Department of Agriculture

Forest Service

DRAFT

ENVIRONMENTAL IMPACT STATEMENT for OIL & GAS LEASING in the ESCALANTE KNOWN GEOLOGICAL STRUCTURE (KGS)

DIXIE NATIONAL FOREST
GARFIELD COUNTY, UTAH

Department of Agriculture
(Forest Service)
and
Department of Interior
(Bureau of Land Management)

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
FOR
OIL AND GAS LEASING
IN THE
ESCALANTE KNOWN GEOLOGICAL STRUCTURE
(KGS)

DIXIE NATIONAL FOREST
AND
CEDAR CITY DISTRICT, BLM

GARFIELD COUNTY, UTAH

Prepared by

Lead Agency: Forest Service
Cooperating Agency: Bureau of Land Management

August 1987

for Regional Forester, Intermountain Region, Forest Service

Roland Robinson
State Director, Utah, Bureau of Land Management

DRAFT ENVIRONMENTAL IMPACT STATEMENT

OIL AND GAS LEASING
ESCALANTE KNOWN GEOLOGICAL STRUCTURE (KGS)

Lead Agency:

U.S. Department of Agriculture
Forest Service
Intermountain Region
Ogden, UT

Responsible Official:

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Abstract

This Environmental Impact Statement analyzes the impacts of various levels of exploration, development, and production assumed to occur under alternative levels of oil and gas and/or CO_2 leasing within the Escalante Known Geological Structure (KGS) in Garfield County, Utah. Inasmuch as no site-specific proposals have been submitted for analysis, the levels of leasing and subsequent development and production considered in this document are based on assumptions utilizing available information.

Based on the issues and concerns identified during the scoping process, the EIS focuses on the impacts to soil, vegetative, visual, recreation, water, wildlife, fisheries, endangered and sensitive species, Wilderness, and socio-economic resources in the KGS.

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P. O. Box 580
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COMMENTS MUST BE RECEIVED BY:

SUMMARY

SUMMARY

INTRODUCTION

This Environmental Impact Statement (EIS) analyzes the impacts of alternative levels of oil and gas and carbon dioxide (CO_2) leasing and subsequent exploration and development within the Escalante Known Geological Structure (KGS). It provides the Utah State Director, Bureau of Land Management (BLM), with information on which to base a leasing decision. It also provides the Regional Forester, Forest Service, with information on which to base recommendations to the BLM relative to leasing of National Forest lands within the KGS. No plans of operation for development have been submitted to the BLM.

CHAPTER I - PURPOSE OF AND NEED FOR ACTION

The Secretary of the Interior, through the Bureau of land Management (BLM), has the authority to issue oil and gas leases on Federal Lands. The BLM has been requested to offer for oil and gas lease certain lands within the Escalante Known Geological Structure (KGS). The BLM has requested recommendations from the Forest Service (surface management agency) concerning unleased tracts of National Forest lands that are available for leasing within the KGS.

The Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area (ISA) are located within the KGS. Portions of both the Wilderness and ISA are leased for oil and gas. The Utah Wilderness Act of 1984 (P. L. 98-428) withdrew the Wilderness from further mineral leasing. The Act also identified five areas, Antone Bench and Areas 2, 3, 4, and 5 (Exclusion Areas), adjacent to the Wilderness, as being available for carbon dioxide (CO_2) leasing only. The Act specified a 5-year period during which the Exclusion Areas can be leased. The processing of new leases within the Phipps-Death Hollow Instant Study Area (ISA) is prohibited by the Department of Interior and Related Agencies Appropriations Act of 1987 (P. L. 99-500 and P. L. 99-591).

CHAPTER II - ALTERNATIVES CONSIDERED

The EIS describes five alternative levels of leasing and development. Alternative I is the "No Action" Alternative. Alternatives II through V allow progressively more leasing, involve a higher projected level of drilling and field development, and include different areas of the KGS. The five alternatives are identified on the following page.

Alternative I - Offer No New Leases in the KGS but Recognize the Potential Development of Existing Oil and Gas Leases in the KGS. This is the "No Action" Alternative.

Alternative II - Offer New Leases for CO_2 Only Within Antone Bench and Exclusion Areas 2, 3, 4, and 5, and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Alternative III - Offer New Leases for Oil and Gas and CO_2 Within the Areas of Greatest Potential for Development and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Alternative IV - Offer New Leases for Oil and Gas Within Those Areas Available for Oil and Gas Leasing and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Alternative V - Offer New Leases for Oil and Gas and CO_2 for All Lands Available for Leasing Within the Escalante KGS and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

CHAPTER III - AFFECTED ENVIRONMENT

Soils and Vegetation

The northern portion of the KGS consists of the Aquarius Plateau, a high elevation plateau of low rolling hills and swales, with good soil stability and low erosion rates.

Below the Plateau Rim are mixed colluvial slopes associated with large slump rocks. The topography is undulating and the surface is bouldery in places. Erosion rates are low and the area has some high shrink-swell potential and mass stability problems.

The southern portion of the KGS contains the Box-Death Hollow Wilderness and Phipps-Death Hollow ISA, and is dominated by exposures of sandstone slickrock. A few small areas have mass stability problems associated with old landslides and geologic formations containing gypsum.

Plant species are quite diverse throughout the KGS. Engelmann spruce and subalpine fir are the dominant tree species in the northern end of the KGS. Progressing south to lower elevations, aspen, ponderosa pine, and pinyon-juniper vegetation types are predominant. No threatened or endangered plant species are known or suspected to occur in or near the KGS.

Wildlife and Fisheries; Sensitive and Endangered Species

The open stands of ponderosa pine, the stands of pinyon juniper, and the sparsely vegetated slickrock areas of the KGS contain common wildlife species such as mule deer, coyotes, badger, wood rats, least chipmunks, red squirrels, common flickers, mountain chickadees, nuthatches, yellow-rumped warblers, mountain bluebirds, western bluebirds, red-tailed hawks, and Swainson's hawks. Some less commonly seen wildlife species found in the KGS are: cougar, black bear, pronghorn, wild turkey, goshawk, and the Mexican Spotted Owl. The endangered peregrine falcon and bald eagle and a number of sensitive animal species are known or suspected to occur in or near the KGS.

Visual and Recreation

The KGS is characterized by three separate landscapes. The northern area is flat to rolling and heavily vegetated with spruce, fir, and aspen. There are many large openings with small lakes and reservoirs. The central portion contains steep to rolling slopes that are heavily vegetated with ponderosa pine, spruce, and aspen. Much of the area has been logged to reduce mountain pine beetle and spruce beetle epidemics. The southern portion contains outstanding sandstone rock formations. The Box-Death Hollow Wilderness, located in the southern portion of the KGS contains landscapes that are unique in the State.

Recreation inventories classify the KGS into three separate recreation opportunity classes. These classes are Primitive, Semiprimitive Motorized, and Roaded Natural.

Wilderness

The southern portion of the KGS is designated as the Box-Death Hollow Wilderness and the Phipps-Death Hollow Instant Study Area. These areas provide the opportunity for solitude and a wilderness experience. The "Old Boulder Mail Trail," the only established hiking trail in the KGS, traverses the extreme southern end of the KGS in the Phipps-Death Hollow ISA.

Water

Average annual precipitation levels in the KGS range from 25 inches on the Aquarius Plateau top to 11 inches in the areas adjacent to Escalante. Snowfall is the dominant form of precipitation in the northern portion of the KGS.

The southern portion is subject to intense, short duration thunderstorms in late summer which account for most of the peak flows in local streams. Very high surface runoff occurs due to extensive areas of exposed bedrock. Flash flooding is common in the numerous dry washes.

Socio-Economic

The economies of the small communities in the area are based on agriculture, although tourism has become increasingly important in the past few years. The communities have deep traditional values that can be traced to the early settling periods of the State.

CO_2 and Oil

Carbon dioxide (CO_2) was discovered in the Escalante Anticline in 1960. Further exploratory drilling confirmed the presence of CO_2 and led to the designation of the Escalante KGS. Production history and reservoir characteristics have not been established. Although several hydrocarbon shows have been reported from drilling, no commercial hydrocarbon discoveries have been made in the KGS.

CHAPTER IV - ENVIRONMENTAL CONSEQUENCES

Chapter IV describes the impacts of implementation of each of the five alternatives described in Chapter II. Prior to conducting any surface disturbing activities, an acceptable plan of operation must be submitted by the lessee/operator to the BLM for approval. Site-specific mitigation will be developed as a result of an environmental analysis of the proposal.

Soils and Vegetation

The extent of impact to soils and vegetation corresponds directly to the amount of surface disturbance occurring under each Alternative. Alternative I involves the fewest acres of surface disturbance for construction of oil and CO_2 development facilities and Alternative V involves the most acres. The impacts of surface disturbance include the loss of productive topsoils and the resulting sedimentation of lakes and streams from erosion. These impacts can be minimized by implementation of proper mitigation such as stipulations prohibiting surface occupancy of sensitive areas.

Wildlife and Fisheries; Sensitive and Endangered Species

Impacts to wildlife and fisheries are directly related to the amount of disturbance to wildlife from drill pad and road construction as well as other vehicular and human activity and the sensitivity of the species. The increased road densities and accompanying increase in human activity, vehicular traffic, and presence of heavy construction equipment resulting from Alternatives II through V will probably displace some wildlife species from the area of activity to adjacent and possibly less desirable habitat. As with impacts to soils and vegetation, proper mitigation measures can mitigate the most adverse impacts.

Visual and Recreation

Large compressor plants, pipelines, and powerlines can create visual intrusions in the area's natural landscape. These impacts to visual resources can be reduced by careful location of facilities in order to utilize the area's natural vegetative and topographic screening. Burying powerlines and pipelines in existing road corridors and painting structures to blend with the natural background colors will also mitigate visual impacts. However, not all visual impacts can be mitigated and activities involved in the development of leases may dominate the area's natural landscape. Conflicts with recreation use will occur from the presence of heavy construction equipment on the major roads during the heavy recreation season. Noise from construction, drilling, and support facilities will alter the recreation experience available in the KGS.

Wilderness

The most scenic and heavily used areas within both the Box-Death Hollow Wilderness and ISA are located in the bottoms of the steeply walled narrow canyons. Most of the activities associated with CO_2 or oil development that may take place will, out of necessity, be located on the ridges and benches above these canyons. The canyon walls and tree cover on the ridges and benches will screen most of the visible and audible activities from the more heavily used areas of the Wilderness and ISA. Portions of some of the existing leases in the Wilderness and ISA are topographically inaccessible and cannot be developed. However, if any portions of the leases are developed, the activities and facilities associated with the exploration, development, and production of CO_2 and possibly oil will be evident within the Wilderness and ISA. Although mitigation will be applied to minimize the visual impacts, some impacts to recreation opportunity in the Wilderness and ISA are unavoidable.

Water

Impacts on the quality and quantity of surface waters within the KGS will result primarily from sedimentation of lakes and streams due to surface disturbance associated with CO_2 or oil exploration and development. Only small-scale water withdrawals will be made from surface waters in the KGS for construction purposes. Impacts to groundwaters in the KGS are most likely from spills of chemicals and other deleterious materials. Stipulations in leases and site-specific mitigating measures in approval of plans of operations will be employed to protect both surface waters and groundwaters.

Socio-Economic

Changes in the socio-economic structures of the communities around Escalante can be dramatic depending on the level of development and the corresponding influx of workers that take place. Disruption to the

communities will be greatest during the drilling and development phases. During the production phase the communities will stabilize. After depletion of the field a degree of recession will be experienced in the local economies.

CO_2 and Oil

The amount of both CO_2 and oil that can produced from the KGS is dependent on the amount of land leased for that purpose. The amount of recoverable CO_2 and oil are unknown. It is known, however, that not all of the resources present in the KGS will be recovered regardless of the Alternative implemented. Topography and legal constraints of the Utah Wilderness Act render an unknown percentage of the resources unrecoverable.

Other Considerations

Other factors identified during the scoping process for this EIS are not evaluated under each alternative either because the environmental consequences were considered to be the same under all alternatives or sufficient information is not available to analyze the consequences until a proposal for exploration and/or development is submitted by a lessee/operator.

PREFERRED ALTERNATIVE

Alternative V, Offer New Leases for Oil and Gas and CO_2 for All Lands Available for Leasing Within the KGS and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS, is selected as the preferred alternative for oil and gas and CO_2 leasing in the Escalante Known Geological Structure (KGS).

