman, W. P., 1982, Development of the Snake River Plain Yellowstone Plateau Province, Idaho and Wyoming: Cenozoic Geology of Idaho, Idaho Bureau of Mines and Geology Bulletin 26.

Mitchell, V. E., and Bennett, E. A., 1979, Geologic Map of the Driggs and Ashton Quadrangles, Idaho: Idaho Geological Survey, 1 x 2 degree map series.

Powers, R. B., 1983, Petroleum Potential of Wilderness Lands in Wyoming-Utah-Idaho Thrust Belt: U. S. Geological Survey Circular 902-N.

Ruppel, E. T., and Lopez, D. A., 1984, The Thrust Belt in Southwestern Montana and East-Central Idaho: U.S. Geological Survey Professional Paper 1278.

Sandberg, C. A., 1983, Petroleum Potential of Wilderness Lands in Idaho: U. S. Geological Survey Circular 902-F.

Spencer C. W., 1983, Petroleum Potential of Wilderness Lands in Wyoming: U. S. Geological Survey Circular 902-M.

U. S. Department of Energy, Energy Information Administration, 1991, Annual Energy Outlook 1991, With Projections to 2010: DOE/EIA 0383(91).

U. S. Department of the Interior, BLM, Idaho Falls District, 1988, Environmental Assessment and Decision Document for Oil and Gas Leasing on Lands Administered by the Bureau of Land Management's Pocatello and Medicine Lodge Resource Areas, and Cooperating Caribou National Forest: Bureau of Land Management EA # Id-030-9-12.

U. S. Department of Interior, BLM, 1990, Narrative and Maps for the Dubois Quadrangle, Dillon Resource Area Management Plan/EIS: Bureau of Land Management Internal Documents, Dillon Resource Area, Montana.

Ver Ploeg, A. J., and De Bruin, R. H., 1982, The Search for Oil and Gas in the Idaho-Wyoming-Utah Salient of the Overthrust Belt: The Geological Survey of Wyoming, Report of Investigations No. 21.

Appendix B

Lease Decision Issuing Process

In many places in the United States, National Forests lie over geological formations that 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.

Lease

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 by the Mineral Leasing Act for Acquired Lands of 1947, unless the lands have been specifically withdrawn by the Department of the Interior. 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 United States citizens, may hold interest in leases, but only through ownership of stock in United States corporations that hold leases. However, aliens may not hold interest in Federal oil and gas leases through units in publicly-traded, limited partnerships.

The issuance of a lease grants to the lessee the exclusive 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 oil and gas (except helium) in the leasehold subject to

- stipulations attached to the lease;
- restrictions deriving from specific, non-discretionary 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 or facilities, timing of operations, and specifications of interim and final reclamation measures. At a minimum, measures will be deemed consistent with the lease rights granted if 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 greater than 60 days in a lease year (43 CFR 3102.1-2).

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 of 1987 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 and 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 10x10 acres in all states.

Competitive Leases

The Bureau of Land Management (BLM) conducts oral auctions for oil and gas leases on at least a quarterly basis, when parcels of land there are available. A Notice of Competitive Lease Sale lists lease parcels to be offered at an 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 that have expired, and leases that have been terminated, canceled, or relinquished;

2. parcels identified by informal expressions of interest from either the public or BLM for management reasons; and

3. lands included in offers filed for noncompetitive leases (effective 3 January 1989).

On the day of the auction, successful bidders must submit a properly executed lease bid form and make a payment consisting of an administrative fee ($75 per parcel), 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 ten working days of the auction. The bid form constitutes the legally binding lease offer.

Noncompetitive Leases

Noncompetitive leases may be issued only for parcels that 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 filing of noncompetitive offers 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 is determined by drawings open to the public.

Lease Restrictions

A lease does not convey an unlimited right to explore for 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 before any sale and must be applied at the time of Application for Permit to Drill (APD).

Standard Lease Terms

The Standard Lease Terms are contained in Form 3100-11, Offer to Lease and Lease for Oil and Gas, United States Department of the Interior, BLM, June 1988 or later addition (see Appendix D). 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 way 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. Surface-disturbing operations that 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 operation, 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.I-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 the 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 attached to the lease (43 CFR 3101.I-2 through 3101.I-4). Additional special stipulations can be developed specifically to meet resource concerns that cannot be mitigated by existing stipulations. All stipulations that may be applied when implementing the Forest Supervisor's decisions are detailed in Appendix D.

Federal Oil and Gas Leasing Process

Prior to the 1987 Leasing Reform Act

The Secretary of the Interior, through the BLM, 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 of 1920 and the Mineral Leasing Act for Acquired Lands of 7 August 1947 (USC 351-359), provide for oil and gas leases on mineral deposits of coal, phosphate, oil, oil shale, gas, sodium, potassium, and sulphur that are owned or may be acquired by the United States and that are within the lands acquired by the United States National Grasslands were authorized by the Bankhead-Jones Farm Tenant Act.

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 BLM. 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 refer to this as the "Leasing Reform Act" throughout this document.) The leasing Reform Act makes leasing on public domain lands very similar to that of acquired lands. The Forest Service could deny consent on public domain and 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 (SUPO) before 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 company 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 and then must approve or disapprove a detailed SUPO at the time of an APD. 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 also is based on an environmental analysis in accord with NEPA, which is specific to the proposed plan of operation.

The Regulations Implementing the Reform Act

The Leasing Reform Act modified the authorities of the Secretaries of the 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 21 March 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 that describe 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 about 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 and 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 reasonably 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] will promptly notify the BLM as to the Area or Forest-wide leasing decisions made, that is, identify lands that have been found administratively available for leasing.

(e) Leasing Decisions for Specific Lands

When specific lands are being considered for leasing, the Forest Supervisor will review the area or Forest-wide leasing decision and will 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."

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, with the second step, the Leasing Specific Lands Decision. Both decisions will be documented in a single Record of Decision. Once these decisions have been made and provided to the BLM, the BLM and Forest Service coordinate to delineate specific lease parcels. Any pre-sale offers submitted by industry will be considered during the delineation of the parcels. 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 APD. That proposal will be analyzed through the Federal environmental process and documented in the appropriate NEPA document before approval, modification, or denial. If the proposal is approved ground-disturbing activities will occur, if not approved the lessee may make another proposal.

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.

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 (only about 15 percent of exploratory wells drilled in the United States result in a paying discovery of oil or gas).

Consequently, companies or individuals pursing oil and gas must be able to plan in advance to most efficiently use 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.

However, those purchasing leases 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. This demonstrates a major distinction between oil and gas leasing and other activities authorized by the Forest Service. Most activities are reasonably certain to proceed to development after the permit or contract is issued. Although great uncertainty exists at the time of lease authorization about 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 based on experience.

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 frame work 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, and (4) analysis of field development if production is established. 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 NEPA. Each decision is appealable to the responsible Federal agency.

The United States 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 that involved another NEPA process and decision by the Government before environmental effects would be experienced. This is very similar to the situation involved here.

Stage One — Lands Available for Leasing

The decision regarding lands available for leasing is based on disclosure and analysis provided in a "Leasing Analysis." 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 was prepared to satisfy the requirements of NEPA and to ensure the leasing analysis is completed and the decision described in 36 CFR 228.102(d) is made.

The decision will identify which, if any, lands will be available for leasing. The Forest Plans will be amended, if necessary, at the same time so that the decisions made based on this EIS will be consistent with the Forest Plans.

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 BLM:

- ➢ verifying that oil and gas leasing on the specific lands has been adequately addressed in a NEPA document, and is consistent with the Forest Plans,
- ➢ ensuring that conditions of surface occupancy identified in section 228.102(c)(1) are properly included as stipulations in resulting leases, and
- ➢ determining that operations and development could be allowed somewhere on each proposed lease, except where stipulations would prohibit all surface occupancy.

Stage Three — Application for Permit to Drill

This document, and its Record of Decision, do not authorize any ground-disturbing activities. After a lease award, the activities will be proposed through an APD and SUPO submitted to the Forest Service for approval. The Forest Service will analyze environmental effects of the proposed operations and issue a decision document. The Forest Service decision to approve or not approve the SUPO is forwarded to the BLM for incorporation into their decision of whether or not to approve the APD.

If modification or changes in the APD are needed, based on drilling conditions encountered or some other unforeseen circumstance, the operator submits a Sundry Notice to the BLM for review and approval. If the change involves surfaced disturbance or potential effects on surface resources, a copy is forwarded to the Forest Service for approval or comment. Depending on the extent and nature of the change additional NEPA analysis may be necessary.

Stage Four — Field Development Plan

If economically-recoverable quantities of oil and gas resources are found through exploratory drilling, industry may submit a field development plan after evaluation of the discovery well and available geologic information. The Forest Service in cooperation with the BLM would analyze the environmental effects associated with the proposed field development and identify reasonable and necessary mitigation measures. Specific well sites and access routes may not be known at the time the field development plan is analyzed, in which case, additional NEPA analysis tiered to the field development plan may be necessary once a specific well is proposed.

Impacts of a Lease

The authorization of a lease grants rights to explore for and develop oil and gas within the terms and stipulations of the lease. The exercise of these rights results in environmental effects. The regulations direct the forest service to consider the subsequent actions that would be authorized by a lease, and their potential environmentally disturbing effects, as connected actions. This includes all activities described earlier in this appendix. These actions also meet the definition of connected actions in the procedural requirements for NEPA (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.

proposed operation and issue a decision document. The Forest Service decision to approve or not approve the SUPO is forwarded to the BLM for incorporation into their decision to approve or not to approve the APD.

If modifications or changes to the APD are needed because drilling conditions are different or some other unforeseen circumstances, the operator submits a Sundry Notice to the BLM for review and approval. If the change involves a new surface disturbance, or potential effects on surface resources, a copy is forwarded to the Forest Service for approval or comment. Depending on the extent and nature of the change additional NEPA analysis may be necessary.

Stage Four — Field Development Plan

If economically recoverable quantities of oil and gas are found through exploratory drilling, including [illegible] substantial field development may occur after evaluation of the discovery well and available geologic information. The Forest Service in cooperation with the BLM would analyze the environmental effects associated with the proposed field development and identify reasonable and necessary mitigation measures. Specific well sites and access routes may not be known at the time the field development plan is analyzed, in which case, additional NEPA analysis tiered to the field development plan may be necessary once site specific detail is proposed.

Impacts of a Lease

The authorization of a lease grants rights to explore for and develop oil and gas within the terms and stipulations of the lease. The exercise of these rights results in environmental effects. The regulations enable the Forest Service to analyze the subsequent actions that would be authorized by a lease, and their potential environmental consequences, as the lease is issued. This includes all activities described earlier in this appendix. These actions also meet the definition of connected actions in the procedural requirements for NEPA (40 CFR 1508).

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.

Appendix C

Oil and Gas Exploration, Development, and Production

Oil and Gas Exploration, Development, and Production

Once an oil and gas lease is issued, the lessee or his designated operator may enter the leasehold to conduct oil and gas operations unless otherwise limited by special stipulations. The following depicts what can be expected to occur when oil and gas are discovered and a lease is developed. For the purpose of this analysis, it is assumed that this scenario will be followed. It also is assumed that the technology of oil and gas exploration and development will not change significantly during the life of this document. This section is an integral part of the assumptions made in Chapter 2.

Successful oil and gas exploration and development generally progresses through five basic operational phases. These include (1) preliminary investigation (including geophysical exploration), (2) exploratory drilling, (3) development, (4) production, and (5) abandonment. Several operational phases can occur in the same area at the same time. One company may drill an exploratory well on a lease, while nearby, another company conducts preliminary investigations. However, if only one company is conducting operations in an area, normally only one phase of the operation will take place at a time. A lapse of several weeks or months also may occur between the exploratory drilling and development phases. The development and production phases may occur simultaneously, especially if a large field has been discovered. On an average, only 15 percent of the wildcat (exploratory) wells drilled in the United States are successful.

It may take several years to determine whether an exploratory well is a financial success. If it is, the operations progress through the three remaining phases over a timespan ranging up to 50 years.

The lapsed time between the production and abandonment phases of a field may be 15 to 20 years. If geophysical exploration and/or exploratory drilling are unsuccessful in the discovery of a commercial deposit of oil and gas, operations are terminated and abandonment is initiated. The operation also may go directly from development to abandonment if one or more of the development wells is unsuccessful.

Preliminary Investigations (Phase 1)

Indications of the presence of oil and gas can be obtained by exploration methods such as remote sensing and mapping rock outcrops and seeps. In many cases, indirect methods, such as seismic, gravity, and magnetic surveys are used delineate subsurface features that may contain oil and gas.

Permitting Process

Geophysical exploration (seismic reflection surveys) on National Forest System lands is authorized under a prospecting permit issued by the Forest Service. However, geophysical operations within the leasehold may be conducted by the lessee under the terms of the oil and gas lease without Forest Service prospecting permit. Proposals for geophysical operations on and off an oil and gas lease are examined by the Forest Service prior to being approved or authorized. However, most casual-use investigation methods, such as geological, gravity, geomagnetic, and geochemical surveys, do not require a permit since no surface disturbance occurs and only a "casual" presence on the land surface is required to conduct the operations.

In order to secure a permit for operations on National Forest System lands, the geophysical operator is required to file, in person or by mail, an application for a prospecting permit. The application must describe the proposed activities in detail and include a map showing access routes and location of exploration activities. Upon receipt of the application, the Forest Service reviews the proposed activities to determine the stipulations necessary to protect surface uses and resources. After the Forest Service reviews the application, a permit is prepared. It indicates stipulations, fee to be paid (if applicable), and amount of bond required. The operator must sign and return the permit with fee and bond required prior to receiving a permit. A permit is not required for casual-use investigations.

The operator must receive approval of a prospecting permit prior to initiating operations outside a lease. The operator also must notify the Forest Service of scheduled entry onto the land, comply with all stipulations, and receive prior approval of any changes in the original plans. A pre-work conference and a cultural resources survey may be required prior to undertaking surface disturbing activities. Compliance inspections are conducted by the Forest Service during exploration operations to ensure compliance with the permit and to prevent unnecessary damage to surface resources.

The geophysical operator is required to notify the Forest Service when operations are completed. The Forest Service conducts a final inspection prior to approval of the permit's termination and release of the bond.

Geologic and Remote Investigations (Surveys)

Geologic investigation begins with a review of geologic and technical data available for the area of interest. If the data indicate a potential for oil and gas, information for specific areas or trends are evaluated. If the area does not have a history of production and no previous wildcat wells have been drilled, an extensive geophysical exploration program covering a large area may be undertaken to collect the subsurface data needed to evaluate the oil and gas producing potential.

Remote investigations may be conducted either from the air or on the ground. These are preliminary investigations that involve only casual use and no permits are required. However, the investigators must comply with the Forest Service's rules and regulations. The oil and gas lease does not grant an exclusive right to conduct remote investigations and geophysical exploration. These activities may be conducted before, or after, leasing by either the lessee or other parties. These investigations may result in an expression of interest to lease specific areas.

Geological Surveys

Geological surveys normally are casual and non-intrusive. Rock outcrops and topography are examined to determine the structural attitude and age of surface formations. Surficial geology maps are then prepared. In some areas, sufficient information may be obtained to enable the geologist to recommend a drilling location without conducting additional exploration.

Geochemical and Soil-gas Surveys

Geochemical and soil-gas surveys involve casual use of the land. In geochemical surveys, the chemical contents of water, soil, or vegetative samples are analyzed for the minute presence of oil or gas.

Gravity Surveys

Gravitational prospecting is a casual use to detect micro variations in gravity caused by the differences in the density of various rock types. A small portable device called a gravimeter is used and can be carried by an individual. There is little surface disturbance associated with gravity prospecting other than that caused by off-road vehicle (ORV) use to transport equipment.

Geomagnetic Surveys

Magnetic prospecting is used to a limited extent in oil and gas exploration. In this type of prospecting, an instrument called a magnetometer is used to detect small magnetic anomalies in the earth's crust. Most magnetic surveys are conducted from the air by suspending a magnetometer under an airplane. This is a casual use because it causes no surface disturbance.

Seismic Reflection Surveys (Geophysical Exploration)

Seismic prospecting is the most common indirect method used for locating subsurface structures that may contain oil and gas. Shock waves are induced into the earth using one of several methods. These waves travel downward and outward encountering various rock strata, each having a different seismic velocity. Sensing devices called geophones are placed on the surface to detect these reflections. The geophones are connected to a recorder that stores the data. The time required for shock waves to travel from the seismic source down to a given reflector (a change in rock strata) and back to the geophone can be correlated with the depth of the reflector.

At present, vibriosis and drilling/explosive are the two most commonly used geophysical exploration methods.

Vibriosis Surveys

The thumper and vibrator methods pound or vibrate the earth to create the shock wave. Usually four large trucks, each equipped with vibrator pads (about four feet square), are used. The pads are lowered to the ground and vibrators on all trucks are turned on simultaneously. Information is recorded, the trucks are moved forward a short distance, and the process is repeated. Except where an access trail needs to be constructed or cross-country travel is necessary, surface disturbance is usually minimal since little surface area or disturbance is required to operate the equipment at each test site.

Drilling/Explosives

The drilling method uses truck-mounted equipment to drill small-diameter holes to depths of 100 to 200 feet. Four to twelve holes are drilled per mile of line. Usually, a 50-pound charge of explosives is placed in the hole, covered, and detonated. The explosion sends energy waves that are reflected back to the surface from subsurface rock layers. The holes are drilled along a line that can be several miles long. In rugged topography, inaccessible to wheeled vehicles, a portable drill may be transported by helicopter. A typical seismic-drilling operation may use 10 to 15 men operating five to seven trucks. Under normal conditions, three to five miles of line can be surveyed each day using the explosive method. The vehicles used for a drilling program include several heavy truck-mounted drill rigs, water trucks, a computer recording truck, and several light pickups for the surveyors, shot-hole crew, geophone crew, permit man, and party chief. Public roads and existing private roads and trails are used. Off-road, cross-country travel is also necessary. Motor graders and/or dozers may be required to provide access to remote areas. Several trips a day are made along a seismograph line, which usually establishes a well defined two-track trail. Drilling water, when needed, is usually obtained locally.

On the Targhee National Forest, the seismic exploration would use heliportable methods. Small portable drills would be transported by helicopter from site to site to drill the “shot holes”. Recording equipment and crews also would be transported by helicopter from a staging area or landing zone. Generally, the shot holes would be shallower than when drilled with truck mounted drills. Also, the size of the explosive charge would be smaller.

Surface Charges

Another portable technique eliminates drill holes by placing charges on wooden sticks, or lath, three feet above the ground. Charges used are either 2.5 or 5 pounds. Usually, ten charges in a line are detonated at once. In remote areas, a series of short seismic lines may be used to determine the regional dip and strike of subsurface formations. Seismic lines then may be aligned in relationship to the regional structures to acquire more accurate seismic data and interpretations. The seismic sensors and energy source are located along lines on a one- to two-mile grid. Although alignment may be critical, spacing of the lines can often be changed up to 0.25 mile on a one-mile grid before the investigation is significantly affected.

Primacord

Another seismic technique involves the use of explosive cord. The cord is buried in a 2.5-foot-deep furrow using a tractor-mounted mechanical plow. Multiple sets of cord, often in a pattern, are buried at the same time. This method is more efficient than the shot-hole seismic method because it is faster, cheaper, and often results in improved data. However, surface disturbance may be considerably greater than with the shot hole seismic method.

Post-Lease Preliminary Investigations

If preliminary investigations indicate an oil or gas trap may exist in an area, the company may secure leases either directly through the Federal leasing system or from existing leaseholders through assignment (lease is purchased and ownership assigned). Additional preliminary investigations may be carried out after a lease is acquired. Post-leasing investigations may include airborne and surface operations similar to those of the pre-leasing phase. The lessee may intensify the seismic studies by extending lines on 0.5 mile grids and laying out a criss-cross pattern of lines tied to previous seismic lines. Other preliminary investigations may also be initiated prior to drilling.

Exploratory Drilling (Phase 2)

Permitting Process

Where preliminary investigations are favorable and information warrants further exploration, exploratory drilling is conducted. More precise data on the geologic structure may be obtained by stratigraphic tests using shallow holes. The presence of suspected oil and gas deposits may be confirmed by exploratory (wildcat) drilling of deep holes. Exploratory drilling on National Forest System lands is authorized only by a Federal oil and gas lease, but cannot be conducted unless a Surface Use Plan of Operations (SUPO), drilling program, and Application for Permit to Drill (APD) are approved.

Proposed construction and other operations that involve surface disturbance conducted under the terms of a lease must be approved by the Forest Service before such activities are conducted. Proposed drilling, development, and production operations must be approved by the BLM. Operations must be approved and conducted in accordance with (1) lease terms; (2) 43 CFR 3160; (3) 36 CFR 228, Subpart E; (4) Onshore Oil and Gas Order No. 1; (5) other onshore oil and gas orders; (6) applicable Notices to Lessees (NTLs); (7) conditions of approval; and (8) subsequent orders of the authorized officers of the BLM and Forest Service.

No drilling operations or related surface disturbance can be conducted without an approved APD. This application includes a drilling plan consisting of (1) a surface use program and (2) a drilling program. The detailed information required to be submitted under each program is identified in Onshore Oil and Gas Order No. 1 and 36 CFR 228, Subpart E. An onsite inspection of the proposed well site, road location, and other areas of proposed surface use is conducted prior to approval. The inspection team includes BLM and Forest Service representatives, the lessee or his designated operator, and operator's principal drilling and construction contractors and archaeologist. The purpose of the onsite inspection is to identify problems and potential environmental impacts associated with the proposal and the methods for mitigating those impacts. These may include making adjustments to the proposed well site and road locations, identifying the construction methods to be employed, and identifying reclamation standards for the lands after drilling.

The Forest Service is responsible for conducting the environmental analysis, preparing the documentation, and providing mitigation measures to protect surface resource values on National Forest System lands for APD approvals. The BLM is responsible for approval of the drilling program, protection of groundwater resources, and final approval of the APD.

Other proposals to occupy the surface that involve surface disturbance, but are not associated with drilling a well, must also receive advance approval under the procedures described above.

There are two options available to the oil and gas operator when applying for approval of an APD. These are (1) the Notice of Staking (NOS) option and (2) the APD option.

NOS Option

The NOS consists of an outline of the company's proposal, including a location map and sketched site plan. The NOS document is reviewed to identify any conflicts with known resource values. It also is used for the onsite inspection and to provide preliminary data to assess what items are needed to complete an acceptable surface use plan and drilling program.

Application for Permit to Drill (APD) Option

The operator or lessee may submit a completed APD, in lieu of a NOS, to the BLM. A field inspection is held by the BLM with the operator and the Forest Service. The drilling plan may be revised or site-specific mitigations added as conditions of approval of the APD for protection of surface and/or subsurface resource values in the vicinity of the proposed activity.

Special-use permits are issued by the Forest Service for facilities, tank batteries, pipelines, truck depots, powerlines, and access roads that occupy National Forest System lands outside the lease or unit boundary whether constructed by the lessee/operator or a third party.

Oil and Gas Exploratory Units

Surface use in an oil or gas prospect may be affected by unitization (consolidation) of the leaseholds. In areas of Federally-owned minerals, an exploratory unit may be formed before a wildcat exploratory well is drilled. The boundary of the unit is based on geologic data. The leaseholders of the unit can enter into an agreement to explore and/or develop and operate a unit, without regard to separate lease ownerships (43 CFR 3180). Costs and benefits of exploration are allocated according to agreed-upon terms.

Stratigraphic Tests

Stratigraphic test holes are drilled 100- to 500-feet deep to locate geologic indicators. The holes are usually drilled with truck-mounted equipment and disturb a relatively small area. Casing is needed for stratigraphic holes in areas of high-pressure. The roads and trails constructed for access to the test sites are temporary and involve minimal disturbance. Only one to three days are required to drill each hole using a truck-mounted drilling rig. The drill site occupies an area approximately 30 feet by 30 feet and is sometimes placed in the center of a new or existing trail.

Wildcat Wells

Wildcat wells are deeper tests, require larger drilling rigs with support facilities, and may disturb a larger surface area than stratigraphic tests. Construction of access roads, drill pads, mudpits, and, in some cases, worker camps and helipads, are required to conduct exploratory drilling operations. The well site is selected on the basis of prior surface investigations, seismic surveys, data from other wells drilled in the area, topography, accessibility, requirements of lease stipulations, and protection of surface resources.

Surface Requirements and Construction

Upon approval of the APD, the construction equipment may enter the leasehold. The types of construction equipment used include dozers (track-mounted and rubber-tired), scrapers, and motor-graders. Moving equipment to the construction site requires several semi-trucks.

Construction usually begins with the access road to the well site. Generally, the shortest feasible route consistent with the topography is selected to reduce the haul distance and construction costs. In some cases, potential environmental impacts or existing transportation plans dictate a longer route. In rough terrain, sidecasting is used (material taken from the cut portion of the road is used to construct the fill portion). Roads are usually constructed to an 14-foot-wide travel surface (in relatively level terrain). Road surfacing may be required because of adverse soil conditions, steepness of grade, and moisture conditions.

Well sites are selected and constructed giving consideration to the amount of level surface required for safe assembly and operation of a drilling rig. The amount of area required varies with the drilling depth and the type of rig used. It may vary between two and four acres in size. The average well site disturbance is approximately four acres. The substructure of the drilling derrick must be located on solid ground. Settling of uncompacted fill material under the drill rig can cause the substructure and mast to lean and even fall. In addition to the drilling platform, a reserve pit is constructed to accommodate spent drilling fluids and rock chips. The pit is usually square or oblong, but may be constructed in another shape to accommodate topography.

Well sites are constructed using dozers, scrapers, and motor graders. All soil material suitable for plant growth is first removed from areas to be disturbed and stockpiled in a designated area. Well sites located on flat terrain usually require little more than removing the topsoil material and vegetation. Well sites on ridge tops and hillsides are constructed by cutting and filling portions of the location to provide a level area (drill pad) to accommodate the drill rig, ancillary facilities, and drilling operations. The majority of the excess cut material is stockpiled in an area that will allow easy recovery for reclamation. Extra cut material may need to be stockpiled to avoid casting it down hillsides and drainages where it cannot be recovered.

Depending on the relation of the drillsite to natural drainages, it may be necessary to construct water bars or diversions. The size of the area disturbed for construction and the potential for successful revegetation often depends on the steepness of the slope.

The drilling rig and its attendant facilities, such as pumps, mud tanks, generators, pipe racks, and tool house, are located on the drill pad. Other facilities such as storage tanks for water and fuel may be located on or near the drill pad.

Drilling Operations

Usually drilling activities begin within a week or two after the well site and access road have been constructed. The drilling rig and associated equipment are moved to the site and erected. Moving a drilling rig requires 30 to 40 truckloads or equipment over public highways and private roads.

The most commonly used well drilling equipment is the rotary rig, which consists of (1) a power system, normally diesel-engine-powered electric generators; (2) a hoisting system, which consists of a derrick ("mast"), crown block, and traveling block used to lift and lower the drill; and (3) the rotary system, which consists of the drill bit attached to a length of tubular high tensile steel "drill-stem pipe" (collectively called the "drill string") which is turned by a rotary table; and (4) the mud circulating system consisting of mud tanks, mud pumps, and reserve pit.

Depending on the height of the substructures, the mast may rise to over 160 feet above the ground surface and is the most visible feature of a drill rig. The start of drilling is commonly referred to as "spudding". The actual drilling is accomplished by passing the drill string through the rotary table, which turns the drill string and bit, which in turn performs the actual drilling. The weight of the drill string provides downward pressure on the drill bit, which chips and pulverizes the rock as it rotates in the bottom of the hole. By continually adding more drill-stem pipe to the drill string, the hole is steadily deepened.

The initial hole is drilled to a depth of 80 to 100 or more feet, depending on the surficial geology of the area. The hole then is lined with conductor pipe (casing). The space between the conductor pipe and the drilled hole (borehole) is filled with cement. The depth of the conductor pipe is an important part of blowout prevention. The pipe must be set in rock that is capable of withstanding the maximum anticipated pressure to which it may be exposed.

After the conductor pipe is in place, a series of blowout preventer (BOP) valves are attached to the well. The valves close down the well in the event the drill bit penetrates extreme pressure zones that could cause a well blowout. Special attention is given to the prevention of well blowouts. Much of the equipment supporting the actual drilling operations is for controlling excess pressure that may be encountered.

Blowouts are extremely dangerous and may result in uncontrolled fire, escape of toxic gases, loss of lives, extensive environmental damage, and loss of resources and equipment. It is usually very difficult and expensive to bring a well under control after a blowout. Prevention equipment is tested and inspected by both the rig personnel and the BLM. The drill rig crew must be trained in safety and blowout prevention.

Drilling is resumed after installation of casing and the BOP using a smaller bit. After the borehole has penetrated all of the surface formations, which may contain fresh water, the bit and drill string are hoisted out of the well and another length of pipe (surface casing) is lowered into the borehole and cemented in place. This prevents unconsolidated surface formations from sloughing into the hole. The casing also protects the freshwater aquifers from being contaminated by drilling mud.

Drilling mud (fluid) is circulated through the drill pipe and bit to the bottom of the hole, then up the bore of the well, through a screen that separates the rock chips, and into holding tanks from which it is pumped back into the well. The mud is maintained at a specific weight and thickness to cool the drill bit, lubricate the drill string, seal porous rock zones, prevent blowout or loss of drilling fluid, and transport the rock chips resulting from the drilling to the surface for disposal. Various additives are used to maintain the drill mud at the desired viscosities and weights. Some additives that may be used are caustic, toxic, or acidic. The spent drilling mud and rock chips are disposed in the reserve pit.

Water for drilling is hauled by truck to the rig storage tanks or transported by surface pipeline. Water sources are usually rivers, wells or reservoirs. Occasionally, water supply wells are drilled on or close to the drill site. The operator must obtain a permit from the State for the use of surface or subsurface water for drilling. When the Forest Service holds the water permits for surface water (stock ponds), it must also approve such use. Water is continually being transported to the well site during drilling operations. Although it will vary significantly from well to well, approximately 40,000 barrels or up to 1,700,000 gallons of water may be required to drill an oil or gas well to the depth of 9,000 feet. If water is hauled by truck, a significant amount of traffic to and from the drillsite will be generated by water hauling. More water is required if the underground rocks are fractured and drilling fluids are lost into the formation (lost circulation zone). Uncontrollable loss of drilling fluids may cause drilling to be terminated.

In areas where drilling must penetrate clay or shale layers, oil-base drilling muds are often used instead of water-base muds after the surface casing has been installed and cemented. The oil-base muds prevent the clays or shales from swelling and caving into the borehole, which can result in the collapse of the borehole making it impossible to pull the bit out of the hole.

As the drilling proceeds, additional casings of concentrically smaller diameter are lowered into the well and sealed in place until the final depth (target zone) is reached. During the drilling process, the drill string must be pulled from the well periodically to change the drill bit, install casing, or remove core samples from the well bore. Core samples are analyzed to determine the type of rocks penetrated and their porosity, permeability, chemical properties, and hydrocarbon content.

Drilling operations continue 24 hours a day and seven days a week. The crews usually work three eight-hour shifts or two 12-hour shifts a day. The greatest amount of human, vehicular, and equipment activity and accompanying noise occurs during construction and drilling activities. A significant amount of traffic is generated by trucks hauling equipment and water, service companies delivering supplies and equipment and performing specialized work on the drill, drilling crew shift changes, well treatment, and testing equipment. There is a high level of human activity and use of heavy construction and drilling equipment during drilling operations, which is accompanied by considerable noise and highly visible activity.

Upon completion of the drilling, the well is "logged" and tested to obtain information about the rock formations penetrated and production of fluids. After completion of the tests, the drill rig and other equipment are removed. If oil or gas is not discovered in commercial quantities, the well is considered dry. The operator must comply with State and Federal procedures for plugging a dry hole.

Directional Drilling

Directional drilling may be used where the drill site cannot be placed directly over the reservoir, as might be the case where a river or mountain is involved, where no surface occupancy is permitted on the leasehold, or where land use restrictions require centrally located drill sites.

There are limits both to (1) the degree that the well bore can be deviated from the vertical and (2) the horizontal distance the well can be drilled from the well site to the target zone. It is not possible to drill directionally from outside an area where surface occupancy is denied and reach a target zone at a horizontal distance of more than one or two miles from the drill site. The limit of horizontal distance also is affected by depth of the target zone, characteristics of the rock formation to be penetrated, and the additional costs of directional drilling. These factors all are considered before applying this technology.

Oil and Gas Discovery

At the completion of drilling, the well is evaluated to determine if hydrocarbons can be commercially produced. A "drill-stem test" is conducted to directly measure the fluid content (water, oil, or gas) of the formation and the amount of flow and shut-in pressure of the well. The well is logged by measuring the electric resistivity that provides information as to the porosity of the rock, the kind of fluids present, and fluid saturation level of the rocks. These physical characteristics of the rock formations and associated fluids are measured and recorded. If it is determined, based on the tests, that the well can be economically developed for production, the well is readied for production, and connected to a gathering system (See Field Development, (Phase 3) and Production (Phase 4)).

Field Development (Phase 3)

The completion of a wildcat well as a commercial producer marks the beginning of the development of an oil and gas field.

Approval of Field Development Plans

A Field Development Plan consists of a coordinated collection of site-specific drilling and surface use proposals for individual wells as required by Onshore Oil and Gas Order No. 1. The lessee/operator is required to submit the plan when sufficient information is available to project a reasonably foreseeable development of the field. Sufficient information may not be available until one or more confirmation wells have been drilled to delineate the characteristics of the reservoir. The limits of a field located on a structural trap can be determined more easily than a stratigraphic field based on the information obtained from drilled wells and geophysical data. The proposed field development is subject to environmental analysis prior to approval or rejection of the APD.

The drilling plan includes information on the existing roads, the proposed location of the access roads, the proposed and existing wells, and the tank battery, camps, and airstrips; the proposed location and type of water supply; the proposed waste disposal methods; plans for reclamation of the surface; and other information deemed necessary.

The required geological includes (a) occurrence and anticipated depths of fresh water aquifers, (b) expected depths of possible oil or gas productive zones above or below the zone already discovered, (c) other mineral-bearing formations, (d) the potential for entering highly permeable formations in which the drilling mud might be lost, (e) the anticipated pressures in the formations to be drilled, and (f) the potential for encountering other geologic conditions that could cause drilling problems. This information is obtained to determine whether the proposed drilling program is adequate, and to ensure the drilling mud, pressure control, casing, cementing, testing, well logging, and completion programs adequately protect the surface and subsurface environments, protect other subsurface resources, and provide safe working conditions.

Well-Spacing Pattern

Before development of an oil and gas field begins, a well-spacing pattern is established to allot a spacing unit for each well that will be drilled in the discovery area. Oil well spacing patterns in the United States range from 2.5 acres per well to 640 acres per well. Spacing units established for oil production are generally in multiples of 40 (40, 80, 160, 320, 640 acres per well). Gas well-spacing patterns in the United States range from 40 to 1440 acres per well. Most spacing patterns established at the present time for production of gas are 160, 320, or 640 acres per well.

The well-spacing pattern established for an oil and gas field is the primary factor that determines the amount and intensity of human presence and associated activity during the development and operation of an oil and gas field and the amount of surface disturbance and land area required to accommodate surface facilities. The wider the well-spacing pattern, the lower the intensity and concentration of human activity and the less the overall surface disturbance within the oil and gas field. Projected well spacing on the Forest would be 160 acres.

Unitization

Surface use in an oil and gas field is affected by unitization (consolidation of leases) of the leaseholds. In areas involving Federal lands an exploratory unit is formed pursuant to 43 CFR Subpart 3180 through Subpart 3186. The area enclosed within an exploratory unit is based on available geologic data.

A unit agreement provides for (a) development and operation of the field as a single consolidated unit without regard to separate lease ownerships; and (b) the allocation of costs and benefits according to terms of the agreement. "Exploratory units" also are formed to share the cost of drilling exploratory wells to test geologic structures. Unit agreements involving Federal leases require BLM approval.

Leases that are committed to a producing unit are considered producing leases and will not terminate as long as production continues. As the limits of the productive area are defined by additional drilling, some leases may be dropped from the unit. If a lease is dropped from a unit, the term of the lease may be extended for a period of two years if less than two years remain in the primary term of the lease.

Field development under a unit agreement reduces the surface use requirements because all wells within the unit boundaries are operated as though they are located on a single lease. Development and operations of the field are planned and conducted by a single unit operator and, therefore, duplication of field processing equipment and facilities is minimized. Oil or gas field development under a unitization plan also may involve a wider well-spacing pattern and fewer wells than a field developed on a lease by lease basis.