The majority of the lands available for lease within the KGS are managed for multiple use under the the Land and Resource Management Plan for the Dixie National Forest. Therefore, leasing and subsequent development and production activities are in line with logging and other accepted uses under multiple use management. The environmental impacts of leasing, development, and production within the KGS can be mitigated through implementation of appropriate measures. Economic benefits will accrue to local communities from increased employment as well as from monetary returns to the State and county from lease rentals.

DRAFT

ENVIRONMENTAL IMPACT STATEMENT
OIL AND GAS LEASING
ESCALANTE KNOWN GEOLOGICAL STRUCTURE
(KGS)

DIXIE NATIONAL FOREST
CEDAR CITY DISTRICT,
BUREAU OF LAND MANAGEMENT (BLM)

GARFIELD COUNTY, UTAH

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CHAPTER I - PURPOSE OF AND NEED FOR ACTION

Current Situation

The Bureau of Land Management (BLM), which has the authority of the Secretary of the Interior to issue oil and gas leases on Federal land, has been requested to offer certain lands within the Escalante Known Geological Structure (KGS) near Escalante, Utah, for oil and gas lease (see map on page I-2). Lands within the KGS are subject to competitive leasing in accordance with 43 CFR 3120. The BLM has requested recommendations from the Forest Service (as surface management agency) relative to leasing National Forest lands within the KGS.

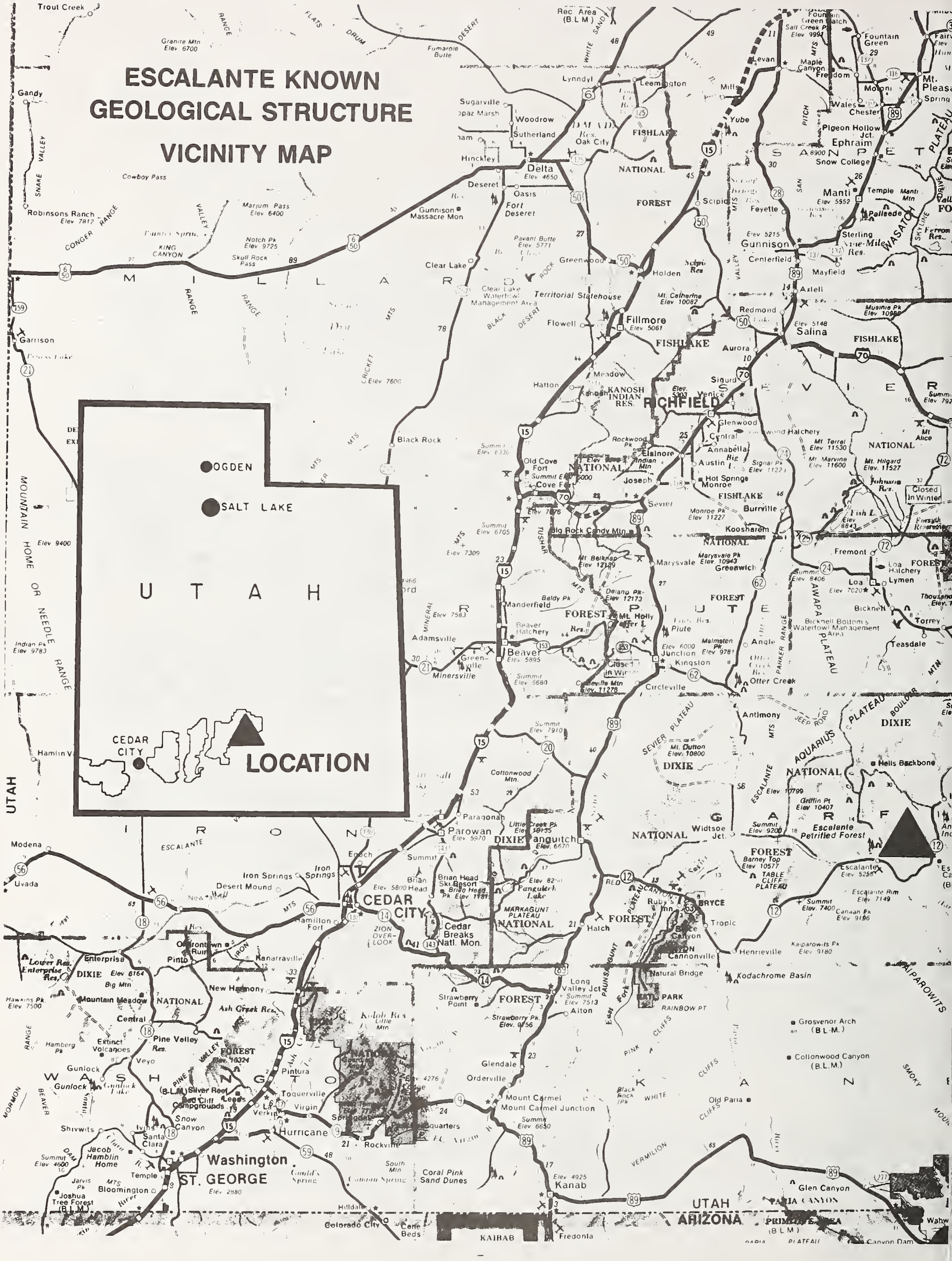
The purpose of this Environmental Impact Statement (EIS) is to provide the Utah State Director, Bureau of Land Management (BLM), information on which to base a decision on whether or not to lease, and under what conditions leasing may occur. The EIS also provides the Intermountain Regional Forester, Forest Service, with information on which to base recommendations for or against lease issuance and for stipulations proposed to be included in any lease that may be issued in order to mitigate impacts to the surface resources if subsequent exploration and development occur.

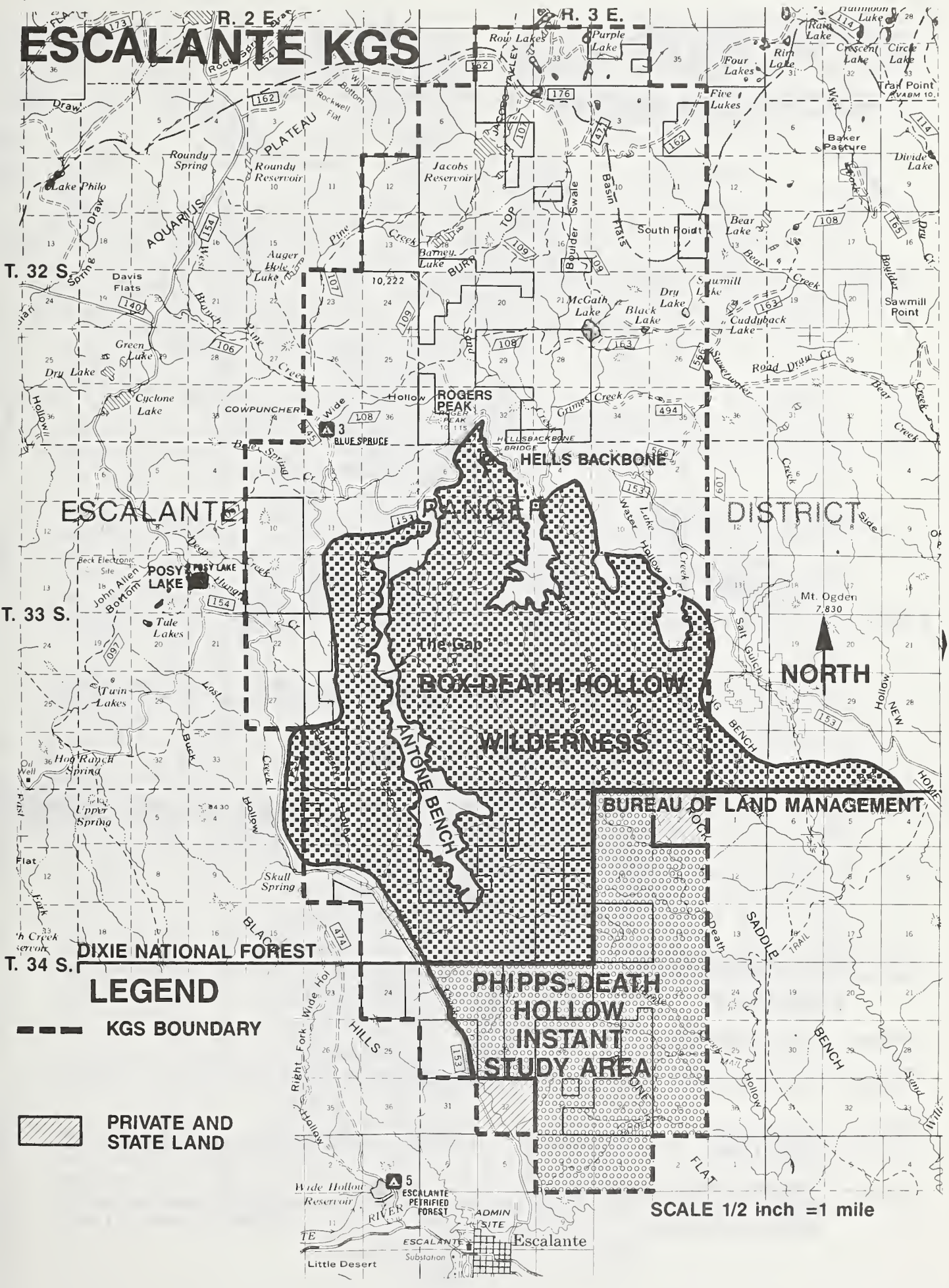
The KGS contains approximately 80,000 acres of which 64,200 acres are National Forest lands and 14,000 acres are administered by the BLM. There are also approximately 1,800 acres of State and private lands within the boundaries of the KGS. This EIS does not address State or private lands (see map on page I-3).

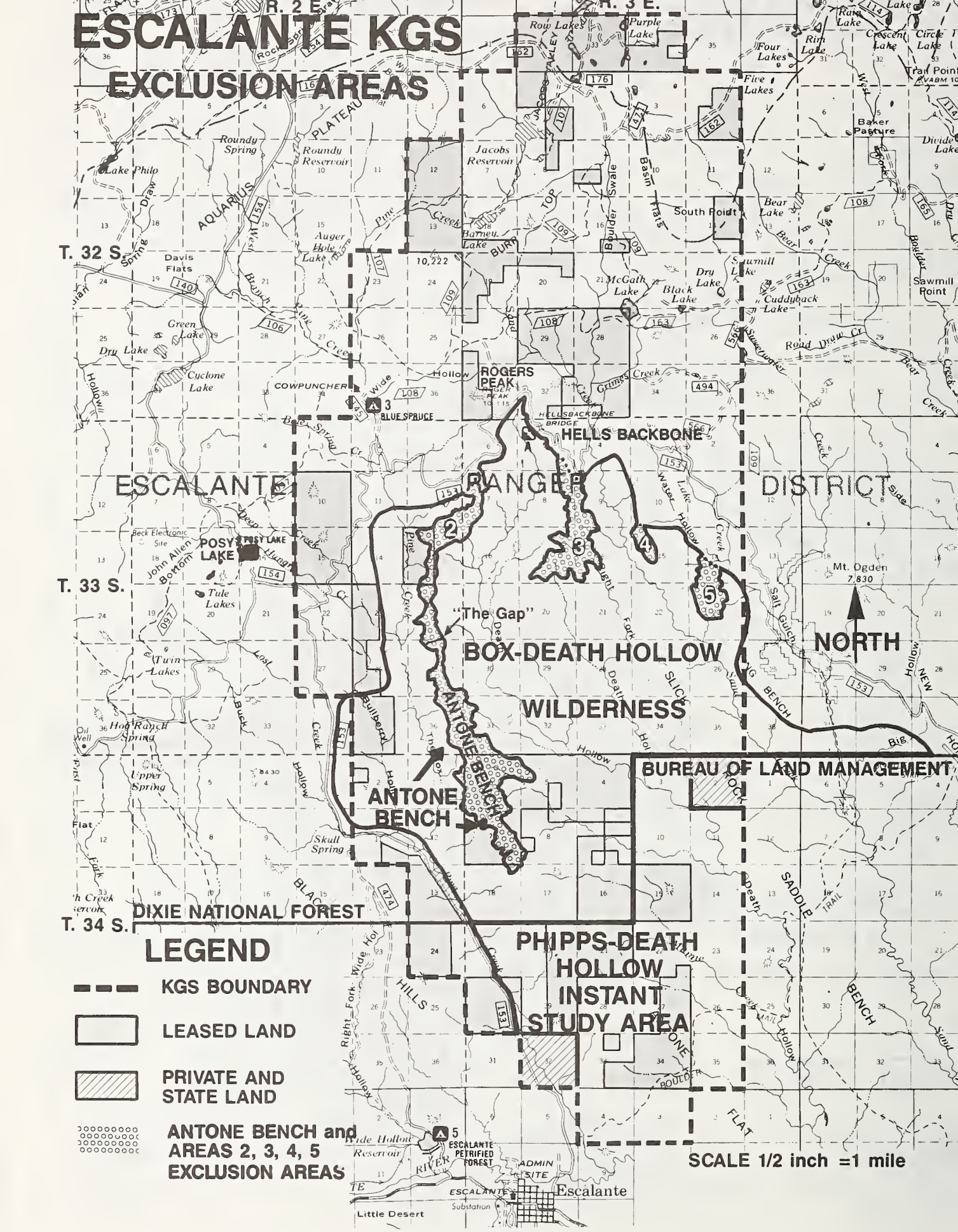
The majority of the BLM administered lands within the KGS are within the Phipps-Death Hollow Instant Study Area (ISA) which is currently under review for possible Wilderness designation. The processing of new leases within the ISA is prohibited by the Department of Interior and Related Agencies Appropriations Act of 1987 (P.L. 99-500 and P.L. 99-591). Although this EIS may refer to the ISA, no consideration is given to issuing new leases in the ISA.