Drilling Procedures

Drilling of development wells is essentially the same as the drilling of a wildcat well. Roads and other facilities are planned and constructed for long-term use.

Surface Use Requirements

Surface uses associated with oil and gas field development wells include access roads, well sites, flowlines, storage tank batteries, and facilities to separate oil, gas and water. In remote locations, worker camps may be required. Access roads are planned, located, and constructed for long-term use as opposed to roads built for short-term use to drill wildcat wells.

Surface Use and Construction Standards

The minimum standards for design, construction, and oil and gas operations are set forth in the *Surface Operating Standards for Oil and Gas Exploration and Development, Third Edition - U.S. Forest Service and Bureau of Land Management*. The publication prescribes the minimum operating standards for oil and gas operations on Federal lands. The objective of the standards is to minimize surface disturbance and effects on other resources and to retain the reclamation potential of the disturbed area. Additional site-specific construction and design standards may be required depending on the proposed activities and conditions encountered at the site.

The locations for well sites, tank batteries, mud pits, pumping stations, roads, and pipelines are selected to minimize, to the extent possible, the long-term impacts to other resources and disruption of other land uses. Ideal locations for oil and gas activities are seldom available and avoidance of damage to surface resources is not always possible. Well sites are constrained by the geologic target to be drilled and pipelines, because of their linear nature, cannot always be located to avoid all areas exhibiting sensitivity to environmental impacts. In the selection of sites, special attention is given to avoiding construction on steep topography and unstable soils, near streams and other open water areas, on cultural resource sites, and in threatened, endangered, or sensitive species habitats. It is not possible or practical to avoid all situations, and special construction techniques may need to be employed to minimize the impacts.

Well sites are usually located on the most level location available that accommodates the intended use consistent with reaching the geologic target. The drill site layout also can be oriented to conform to or fit into the topographic conditions at the drill site. However, safety considerations in a hydrogen sulfide (H_2S) area may be an overruling factor when determining the topographic setting and providing adequate escape routes for the drill crew. In general, steeply sloping locations, which require deep, nearly vertical cuts and steep fill slopes, are avoided or appropriately mitigated. The well site also is reviewed to determine its effect in conjunction with the location of the access road. Advantages gained from a good well site or tank battery location may be negated by adverse effects from the location of the access road.

Well-Site Construction Standards

Construction of the well site must conform to the approved well site and layout plan in the Surface Use Plan of Operations (SUPO). Excavation of the cut-and-fill slopes of the well site is guided by information on the surveyed construction stakes. Generally, all surface soil materials (topsoil) are removed from the entire construction area and stockpiled. The depth of topsoil to be removed and stockpiled is determined at the pre-drilling inspection. It is stated within the proposed SUPO or specified as a condition of approval. In order to avoid mixing topsoil with subsurface materials during construction and reclamation, topsoil stockpiles are located at the specified locations, out of the way of construction activities.

Fill materials are to be compacted to minimize the chance of slope failure. Terracing may be used on both cut and fill slopes to reduce the land area occupied by the well site, to prevent excessive water accumulation, slope failure, and erosion. If excess material needs to be excavated, it is to be disposed of or stockpiled at approved locations. Snow and frozen soil material cannot be used in the construction of fill areas and a reserve pit.

The area of the well pad that actually supports the drilling rig substructure must be level and capable of supporting the weight of the rig. The drilling rig, tanks, heater-treater, etc., are not to be placed on uncompacted fill material. The area used for mud tanks, generators, mud storage, and fuel tanks, etc., is usually slightly sloping to provide surface drainage from the work area. Runoff water from offsite areas is diverted away from the well site by ditches, waterbars, or terraces up-slope from the drilling and well site.

The reserve pit is to be located and constructed entirely in cut material. If this is not possible, at least 50 percent of the reserve pit must be constructed below original ground level to prevent failure of the pit dike. If constructed of fill material, pit dikes are to be adequately compacted.

Pits improperly constructed on slopes may leak along the plane between the natural ground level and the fill. There is a significant potential for pit failure in these situations.

It may be required to line reserve pits to prevent contamination of ground water and soil. Bentonite, plastic, or other synthetic liners may be required. Fencing of reserve pits is usually required to deny access to wildlife or livestock. In some environmentally sensitive areas or where topography limits the size of the well site, a "self-contained mud system" may be required. The drilling fluids, mud, and cuttings are stored in metal tanks and transported to approved offsite disposal areas.

A closed mud system and safety "surge tank" may be used in lieu of a reserve pit at locations with limited space in which to locate a drill pad, in a high-water-table area, or in other situations where a reserve pit cannot be accommodated. The surge tank is used to contain the spent downhole fluids, muds, and cuttings from the well bore. Since there is no reserve pit in which to dispose the cuttings and spent drilling fluids, they must be periodically trucked from the drill site and disposed at an approved location. The removal and disposal of well bore cuttings and spent drilling fluids is very expensive. Thus, closed mud systems, although sometimes used, are not employed as a standard drilling practice.

Roads and Access Ways

It is Forest Service policy that existing roads be used for access when they are available, when they meet Forest Service standards for the intended use, and when there are no significant conflicts with other uses. When access involves use of existing agency roads, the oil and gas operator may be required to contribute to the road's maintenance. Usually this is authorized by a joint use agreement in which each user's pro rata share of the road maintenance costs are assessed.

New road construction, or reconstruction, by the operator is consistent with the goals of the Forest's transportation plan and must meet Forest Service standards established for the intended road use.

Proper road location is critical for the engineering success and mitigation of the environmental effects of road construction. The surface and subsurface conditions of a proposed road location also determine the cost to survey, design, construct, and maintain a road. The following factors are considered when determining road locations: (1) intended use of the road, planned season of use, and type of vehicles to be used; (2) Forest's transportation plan, which may already identify feasible routes for the area; and (3) existing data including maps and aerial photos, of administrative, biological, physical, and cultural conditions of the area.

A field reconnaissance during the pre-drill inspection of the proposed and alternative routes is made to determine type of excavation, landslide areas, and subgrade conditions, indicating the need for surfacing, potential cut slope problems, surface or subsurface water problem areas, suitability of fill material, potential gravel pits or quarries for road aggregate, and potential borrow and waste sites.

When steep slope areas, erosion hazard areas, visually sensitive areas, stream crossings, and other areas of high environmental sensitivity cannot be avoided, special road design and construction techniques may be required.

Both the BLM and the Forest Service require that all permanent roads constructed by nongovernment entities across public or National Forest System lands be designed by or constructed under the direction of a licensed professional engineer, The design and construction requirements depend on the site conditions, planned use of the road, seasons of use, amount and type of traffic, and whether use will be short or long term. These factors also are used to determine the class of road built to accommodate the intended use of uses.

The specific design specifications and requirements depend on whether the road class is (1) short term, (2) local, (3) collector, or (4) arterial road. The design and construction standards for these road classes are described in *Oil and Gas Roading Guidelines; R-4* and in *Surface Operating Standards for Oil and Gas Exploration and Development; USDI and USDA, Third Edition*, as well as Forest Plan standards and guidelines for roads.

Other factors, unique and directly applicable to the oil and gas industry, include:

- The prevailing wind direction in relation to the potential for encountering sour gas (H_2S) and the need for a clear escape route from the drill site.

- The potential for year-round operation. Drill sites and producing locations may require all-weather access and special maintenance considerations for snow removal.

- The potential for exploratory drilling to result in a producing operation. The initial road alignments will allow upgrading to a permanent road if a discovery is made.

When the road location information is submitted to the Forest Service in the Surface Use Plan, the proposed route (and if applicable, alternative routes, road design standards, and construction methods) will be evaluated. Final approval of the road location, road design standards, and construction standards will be made during processing of the Surface Use Plan.

Pipelines Standards

General pipeline construction standards were established to minimize surface disturbance, provide soil stability, and preserve reclamation potential. Pipeline construction usually involves clearing vegetation and leveling a strip of land wide enough to accommodate a pipeline trench, excavated material, pipeline construction equipment, and transport trucks. The width of the area cleared and leveled is kept to a minimum consistent with access and construction requirements.

The width of the disturbed area varies depending on the number of lines within a corridor, size of the pipeline, equipment to be used, and topographic setting.

Locating pipeline routes on steep hillsides or adjacent to streams should be avoided to the extent possible. However, because of the extended linear nature of a pipeline, these situations cannot be entirely avoided. Extensive cuts and fills that destabilize steep slopes are major problems with sidehill locations. Pipelines located adjacent to water courses increase the risk of petroleum spills and silt from construction sites entering streams.

Pipeline beds are constructed so they do not block, dam, or change the natural water courses. Pipelines suspended above watercourses must provide adequate clearance for water runoff and waterborne debris, and allow for the passage of wildlife and livestock. Pipelines located on gentle topography usually require less surface disturbance and are; therefore, inherently more stable with greater reclamation potential.

It is a standard practice to stockpile topsoil to the side of the pipeline right-of-way prior to construction and leveling the pipeline bed. The topsoil is segregated and not mixed or covered by excavated subsoil.

Upon completion of construction, the pipeline is graded to conform to the adjoining terrain, the topsoil is returned to the right-of-way, and the pipeline right-of-way is waterbarred and revegetated to avoid erosion and minimize visual intrusion.

Oil Field Production Development

Production operations in an oil field begin soon after the discovery well is completed. Portable and temporary facilities located on the drill pad are used to initiate the production of oil from the reservoir. As further drilling proceeds and reservoir limits are established, permanent production facilities are designed and installed at centralized locations. The type, size, and number of the facilities are determined by the number of producing wells, expected production rates, volumes of gas and water expected to be produced with the oil, and the number of separate leases involved. They also depend on whether or not the field is being developed on a unitized or individual lease basis. Development of production on a lease basis requires handling and processing facilities be installed on or near each lease. Unitization reduces the number of facilities needed to produce, process, and store the oil prior to transporting off site.

Gas Field Production Development

Production operations in a gas field begin when construction of a pipeline to a market outlet is completed. Market pipelines are not economical unless sufficient gas reserves have been discovered during drilling operations. Gas wells are often shut-in after completion for periods of several months or years until a pipeline connection becomes available.

Rate of Development

The rate at which development wells are drilled in a newly discovered field depends upon (a) whether the field is developed on a lease basis or a unitized basis, (b) the probability of profitable production, © the availability of drilling equipment, (d) protective drilling requirements, and (e) the degree to which limits of the field are known. The development of a field that is based on a stratigraphic reservoir may proceed more slowly and yield more dry holes than development of a field located on a structural trap reservoir.

The most important factor when determining how fast field development is undertaken is indicated production potential. If large productive capacity and substantial reserves are indicated, development drilling proceeds at a rapid pace. If there is a question as to whether indicated reserves are sufficient to warrant additional wells, the development drilling occurs at a slower pace. An evaluation period to observe production performance may follow the drilling of each well.

Development of an individual lease basis proceeds more rapidly than development in a unitized area. When development drilling is undertaken on a lease basis, each lessee drills his own well(s) to obtain production from the field. This creates a competitive situation where the first wells drilled produce the greatest share of oil from the reservoir and quickest and greatest return on investment. When unitized, all owners within the "participating area" share in a well's production regardless of whose lease the well is located on. The development of a reservoir then can proceed in an orderly manner and pace.

Protective Drilling

Drilling a well to prevent drainage of petroleum to a producing well on an adjoining lease may be required in fields that contain a mixture of Federal lands and patented or fee lands. The terms of Federal leases require drilling a protective well on the leased tract if an "offset" well is located on adjacent non-Federal lands or on Federal lands leased at a lower royalty rate. An "offset" well is a well drilled at the next location in accordance with the established spacing rule to prevent the drainage of oil and gas to an adjoining tract where a well is being drilled or is already producing.

Pool Discoveries

Discovery of a "new pay zone" within an existing field is a "pool" discovery, as distinguished from a new field discovery. A pool discovery results in the drilling of additional wells - often on the same well pads as existing wells, or even sharing existing boreholes. Existing wells also may be drilled deeper to the new pay zone. Each new pay zone developed requires additional flowlines, storage, and treatment facilities if the fluids from the various pools are to be kept separate. Some fields contain as many as seven, or more, pay zones all sharing a geologic structure that created the conditions for the accumulation of oil and gas.

Production (Phase 4)

Production is a combination of operations that includes: (1) bringing the fluids (oil, gas, and water) to the surface; (2) maintaining and/or enhancing the productive capacity of the wells; (3) treating and separating the fluids; (4) purifying, testing, measuring, and otherwise preparing the fluids for market; (5) disposing of produced water; and (6) transporting oil and gas to market.

The production of oil and gas from a single well is usually initiated as soon as drilling is completed and the well is developed for production. In the meantime, other wells may be in production, being drilled, or exist only in the field development plans. Also, there is usually a short time separation between the activities associated with exploratory drilling, oil and gas and field development, and actual production of oil or gas. It may take a few months to several years before a field is fully developed. Therefore, field development activities and those activities normally associated with oil and gas production occur simultaneously during the early life of a field. Drilling of new wells is undertaken periodically throughout the life of a producing field to increase or maintain production from the reservoir.

Well Completion Report

A "Well Completion or Recompletion Report and Log" must be filed with the BLM within 30 days after completion of a well for production. The completion report reflects the mechanical and physical condition of the well. Geologic information and, when applicable, information about the completed interval and production is required. Operators must notify the BLM no later than the fifth business day after a well begins production.

Well Completions

After a well has been drilled and evaluated for its economic potential, work to set the casing and prepare the well for completion and production begins. The decision to complete an individual well for production is based on the type of oil or gas accumulations involved, the expected future development that may be undertaken during the life of the well, and the economic circumstances at the time that the work is done. Completion equipment and the methods employed vary.

Well completion involves installation of steel casing between the surface casing and the oil and gas producing zone. The casing is cemented between the well bore and casing wall to provide stability and to protect specific zones (i.e., fresh water aquifers). The casing is perforated opposite the "pay zone" and the "pay zone" may then be "stimulated" or "treated" to increase productivity.

The drilling rig and most of the support equipment are moved from the well site after the casing is cemented and the pay zone is stimulated. Small diameter "production" tubing is then placed inside the casing down to the producing zone. The tubing is connected to the surface equipment and transports the oil and gas from the bottom of the well to the surface. If the pressure is sufficient to raise a column of oil to the surface the well is completed as a flowing well. When pressure is not sufficient, a pumping system is installed. After the well is completed, it is tested for a period of days or months before another well is drilled.

Temporary storage tanks are normally used to hold the produced oil during testing. A "separator" is required to separate the gas from the oil. The gas separated from the oil may be burned off as waste until a pipeline connection is available. If water is produced with the oil, a "treater" is need to separate emulsified oil and water.

Well Stimulation

"Well stimulation" is employed to enlarge channels or to create new ones in the producing formation rock to enhance oil and gas production. Since oil is usually contained in the pores or cracks of sand or limestone formations, enlarging or creating new channels allows the oil or gas to accumulate and move more freely to a well bore. A well may be restimulated several times during its lifetime to maintain or increase production. There is a short-term increase in activity at the well site during this process. Generally, no new surface disturbance is required to perform these operations. Three basic well stimulation methods have been developed: explosive fracturing, acid treatment, and hydraulic fracturing.

Explosive fracturing is used to enlarge the well bore, eliminate nearby plugging of the rock pores, and force fluids into the formation, thereby fracturing the rock in the proximity of the well bore to stimulate increased production.

Acid treatment dissolves rock with weak hydrochloric acid, thereby enlarging existing channels and opening new ones for oil to flow to the well bore. Reservoir rocks most commonly acidized are limestone (calcium carbonate) and dolomite that exhibit low permeability. Well service rigs are used to prepare both new and old wells for acid treatment.

Hydraulic fracturing is used to create or enlarge cracks in sandstone reservoirs in the same manner as acid treatment is used in limestone or dolomite reservoirs. Hydraulic pressure is applied against the formation by pumping fluid, usually diesel fuel, under high pressure into the well. This pressure splits and cracks the rocks to improve the productivity of the well, or increase the rate fluids can be injected into disposal wells. Most well pads are of sufficient size to accommodate the trucks and other equipment needed to complete a "frac" job. However, a second pad and additional surface disturbance may be required for safety considerations and to accommodate the large amount of equipment needed to perform special "massive fracture" jobs.

Oil Wells - Wellhead Facilities

The "wellhead" is the equipment installed to maintain control of the well at the surface and to prevent well fluids from "blowing" or "leaking" at the surface. The pressures encountered in the well determine the type of wellhead equipment needed. This varies from a simple assembly to support the weight of the production tubing in the well to a high-pressure wellhead to control reservoir pressures. Pressures in these reservoirs are usually great enough to result in a "flowing" well. However, after reservoir pressures are depleted, some type of artificial lift is usually required to bring the oil to the surface.

Flowing Wells

The surface equipment at the head of a flowing well is limited to a series of valves, or "Christmas tree", and a fenced service area ranging from 15 by 15 feet to 50 by 50 feet around the wellhead. A service area also may contain a small (1 by 2 by 3 feet) gas powered chemical pump and "guy line" anchors for servicing units brought in for well repairs. Chemical pumps used to inject emulsion breakers, corrosion inhibitors, or paraffin solvents into the well or flowline may be present.

Artificial Lifts (Pumping)

When a well is completed, the natural reservoir pressure drives the fluid to the surface. At some time during the life of an oil well, the pressure is depleted and some form of artificial lift is used to raise the fluid to the surface. The most common methods of artificial lift are sucker rod pumps, centrifugal pumps, hydraulic pumps, and gas lift. All of the pump systems require some type of surface equipment and a power system. All power systems generate noise; however, this ranges from almost none for electric motors to high noise levels for single cylinder gas engines.

Sucker Rod Pumps

The pumping unit is the most visible and recognizable piece of equipment within oil fields. Pumping units vary in size from 4 feet to over 25 feet in height depending on depth of well. The principles of the sucker rod pump is the same as that of the common hand pump used to lift water. A series of rods and a valve move up and down through a "stuffing box" in the well to bring the oil to the surface. The stuffing box is regularly maintained to prevent oil leaks from the wellhead. Failed packing in stuffing boxes is a common cause of oil spills. The rod is connected to a reciprocating pumping unit or "pump jack". Surface pumping units are usually powered by electric motors; however, internal combustion engines are used when electric power is not available. Single-cylinder engines operate at very high noise levels, multi-cylinder engines operate at lower noise levels, and electric motors at very low noise levels.