The Box-Death Hollow Wilderness is also located within the KGS. The Utah Wilderness Act of 1984 (P.L. 98-428) withdrew the Wilderness from further mineral leasing. Therefore, no consideration is given to issuing new leases in the Box-Death Hollow Wilderness. The Act also designated five areas, Antone Bench and Areas 2, 3, 4, and 5 (Exclusion Areas), adjacent to the Wilderness and specified that the Exclusion Areas are available for CO_2 leasing only. The Act further specified a 5-year period during which the areas can be leased. The Exclusion Areas are depicted on the map on page I-4.

Existing leases within the KGS cover approximately 17,581 acres (see map on page I-6). There are approximately 31,700 acres of unleased Federal land available for leasing in the KGS. The remaining 34,885 acres are


ESCALANTE KNOWN GEOLOGICAL STRUCTURE VICINITY MAP
UTAH
OGDEN
SALT LAKE
CEDAR CITY
LOCATION
MILLARD
IRON
WASHINGTON
GARFIELD
KANE
SEVIER
PIUTE
SANPETE
Delta
Fillmore
Richfield
Salina
Beaver
Parowan
Panguitch
Cedar City
St. George
Washington
Hurricane
Kanab
Escalante
Tropic
Henrieville
Cannonville
Boulder
Marysvale
Circleville
Junction
Kingston
Antimony
Widtsoe Jct.
Minersville
Milford
Manti
Ephraim
Gunnison
Mayfield
Fountain Green
Moroni
Mt. Pleasant
Levan
Nephi
Scipio
Holden
Kanosh
Meadow
Elsinore
Joseph
Monroe
Sevier
Koosharem
Loa
Lyman
Bicknell
Torrey
Teasdale
Enterprise
Central
Pine Valley
Veyo
Gunlock
Santa Clara
Leeds
Toquerville
Virgin
Springdale
Rockville
Orderville
Glendale
Mount Carmel
Mount Carmel Junction
Alton
Long Valley Jct
Hatch
Bryce
Fredonia
Colorado City
Hildale
Glen Canyon
Cedar Breaks Natl. Mon.
Escalante Petrified Forest
Kodachrome Basin
Grosvenor Arch (B.L.M.)
Cottonwood Canyon (B.L.M.)
Coral Pink Sand Dunes
Hells Backbone
FISHLAKE NATIONAL FOREST
DIXIE NATIONAL FOREST
AQUARIUS PLATEAU
SEVIER PLATEAU
MARKAGUNT PLATEAU
PAUNSAUGUNT PLATEAU
TABLE CLIFF PLATEAU
KAIPAROWITS
VERMILION CLIFFS
WHITE CLIFFS
PINK CLIFFS
AWAPA PLATEAU
WASATCH PLATEAU
UTAH
ARIZONA
KAIBAB


ESCALANTE KGS
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
HELLS BACKBONE
BOX-DEATH HOLLOW WILDERNESS
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
ROGERS PEAK
10,222
BLUE SPRUCE
POSY LAKE
The Gap
ANTONE BENCH
NORTH
Mt. Ogden 7,830
ESCALANTE PETRIFIED FOREST
ADMIN SITE
Escalante
Wide Hollow Reservoir
Jacobs Reservoir
Roundy Reservoir
Lake Philo
Davis Flats
Dry Lake
Cyclone Lake
Green Lake
Tule Lakes
Twin Lakes
Hog Ranch Spring
Upper Spring
Skull Spring
Auger Hole Lake
Barney Lake
McGath Lake
Black Lake
Cuddyback Lake
Bear Lake
South Point
Sawmill Point
Baker Pasture
Four Lakes
Five Lakes
Rim Lake
Row Lakes
Purple Lake
Little Desert
Escalante Substation
LEGEND
KGS BOUNDARY
PRIVATE AND STATE LAND
SCALE 1/2 inch =1 mile


ESCALANTE KGS
EXCLUSION AREAS
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
HELLS BACKBONE
ROGERS PEAK
10,115
BLUE SPRUCE
POSY LAKE
"The Gap"
BOX-DEATH HOLLOW WILDERNESS
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BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
NORTH
Mt. Ogden 7,830
10,222
2
3
4
5
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
ANTONE BENCH and AREAS 2, 3, 4, 5 EXCLUSION AREAS
SCALE 1/2 inch =1 mile

designated Wilderness or Instant Study Area and are not available for future leasing. This figure includes 5,945 acres of Wilderness and ISA which are under lease. All unleased Federal lands that are available for leasing within the boundaries of the KGS are considered in this Environmental Impact Statement (EIS). Those lands in the KGS which are presently under lease outside of the Wilderness and Instant Study Area (ISA) are also considered for leasing upon expiration or termination of the existing leases.

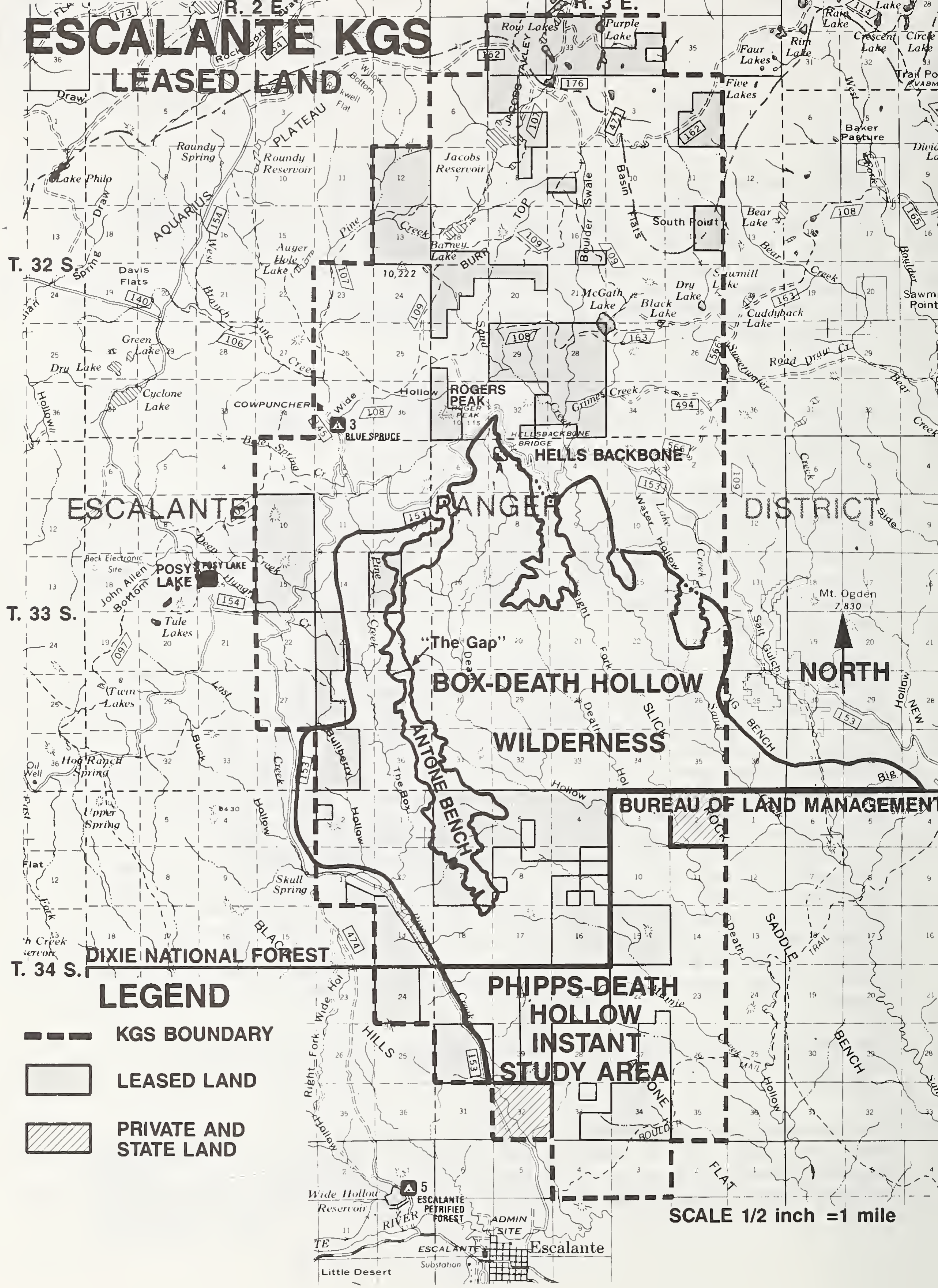
When the term "oil and gas leasing" is used in this EIS, it includes, by connotation, an authorization to produce and remove carbon dioxide CO_2 in addition to oil and other gases of commercial value. When the term "carbon dioxide leasing" is used, it does not include an authorization to produce and remove oil or other gases of commercial value.

This Environmental Impact Statement (EIS) describes the existing surface resources and human environment; proposes alternative levels of leasing and development; evaluates the potential impact of each alternative on the surface resources and human environment if implemented; and recommends appropriate mitigating measures which will be included as stipulations in leases issued under each alternative or as conditions to the approval of operating plans.

Although CO_2 is known to exist in the KGS, site-specific proposals or plans of operations have not been submitted to the BLM for approval. Therefore, site-specific impacts cannot be identified at this time and it cannot be predicted when and where future actions might be proposed or occur. To attempt such an analysis based on current information would be speculative and the analysis premature and inaccurate. This EIS addresses the cumulative effects of full field development prior to leasing to the extent that available information permits such an analysis to be made. This EIS can only address potential impacts that can be identified based on an assumed level of development and what typically can be expected during oil and gas field development. When a proposal or plan of operations is submitted, further environmental analysis will be conducted to address the site-specific impacts of the proposed operations including full field development and associated facilities such as processing plants and transportation pipelines. Mitigation of impacts will be identified as a result of the analysis and applied as conditions of approval to the Plan of Operations.

The exploration, development, and production of oil is evaluated only to the extent that existing information indicates that oil may be present in the KGS.

The document does not address site-specific operating plans since no plans have been submitted to the BLM for approval. This EIS does not address economic tradeoffs between subsurface mineral resource and surface resource values because exploration of subsurface mineral deposits is done following


ESCALANTE KGS
LEASED LAND
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
BOX-DEATH HOLLOW WILDERNESS
ANTONE BENCH
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BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
NORTH
POSY LAKE
Escalante
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
SCALE 1/2 inch =1 mile

leasing, when the quality and quantity of the reservoir are known. Economic consideration requirements of Section 306(b)(2) of the Utah Wilderness Act will be addressed if and when appropriate, and only in conjunction with the analysis of a site-specific development proposal for CO_2 on Antone Bench.