Centrifugal Pumps

Centrifugal submersible oil well pumps consist of a stack of 25 to 300 small electric powered pumps located inside the well casing. Centrifugal pumps require little equipment above the ground and generate no noise at the surface. Surface equipment requirements include a switch or control cabinet, the wellhead, a spool for the cable used to transmit electricity to the pumps, and an electric powerline.

Hydraulic Pumps

The pumping unit of a hydraulic system is located inside the well and is powered by oil under high pressure. The equipment required on the surface includes a storage tank for the power oil, a pump to pressurize the oil, an electric motor or internal combustion engine to power the oil pump, power oil regulating valves and pressure gauges, a hydraulic pump, and oil wells. The total surface area used for this type of facility may be greater than for other pumping systems if a centralized power system and additional oil pressure lines are used to carry the power oil from the pump to the wellheads. The noise level created at the wellhead depends on whether an electric motor or internal combustion engine is used to power the oil pump.

Gas Lift

Gas lift is commonly used where low-cost, high-pressure natural gas is available and where pressure in the petroleum reservoir is sufficient to force the petroleum part of the way up the well. In this system, natural gas under pressure is injected into the well casing. The gas forces the fluids up the production tubing to the surface. The gas pressure maintained inside the casing creates a flowing well. The surface equipment used for gas lift includes a gas compressor, oil storage tank, and separator. The system is quiet if the compressor is powered by an electric motor and little physical space is required at the wellhead.

Gas Wells

Most gas wells produce by normal flow and, in most cases, do not require pumping. Surface use at a flowing gas well usually is limited to a 20-foot by 20-foot fenced area. Water may enter a gas well and choke off the gas flow. A pump is then installed to pump off the column of water. Some gas wells may require periodic to almost continual water pumping. The typical gas wellhead facilities are similar to those of a flowing oil well, consisting of a relatively unobtrusive wellhead “Christmas tree”.

Oil Field Gathering Systems

Crude oil is transferred in small diameter pipelines called “flowlines” from the wells to treatment facilities and central track storage battery before it is transported from the lease. The flowlines may be constructed with 3- or 4-inch-diameter steel pipes, but plastic pipe is more commonly used.

Flowlines are usually buried. However, under certain circumstances, they may be elevated above the ground. The installation of flowlines is similar to small scale pipeline construction. Generally, a level bed is constructed to provide for vehicle access, trenching, and burial of the flowline. They are often installed in, or adjacent to, a roadbed to reduce surface disturbance and facilitate their installation.

After the oil is gathered from the field and is treated, measured, and tested, it will be transported from the lease by pipeline or trucked to market.

Gas Field Gathering Systems

Natural gas is often sold at the wellhead and transported directly off the lease. If processing and conditioning are required to remove liquid hydrocarbons, "acid gases", and water, the gas may be transferred to a central collection point and treating facility through flowlines prior to sale. All gas gathering systems include equipment for (1) conditioning and upgrading the gas; (2) compressing the gas so that it flows through the pipelines; and (3) controlling, measuring, and recording its flow.

Oil and Gas Separating, Treating, and Storage Facilities

Fluids produced from a well normally contain oil, gas, and water. The oil, gas, and water are separated or treated before the oil is stored in the tank battery. The treating facilities may be located at the wellhead, but in a fully developed field, they are usually located at the tank battery site. If enough "natural gas" is produced with the oil to warrant separation, it will be separated from the fluids, compressed, and pipelined directly to market.

Enough "casinghead gasoline" or "drip gas" may be produced in the field to make it economical to process for marketing. A "gasoline" plant may then be built in the area to remove natural gasoline, butane, and propane. Some of the residue gas may be used to fuel gas compressors, pump engines, and heat the separating and treating vessels. The remainder of the gas is marketed.

The oil and water produced from a well are usually in the form of an emulsion. Water is separated and removed after the gas is removed. The type of treatment facilities used depends on the amount of emulsification. If emulsification is high, chemical and/or heat treatment is used to separate the oil and water. Heat is applied in a facility called a "heater-treater", which breaks the oil in water emulsification. The heat is supplemented in most cases by chemical emulsion breakers. The oil and water, when not highly emulsified, may be separated by gravity in a tall settling tank called a "gun barrel". Conditioning equipment such as separators, heaters, dehydrators, and compressors may be located at the wellhead where the oil and gas first reach the surface or at the tank batteries and/or gas compressor stations in the field.

After the oil and water are separated, the oil is piped to storage tanks (tank batteries). The tank batteries are usually located on, or in the vicinity of, the lease. Tank batteries usually contain at least two tanks. The number and size of tanks vary with the rate of petroleum production from the field. Small leases may contain only one tank battery; large leases or units may contain several, each with its own separating, treating, and storage facilities. Tank battery sites may occupy from one to five acres depending on associated facilities and number and size of tanks.

Although natural gas is produced in varying quantities with the crude oil, in many fields the primary or sole production is the natural gas itself. Field processing to upgrade the gas for transportation and marketing consists of two primary treatments. The first is separation of the natural gas from crude oil and/or other liquid condensates including free water. In this process the gas is run through "separators" and "heaters" to separate the liquids from the gas. The gas then is run through a "dehydration unit" to remove the remaining water vapor. The removal of the water vapor is important since in the presence of natural gas or other hydrocarbons it wiii form "hydrates" that precipitate out and cause blockage of pipelines. The treatment of the gas is done either at the wellhead or at a centralized field facility located at the tank battery site or at a compressor plant. No gas is stored at these facilities, but is entered directly into a marketing pipeline after treatment.

Hydrogen sulfide (H_2S) and carbon dioxide (CO_2) are "acid gases" commonly produced with the natural gas. H_2S is extremely toxic, heavier than air, highly corrosive to unprotected metal, and will cause eventual failure of metal. Unless these gases are present in very small quantities they must be removed from the natural gas. There are several processes used to remove "acid gases". The most common is the alkanolamine process in which the gas is absorbed in an alkanolamine solution. Large compressors are used compress the gas up to, or in excess of, a hundred times the normal atmospheric pressure. Large reciprocating compressors driven by gas engines are commonly used, but centrifugal units driven by gas turbines or electric motors are also used. Large compressor stations along the pipeline often use natural gas from the pipeline for fuel. These stations operate at a high noise level and are normally housed in large metal buildings. Storage and maintenance facilities for the gas field's operations are usually located at the compressor station. Compressor stations are the largest and most visible features in a gas field and are the center of most of the human activity.

Disposal of Produced Water

After water is separated from oil at the tank battery, it is disposed under BLM approval and supervision. Although most produced waters are brackish to highly saline, some produced waters are fresh enough for beneficial surface use.

Produced water from oil and gas operations is disposed by subsurface injection, lined pits, or other methods acceptable to the BLM, in accordance with the requirements of Onshore Oil and Gas Order No. 7, entitled: *Disposal of Produced Water*, or another applicable Onshore Oil and Gas Order. Disposal of produced water by disposal/injection wells requires permit(s) from the primacy State or Environmental Protection Agency (EPA). Approval of surface use by the Forest Service also is required.

The advantages and disadvantages of the alternative water disposal systems vary. Surface systems (lined evaporation pits) may require an area larger than the tank batteries. Because saltwater seldom issues from heater-treaters completely free from oil, oil skimmer pits are installed between the separating facilities and the evaporation pits. If a skimmer or evaporation pit is accidentally breached, oil and/or saltwater spills may occur. Evaporation pits do not work efficiently at high elevations and cool temperatures. Evaporation and skimmer pits are hazardous to waterfowl and other wildlife because of the presence of residual oil.

When saltwater is disposed underground, it is introduced into a subsurface horizon containing water of equal or poorer quality. Also, it may be injected into the producing zone from which it originated to stimulate oil production. Dry holes or depleted wells may be converted for saltwater disposal. Occasionally, new wells will be drilled for this purpose. An injection pump is used to force the saltwater into the disposal zone. Saltwater is prevented from migrating up or down from the injection zone and into other formations in disposal wells.

Secondary and Enhanced Recovery of Oil

Oil, gas, and water are typically trapped within fine rock pores under high pressure in the oil reservoir. Because of the high pressures, much or all of the gas is dissolved in the oil. Expansion of pressurized water and gas in solution forces oil out of the rock pores into the well and up to the surface. This is known as the "primary drive" or "primary recovery". Oil flowing out of the rock drains energy from the formation; pressure in the reservoir begins to slowly decline; primary drive diminishes and the production rate falls. The oil cannot be produced unless pressures within the reservoir are maintained or restored to cause displacement of the oil being held in the rock and to drive it to the well bore. Usually, only 15 to 20 percent of the oil is recovered from a reservoir during primary production. As reservoir pressures continue to drop, gas in the oil escapes, forming bubbles in the rock pores. This retards the flow of oil and, over time, oil production ceases. Installation and implementation of a secondary and enhanced recovery system significantly increase a field's productivity and longevity. Many reservoirs are developed for secondary and enhanced recovery early in the life of a field.

Secondary Recovery Methods

Fluid injection is a secondary recovery operation in which a depleted reservoir is restored to production by the injection of liquids or gases (from extraneous sources) into the well bore. In essence, this injection restores reservoir pressures and moves the formerly unrecoverable oil through the reservoir to the well. Fluids are injected into selected wells at, or near, original pressure levels to achieve maximum recovery efficiency. Two of the more common fluid injection methods are waterflood and saltwater disposal.

The installation of a secondary recovery system involves drilling of injection wells and new recovery wells or conversion of production wells to injection wells. Fluid injection lines are installed and additional water separation and storage facilities constructed to implement the secondary recovery system. Secondary recovery results in a significant increase in the amount of water produced. Additional land area is needed to accommodate water supply facilities, water storage and treating facilities, water injection pumps, and waterlines to wells. Drilling and construction and other human activities intensity in the oil field during installation of a fluid injection system.

Waterflood

The most commonly employed form of secondary recovery is waterflooding. Water is injected into the reservoir under pressure to drive additional oil to the producing wells. On the average, a successful waterflood doubles the amount of oil recovered from a reservoir. In some fields, water for waterflooding is injected into depleted existing wells. In other cases, additional wells may need to be drilled for water injection. Most waterfloods are difficult to operate on a lease basis, so entire fields, if not already being operated under a unitization agreement, are usually unitized before flooding. If unitization precedes a waterflood, there is little or no duplication of secondary recovery facilities. However, additional surface area is used for the water supply facilities, water storage and treating facilities, water injection pumps, and waterlines to injection wells. If the injection well is a converted producing well, the waterline replaces the producing flowline. If the injection well is a converted dry hole or a new well drilled for the waterflood, the water injection line is the only addition to the pipeline system and requires the same amount of land as a flowline for a producing well.

Gas Injection

Gas injection is a secondary recovery technique that is generally used only in oil and gas reservoirs that have an existing gas cap. Natural gas is injected under pressure to restore and maintain reservoir pressures to displace and move oil to the producing wells.

Saltwater Disposal

Although not a secondary recovery process, saltwater disposal is a common form of fluid injection. Its primary purpose is simply to dispose of the saltwater produced with crude oil. A typical system is composed of collection centers in which saltwater from several wells is gathered, a central treating plant in which corrosion-forming substances are removed, and a disposal well. The saltwater is injected into the originating zone and used to pressurize and drive the oil towards the borehole of a producing well. (See Disposal of Produced Water above).

Enhanced Recovery Methods (Tertiary recovery)

Enhanced recovery methods increase the amount of oil produced and recovered from an oil reservoir beyond that obtained from primary and secondary methods. Enhanced oil recovery techniques employ chemicals, water, gases, and heat singly, and in combination, to reduce the factors that inhibit oil recovery. Considerable technical and financial risk is involved because of the large investment in equipment and the unknown factors or characteristics of the oil reservoir that may affect the success of an enhanced recovery method. There are three broad categories of enhanced recovery methods currently used; namely (1) thermal enhancement, which primarily involves injecting high-pressure steam into the oil reservoir to reduce oil viscosity and increase its ability to flow; (2) miscible flood, in which propane, butane, natural gas, CO_2, or other gases are injected into the reservoir to dissolve and displace the oil; and (3) chemical enhancement, which includes injecting polymers to thicken injected waters to increase uniformity of oil displacement in the reservoir or injecting detergents ("surfactants") that essentially "wash" the oil from the reservoir rocks.

As with secondary recovery systems, additional land surface is required to accommodate the injection and oil recovery systems. This includes additional wells, injection lines and flowlines, roads, storage, and treatment facilities, pumps, and injection equipment. There also is an increase in construction and drilling activities during the installation of all enhanced recovery systems.

Transportation Pipelines

A transportation pipeline is needed in order to transport natural gas and oil to market or refineries. In most cases, oil is transported to the refinery via a pipeline, although trucks may be used to transport oil from isolated fields or new fields to pipeline terminals or the refinery.

Oil is moved through the pipeline by pumps. Pump stations are located either at gathering stations or trunkline stations or a combination of both. A gathering station is located in or near an oil field and receives oil through a pipeline gathering system from the operators' tanks. From the gathering station, oil is relayed to a trunkline station, which is located on the main pipeline, or trunkline. The trunkline station relays the oil to refineries or shipping terminals. To maintain pressure, booster pumps are spaced along the trunkline. Tank batteries located along the line receive and temporarily store the oil before it continues.

Months and sometimes years of engineering studies and surveys of potential gas reservoirs and markets precede the final decision to build a pipeline.

Construction of a large transportation pipeline may involve as many as 250 to 300 men in a normal operation and up to 500 men in a very large operation. The amount of construction equipment needed depends on the variety and difficulty of terrain. Stream crossings marshes, bogs, heavily timbered forests, steep slopes, or rocky ground can require different types of equipment and construction practices. 250 to 300 men can move at a rate of three miles a day with a distance of up to 10 or 15 miles separating the beginning of the work crew from the end.

In practice, a strip of land from 50 to 75 feet wide is cleared depending on the size of the pipe and the type of terrain. The clearing crews open fences and build gates, cattle guards, and bridges. Salable timber cut by clearing crews is stacked; the rest is cut and disposed. A roadway capable of supporting vehicle access is graded and completed adjacent to the pipeline. The cleared area needs to be wide enough for the pipeline trench, the largest side-boom tractor, and transportation of pipe and equipment. In rocky terrain, a machine equipped with a ripper that extends several feet into the ground is often used to loosen rocks for removal before the ditching operation begins.

A ditch is made by loose-dirt ditching machines or by wagon drills suspended from side-boom tractors. Dynamite blasting is used for very hard rock surfaces. Pipe is transported to the ditching sites where it is coated, double jointed, welded, and lowered into the ditch. The pipe must be buried deep enough to ensure that it does not interfere with normal surface uses. The Department of Transportation requires a minimum of 36 inches of cover. The trench is then backfilled and compacted. Finally, the cleared area is waterbarred and revegetated.

Well Servicing and Oil and Gas Field Maintenance

Producing wells in active oil and gas fields periodically require repair and work-over operations. Operations involving no new surface disturbance to redrill, deepen, and plug-back require prior approval of the authorized officer of the BLM. In some cases, these operations require the approval of the Forest Service. No prior approval or subsequent report is required for well clean-out work, routine well maintenance, bottom hole pressure survey, or for repair, replacement, or modification of surface production equipment provided no additional surface disturbance is involved.

When prior approval is required, the operator must submit a Sundry Notice, or APD, as applicable. A detailed written statement of the plan of work must be provided to the authorized officer with the appropriate form. When additional surface disturbance will occur, a description of any subsequent new construction, reconstruction, or alteration of existing facilities, including roads, dam sites, flowlines and pipelines, tank batteries, or other production facilities on any lease, must be submitted to the authorized officer for environmental reviews and approvals. On National Forest System lands, the BLM coordinates with the Forest Service to obtain their approval on the surface disturbing activities. Emergency repairs may be conducted without prior approval provided the authorized officer is promptly notified.

The servicing of individual wells to improve or maintain oil and gas production is an activity that extends throughout the life of the field. This work is usually performed with the use of a well servicing unit or self-propelled work-over rig, which is similar to a scaled down oil rig. Both the work-over rig or well-servicing unit carry hoisting machinery that is used to pull sucker rods and tubing from the well bore. The most common well-servicing operations conducted are: cleaning out the well, changing pumps, repairing rod string and tubing, changing and reestablishing oil producing intervals, installing artificial lifts, and repairing casing and other downhole equipment. There is an intense, but short-term, increase in human and motorized activity at the well site during servicing.

Construction, reconstruction, and normal maintenance work continue throughout the field's life. Flowlines, pipelines, pumping units and other oil gas field equipment, no longer functional because of corrosion, metal fatigue, wear, or because it has become outdated and inefficient, is replaced, upgraded, or abandoned and removed. Major and minor maintenance activities are a normal part of the operations during the life of the oil and gas field.

Pollution Control

All spills or leakages of oil, gas, produced water, toxic liquids or waste materials, as well as blowouts, fires, personal injuries, and fatalities must be reported by the operator to the BLM and the surface management agency in accordance with the requirements of Notice to Lessees 3A (NTL 3A), "Reporting of Undesirable Events", or an applicable Onshore Oil and Gas Order. The BLM requires immediate reporting of all Class I events (more than 100 barrels of fluid/500 MCF of gas released or fatalities involved). A spill prevention, control and countermeasure plan (SPCC) is required by the EPA under 40 CFR Part 112 and any discharge of oil (oil spill) must be reported immediately to the EPA's National Response Center (See 40 CFR 110).

Firewalls/containment dikes must be constructed and maintained around all storage facilities/batteries. The containment structure must have sufficient volume to contain, at a minimum, the entire content of the largest tank within the facility/battery, unless more stringent site-specific protective requirements are deemed necessary by the authorized officer.

Inspection and Enforcement

The BLM and Forest Service have developed procedures to ensure that leaseholds, which are producing or expected to produce significant quantities of oil or gas in any year or have a history of noncompliance, are inspected at least once a year. Other factors such as health, safety, environmental concerns, and potential conflict with other resources also determine inspection priority. Inspections of leasehold operations ensure compliance with applicable laws, regulations, lease terms, Onshore Oil and Gas Orders, NTLs, other written orders of the authorized officer, and the approved plans of operation. The administration of oil and gas operations on National Forest System lands is conducted in accordance with 36 CFR 228.111 through 36 CFR 228.114.

Abandonment (Phase 5)

All abandonments, whether they involve one wildcat well, a well no longer productive, or an entire leasehold, require the approval and acceptance of the abandonment of the individual wells(s) by the BLM and the Forest Service. An acceptable abandonment includes (1) the plugging of the well bore and (2) reclamation of the land surface to a stable and productive use.

Approval of Abandonment

Well abandonment operations may not be started without prior approval of a "Sundry Notices and Reports on Wells" by the authorized officer of the BLM. The Sundry Notice serves as the operator's Notice of Intent to Abandon (NIA). In the case of newly drilled dry holes, failures, and in emergency situations, oral approval may be obtained from the authorized officer followed by written confirmation. In such cases, the surface reclamation requirements will have been discussed with the operator and stipulated in the approved APD. Additional surface reclamation measures may be required by the Forest Service. For older existing wells not having an approved surface use plan of operations, a reclamation plan must be submitted with the NIA. Reclamation requirements are part of the approval of the NIA. The operator must contact the BLM prior to plugging a well to allow for approval and witnessing of the plugging operations.

Plugging of Wells

The purpose of plugging a well is to prevent fluid migration between zones within the well bore, to protect other minerals from damage, and to assist in the reclamation of the surface area. Well plugging requirements vary with the characteristics of the rock, geologic strata, well design, and reclamation requirements.

The operator's plan for plugging and abandonment is submitted with the Notice of Intent to Abandon and is reviewed for completeness and adequacy. Although the plugging of each well must be designed individually, the minimum requirements are described below.

In open hole situations, cement plugs must extend at least 50 feet above and below zones with fluid that has the potential to migrate, zones of lost circulation (this type of zone may require an alternate method to isolate), and zones of potentially valuable minerals. Thick zones may be isolated using 100-foot plugs across the top and bottom of the zone. In the absence of productive zones and minerals, long sections of open hole may be plugged with 150-foot plugs placed every 2,500 feet. In cased holes, cement plugs must be placed opposite perforations and extending 50 feet above and below them except where limited by plug back depth. (See Onshore Oil and Gas Order No. 2).

A permanent abandonment marker is required on all wells unless waived by the Forest Service. This marker pipe usually extends four feet above the ground and is embedded in cement at the borehole site. The pipe is capped and the well's identity and location permanently inscribed.

Dry wildcat and development wells are normally plugged before the drill rig is removed from the well site. This avoids the necessity of bringing in other plugging equipment.

Before a lessee/operator abandons a well no longer capable of production, it must be shown that it is no longer suitable for profitable operation. Wells are normally plugged when they are no longer capable of production. However, if a well has potential for use in a secondary recovery program, it may be allowed to stand idle. Truck-mounted equipment is used to plug former producing wells.

Surface Reclamation

A reclamation plan is a part of the Surface Use Plan of Operations. Reclamation may be required of any surface previously disturbed that is not necessary for the continued well or other operations. When abandoning a well and other facilities that do not have a previously approved reclamation plan, a plan must be submitted with a NIA. Additional reclamation measures may be required based on the conditions existing at the time of abandonment. Any additional reclamation requirements are made part of the conditions of approval of the NIA. The general standards and guidelines for reclamation and abandonment of oil and gas operations are set forth in the third edition of the *Surface Operating Standards for Oil and Gas Exploration and Development*. Additional standards and requirements may be applied to accommodate the site-specific and geographic conditions of the reclamation site.

Prior to the start of reclamation, all equipment and trash must be removed from the well site or the area to be reclaimed. When an entire lease is abandoned, the separators, heat treaters, tanks, and other processing and handling equipment are removed and the surface restored. Flowlines and injection lines installed on the surface are removed, but buried lines usually are left in place.

Well Site Reclamation

Well site reclamation must be planned for both producing and abandoned well sites. The entire site, or portion not required for the continued operation of the well, is reclaimed.

When dry, all excavations and mud pits must be closed by backfilling and graded to conform to the surrounding terrain. Waterbreaks and terracing may be installed to prevent erosion of fill material.

Cut and fill slopes must be reduced and graded to blend the site to the adjacent terrain. The well site may be re-contoured by bringing construction material back onto the well pad and reestablishing the natural contours where desirable. Areas surfaced with gravel are buried deep in the re-contoured area to prevent possible surface exposure.

The topsoil is replaced on the reclamation area and prepared to provide a seedbed for reestablishment of desirable vegetation. Standard reclamation practices may include contouring, terracing, gouging, scarifying, mulching, fertilizing, and/or seeding.

Reserve Pit Reclamation

All pits must be reclaimed to a natural condition similar to the rest of the reclaimed well site area. In addition, the reclaimed pit must be restored to a safe and stable condition. In most cases, if a pit contains a synthetic liner, the pit is not to be trenched (cut) or filled while still containing fluids. Pits must be allowed to dry, be pumped dry, or solidified by adding cement *in situ* prior to backfilling. The pit area is usually mounded to allow for settling. The mounding allows for positive surface drainage off the reclaimed pit, which lessens the possibility of leaching or lateral movement of undesirable substances from the buried pit into surface streams or shallow aquifers.

The concentration of hazardous substances in the reserve pit at the time of pit backfilling must not exceed the standards set forth in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). All oil and gas drilling-related CERCLA hazardous substances removed from a location and not reused at another drilling location are disposed in accordance with applicable state and federal regulations.

Road Reclamation

Roads no longer needed for oil and gas operations and not within the Forest Service Transportation System must be abandoned, closed, and obliterated. Reclamation of abandoned roads will involve one or more of the following techniques: (1) re-contouring to the original contour, (2) re-contouring to blend with natural contours, (3) re-contouring only selected sections of the roadway, and (4) obliteration of the roadway surface with no other modification of the road profile. Reclamation treatments also may include ripping, scarifying, waterbarring, and barricading. Stockpiled soil, debris, and fill materials are replaced on the roadbed and the road reseeded in accordance with the approved site-specific reclamation plan.

Pipeline and Flowline Reclamation

Abandonment and reclamation of pipelines and flowlines, similar to the reclamation of abandoned roads, involve replacing fill material in the original cuts, reducing and grading cut and fill slopes to conform to the adjacent terrain, replacement of surface soil material, waterbarring, and revegetating in accordance with the reclamation plan.

Pipeline trenches are compacted during backfilling and must be maintained to correct backfill settling and prevent erosion. Waterbars and other erosion control devices are repaired or replaced as necessary.

Revegetation

Disturbed areas are revegetated after the site has been contoured, graded, and the soil surface satisfactorily prepared. In order to minimize the soil erosion potentials and provide as stable seed bed, site preparation may include ripping, contour furrowing, terracing, reduction of steep cut and fill slopes, waterbarring, etc. Revegetation involves seeding, planting containerized plants, or a combination of the two. Native perennial species, or other plant materials specified by the Forest Service, are used. The oil and gas operator is advised as to species, methods of revegetation, and seasons to plant. Seeding is normally done by drilling on the contour or by other approved methods. Seeding and/or planting is repeated until satisfactory revegetation is accomplished, as determined by the Forest Service. Mulching, fertilizing, fencing, or other practices also may be required depending on site-specific conditions.

Visual Resources

For all activities that alter landforms, disturb vegetation, or require temporary or permanent structures, the operator is required to comply with visual resource management objectives for the area. Site-specific mitigation practices may be required by the Forest Service to avoid or minimize changes in the character of the landscape or minimize the impacts of unnatural intrusions on the landscape.

Additional Requirements

Additional reclamation methods and techniques that reflect local site conditions are required. Technical advances in reclamation practices that may be successfully applied to oil and gas construction are continually being developed.

Inspection and Final Abandonment Approval

Final abandonment is not approved until the surface reclamation work required by the APD or NIA is completed and the required reclamation is acceptable to the Forest Service. The operator must file a Subsequent Report of Abandonment (SRA) following the plugging of a well. A Final Abandonment Notice (FAN), which indicates that the site is ready for inspections, must be filed upon completion of reclamation.

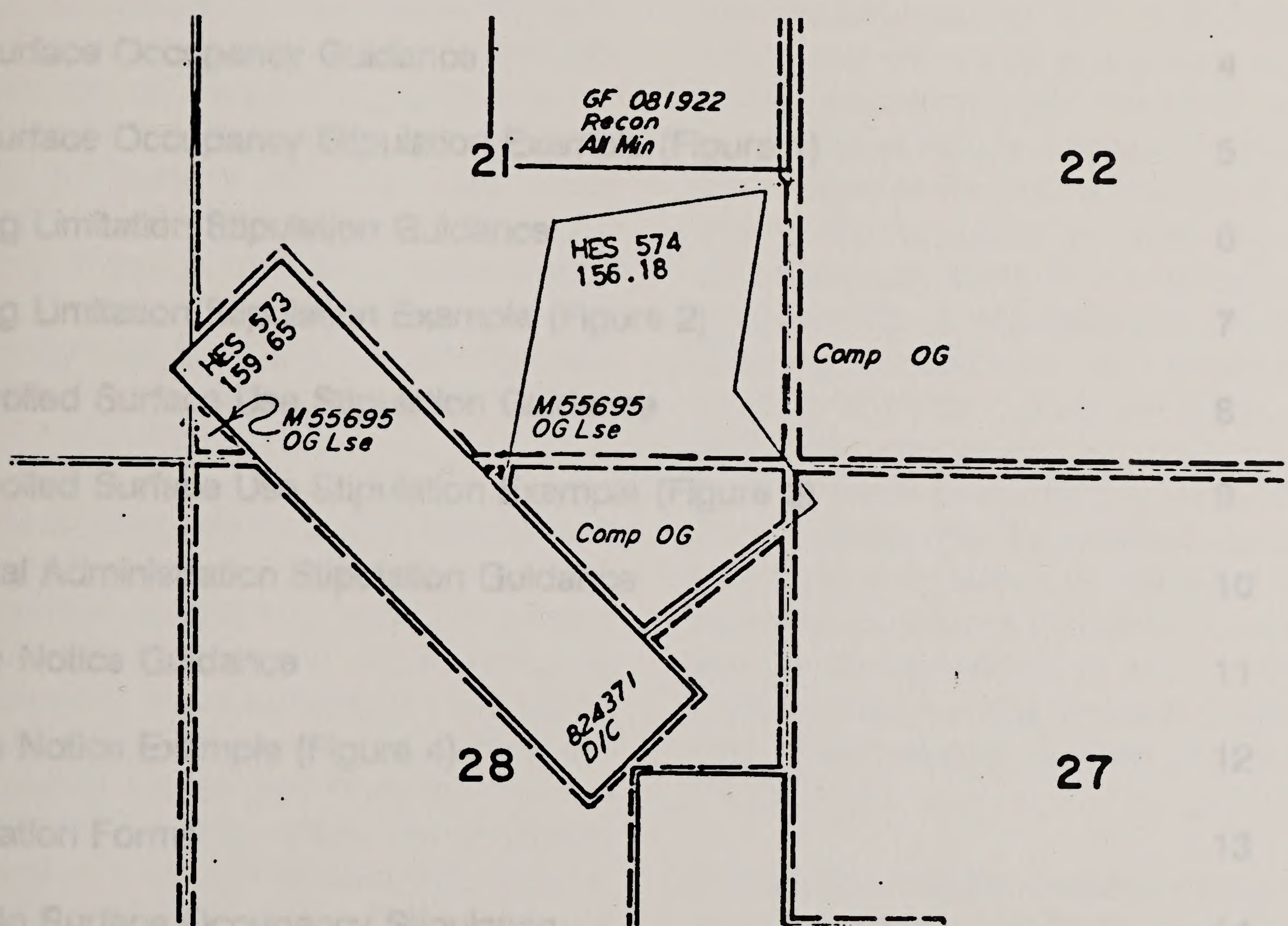
Release of Bonds

If the well is covered by an individual lease bond, the period of liability on that bond is terminated once the final abandonment or phased bonding release has been approved. The lessee can request termination of the period of liability from the BLM State Office holding the bond. If the well is covered by a state-wide or nation-wide bond, termination of the period of liability of these bonds is not approved until final abandonment of all activities conducted under the bond have been approved by both the BLM and Forest Service.

Appendix D

Uniform Format for Oil and Gas Lease Stipulations.

UNIFORM FORMAT FOR OIL AND GAS LEASE STIPULATIONS



Final Recommendations Prepared By:

Rocky Mountain Regional Coordinating Committee

March 1989

ROCKY MOUNTAIN REGIONAL COORDINATING COMMITTEE
STIPULATION SUBCOMMITTEE
STANDARDIZATION OF STIPULATION FORMAT

March 1989

CONTENTS

GENERAL GUIDANCE

Introduction

Federal land managers and the oil and gas industry have noted inconsistency and variation in the application of lease stipulations and notices between the various offices of Federal land management agencies throughout the Rocky Mountain States. The Coordinating Committee has been requested to determine if the number of apparently similar stipulations could be reduced, their wording standardized, and guidelines developed for consistent usage. This document provides guidance for the standardization of Federal oil and gas lease stipulations, uniform definitions, format, and wording. These guidelines were developed by the Bureau of Land Management and Forest Service but may be adopted and used by other surface management agencies.

In consolidating existing stipulations to a minimum number and expressing them in a standardized format, emphasis was placed on providing a system for accommodating all necessary lease conditions recognized by Federal land managers. Stipulations are to be part of a lease only when the environmental and planning record demonstrates the necessity for the stipulations. Stipulations, as such, are neither "standard" nor "special" but rather a necessary modification of the terms of the lease.

These forms, given on Pages 14-16, provide for standardized structure, wording, and usage. In order to accommodate the variety of resources encountered on Federal lands, these stipulations are categorized as to how the stipulation modifies the lease rights, not by the resource(s) to be protected. What, why, and how this mitigation/protection is to be accomplished is determined by the land manager through the land use planning and National Environmental Policy Act (NEPA) analysis.

Implementation

If upon weighing the relative resource values, there are values, uses, and/or users identified that conflict with oil and gas operations and cannot be adequately managed and/or accommodated on other lands, a lease stipulation is necessary. Land use plans serve as the primary vehicle for determining the necessity for lease stipulations (BLM Manual 1624). Documentation of the necessity for a stipulation is disclosed in planning documents or through site-specific analysis. Land use plans and/or NEPA documents also establish the guidelines by which future waivers, exceptions, or modifications may be granted. Substantial modification or waiver subsequent to lease issuance is subject to public review for at least a 30-day period in accordance with Section 5102.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 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 necessity for individual lease stipulations is documented in the lease-file record with reference to the appropriate land use plan or other leasing analysis document. The necessity for exceptions, waivers, or modifications will also be documented in the lease-file record through reference to the appropriate plan or other analysis. The uniform format for stipulations should be implemented when amendments or revisions of land use plans are prepared or by other appropriate means.

The uniform format for stipulations is designed to accommodate most existing stipulations by providing space to record the local mitigation objectives. The stipulations have been developed for the categories of: (1) no surface occupancy, (2) timing or seasonal restriction, and (3) controlled surface use. This guidance also includes the use of lease notices. There is also provision for special or unique stipulations, such as those required by prior agreements between agencies when the standardized forms are not appropriate. In all cases, use of the uniform forms for stipulations will require identification of specific resource values to be protected and description of the specific geographical area covered. Stipulations attached to noncompetitive leases will require the applicant's acceptance and signature.

DEFINITIONS

Condition of Approval (COA): Conditions or provisions (requirements) under which an Application for a Permit to Drill or a Sundry Notice is approved.

Controlled Surface Use (CSU): Use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational constraints that may modify the lease rights. CSU is used for operating guidance, not as a substitute for the NSO or Timing stipulations.

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.

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. Lease Notices attached to leases should not be confused with NTLs--Notices to Lessees. (See 43 CFR 3160.0-5)

Modification: Fundamental change to the provisions of a lease stipulation, either temporarily or for the term of the lease. A modification may, therefore, 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.

No Surface Occupancy (NSO): Use or occupancy of the land surface for fluid mineral exploration or development is prohibited to protect identified resource values. 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)."

Notice to Lessees (NTL): The NTL is a written notice issued by the authorized officer. NTLs implement regulations and operating orders, and serve as instructions on specific item(s) of importance within a State, District, or Area.

Stipulation: A provision that modifies standard lease rights and is attached to and made a part of the lease.

Timing Limitation (Seasonal Restriction): Prohibits surface use during specified time periods to protect identified resource values. This 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.

Waiver: Permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

NO SURFACE OCCUPANCY STIPULATION GUIDANCE

The No Surface Occupancy (NSO) stipulation is intended for use only when other stipulations are determined insufficient to adequately protect the public interest. The land use plan/NEPA document prepared for leasing must show that less restrictive stipulations were considered and determined by the authorized officer to be insufficient. The planning/NEPA record must also show that consideration was given to a no-lease alternative when applying a NSO stipulation. A No Surface Occupancy Stipulation is not needed if the desired protection would not require relocation of proposed operations by more than 200 meters (43 CFR 3101.1-2).

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. Land description may be stated as: the "Entire Lease", Distance from resources and facilities such as rivers, trails, campgrounds, etc.; legal description; geographic feature such as the 100-year floodplain, municipal watershed, percent of slope, etc.; Special Areas with identified boundaries--area of critical environmental concern, Wild and Scenic River, etc., or other description that specifies the boundaries of the lands affected. The estimated percent of the total lease area affected by the restriction must be given if no legal or geographic description of the location of the restriction is given. In other cases the estimated percent is optional. (See Example: Figure 1).

Land use plans and/or NEPA docume should identify the specific conditions providing waivers, exceptions, or modif tions to lease stipulations. Waivers, exc tions, or modifications must be suppor by appropriate environmental analysis documentation, and subject to the sa test used to initially justify the impositio this stipulation. Language may be adde the NSO stipulation form to provide lessee with information or circumstan under which waivers, exceptions, or mo cations would be considered. A waiver, ception, or modification may be approv the record shows that circumstances or ative resource values have changed or the lessee can demonstrate that operat can be conducted without causing u ceptable impacts, and that less restric stipulations will protect the public inte Waivers, exceptions or modifications only be granted by the authorized offic the waiver, exception, or modification i consistent with the land use planning d ment, that document must be amende necessary, or the change disallowed.

If the authorized officer determines, pri lease issuance, that a stipulation invo an issue of major concern, modificatio waiver of the stipulation will be subje public review (43 CFR 3101.1-4). The use plan may also identify other cases w a public review is required for waiver ception, or modification. In such c wording such as the following shou added to the stipulation form to infor lessee of the required public revie 30-day public notice period is require to modification or waiver of this stipul

EXAMPLE

Serial No._________

NO SURFACE OCCUPANCY STIPULATION

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

a. T. 147 N., R. 103 W., 5th P.M.
Sec. 29: N1/2NW1/4, SW1/4NW1/4

b. 1,320 feet from scenic and recreational segments of Flathead Wild and Scenic River.