The Land and Resource Management Plan for the Dixie National Forest addresses resource use within the KGS (see map on page I-8). The proposed actions discussed in this EIS are in conformance with the Management Direction and Guidelines in the Plan.

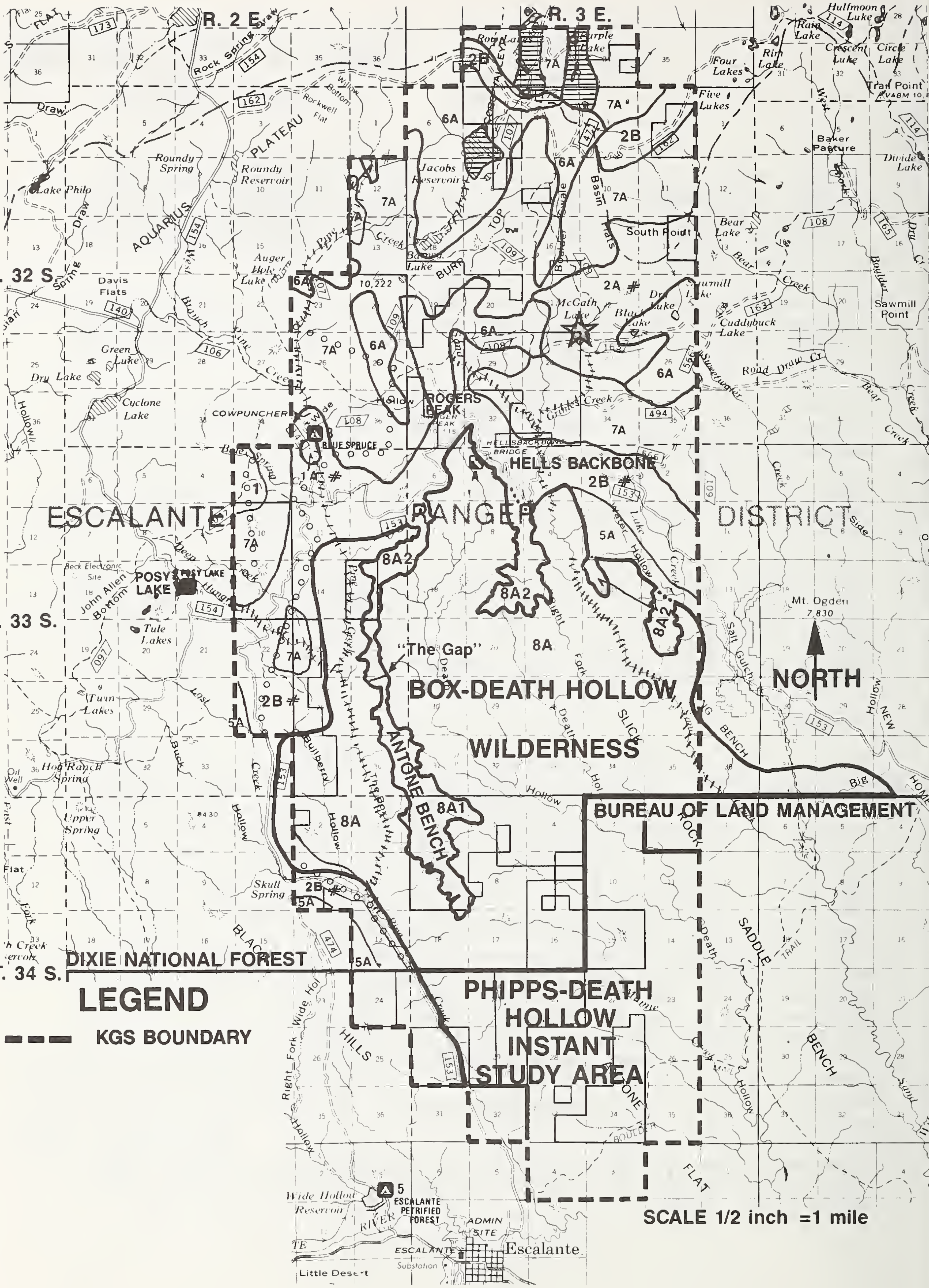
The BLM lands within the KGS are managed under the Escalante Management Framework Plan. Mineral leasing under the Framework Plan is addressed by the District-Wide Programmatic Oil and Gas Environmental Analysis Record (EAR). The BLM lands in the KGS, which are outside of the ISA and available for lease, are classified as Category I and are recommended for leasing. This recommendation also applies under this Environmental Impact Statement.

The potential for developing a commercial CO_2 field within the KGS is assumed to be high because CO_2 has been discovered in the KGS, and it is also assumed that current gas field development methods will be used to develop the CO_2 field (Appendix H). These methods require access roads, drill sites, pipelines, powerlines, pump stations, and dehydration-compressor stations.

Background

Carbon dioxide was first encountered in the Escalante KGS when Phillips Petroleum Company drilled the #1 Escalante Unit in 1960. CO_2 flowed from this well, but mechanical difficulties and lost circulation problems resulted in abandonment of the well. An undefined KGS determination was made by the U. S. Geological Survey (USGS) in 1961 which conservatively covered only a portion of the crest of the Escalante Anticline (see Item A, page I-10). In 1961, Phillips drilled the #2 Escalante Unit well near Roger's Peak (Item B, page I-10). Corrected flow rates of CO_2 were as high as 24.8 million cubic feet of gas per day (MMCF/D) in the #1 Escalante Unit. Hydrocarbon shows were encountered in the Kaibab formation in the #1 and #2 Escalante Unit wells. The #2 Escalante Unit well was plugged and abandoned due to the influx of salt water and severe lost circulation problems. The Skyline #12-24 Escalante Federal well was drilled in 1969 (see Item C, page I-10) and CO_2 flowed from the Kaibab. It was reported that the " . . . hole was flowing too much gas to continue drilling without mudding up." An attempt to "mud up" was made and lost circulation occurred. The well was plugged and abandoned. No hydrocarbon shows were reported.

A reentry of the Phillips #2 Escalante Unit was attempted by Arco in 1980. Casing was perforated and the Kaibab was tested for CO_2. Although a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ANTONE BENCH
"The Gap"
ROGERS PEAK
POSY LAKE
NORTH
LEGEND
KGS BOUNDARY
SCALE 1/2 inch =1 mile
Escalante
ESCALANTE PETRIFIED FOREST

FOREST PLAN
MANAGEMENT AREA MAP

This map provides information on how the Forest will be managed. The assignments of Management Prescriptions to various areas of the Forest are identified by map symbols, which are keyed to the legend below. Chapter IV of the Forest Plan contains detailed information of the Management Prescriptions.

MANAGEMENT AREA DESCRIPTIONS

1 GENERAL FOREST DIRECTION

1A RECREATION SITES

2A SEMI PRIMITIVE RECREATION OPPORTUNITIES

2B RURAL & ROADED RECREATION OPPORTUNITIES

☆ 4A FISH HABITAT EMPHASIS

5A BIG GAME WINTER RANGE (NON-FOREST)

6A LIVESTOCK GRAZING

7A TIMBER MANAGEMENT

8A WILDERNESS

8A1 ANTONE BENCH CO_2

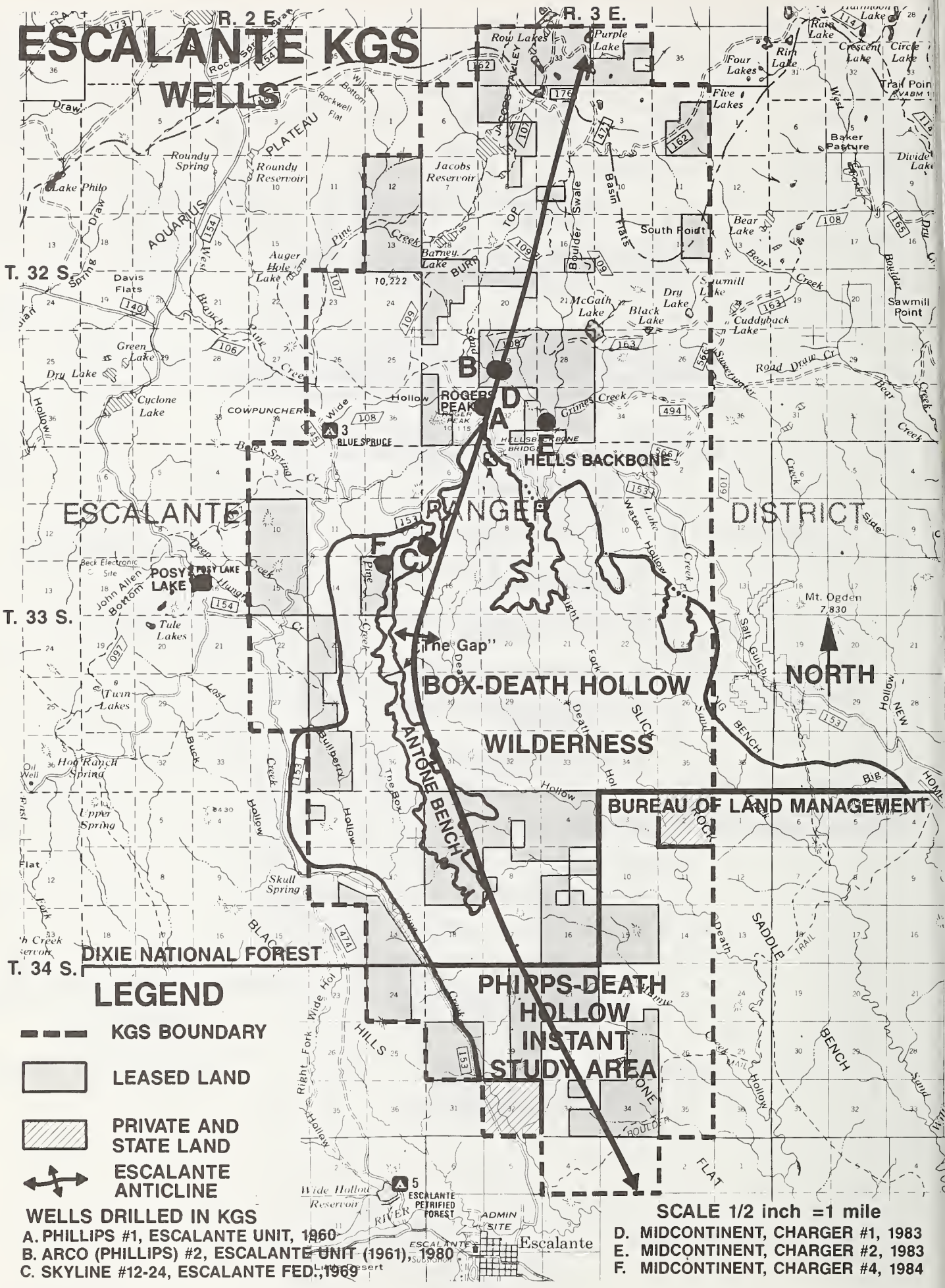
8A2 OTHER CO_2 AREAS

IIIIIIIIII 9A RIPARIAN MANAGEMENT

MANAGEMENT AREAS MARKED WITH ☆ HAVE A NO SURFACE OCCUPANCY STIPULATION FOR MINERAL ENTRY

OTHER MAP INFORMATION

oooooo UTILITY WINDOW AREAS


ESCALANTE KGS
WELLS
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
HELLS BACKBONE
BOX-DEATH HOLLOW WILDERNESS
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
"The Gap"
ANTONE BENCH
NORTH
Mt. Ogden 7,830
ROGERS PEAK
COWPUNCHER
BLUE SPRUCE
POSY LAKE
ESCALANTE PETRIFIED FOREST
ADMIN SITE
Escalante
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
ESCALANTE ANTICLINE
WELLS DRILLED IN KGS
A. PHILLIPS #1, ESCALANTE UNIT, 1960
B. ARCO (PHILLIPS) #2, ESCALANTE UNIT (1961), 1980
C. SKYLINE #12-24, ESCALANTE FED., 1969
D. MIDCONTINENT, CHARGER #1, 1983
E. MIDCONTINENT, CHARGER #2, 1983
F. MIDCONTINENT, CHARGER #4, 1984
SCALE 1/2 inch =1 mile

pressure test of the perforated interval yielded a pressure of 120 psi (pounds per square inch) at the surface, a drillstem test (DST) recovered water and gas at low pressure. Arco concluded that significant quantities of CO_2 were not present in the Kaibab in the #2 Escalante Well. The well was plugged and abandoned. No additional hydrocarbon shows were reported in the reentry of the #2 Escalante Unit; the 1961 Phillips #2 Escalante Unit had an oil show in the Kaibab.

Mid-Continent Oil and Gas Reserves, Inc. (Mid-Continent), drilled the No. 1 Charger in 1983 (see Item D, page I-10). The No. 1 Charger was drilled within 50 feet of Arco's (Phillips) #2 Escalante Unit. The highest calculated absolute open flow was stated to be 111.2 MMCF/D. This well was completed as a CO_2 well in June 1986. Hydrocarbon shows were encountered in several strata.

The KGS was defined to cover the crest of the Escalante Anticline in 1961. In 1984 the boundaries of the KGS were expanded to encompass approximately 80,000 acres. (See BLM Technical Report - Escalante KGS, Appendix E.)

Mid-Continent drilled the #2 Charger in August 1984 and reported a calculated open flow of 38 MMCF/D (see Item E, page I-10). Hydrocarbon shows were also reported. However, the #2 Charger was not completed and tested. The operator lost the lease and consequently the wellbore because of failure to act in a timely manner. Mid-Continent drilled #4 Charger (Item F, page I-10) in October and November 1984. Carbon dioxide was tested at a flow rate of 59 MMCF/D. The #4 Charger was completed as a CO_2 well in June 1986. No hydrocarbon shows were reported. (see Oil and Gas potential of the Escalante Known Geological Structure, Utah Geological and Mineral Survey Open File Report No. 102, Appendix F.)

Although CO_2 reserves can be estimated based on the two wells that were completed and tested for production within the KGS, not all of the intervals potentially capable of producing CO_2 were tested in these wells. Since the tests were incomplete, these wells may not reflect the total production potential of the entire field. There is insufficient information on which to base estimates of the total reserves within the Escalante Anticline. It is expected that additional reserves of CO_2 will be confirmed with more complete testing and drilling within the KGS.

Information from drilling conducted to date was used to project the probability that CO_2 development of at least part of the KGS can be expected to occur. Although several hydrocarbon shows have been reported, no commercial hydrocarbon discoveries have been made in the KGS to date.

Issues, Concerns, and Opportunities

Issues

The following issues were developed from the scoping process (Chapter VI).

a. Development on Antone Bench is incompatible with recreation and visual qualities.

b. Antone Bench may not be reclaimable to a substantially unnoticeable state due to blasting for road construction.

c. CO_2 development can affect the hydrology of the Box-Death Hollow Wilderness and the Phipps-Death Hollow ISA.

d. CO_2 development will degrade wildlife habitat.

e. CO_2 development will degrade the adjacent Box-Death Hollow Wilderness.

f. Threatened and endangered species sensitivity and seasons of use should be more definitively explained.

g. What is the appropriate level of leasing in the KGS?

Concerns

Leasing may lead to surface disturbance through exploration and development. Surface disturbance will create the following concerns:

a. What impacts will occur as a result of exploration and development of CO_2 and/or oil to Wilderness and/or sensitive areas?

b. What impacts will occur to wildlife and wildlife habitat?

c. What impacts will occur to visual resources in the KGS?

d. What impacts will occur to vegetation, soil,and water?

e. How will recreation resources in the KGS be affected?

f. How will the quality and quantity of surface and subsurface water and the integrity of dependent fisheries be protected?

g. What impacts will occur on backcountry fisheries from CO_2 and/or oil development within the KGS?

h. How will road construction impact primitive and semiprimitive recreation areas.

Opportunities

a. CO_2 has been proven to be a valuable resource for use in enhancing oil recovery. Development of a CO_2 field in the KGS may result in increased recovery of oil from oil fields in other parts of the country that might otherwise be lost, thereby adding to the gross National product. Carbon dioxide has other uses including use in the production of dry ice and manufacturing of chemicals. It has also been proposed as a carrier for coal in pipelines.

b. Exploration and development will improve local employment and increase the tax base for Federal, State, and local governments.

c. Development will result in a developed or improved road system which will meet Forest objectives for roaded recreation areas.

Legal Requirements, Policy, and Direction

The Mineral Leasing Act of 1920, as amended, authorizes the Secretary of the Interior to issue leases and permits on Federal land including lands administered by the Forest Service. Lands under the jurisdiction of the Bureau of Land Management are administered under the Federal Land Policy and Management Act of 1976. Under the Organic Administration Act (16 USC 551) the Secretary of Agriculture is authorized to make such rules and regulations as are needed to govern the use and occupancy of the National Forests, and to assure their preservation. By agreement with the Bureau of Land Management, the Forest Service reviews mineral permit and lease applications, conducts environmental analysis, and makes recommendations to the BLM for the protection of surface resources and avoidance of conflicts with other activities, plans, and programs of the Forest Service.

An oil and gas lease grants unto the lessee the exclusive right to drill for, mine, extract, remove, and dispose of all the oil and gas in the leased lands. The lease also grants the right to build and maintain the necessary improvements. These rights are subject to the applicable laws, terms, conditions, and stipulations attached to the lease. See Chapter II, B, "Other Alternatives Considered but Eliminated", for additional information on the rights granted by an oil and gas lease and administrative constraints.

Legal requirements and constraints which apply directly to the Escalante KGS are:

1. No further leasing is allowed within the Box-Death Hollow Wilderness as set forth in the Utah Wilderness Act of 1984 (P.L. 98-428).

2. Only carbon dioxide (CO_2) may be leased in Antone Bench and Exclusion Areas 2, 3, 4, and 5; as designated by the Utah Wilderness Act.

3. The BLM is constrained from expending funds to process any new leases within the Phipps-Death Hollow Instant Study Area in accordance with the Department of Interior and Related Agencies Appropriations Act of 1987 (P.L. 99-500 and P.L. 99-591).

4. Applications for Permit to Drill (APD's) and other proposed operations requiring approval on leases will be processed in accordance with 43 CFR 3160 and Onshore Oil and Gas Order No. 1.

5. Leases issued within the Box-Death Hollow Wilderness prior to the Utah Wilderness Act of 1984 and leases issued in the ISA prior to the Federal Land Policy and Management Act of October 21, 1976, (FLPMA) represent valid existing rights.

CHAPTER II

CHAPTER II - ALTERNATIVES

Formulation of Alternatives

Five alternatives have been identified for detailed analysis in this EIS. They are briefly listed here and described in greater detail in Section D of this Chapter. Many variations of alternatives can be formulated. However, the alternatives that were selected provide the decisionmaker with different options based on various levels of leasing and an assumed level of development. Table 1, page II-3, depicts the land allocation in the KGS by alternative. The five alternatives also provide options as to whether or not to lease in different geographic areas of the KGS.

The following alternatives are evaluated in this Environmental Impact Statement.

Alternative I - Offer No New Leases in the KGS, but Recognize the Potential Development of Existing Oil and Gas Leases in the KGS. (No Action Alternative).

Alternative II - Offer New Leases for CO_2 Only Within Antone Bench and Exclusion Areas 2, 3, 4, and 5 and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Alternative III - Offer New Leases for Oil and Gas and CO_2 Within the Area of Greatest Potential for Development and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Alternative IV - Offer New Leases for Oil and Gas Within those Areas Available for Oil and Gas Leasing and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

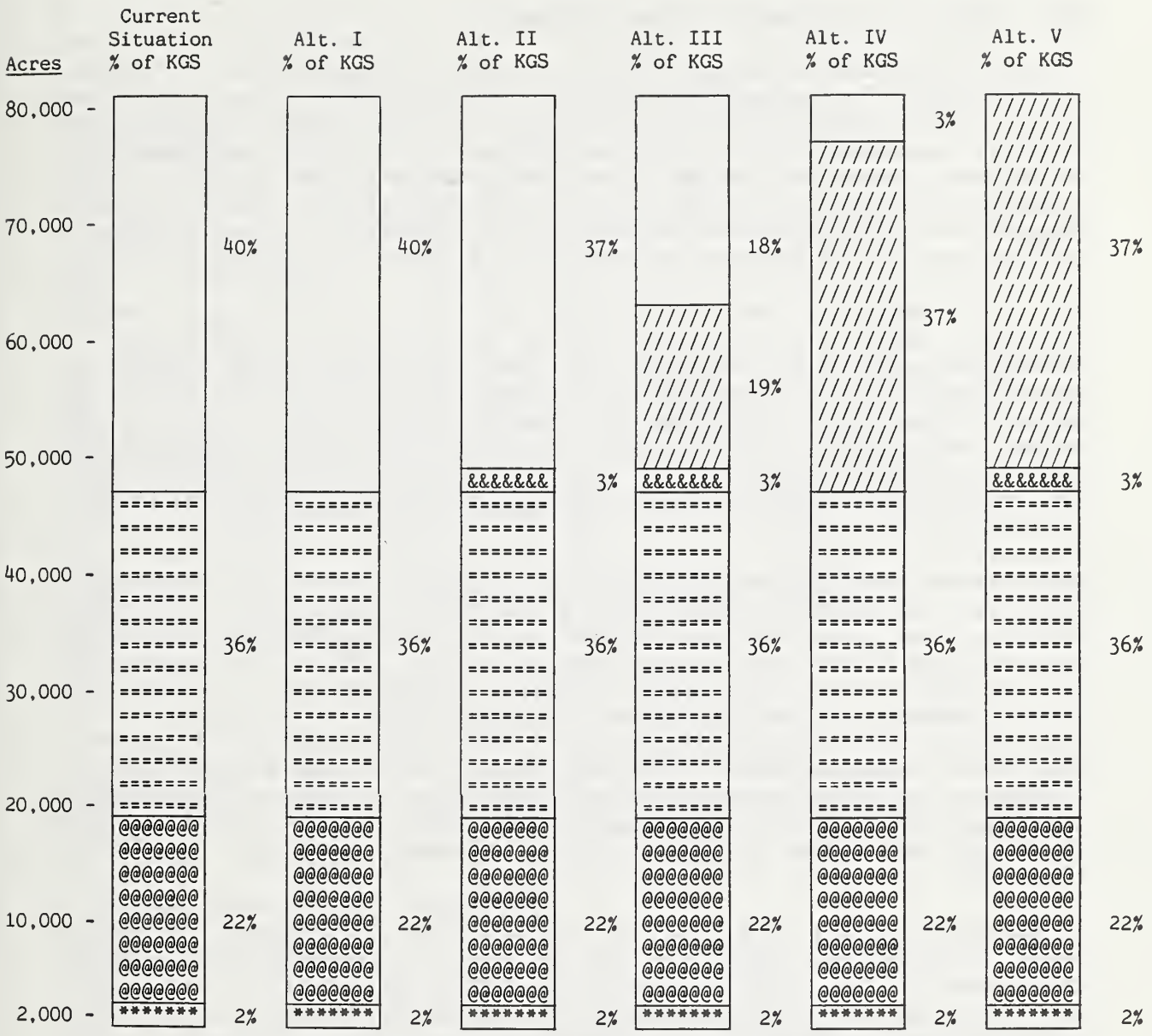
Alternative V - Offer New Leases for Oil and Gas and CO_2 for All Lands Available For Leasing Within the Escalante KGS and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Since no site-specific plans of development for a CO_2 or oil field have been submitted to date, the development scenarios for each alternative are based on available information and assumptions concerning the mineral resources within the KGS and other information concerning oil or gas field development.

Alternative I addresses the development of only those lands currently under oil and gas lease within the KGS. This alternative provides the base level of development. One of the remaining alternatives will be adopted only after considering the potential additive effects to Alternative I that additional leasing and development will have.

TABLE 1

Land Allocation in the Escalante KGS
by Alternative



******* State and Private Land

@@@@@@@ Under Oil and Gas Lease

======= Unavailable for Lease (Wilderness and ISA)

Unleased (Do not offer for lease)

&&&&&&& Offer for CO_2 lease

/////// Offer for Oil and Gas Lease

Other Alternatives Considered But Eliminated

A number of comments received during Scoping suggested that a "True No Action Alternative" be included for analysis in the EIS. This alternative would involve the withholding of approval of proposed operations on existing leases and offer no additional leases within the Escalante KGS. As existing leases expire the lands leased would not be offered for new leases. The Department of the Interior's (BLM's) authority to implement a "no action" alternative is limited in this instance. An explanation of this limitation and the latitude the Department has in this regard follows.