T. 31 N., R. 17 W., PMM
Sec. 28: E1/2SE1/4

For the purpose of:

a. Avoidance of steep slopes exceeding 40 percent to avoid mass slope-failure (Management D, Custer Forest Plan, page 55).

b. Protection of visual and recreational qualities as discussed in Flathead Forest Plan (p. 89) and EIS (p.171).

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 1

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).

The land use plan/NEPA document prepared for leasing must show that less restrictive stipulations were considered and determined to be insufficient. The environmental effects of exploration, development, and production activities may differ markedly from each other in scope and intensity. If the effects of reasonably foreseeable production activities necessitate timing limitation requirements, this need should be clearly documented in the record. The record should also show that less stringent, project-specific mitigation may be insufficient. In such cases the stipulation language should be modified on a case-by-case basis to clearly document that the timing limitation applies to all stages of activity.

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 planning and/or NEPA document. The timing limitations for separate purposes may be written on separate forms or as one combined stipulation. (See Example: Figure 2.) During the review and decisionmaking process for APD's and Sundry Notices, the date(s) and location(s) should be refined based on current information.

Land use plans and/or NEPA documents should identify the specific conditions for providing waivers, exceptions, or modifications to lease stipulations. Waivers, exceptions, or modifications of this stipulation such as continuing drilling operations into a restricted time period, must be supported with appropriate environmental analysis and documentation, and will be subject to the same test used to initially justify the imposition of this stipulation. Language may be added to the stipulation form to provide the lessee with information or circumstances under which waiver, exception, or modification would be considered. The need for one-time, case-by-case exceptions of timing limitation stipulations may arise from complications or emergencies during the drilling program. The need for timely review and decisionmaking is great in such cases. For this reason, it is desirable that land use plans/NEPA documents clarify what review procedures and other requirements, if any, will apply in such cases.

A waiver, exception, or modification may be approved if the record shows that circumstances or relative resource values have changed or that the lessee can demonstrate that operations can be conducted without causing unacceptable impacts, and that less restrictive stipulations will protect the public interest. Waivers, exceptions or modifications can only be granted by the authorized officer. If the waiver, exception, or modification is inconsistent with the land use planning document, and that document does not disclose the conditions under which such changes will be allowed, the plan or NEPA document must be amended as necessary, or the change disallowed.

If the authorized officer determines, prior to lease issuance, that a stipulation involves an issue of major concern, modification or waiver of the stipulation will be subject to public review (e.g., 43 CFR 3101.1-4). The land use plan may also identify other cases when a public review is required for waiver, exception, or modification. In such cases, wording such as the following should be added to the stipulation form to inform the lessee of the required public review: "A 30-day public notice period is required prior to modification or waiver of this stipulation."

EXAMPLE

Serial No.____________

TIMING LIMITATION STIPULATION

No surface use is allowed during the following time period(s). This stipulation does not apply to operation and maintenance of production facilities.

a. May 1 to June 15.

b. During periods when soils are water saturated.

On the lands described below:

a. Section 21, T. 22 N., R.12 E.

b. Entire Lease.

For the purpose of (reasons):

a. Protect elk calving area; North Fork Forest Plan (p. 62) and EIS (p. A-34).

b. Prevent excessive soil erosion and stream sedimentation resulting from construction activities during periods when soils are saturated. This does not apply to operation and maintenance of production facilities; Broad Draw Resource Management Plan (p. 61).

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 2

CONTROLLED SURFACE USE STIPULATION GUIDANCE

The Controlled Surface Use (CSU) Stipulation is intended to be used when fluid mineral occupancy and use are generally 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. This stipulation replaces stipulations commonly referred to as Limited Surface Use Stipulations. 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 (No Surface Occupancy) or Timing Limitation stipulations, which prohibit all occupancy and use 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. The use of this stipulation should be limited to areas where restrictions or controls are necessary for specific types of activities 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 record must show that less restrictive stipulations were considered and determined to be insufficient. 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. (See Example: Figure 3)

Land use plans and/or NEPA documents should identify the specific conditions for providing waivers, exceptions, or modifications to lease stipulations. Waivers, exceptions, or modifications of this stipulation must be supported with appropriate environmental analysis and documentation, and will be subject to the same test used to initially justify the imposition of this stipulation. Language may be added to the stipulation form to provide the lessee with information or circumstances under which waiver, exception, or modification would be considered. A waiver, exception, or modification may be approved if the record shows that circumstances or relative resource values have changed or that the lessee can demonstrate that operations can be conducted without causing unacceptable impacts, and that less restrictive stipulations will protect the public interest. Waivers, exceptions or modifications can only be granted by the authorized officer. If the waiver, exception, or modification is inconsistent with the land use planning document, that document must be amended as necessary, or the change disallowed.

If the authorized officer determines, prior to lease issuance, that a stipulation involves an issue of major concern, modification, or waiver of the stipulation will be subject to public review (43 CFR 3101.1-4). The land use plan may also identify when a public review is required for waiver, exception, or modification. In such cases, wording such as the following should be added to the stipulation form to inform the lessee of the required public review: "A 30-day public notice period is required prior to modification or waiver of this stipulation."

EXAMPLE

Serial No.______________

CONTROLLED SURFACE USE STIPULATION

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

Unless otherwise authorized, access to this leasehold will be limited to the established roadway.

On the lands described below:

Entire lease

For the purpose of:

To meet visual quality objectives and to protect semiprimitive recreation values; Grand Junction Resource Management Plan (p. 89).

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 3

SPECIAL ADMINISTRATION STIPULATION GUIDANCE

There is no required or suggested uniform format for these stipulations. They are usually provided by another agency or organization. However, other agencies are to be encouraged to use the uniform stipulation format.

Special Administration Stipulations are used in situations where the three uniform stipulation forms or Lease Notices do not adequately address the concern. Special Administration Stipulations should be used only when special external conditions, such as pre-existing agreements with other agencies, require use of a one-of-a-kind stipulation that is not used in any other area or situation. The resource use or value, location, and specific restrictions must be clearly identified. In addition, the external agency, agreement or pre-existing use that dictates the special restrictions must be identified. The stipulation should state if and under what circumstances a waiver, exception, or modification may be allowed

EXAMPLES OF SPECIAL ADMINISTRATION STIPULATIONS ARE:

1. Stipulation for Lands of the National Forest System Under Jurisdiction of Department of Agriculture (Bureau of Land Management IM 84-415).

2. Stipulation for leases subject to a Highway Material Site Right-of-Way (Bureau of Land Management, New Mexico; Agreement with New Mexico Highway Department).

3. New Mexico Potash Stipulation for Oil and Gas Leases (Department of Interior, Federal Register Notice, November 5, 1975).

4. Jackson Hole Area Oil and Gas Lease Stipulation (Department of the Interior, Federal Register Notice, August 30, 1947).

5. White Sands Missile Range Stipulation (Bureau of Land Management, New Mexico; Agreement with Army Corps of Engineers).

6. Lease Stipulation, Bureau of Reclamation, Form 3109-1, (Bureau of Land Management, Utah; Agreement with Bureau of Reclamation).

7. Special State of Idaho Stipulations; Bureau of Aeronautics and Public Transportation (Bureau of Land Management, Idaho; Agreement with State of Idaho).

LEASE NOTICE GUIDANCE

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, regulations, standard lease terms, or onshore oil and gas orders. 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; 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 affect 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 nondiscretionary 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 officer whether a situation is sufficiently sensitive to warrant the use of a lease stipulation. An examples of a Lease Notice is found in Figure 4.

EXAMPLE

Serial No.______________

LEASE NOTICE

A 5-acre graveyard is located in the NW1/4NW1/4, Section 6, T. 5 N., R. 31 W., 6PM. In accordance with Section 6 of the lease terms and 43 CFR 3101.1-2, exploration and development activities must occur outside the graveyard.

Form #/Date

Figure 4

STIPULATION

FORMS

Serial No.____________

NO SURFACE OCCUPANCY STIPULATION

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

For the purpose of:

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

Serial No.____________

TIMING LIMITATION STIPULATION

No surface use is allowed during the following time period(s). This stipulation does not apply to operation and maintenance of production facilities.

On the lands described below:

For the purpose of (reasons):

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

Serial No.____________

CONTROLLED SURFACE USE STIPULATION

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

On the lands described below:

For the purpose of:

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

Appendix E

Acts of Authority and Mandates For the Forest Service and Bureau of Land Management

Acts of Authority and Mandates For the Forest Service and Bureau of Land Management

The authority of the Authorized Officer to make these decisions is conferred by the Leasing Reform Act of 1987. 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 Targhee National Forest. Other acts are mandates to the Forest Supervisor that must be carried while implementing any activities on the ground.

Background Acts

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 February 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 U.S. 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 Udal 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

The Act of March 4, 1917 (39 Stat. 1150, as supplemented; 16 USC 520) this act authorizes the Secretary of the Interior to prescribe general regulations to permit prospecting, development, and use of the mineral resources of the lands acquired under the Act of March 1, 1991, known as the Weeks Law, for the best interests of the United States.

Reorganization Plan No. 3 of 1946

Par 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.

Energy Security Act of June 30, 1980

The Energy Security Act (P.L. 96-294, 94 Stat. 611; 42 USC 8801 (note), 8854, 8855) 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.

Acts of Authority

Mineral Leasing Act for Acquired Lands of August 7, 1947

The Mineral Leasing Act (Ch. 513, 61 Stat. 913; 30 USC 351, 352, 354, 359) provides that all deposits of coal, phosphate, oil, oil shale, gas, sodium, potassium, and sulphur that are owned or may be acquired by the United States and that 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 that is unsatisfied of record, and subject to such conditions as that official may prescribe to ensure the adequate use of the lands for the primary purposes for which they have been acquired or are being administered.

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

The 1987 Leasing Reform Act (30 USC 181, et seq.; P.L. 100-203) 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 National Forest System lands cannot be issued by the BLM without the approval of the Forest Service. All surface-disturbing activities on National Forest System 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 Forest Service on March 21, 1990 (55 FR 10423, et seq.). The regulations were codified in 36 CFR 228.100 et seq.

Mineral Leasing Act of February 25, 1920

The Bureau of Land Management, Department of the Interior, is responsible for leasing under this Act. Technical administration of leases and permits is the responsibility of the U.S.

Geological Survey. By interdepartmental agreement all applications to lease lands under Forest Service jurisdiction are referred to the Forest Service for review, recommendation, and special stipulations to protect the surface and surface functions.

Mandates

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...." (Chapter 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 of 1960

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 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 of 1976

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 that limit the discretion of the Supervisor to make these decisions are described below.

National Environmental Policy Act of 1969

This statute (40 USC 4331 et seq.) and its implementing regulations (40 Part 1500) apply to federal actions relating to oil and gas leasing. This statute requires the Federal Authorized Officers in the Forest Service and other Federal Agencies to perform an environmental analysis and disclose the effects of their decisions on the quality of the human environment. The law further requires the Federal Officers to identify and describe the significant environmental issues associated with his/her decision and to develop alternatives to his proposed action (including the alternative of no action). Federal Officers must disclose the direct, indirect, and cumulative effects of the decisions, and adverse environmental effects that cannot be avoided, the relationship between short-term uses of man's environmental 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

The Clean Air Act (91 Stat. 685; 42 USC 7401 et seq.) provides that each State is responsible for ensuring achievement and maintenance of air quality standards within its borders so long as such standards are at least as stringent as Federal Standards established by the U.S. Environmental Protection Agency (EPA).

The Endangered Species Act of 1973

The Endangered Species Act (Public Law 93-204; 16 USC 15311, et seq.), as amended, requires special protection and management on Federal lands for threatened or endangered species. The U.S. Fish and Wildlife Service (FWS) 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 FWS 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 a formal "FWS Biological Opinion" as to whether or not the proposed action would jeopardize the continuous existence of any officially listed endangered or threatened species.

Clean Water Act

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 as long as they are at least as stringent as Federal standards established by the EPA.

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 resources 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.

Energy Policy Act of 1992

Changed the primary term of competitive leases from five years to ten years.

Federal Land Policy and Management Act of 1976

This statute (43 USC 1700, et seq.) and its implementing regulations define principals for management of public lands and their resources. This act directs the Secretary of the Interior to develop, maintain, and, when appropriate, revise Land Use Plans which provide for the use of public lands and that management on the basis of multiple use and sustained yield unless otherwise specified by law.

Appendix F

Committed Mitigation Measures

The Forest Service has developed this appendix as a guideline to mitigation measures it would consider, at a minimum, when implementing each action alternative described in Chapter 2 of this DEIS. These measures, which consist of general measures and measures that are specific to a particular component of the Reasonably Foreseeable Development Scenario, would be considered on a site-specific basis during stages three and four of the four-stage decision process. These measures are described in this appendix with the general mitigation plans presented first. This discussion is then followed by general conditions for all site-disturbing activities and component-specific measures.

The following mitigation plans will be required 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, shall be developed by each lessee. The plan will include the site-specific location of all mitigation measures and it will be approved by the Forest Service before implementation begins. The Erosion Control Plan will be jointly administered by the Forest Service and the lessee.

2. The Erosion Control Plan shall contain specific measures or BMP's for minimizing or eliminating the nature and degree of specific impacts that 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, revegetation, slope stabilization, velocity controls, sediment barriers, retention ponds, and so forth.

   Soil stabilization and revegetation 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, 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 the 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 3 of this DEIS.

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 shall have a Spill Prevention Control and Counter Measure 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 shall be located to minimize visual impacts.

All operations shall 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, 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 Office 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 timer 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 disturbances 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 shall be protected form all development activities.

All known populations of sensitive fish, wildlife and plants, and identified high priority remnant vegetation associations shall be protected from surface-disturbing activities. The area of protection shall include the actual location of the populations or occurrences of important associated vegetation and shall be determined in consultation and coordination with the Forest Service.

Those populations/occurrences which analysis determines need protection shall be protected by: 1) requiring relocation or rerouting of proposed developments (i.e. well sites, pipelines, roads, other surface facilities, etc.); or 2) applying other protective mitigation (i.e. fencing). The Forest Service shall require the 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 percent of capable ground cover of plants and litter; and 2) stable stream channels and favorable water quality and aquatic habitat.

Land vehicles are prohibited in stream channels, except at designated crossings.

An area specific Waste Management Plan shall be required at the time of the APD.

Filter strips shall be used along lake shores, wetlands, and streams to trap sediment before it reaches water bodies and impairs channel stability or aquatic habitat. Over 80 percent of a capable ground cover of plants and litter will be maintained in filter strips. Filter strip width will be designed to have an over 80 percent chance of trapping all sand size sediment, and will consider types of actions, vegetation, soils, and topography.

All activities shall ensure that the instream flows are maintained as needed to protect channel stability aquatic habitat, and riparian vegetation.

Road Construction and Operations

Existing roads shall 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 alternate 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.

Roads and drainage structures shall be located and designed to prevent road or slope failure. Other structures will be installed as needed to avoid slope saturation and failure.

Service and refueling areas shall be located on ridges or benches upslope from floodplains and terraces, and bermed to trap spills onsite.

Slash or other organic material shall not be incorporated into fills.

Cuts and fills shall be seeded and drain outlets armored promptly at final shaping. Mulch or matting will be used on steep, highly erodible fill as needed to achieve over 80 percent of potential ground cover of plants and litter before onset of seasonal runoff. At drain outlets, cobbles or larger rocks will be used as needed to prevent rill or gully erosion of fills and downslope areas.

Sediment traps shall be installed below fills in filter strips, tying them into stream crossings. All slash windrows will be compacted, and all straw bales and filter fences will be keyed and staked into the ground to enhance trapping efficiency. Traps will be cleaned before they are 80 percent full, and cleaned material will be placed and revegetated on a gentle slope outside the floodplain, or on a designated site approved by the Forest Service.

Streams shall be crossed perpendicular to channels on as gentle grades and slopes as possible. All crossings will be installed using fluvial and fisheries design concepts to maintain stable channels and favorable water quality and aquatic habitat. Bridges and fords will be used instead of culverts where practical.

New facilities shall be located outside of the 100-year floodplain.

All new roads shall be closed with a lockable gate to prevent general use of the road. Use of closed road segments shall be restricted authorized agents of: 1) the operator and/or the subcontractor(s); 2) the Forest Service; and 3) other agencies with a legitimate need (wildlife departments, other law enforcement agencies, and so forth). Unauthorized use or failure to lock gates during specified timeframes 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 shall be minimized by controlling use or by applying surface treatments to hold down fine particles.

Cattle guards heavy enough to handle proposed road traffic shall be installed, maintained, and kept cleaned out when access roads pass through pasture gates or fences.

Improvement to existing access will occur as necessary, and shall be limited to a 12-foot running surface with turnouts as needed and minimum disturbance of surrounding soil and vegetation (abrupt back sloped borrow and ditch). cut and fill will be 1.5:1 up to 50 percent sideslope. Over 50 percent sideslope cut will be 0.75:1 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; 4 to 5 percent grade, 75-foot spacing; greater than 5 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 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/streams.

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 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 - 10Y
  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 "skylighting."

- ➢ Maintain a minimum distance of 0.25 mile from recognized scenic natural features, such as rock outcrops, peaks, cliff, waterfalls, and so forth.

Pads shall not be constructed in riparian areas or floodplains. Pads will be constructed in a manner that minimizes impacts to the areas.

Pads shall 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 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 over ground to these areas.

A minimum of 2 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 the cut portion of a well pad site.

Mud, separation pits, and other containments used during the exploration of 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.

Final written certification is required, confirming that there are no hazardous materials on the RARA 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. If the operator an provide certification, the pit should be drained of fluids, and pit liner disposed of in a manner consistent with EPA standards.

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 waste.

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 blooie line discharge dust by use of water injection or any other acceptable method. The blooie line discharge shall be a minimum of 100 feet from the blow out preventer and be directed into the blooie pit so that the cuttings and waste are contained in the pit.

All open pits and tanks shall be netted or otherwise covered to prevent the entry and death of migratory birds. The U.S. Fish and Wildlife Service will be consulted for detailed guidelines.

Pipelines

Where possible existing corridors will be utilized.

Linear openings should have a turn or angle every 0.25 mile.

Horizontal vertical edges of corridors will be scalloped.

Pipeline and transmission corridors should parallel contours on slopes greater than 20 percent.

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), snowcat, and so forth, 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 liens, 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.

Acquiring rights-of-way across private lands, or other non-Federal ownership, will be the responsibility of the lessee or operator. The lessee will need to provide documentation showing that Right-of-way was obtained, or could not be acquired, and why. Federal lands will be used whenever possible, in lieu of crossing privately owned lands.

Production

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 a 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 shall 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 shall be required form the state for point discharge.

Small amounts of oil field 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, and so forth) 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. All well casings and collars will be designed for the lowest practical contamination risk. Petroleum facilities will have appropriate berm and liner to contain the storage capacities of the fuel tank.

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 a project as possible, or within one year of the conclusion of operations, unless a longer period is allowed by the authorized officer. 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 anc 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. The operator will continue revegetation efforts using any and all cultural methods available until this standard is met. Revegetation will not include undesirable weedy species such as diffuse knapweed, tansy ragwort, and other noxious weeds.

Tree planting shall 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 afer nonuse. 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 shall 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, shall 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 shall 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 shall be allowed to evaporate through the entire summer season (June-August) after drilling is completed, unless an alternate method of disposal is approved. Afer 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 3 feet of cover (overburden) on the pit. At the discretion of the Forest Service, lined pits will be effectively folded over and effectively capped or pit liners and any solids contained in them will be removed off Forest to an appropriate disposal area by the operator. 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 distributed 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 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 recontouring, terracing, gouging, scarifying, mulching, fertilizing, seeding, and planting.

Reclamation, removal, 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, pipelines, and other structures, which are not required for present or future operations, shall be removed upon termination of use.

confirmation (one which allows leave conditions, avoids steep cut and fill slopes), as soon as possible. All of the topsoil stockpiles will be evenly distributed over the reconcoured areas. Brush cleared prior to construction of the well site shall be respread back over the reconcoured area.

Immediately after seeding, the stockpiled trees and slash will be logged and scattered evenly over the disturbed areas. The access will be blocked to prevent vehicular use. Logs and 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 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 reconctouring, terracing, gouging, scarifying, mulching, fertilizing, seeding, and planting.

Reclamation, removal, and abandonment of pipelines and flowlines 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, waterbars, and revegetating in accordance with rehabilitation practices specified by the Forest Service.

Surface buildings, supporting facilities, pipelines, and other structures, which are not required for present or future operations, shall be removed upon termination of use.

Appendix G

Leases Stipulations

The following section lists the stipulations that will be applied (by resource by stipulation type by site specific resource area), and a short explanation of the reasons for the stipulation. This is mandated by section 102(c)(1)(ii) of the oil and gas regulations found in 36 CFR Part 228 Subpart E — Oil and Gas Resources, where it states: "As part of the analysis, the authorized Forest Officer shall identify on maps those areas that will be 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)." Section 102(3)(2) also reiterates this direction in its discussion of leasing decisions for specific lands. Forest Service policy states (FSM 2822.42) that the stipulations should be "held to a minimum consistent with those purposes," meaning that the least restrictive stipulation should be applied which protects the target resource. This section will also discuss guidelines by which future waivers, exceptions, or modifications may be granted.

When a request to modify, waive, or grant an exception to lease stipulations is received, the authorized Forest officer shall review the request as provided for in 36 CFR 228.104. As part of the review, the authorized Forest officer will ensure compliance with the National Environmental Policy Act and other applicable laws, and may authorize the BLM to modify, waive, or grant an exception to a stipulation if:

1) The action would be consistent with applicable Federal laws;
2) The action would be consistent with the current forest land and resource management plan;
3) The management objectives which lead to the Forest Service to require the inclusion of the stipulation in the lease can be met without restricting operations int he manner provided for by the stipulation given the change in the present condition of the surface resource involved, or given the nature, location, timing, or design of the proposed operation; and
4) The action is acceptable to the authorized Forest officer based upon a review of the environmental consequences.

RESOURCE: **Elk Calving Areas**

Stipulation: Timing Limitation

Objective: To preclude new surface disturbing activities within the elk calving area (Figure 309) which could cause increased stress and/or displacement during the critical time period (May 15 to July 15).

Waiver: A waiver may be granted if new habitat studies in coordination with the applicable state wildlife agency concludes that the area affected by this stipulation is no longer used as a calving area. A waiver may also be granted if, after consultation with the applicable state wildlife agency, it is determined that activities within the area would help temporarily disperse the elk from areas of intensive use and provide a tool for herd management.

Exception: An exception may be granted if season conditions are such (i.e. an early spring and snowmelt) that the elk have moved out of and are not using the general area during the particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as a calving area.

Justification: Under standard lease terms activities can be delayed for up to 60 days to mitigate disturbance to elk during the calving period, but would not provide needed mitigation in areas that are also elk summer. A lease stipulation would be needed to preclude commencement of activities during the extended protection period, April 1 to November 30. Also, by attaching a Timing Limitation stipulation to the lease, the lessee is made aware of that requirement at the time the lease is acquired. The no lease option or a No Surface Occupancy stipulation is deemed to be overly restrictive since operations conducted outside the calving period would have minimal effect on the elk.

RESOURCE: Elk Summer Range

Stipulation: Timing Limitation

Objective: To preclude new surface disturbing activities within areas used by elk as summer range, which could cause increase stress and/or displacement during the critical time period (April 1 to November 30).

Waiver: A waiver may be granted if new habitat studies in coordination with the applicable state wildlife agency concludes that the area affected by this stipulation is longer used as a calving area. A waiver may also be granted if, after consultation with the applicable state wildlife agency, it is determined that activities within the area would help temporarily disperse the elk from areas of intensive use and provide a tool for herd management.

Exception: An exception may be granted if seasonal conditions are such that the elk have moved out of and are not using the general area during the particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as a calving area.

Justification: Standard lease terms provide for delays of activities for up to 60 days. Because the critical period extends for approximately 240 days, the standard lease terms would not be adequate. A lease stipulation would be needed to preclude commencement of activities during the extended protection period (April 1 to November 30). Also, by attaching a Timing Limitation stipulation to the lease, the lessee is made aware of that requirement at the time the lease is acquired. The no lease option or a No Surface Occupancy stipulation is deemed to be overly restrictive since operations conducted outside the summer period would have a minimal effect on the elk.

RESOURCE: **Elk Winter Range**

Stipulation: Timing Limitation stipulation

Objective: To preclude new surface disturbing activities within the elk winter range (Figure 3-9) which could cause increased stress and/or displacement of animals during the critical time period (November 30 to April 2).

Waiver: A waiver may be granted if new habitat studies in coordination with the applicable state wildlife agency concludes that the area affected by this stipulation is no longer used as a winter range. A waiver may also be granted if, after consultation with the applicable wildlife agency, it is determined that activities within the area would help temporarily disperse the elk from areas of intensive use and provide a tool for herd management.

Exception: An exception may be granted if seasonal conditions are such (i.e. an early spring and snowmelt) that the elk have moved out of and are not using the general area during the particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as a winter range.

Justification: Standard lease terms provide for delay of activities for up to 60 days. Since the critical period extends for approximately 120 days, the standard lease terms would not be adequate. The no lease option or a No Surface Occupancy stipulation is deemed to be overly restrictive since operations conducted outside the wintering period would have a minimal effect on the elk.

RESOURCE: **Moose Winter Range**

Stipulation: Timing Limitation stipulation

Objective: To preclude new surface disturbing activities within the moose winter range (Figure 3-10) which could cause increased stress and/or displacement of animals during the critical time period (November 15 to April 30).

Waiver:	A waiver may be granted if new habitat studies in coordination with the applicable state wildlife agency concludes that the area affected by this stipulation is no longer used as a winter range.
Exception:	An exception may be granted if seasonal conditions are such (i.e. an early spring and snowmelt) that the moose have moved out of and are not using the general area during the particular year.
Modification:	A modification of the stipulation may be granted if new habitat studies show that a portion of the are is not used as a moose winter range.
Justification:	Standard lease terms provide for delay of activities for up to 60 days. Since the critical period extends for approximately 165 days, the standard lease terms would not be adequate. The no lease option or a No Surface Occupancy stipulation is deemed to be overly restrictive since operations conducted outside the wintering period would have a minimal effect on the moose.

RESOURCE:	**Non-Motorized Recreation**
Stipulation:	Controlled Surface Use stipulation
Objective:	To minimize the effects of activities within the non-motorized areas by requiring that activities be located or projects designed in a manner that would have minimal effects on the non-motorized characteristics and/or provide for extensive reclamation.
Waiver:	None
Exception:	None
Modification:	None
Justification:	A Controlled Surface Use stipulation is needed to ensure minimal effect on the natural integrity and long-term appearance of the area, including the scenic quality and opportunities for semi-primitive recreation. the no lease option or a No Surface Occupancy stipulation are deemed overly restrictive since the Forest Plan allows other surface disturbing resource activities within the area. Under standard lease terms reclamation requirement could be identified at the drilling stage, but the use of a CSU informs the lessee of the resource concern at the time the lease is acquired.

RESOURCE: **Developed Recreation Sites**

Stipulation: No Surface Occupancy stipulation

Objective: To preclude surface occupancy and new surface disturbing activities within developed recreation sites.

Wavier: A waiver may be granted if the site is moved or eliminated.

Exception: Same

Modification: Same

Justification: Construction of a developed recreation site allocates those specific lands for a specific use and a NSO stipulation is deemed necessary to protect the capital investment made. Operations within these areas would be allowed under either a Controlled Surface Use or under standard lease terms which would affect the capital investment and/or recreational setting. The no lease option is not considered appropriate since impacts can be mitigated using a NSO stipulation and not leasing could cause administrative problems related to unleased lands within a spacing unit.

RESOURCE: **Unstable Soils**

Stipulation: No Surface Occupancy stipulation

Objective: To preclude surface disturbing activities on areas that have a high erosion/ stability hazard and would be difficult to reclaim (Figure 3-2).

Waiver: None

Exception: An exception may be granted if the operator can demonstrate in a surface use plan of operations that adverse effects can be minimized and activities safely conducted.

Modification: A modification may be granted if an on-site inspection demonstrates that unstable soils do not exist on the specific site.

Justification: Surface disturbance within these areas would cause accelerated erosion or increased instability and would be difficult to reclaim, therefore, a No Surface Occupancy stipulations was deemed necessary. Operations within these areas could potentially occur under either a Controlled Surface Use or under standard lease terms, which could affect erosion and the stability of the area.

The no lease option is not considered appropriate since impacts can be mitigated using a NSO stipulation and not leasing could cause administrative problems related to unleased lands within a spacing unit.

RESOURCE: **Slopes > 40 Percent**

Stipulation: No Surface Occupancy stipulation

Objective: To preclude construction of well sites and related facilities such as tank batteries on slopes over 40 percent which would involve relatively large cut and fill slopes and would be difficult to rehabilitate (Figure 3-2).

Waiver: None

Exception: An exception may be granted if the operator can demonstrate in a surface use plan of operations that adverse effects can be minimized and activities safely conducted.

Modification: A modification may be granted if an on-the-ground review of a proposed well site or facility shows that an area of less than 40 percent slope exists or that engineering design of the site can mitigate erosion and reclamation concerns.

Justification: This stipulation is deemed necessary to protect the basic soil and water resources. Soil disturbance of an area required for a well pad on steep slopes would be difficult to reclaim and could result in unacceptable soil loss through erosion and potentially increase the sediment load of streams. Operations within these areas could potentially occur under either a Controlled Surface Use or under standard lease terms which could affect erosion and reclamation of the area. The no lease option is not considered appropriate since impacts can be mitigated using a NSO stipulation and not leasing could cause administrative problems related to unleased lands within a spacing unit.

RESOURCE: **Riparian Areas > 40 acres**

Stipulation: No Surface Occupancy stipulation

Objective: To preclude surface disturbing activities and protect riparian areas.

Wavier: None

Exception: An exception may be granted if the operator can demonstrate in a surface use plan of operations that adverse effects can be minimized and the area reclaimed.

Modification: A modification may be granted if an on-the-ground inspection shows that the area of the proposed activity is not riparian.

Justification: A No Surface Occupancy stipulation is deemed necessary for areas greater than 40 acres which may not be avoided or protected under standard lease terms. Protection of riparian areas is important to help maintain water quality and stream bank stability when adjacent to streams, and to provide wildlife habitat and shade for fisheries. Operations within these areas could potentially occur under either a Controlled Surface Use of under standard lease terms which could affect the riparian ecosystem. The no lease option is not considered appropriate since impacts can be mitigated using an NSO stipulation and not leasing could cause administrative problems related to unleased lands within a spacing unit.

RESOURCE: Retention Visual Quality Objective

Stipulation: Controlled Surface use stipulation — proposed activities would be required to be located or designed to meet the visual quality objective of retention within one year of commencing operations.

Objective: To ensure that the visual quality of the area is maintained as designated in the Forest Plan.

Waiver: None

Exception: An exception may be granted if for unforeseen circumstances, such as drilling problems, or other resource concerns, such as not being able to reclaim an area due to wet soil conditions, the visual quality objective cannot be met within one year.

Modification: A modification may be granted if it can be shown that a portion of a given lease is screened adequately by topography or vegetation that operations could be conducted with minimal visual impacts.

Justification: Application of the Controlled Surface Use stipulation identifies the standard that the operator must meet and provide the opportunity to still conduct activities as long as the standard is met. The no lease operation or a No Surface Occupancy stipulation are deemed overly restrictive in that the visual quality objective can often be met using vegetative or topographic screening and similar methods to mitigate the visual impacts. Under standard lease terms some impacts could be mitigated but operations could not be denied if the visual quality objective could not be met.

RESOURCE: **Partial Retention Visual Quality Objective**

Stipulation: Controlled Surface Use stipulation — proposed activities would be required to be located or designed to meet the visual quality objective of partial retention within one year of commencing operations.

Objective: To maintain the highly valued scenic quality of the area as designated in the Forest Plan.

Waiver: None

Exception: An exception may be granted if for unforeseen circumstances, such as drilling problems, or other resource concerns, such as not being able to reclaim an area due to wet soil conditions; the visual quality objective cannot be met within one year.

Modification: A modification may be granted if it can be shown that a portion of a given lease is screened adequately by topography or vegetation that operations could be conducted with minimal visual impacts.

Justification: Application of the Controlled Surface Use stipulation identifies the standard that the operator must meet and provides the opportunity to still conduct activities as long as that standard is met. The no lease option or a No Surface Occupancy stipulation is deemed overly restrictive in that the visual quality objective can often be met using vegetative or topographic screening and similar method to mitigate the visual impacts. Under standard lease terms some impacts could be mitigated but operations could not be denied if the visual quality objective could not be met.

RESOURCE: **Sensitive species**

Stipulation: Controlled Surface Use stipulation — a survey would be required prior to surface disturbing activities to determine the possible presence of any sensitive species, and operations be designed or located so as to not adversely affect the viability of the species.

Objective: To ensure that proposed activities do not adversely affect the viability of a species.

Waiver: A waiver may be granted if surveys and research shows that potential habitat for sensitive species does not exist within the area.

Exception: Same

Modification: Same

Justification: Since the specific location of sensitive species is not known or can change over time, a Controlled Surface Use stipulation identifies the need to ensure that activities do not adversely affect the viability of these species should they be found during an on-the-ground survey at the time a well is proposed. The no lease option or a No Surface Occupancy stipulation is deemed overly restrictive since the viability of a species must be protected rather than individuals and they can often be avoided when locating facilities. Under standard lease terms, moving a facility 200 meters may not be sufficient to ensure the viability of a particular species.

RESOURCE: Concentrated Development Sites

Stipulation: No Surface Occupancy

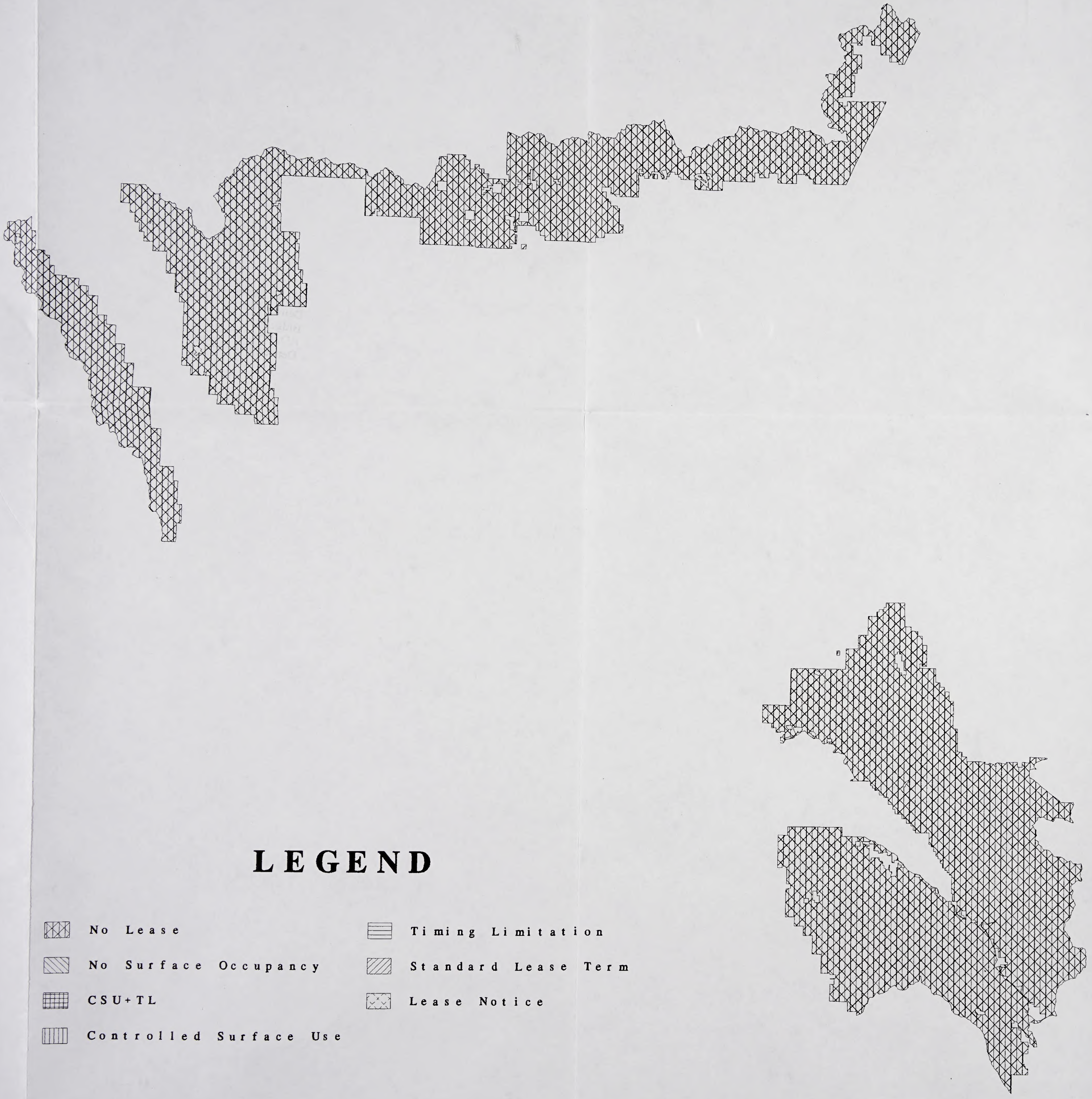
Objective: To preclude surface occupancy and new surface disturbing activities within concentrated development sites.