An oil and gas lease grants the lessee the "right and privilege to drill for, mine, extract, remove and dispose of all the oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease. Because the Secretary of the Interior has the authority and responsibility to protect the environment within Federal oil and gas leases, restrictions are imposed on the lease terms (see Copper Valley Mach. Works, Inc., V. Andrus, 474 F. Supp 189, 191; D.D.C. 1979; 653 F. 2d 595; D.C.C. 1981; Natural Resource Defense Council V. Bergland 458 F. Supp 925, 937; D.D.C. 1978).

The Court of Appeals in Sierra Club V. Peterson (717 F. 2d 1409, 1983) found that "on land leased without a No Surface Occupancy stipulation, the Department no longer has the authority to preclude surface disturbing activity even if the environmental impact of such activity is significant. The Department can only impose mitigation measures upon a lessee who pursues surface disturbing exploration and/or drilling activities..."

The Court stated further, "Notwithstanding the assurance that a later site-specific environmental analysis will be made, in issuing these leases the Department made an irrevocable commitment to allow some surface disturbing activities, including drilling and road building." (pp. 1411, 1414-1415).

In the absence of a no surface occupancy stipulation covering the entire lease, restrictions based on oil and gas lease operations must be "reasonable." They cannot directly or indirectly, prohibit, altogether, the development of the lease. Although a given APD (Application for Permit to Drill) can be denied, the right to drill and develop somewhere on the leasehold cannot be denied by the Secretary. Authority for complete denial can only be granted by Congress. None of the stipulations on existing leases within the KGS empower the Secretary of the Interior to deny all drilling activity because of environmental concerns.

Conditions under which "No Action" can be considered are constrained by the authority granted to the executive level to deny activity upon the lease. The Secretary of the Interior, because of lease provisions, has limited authority. Congress, on the other hand, has complete authority.

As the law now stands, the Secretary of the Interior has no authority to deny all activity upon the lease. To deny all activity would constitute a "taking" of an operator's rights to conduct development activities on the leased lands. As the Court held in Union Oil Company of California V. Morton (512 F. 2d 743, 750-751; 9th Cir. 1975): "Congress itself can order the leases forfeited even now, subject to payment of compensation. But without Congressional authorization, the Secretary or the executive branch in general has no intrinsic powers of condemnation." The Secretary, therefore, can only suspend the lease pursuant to Section 39 of the Mineral Leasing Act of 1920, as amended, pending consideration by the Congress of a grant of authority to preclude drilling and provide compensation to lessees.

In summary, an alternative in which the Government denies the development of existing leases in the Box-Death Hollow Wilderness and the Phipps-Death Hollow Instant Study Area and other areas of the KGS was considered, but eliminated from full analysis in this EIS. The rights conveyed in the existing leases located in the Box-Death Hollow Wilderness were protected as valid existing rights by Section 103(b) of the Utah Wilderness Act of 1984. Although the Government may deny approval of a wellsite, require certain facilities be located in specific areas, or require other specific measures be taken to avoid or minimize environmental impacts and undue degradation of an area, it is beyond the administrative authority of the BLM to deny the rights granted by existing leases.

It is sufficient to recognize the legal constraints and limitations of such an alternative and to also recognize that if approval of operations were withheld, if Congress ordered forfeiture of the leases, and if no further leasing were allowed within the KGS that none of the impacts from CO_2 or oil exploration, development, or production described in Chapter IV of the EIS will occur. However, the recovery and beneficial use of the CO_2 or any oil and other hydrocarbons within the KGS will be foregone.

Situations Common to All Alternatives

CO_2 and Oil Development

The individual tracts that will be offered for competitive lease have not been delineated. Prior to the offering of competitive leases under Alternatives II through V, each proposed lease tract will be evaluated independently for conformance with this EIS and the Forest Plan. It will also be reviewed for application of special stipulations in accordance with the criteria contained in the matrix found in Appendix B. This review will result in the recommendation of special restrictive stipulations applicable to all or part of the leasehold. All oil and gas leases will be issued on Form 3100-11 (Offer to Lease and Lease for Oil and Gas) contained in Appendix A. Carbon dioxide leases will be issued on Form 3100-11, modified to authorize the development and production of CO_2 only. All leases issued for National Forest lands will include the "Stipulation for Lands of

the National Forest System Under Jurisdiction of Department of Agriculture", Appendix A.

There will be no new leases offered in the Box-Death Hollow Wilderness nor in the Phipps-Death Hollow Instant Study Area. Where existing leases expire or terminate in the Wilderness or ISA (assuming the ISA is not released for multiple use management), the lands included in those leases will not be offered for lease.

All proposed drilling, construction, and other operations and related surface disturbance conducted under the terms of a lease must be approved by the BLM before such activities are conducted. All approved operations must be conducted in accordance with (1) lease terms, (2) 43 CFR 3160, (3) Onshore Oil and Gas Order No. 1, and (4) other onshore oil and gas orders, applicable Notices to Lessees (NTL's), and subsequent orders of the authorized officer of the Bureau of Land Management. No drilling operations or related construction can be conducted without an approved Application for Permit to Drill (APD). An APD consists of a drilling plan which includes a surface use program and a drilling program. The detailed information required to be submitted under each program is found in Onshore Oil and Gas Order No. 1. An onsite inspection of the proposed wellsite, road location, and other areas of proposed surface use is normally conducted. The Inspection Team includes BLM and Forest Service representatives (when National Forest System lands are involved), the lessee or his designated operator, operator's principal drilling and construction contractors and archaeologist, and other interested parties. 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, including adjustment of the proposed wellsite and road locations, construction methods to be employed, and reclamation of disturbed areas. The BLM, with assistance of the Forest Service, prepares an environmental analysis for each proposal on National Forest System lands.

Other proposed activities that involve surface disturbance but are not associated with drilling a well must also receive advance approval under the procedures described above.

Carbon dioxide was discovered in the Escalante Anticline in 1960. Further exploratory drilling from that time to the present has confirmed the presence of CO_2 and led to the designation of the present KGS (see map on page I-3). Redefining of the Anticlinal structure will continue as more drilling information becomes available and future adjustments to the KGS boundaries will be made. Based on current drilling information, CO_2 wells in the KGS are expected to be low pressure, but high volume wells and the greatest potential for CO_2 development is believed to be near the crest of the Anticline. However, structural, stratigraphic, and combination traps are considered likely to be present within the Anticline and CO_2 may be produced outside of the Anticline's crest. No production

history has been established and reservoir characteristics still need to be established. The CO_2 deposit has not been developed to date because of lack of a suitable market. Recent technology utilizing CO_2 as an injection media to enhance oil recovery from old oil fields has increased the interest in CO_2 as a resource. Interest has been expressed recently in developing and marketing the Escalante CO_2 deposit.

Development of a commercial CO_2 field has been projected to occur within the next ten years. However, the present climate of low oil prices will affect the profitability of any capital outlay needed to transport the CO_2 and to install CO_2 oil recovery systems in the benefitting oil fields. Securing a firm market for the CO_2, may slow or delay development of a commercial CO_2 field within the Escalante KGS. For more detailed information concerning carbon dioxide resources and development, see "Petroleum and Carbon Dioxide Resources of Kane County, Utah, Geology of Kane County", Utah Geological and Mineral Survey Open File Report No. 97, November 13, 1986.

Generally, an oil and gas field will progress through five basic phases: (1) preliminary investigation, (2) exploratory drilling, (3) development, (4) production, and (5) abandonment. The Escalante CO_2 field is currently undergoing exploratory and development drilling. It remains to be determined through drilling if sufficient reserves and production of CO_2 and/or oil can be established and maintained to support commercial development of a field. Further exploration and development drilling and production can be expected to occur at the same time throughout the life of the field. The life of the field cannot be predicted at this time. The lapse time between production and abandonment of a field may be 15 to 20 years or longer.

The development of a CO_2 field is limited by market demands, topographic limitations, reservoir characteristics, and other factors. The level of development that will occur within the KGS cannot be accurately predicted. However, development of a field usually expands outward from existing shut-in wells. Therefore, the entire area available for development will be examined for potential impacts although it cannot logically be assumed that the entire KGS will be developed and produce CO_2 or hydrocarbons.

Before development drilling can proceed, a well spacing pattern must be established to determine the spacing unit assigned to each well. Well spacing patterns are established by the State of Utah to provide for the orderly development of the CO_2 reservoir, to avoid drilling unnecessary wells, to protect the lessees' rights, and to insure conservation of the resources. No spacing pattern has been established for the Escalante KGS. Gas well spacings in the United States range from 40 to 1,440 acres per well. However, it is assumed for analysis purpose that the Escalante CO_2 field will be developed based on a 640-acre well spacing pattern or one well per square mile, which is considered the standard spacing for gas field development. Although the field can possibly be developed on

alternate spacings of 320 or even 160 acres, it is not considered economical to drill that many wells for CO_2 field development. Conversely, well spacings greater than 640 acres will probably not maximize economical gas recovery. It is highly probable that the production of CO_2 will be confined within the area encompassing the Anticline's crest and possibly involve more closely spaced wells.

Surface use in the CO_2 field may be affected by the unitization of the leaseholds by the lessees. The lessees, by entering into a unit agreement, provide for (1) the development and operation of that field as a single, consolidated unit without regard for separate leases, and (2) allocation of costs and benefits according to the terms of the agreement. Unitization requires BLM approval. Field development conducted under a unit agreement avoids unnecessary duplication of equipment and facilities and reduces or eliminates the need for protective wells. One or more unit agreements may be entered into in the KGS. Upon unitization of all or any part of the KGS, a plan of development for the area will be submitted which will be subject to environmental analysis, mitigation of site-specific impacts, and approval by BLM. No unit agreements exist within the KGS at this time.

Upon approval of the application for permit to drill (APD), construction of the access road and drilling pad can begin. The wellsite is cleared of vegetation and a level pad is constructed to accommodate the drilling rig, mud pumps, reserve pit, generators, pipe racks, and tool house. A small-to-medium size drilling rig is expected to be utilized to drill the CO_2 wells because of the relatively shallow drilling depths of 1,300 to 4,200 feet. A two-acre drilling pad will be required to accommodate that size drilling rig. Because of the expected shallow drilling depths, a relatively small reserve pit will be required to accommodate the drilling fluids and cuttings from the well. Drilling will be done by conventional methods or possibly by utilizing an air-foam system that requires a minimum amount of drilling water. Drilling water will need to be acquired off-Forest and trucked to the drillsite. An estimated 60 to 70 truckloads of drilling water will be required to drill each well assuming 100-barrel capacity trucks and conventional drilling methods are employed.

The time needed to drill a CO_2 development well to a total depth of 4,200 feet is normally 4 to 6 weeks. The greatest amount of human, vehicular, and equipment activity and accompanying noise, etc., occur during drilling and construction activities. There is continuous activity at one or more sites during the development of a field. The number of drilling rigs operating at any one time depends on how fast the field is developed. The rate at which field development will occur cannot be predicted at this time.

Well drilling operations generate significant amounts of traffic. Transporting a drilling rig to a wellsite requires between 30 and 40 truckloads. During drilling additional traffic is generated by trucks hauling water, service companies delivering supplies and equipment, drilling crew shift changes, well treatment and testing equipment, etc.

Hydrogen sulfide (H_2S), an extremely toxic gas, is commonly encountered in oil and gas drilling and production. It has been encountered in small quantities with CO_2 during the drilling of several of the wells in the KGS. It is anticipated that future drilling will also encounter H_2S. Hydrogen sulfide is heavier than air and odorless. It is highly corrosive to metal and causes hydrogen embrittlement especially in high strength steel which leads to failure of the metal. Metal equipment will have to be lined with special materials to avoid direct contact with the H_2S. There is insufficient information at this time as to the potential concentrations of H_2S to fully evaluate the hazards.

Carbon dioxide is also heavier than air and can displace air creating the hazard of suffocation if it escapes in quantity and is accompanied by environmental conditions that allow it to settle.

The lessee/operator will be required to seal off, protect, and isolate fresh water zones during and after drilling, during production activities, and upon abandonment.

After the well is drilled, steel casing is installed inside the surface casing used for drilling, then cemented in place. The producing zone can be fractured to increase the permeability of the productive zone and stimulate CO_2 recovery from the well. The drilling rig and support equipment are removed after the casing is cemented and the producing zone treated. Carbon dioxide wells in the KGS are expected to produce by normal flow and should not require pumping. Data from the #1 and #4 Charger wells, which were completed in June 1986, indicate that wellhead pressures of the CO_2 can be approximately 100 psi. The possibility of a well blowout occurring during the development of the CO_2 field cannot be discounted considering the number of wells that may be drilled in the KGS. However, because of the relatively shallow drilling depths, low pressure, and nonflammability, control should not present any unusual problems. However, escaping H_2S and CO_2 may create special hazards during local control efforts. Well control equipment ("blowout preventors") are required to be installed on each well during drilling.

The surface area required for a flowing gas well is usually a 20' by 20' area together with an access road and turnaround. Wellhead valves to control gas flow, metering and treatment facilities, and compressor equipment will be installed on each well. Water associated with the gas may enter the well and choke off the gas flow. If that occurs, a pump is needed to remove the column of water. Flowlines are installed when the well is to be placed into production. The flowlines transport the CO_2 from the wellhead to a collector pipeline system which carries the CO_2 to the gas plant. An electrical transmission system is needed to supply electricity to the wellsites and other facilities within the field. Flowlines, collector lines, and powerlines will be buried to the extent practicable within roadways to minimize surface disturbance. During production little activity occurs at the wellsite except for periodic

maintenance and daily to weekly visits to assure the well is operating properly. This requires maintaining open road conditions yearround.

Production of the CO_2 cannot begin until a pipeline to a market outlet has been constructed. CO_2 wells will be shut in until hookup to the pipeline system can be completed. "Sales" pipelines are not economical unless sufficient gas reserves are proven by drilling and a contract for sale of the CO_2 is obtained. The wells may be shut in from several months to several years until pipeline connections become available.

Wells are plugged and abandoned upon depletion of the gas. Before abandoning a formerly producing well, the lessee/operator must demonstrate that the well is unsuitable for further profitable production and file a Notice of Intent to Abandon (NIA) with the BLM. When National Forest lands are involved, the BLM provides a copy of the NIA to the Forest Service and requests recommendations for final surface reclamation. Truck mounted equipment is used to plug formerly producing wells, all surface equipment is removed, and the site is reclaimed. The operator's bond with the Federal government covering his operations cannot be released until the BLM approves the surface reclamation and final abandonment of the lease area.

Major access to the CO_2 field from Escalante will be via Hells Backbone Loop Road (No. 153) also known as the "Pine Creek Road". The road is currently being utilized for log haul and provides access to the Forest for other uses. The area paralleling this road has been identified in the Dixie National Forest Land and Resource Management Plan as a potential energy corridor.

Carbon dioxide will be transported from the wellhead via flowlines to compressor plants. The CO_2 is dewatered and desulfurized, compressed, and liquified at these plants. Approximately seven acres are needed to accommodate each plant which can service up to six wells. A relatively large work force is needed to construct each compressor plant complex. During construction there is continuous intensive human and equipment activity at the compressor plants and along pipeline routes and roads. After construction there is considerably less activity, however, human and vehicular activity will be a continuous factor throughout the life of the field. H_2S is not expected to occur in sufficient quantities to require construction of a desulfurization facility.

The dried and compressed CO_2 exits the dehydration-compressor plant in liquid form and is transported in a large high-pressure buried pipeline to the point of utilization. A number of alternate routes will be evaluated at the time a transportation pipeline is proposed. Pipeline construction requires a large but very short-term work force at points along the pipeline route.

The point of utilization for the CO_2 has yet to be determined and evolves from the establishment of a viable commercial field and the securing of a

market agreement for the sale of the gas. Preliminary information indicates that viable markets may exist in California for utilizing CO_2 for oil field injection to enhance oil recovery. Potential markets for the same purpose also exist in Utah and New Mexico.

There is a possibility that hydrocarbons, in addition to CO_2, can be produced from the Escalante Anticline. The six exploratory wells that have been drilled on or near the crest of the Anticline did not result in the discovery of commercial quantities of hydrocarbons and no recent interest has been forthcoming for hydrocarbon exploration in the Escalante Anticline area. However, reports on several of the wells drilled indicated oil shows from the Kaibab and other formations. The possibility of oil production from the Escalante Anticline cannot be discounted based on the wells that have been drilled to date.

The Upper Valley oil field, located 10 miles southwest of Escalante, must be considered when evaluating the Escalante Anticline and Escalante KGS for hydrocarbon potential. As of September 1986, the Upper Valley field had produced approximately 22 million barrels of oil from the Kaibab formation from a similar but smaller anticline.

The Upper Valley field had a small CO_2 cap above the oil, and water-filled strata have been found at the crest of the Anticline. Downdip and on the west flank of the Upper Valley Anticline, oil was found in commercial quantities. There are good indications that a similar situation may be present in the Escalante Anticline. The fact that CO_2 has flowed from many intervals in wells drilled in the Escalante Anticline area indicates the presence of porous and permeable reservoir rocks favorable for hydrocarbon accumulation. The Escalante Anticline may be a trapping mechanism for both CO_2 and hydrocarbons in the same manner as the Upper Valley Anticline. It is possible that the CO_2 is trapped near the crest of the Anticline, and that the hydrocarbons have been pushed off the crest and westward by the CO_2 cap and possibly by hydrodynamic drive. (see "Oil and Gas Potential of the Escalante Known Geological Structure", Utah Geological and Mineral Survey Open File Report No. 102, Appendix F).

Structural, stratigraphic, and combination traps, plus the presence of rocks exhibiting porosity and permeability changes over short distances can lead to stratigraphic trapping of hydrocarbons at different locations within the Anticline. Based on available information, the Escalante Anticline area appears to have a moderate potential for commercial hydrocarbon accumulation. Again, based on available information and on analogy with the Upper Valley field, potential exists for commercial hydrocarbon accumulations along the western flanks of the Escalante Anticline (see "Oil and Gas Potential of the Escalante Known Geological Structure", Utah Geological and Mineral Survey Open File Report No. 102, Appendix F).

The producing area of the Upper Valley oil field is approximately 7 miles long and 1/2-mile wide and contains 24 producing wells and eight water injection wells. The well spacing for the Upper Valley field is 80 acres per wellsite or eight wells per section. The field is currently undergoing secondary recovery. An estimated 20 miles of road and 17 miles of pipeline and powerline corridor were constructed to service the field. Although it is speculative at this time to assume the presence, exact location, and size of an oil field, based on existing information, it is assumed for the purpose of analysis in this EIS, that a similar type and size of development may occur on the west side of the Escalante KGS. The Box-Death Hollow Wilderness located to the south and west of the crest of the Anticline cannot be leased for oil and gas and only limited acreage is currently under lease. The Wilderness will probably limit the size of development on the western side of the KGS. Oil, if developed, will require facilities similar to those found in the Upper Valley oil field. Methane gas is not expected to be produced in commercial quantities. Drilling and development of an oil field is similar to that of a CO_2 field; however, larger drilling rigs are used and an estimated 3 acres are required to construct a well pad to accommodate the larger oil drilling rigs. Where CO_2 and oil development overlap, the same access roads will be used to the extent possible. Flowlines and powerlines will be buried in the roadways when possible. In addition, one or more unsuccessful explorational wells can be expected to be drilled and abandoned during field development.

Because of the greater drilling depths, it is estimated that 100 truckloads (100-barrel capacity truck) of drilling water are required to drill an oil well. Pressures are expected to increase at the greater drilling depths, but are not likely to be a problem requiring other than normal pressure control equipment. Drilling depths are expected to remain comparatively shallow by current standards.

The lessee/operator must file an APD or development plan for approval by the BLM before any surface disturbance, drilling, or construction takes place for oil exploration and development. The approval procedures described for CO_2 exploration and development also apply to oil and gas.

The most significant differences between CO_2 field and oil field operations are the additional production facilities needed to produce oil. Oil wells require some form of artificial lift to bring the oil to the surface. The most commonly used lifts are sucker rod pumps connected to a reciprocating pumping unit or "pump jack". Pump jacks are powered by an electrical motor or internal combustion engine, if electricity is not available. Single cylinder engines which operate at extremely high noise levels are commonly used; however, operators prefer electric motors. Submersible electric pumps are being used in the Upper Valley field and are expected to be installed as soon as possible on any development of the Escalante field. Only a "Christmas tree" and electric cable are visible at the wellhead if submersible pumps are used.

Tank batteries are needed to store the produced oil until it is sold and transported. Water will probably be produced with the oil and a certain amount of emulsification can be expected. A heater treater and tall settling tank (separator) located at each tank battery site are needed to separate the water from the oil. Most water produced in oil fields varies from brackish to highly saline. Brackish and saline waters are disposed of either by evaporation ponds that are lined with impervious material, or more preferably, by injection into the same formation through wells either drilled or set aside for that purpose. Evaporation ponds are located in the vicinity of the tank batteries. It is doubtful that evaporation ponds will be successful at the higher elevations of the KGS, if large amounts of water are produced. Produced water will be disposed of in conformance with appropriate operating regulations. Chemical, water, and oil spills can be expected to increase during the life of the field.

It is unlikely that enough oil can be produced from the KGS to justify a transportation pipeline. Produced oil will probably be piped from the field to a terminal where it will be trucked to a refinery as is currently being done with the oil produced from the Upper Valley field.

Oil cannot be produced unless forces within the reservoir are great enough to drive the oil to the wellbore. Usually, 15 to 20 percent of the oil is recovered from a reservoir during primary production with gas drive mechanisms. Because of these low primary recovery rates, many reservoirs are developed for secondary recovery. The most commonly used secondary recovery method is waterflooding. Water is injected into the reservoir to drive additional oil to the producing wells. This method is being used in the Upper Valley field. A secondary recovery system usually involves drilling of injection wells and new recovery wells or conversion of production wells to injection wells. Water injection lines will need to be installed and additional water separation and storage facilities constructed to implement a 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 activity intensify again if a waterflood system is installed.

As with CO_2 field development, the greatest amount of activity and human presence in oil field development occurs during the drilling of the wells and construction of roads, flowlines, tank batteries, and other facilities. The amount of activity occurring at any one time depends on how rapidly development of an oil deposit is undertaken. During the production phase, generally little activity occurs at the wellsites except for daily visits to wellheads and tank batteries for checking, maintenance, and removal of the oil. Periodic maintenance of well pumps and sucker rod replacement is required. A "work over" rig is used during down hole maintenance to pull the tubing, sucker rods, and pump from the wellbore.

Other Proposed Forest Uses and Existing Developments

Timber

Two timber sales are proposed in the KGS for 1990 and 1991. Approximately 3.4 million board feet of Engelmann spruce and subalpine fir in the Jacob's Valley timber sale are scheduled to be sold in 1990, and 3 million board feet of Engelmann spruce and subalpine fir are scheduled to be sold in the Boulder Swale timber sale in 1991 (see map, page II-15). The existing Spectacle Lake Road (No. 162) is scheduled to be upgraded to serve as a collector road for the two proposed timber sales. This road can also be used by drilling rig trucks, service vehicles, and water trucks in the event that leasing, exploration, and development take place.