Waiver: A waiver may be granted if the site is moved or determined to be no longer needed.

Exception: Same

Modification: Same

Justification: Designation of a concentrated development site allocates those specific lands for a specific use and an NSO stipulation is deemed necessary to protect the capital investments usually associated with these sites and their uses. Operations within these areas would be allowed under a Controlled Surface Use or under standard lease terms which would affect the capital investment and/or the use of the area. The no lease option is not considered appropriate since impacts can be mitigated using an NSO stipulation and not leasing could cause administrative problems related to unleased lands within a spacing unit.



1 : 525,000

0 5 10 20 miles

LEGEND

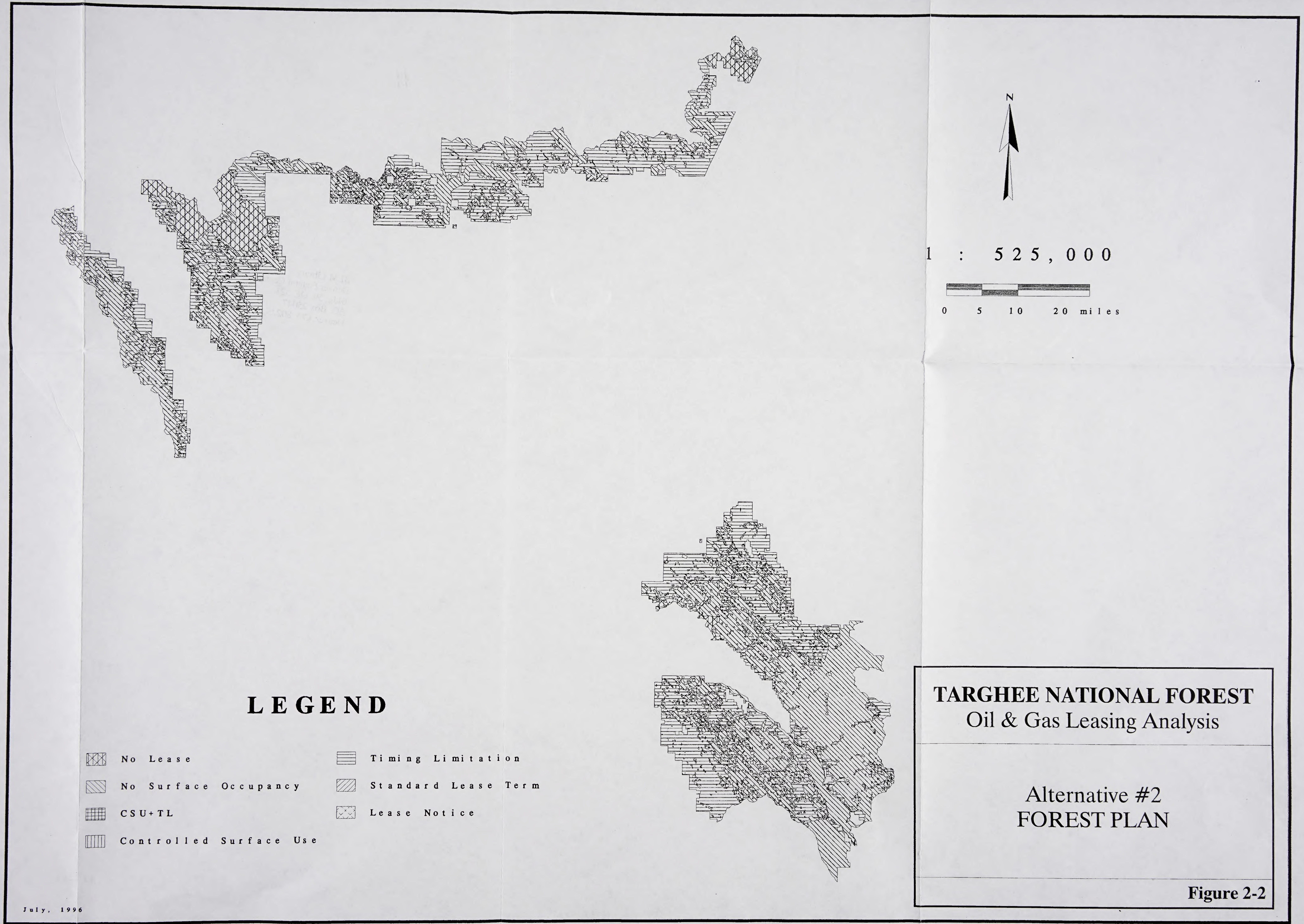
- No Lease
- No Surface Occupancy
- CSU+TL
- Controlled Surface Use
- Timing Limitation
- Standard Lease Term
- Lease Notice

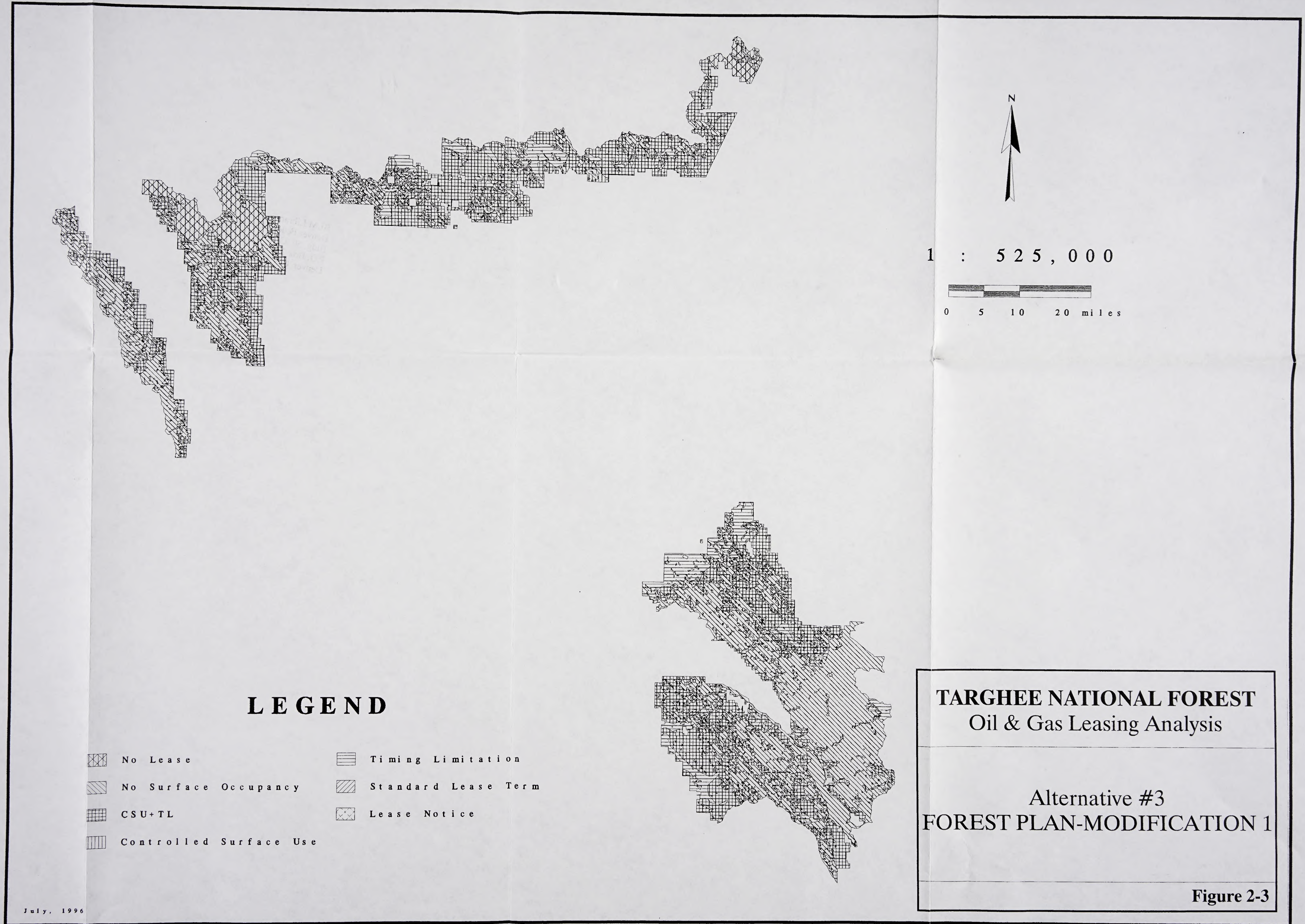
TARGHEE NATIONAL FOREST
Oil & Gas Leasing Analysis

Alternative #1
NO LEASE (No Action)

Figure 2-1

July, 1996

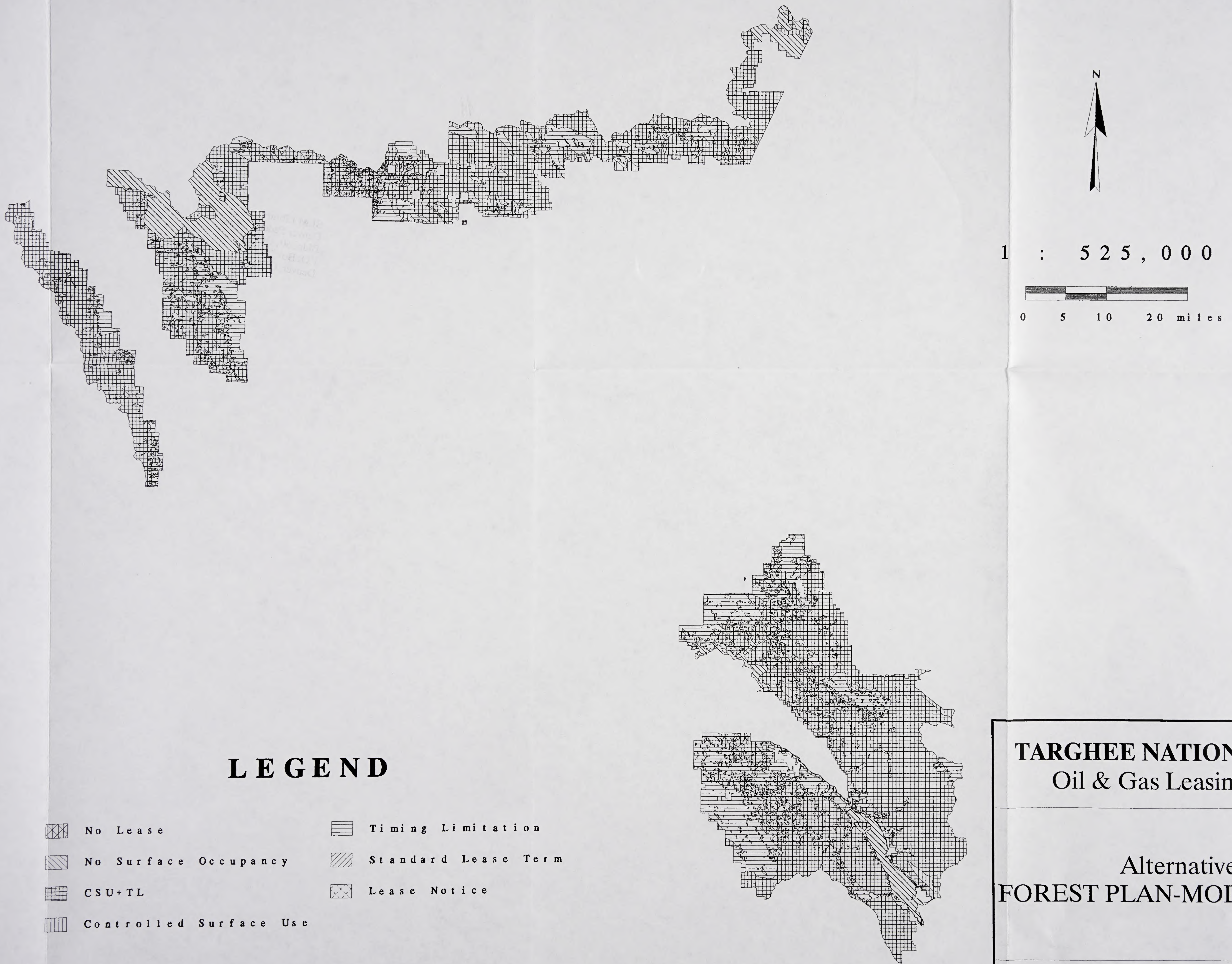

N
1 : 525,000
0 5 10 20 miles
LEGEND
No Lease
No Surface Occupancy
CSU+TL
Controlled Surface Use
Timing Limitation
Standard Lease Term
Lease Notice
TARGHEE NATIONAL FOREST
Oil & Gas Leasing Analysis
Alternative #2
FOREST PLAN
Figure 2-2
July, 1996



TARGHEE NATIONAL FOREST
Oil & Gas Leasing Analysis

Alternative #3
FOREST PLAN-MODIFICATION 1

Figure 2-3



TARGHEE NATIONAL FOREST
Oil & Gas Leasing Analysis

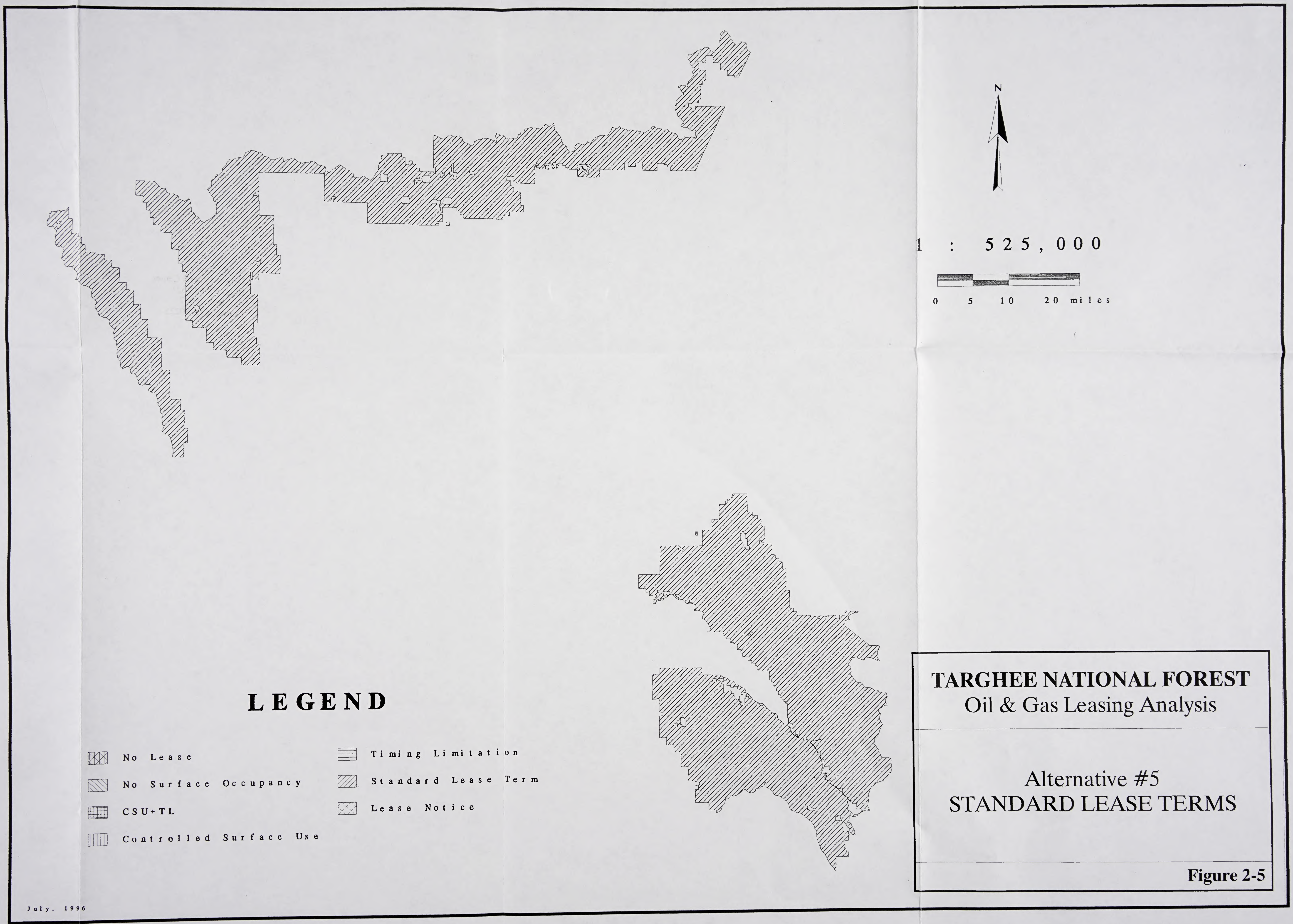
Alternative #4
FOREST PLAN-MODIFICATION 2

Figure 2-4

LEGEND

- No Lease
- No Surface Occupancy
- CSU+TL
- Controlled Surface Use
- Timing Limitation
- Standard Lease Term
- Lease Notice

July, 1996


N
1 : 525,000
0 5 10 20 miles
LEGEND
No Lease
No Surface Occupancy
CSU+TL
Controlled Surface Use
Timing Limitation
Standard Lease Term
Lease Notice
TARGHEE NATIONAL FOREST
Oil & Gas Leasing Analysis
Alternative #5
STANDARD LEASE TERMS
Figure 2-5
July, 1996

July, 1996

Targhee National Forest
P.O. Box 208
St. Anthony, Idaho 83445