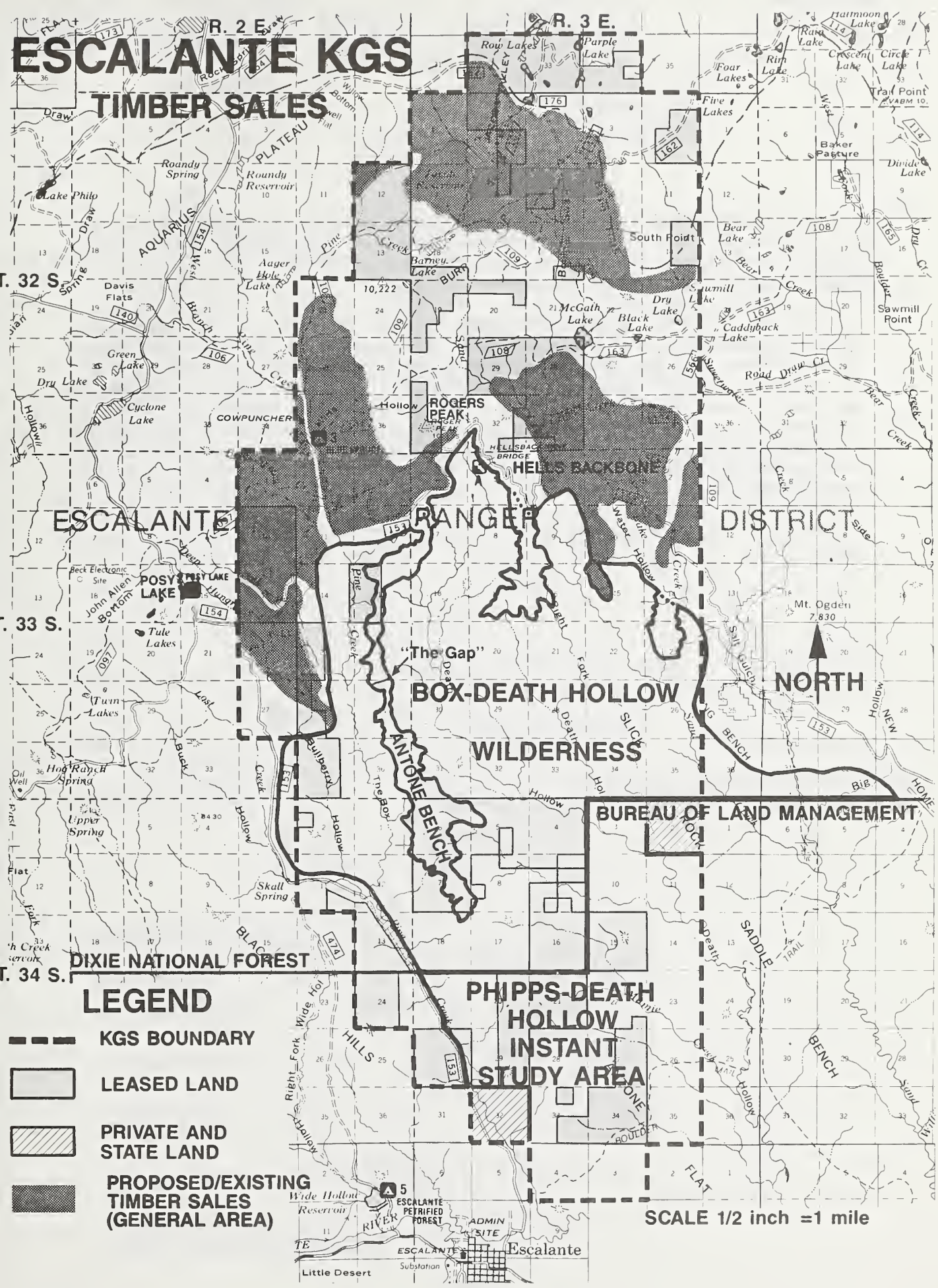
It is premature to analyze in detail the conflicts between logging traffic and oil and gas development and recreation traffic at this time. Timber sales of this size generally have a four-year contract. Logging traffic can be expected to use this road off and on from 1990 to 1996. The areas expected to be leased, drilled, and developed in the timber sale areas during that timeframe cannot be predicted at this time. The additive effects of the timber sales to oil and gas development or vice versa will be analyzed in detail in an environmental assessment at the appropriate time and detail when a timber sale or oil and gas and/or CO_2 development is proposed.

Transportation System

An established transportation system of approximately 83 miles of road has been established within portions of the KGS. A number of these roads have been constructed within the last five years to provide access to timber sales in the area. An additional 35 miles of timber sale roads are planned for construction before 1990.

The Hells Backbone Loop Road (No. 153) is an arterial road that provides access between the towns of Escalante and Boulder. This road runs east to west through the center of the KGS and is the major access within the area. The first 10-mile section of this road (from Escalante to the Aquarius-Teasdale Junction) is a double lane road with crushed aggregate surface. The remainder of the road is single lane. All but 4 miles of the road on the east side of the Hells Backbone Bridge has a crushed aggregate surface. This 4-mile section, from the Hells Backbone Bridge to Sand Creek, is scheduled for reconstruction during the summer of 1987.

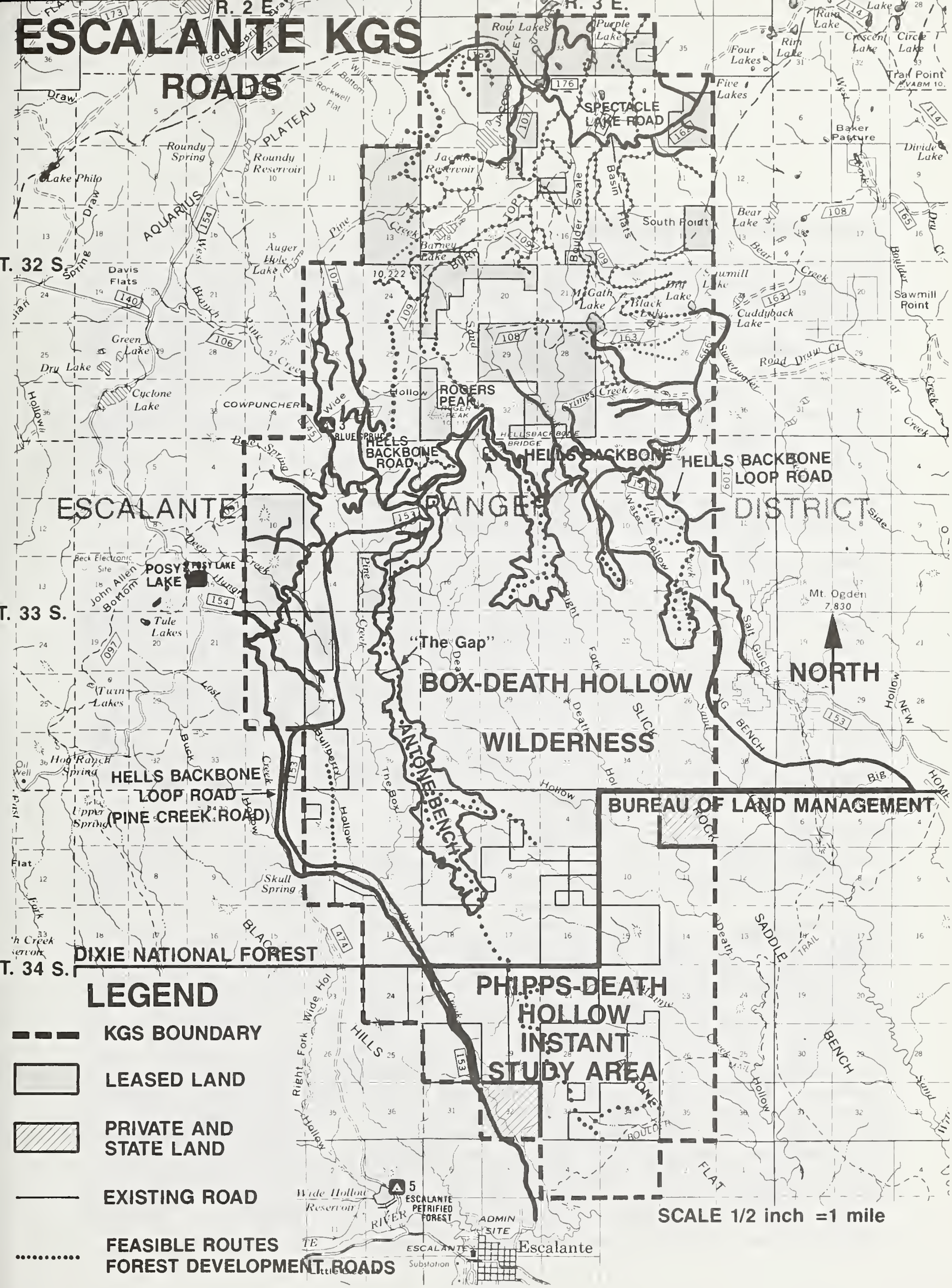
The Spectacle Lake Road (No. 162) is planned for reconstruction during the summer of 1987 and for surfacing during the summer of 1988. This road is a collector road and provides access to areas above the Aquarius Plateau Rim in the northern part of the KGS. All other roads within the KGS are considered to be either collector or local roads and are single lane roads. Most of the roads have a native surface.


ESCALANTE KGS
TIMBER SALES
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
ROGERS PEAK
HELLS BACKBONE
"The Gap"
BOX-DEATH HOLLOW WILDERNESS
ANTONE BENCH
BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
NORTH
POSY LAKE
ESCALANTE PETRIFIED FOREST
ADMIN SITE
Escalante
Little Desert
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
PROPOSED/EXISTING TIMBER SALES (GENERAL AREA)
SCALE 1/2 inch =1 mile

The area between the Rim and the north end of the KGS is currently planned for the Jacob's Valley, Boulder Swale, and the Dark Valley Shelf timber sales. The timber roads proposed for this area can also be used for mineral exploration and development.

In addition to the established road system, construction of additional roads is planned to accommodate timber sales contained in the Forest Plan. It is assumed that the existing and planned roads will be utilized in order to explore, develop, and produce CO_2 and any oil that may be present in the KGS. Also roads constructed for oil and gas access may also be utilized for planned timber sales. It should be noted in the Description of Alternatives (Chapter II, Section D) that in some alternatives few additional roads will need to be built in order to accommodate CO_2 or oil field development.

A map depicting existing and feasible road locations in the KGS is found on page II-17.


ESCALANTE KGS
ROADS
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
SPECTACLE LAKE ROAD
ROGERS PEAK
HELLS BACKBONE ROAD
HELLS BACKBONE
HELLS BACKBONE LOOP ROAD
ESCALANTE RANGER DISTRICT
POSY LAKE
"The Gap"
BOX-DEATH HOLLOW WILDERNESS
NORTH
HELLS BACKBONE LOOP ROAD (PINE CREEK ROAD)
BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
EXISTING ROAD
FEASIBLE ROUTES FOREST DEVELOPMENT ROADS
SCALE 1/2 inch =1 mile
Escalante

Description of Alternatives

The five alternative levels of leasing and development evaluated in this EIS are described in this Section. Alternative I is the "No Action" Alternative and provides the base level of development. Alternatives II through V allow progressively more leasing and development. The development scenarios expected to occur under each of the five alternatives are found in Table 2, page II-34 . The environmental impacts of each alternative to various resources are described in detail in Chapter IV, Environmental Consequences. A comparison summary of the impacts expected to occur under each alternative is shown in Table 3 in this chapter (see Impact Comparison Between Alternatives, page II-35).

Alternative I (No Action) - Offer No New Leases in the KGS, but Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Under this alternative, no additional oil and gas or CO_2 (carbon dioxide) leases will be issued within the Escalante KGS, and lands presently leased will not be leased again upon expiration or termination of existing leases. This alternative recognizes, as valid rights, the existing leases within the KGS which grant the lessee ". . . the exclusive right and privilege to drill for, mine, extract, remove and dispose of all the oil and gas deposits, except helium gas in the land leased together with the right to construct and maintain thereupon all works, buildings, plants, waterways, roads, telegraph, or telephone lines, pipelines, reservoirs, tanks, pumping stations or other structures necessary to the full enjoyment thereof, for a period of 10 years or so long thereafter as oil and gas is producing in paying quantities. . . ."

The lands currently under lease within the KGS that can be explored and developed under Alternative I are shown on the map on page II-21, and the level of development assumed for Alternative I is summarized in Table 2, page II-34. A comparison summary of the impacts expected to occur under each alternative is shown in Table 3, page II-35. There are currently 18 leases held by seven lessees that encompass approximately 17,581 acres within the KGS. Seven of these leases include 5,945 acres located within the Box-Death Hollow Wilderness and the Phipps-Death Hollow Instant Study Area (ISA). The leases within the Wilderness are recognized as valid existing rights protected under the Utah Wilderness Act of 1984. Five of the leases located within the Wilderness and Instant Study Area were placed in suspension because approval of an exploratory drilling plan was delayed. These leases were issued prior to the enactment of the Federal Land Policy and Management Act of 1976 (FLPMA). Any operations conducted on leases within the ISA that were issued prior to FLPMA are subject to undue degradation standards as opposed to meeting non-impairment standards on post-FLPMA leases. (Interim Management Policy and Guidelines for Lands Under Wilderness Review; 12/12/79; Revised 7/12/83, USDI, BLM). The lessees can reactivate the suspended leases by filing and receiving approval from the BLM of an Application for Permit to Drill (APD).

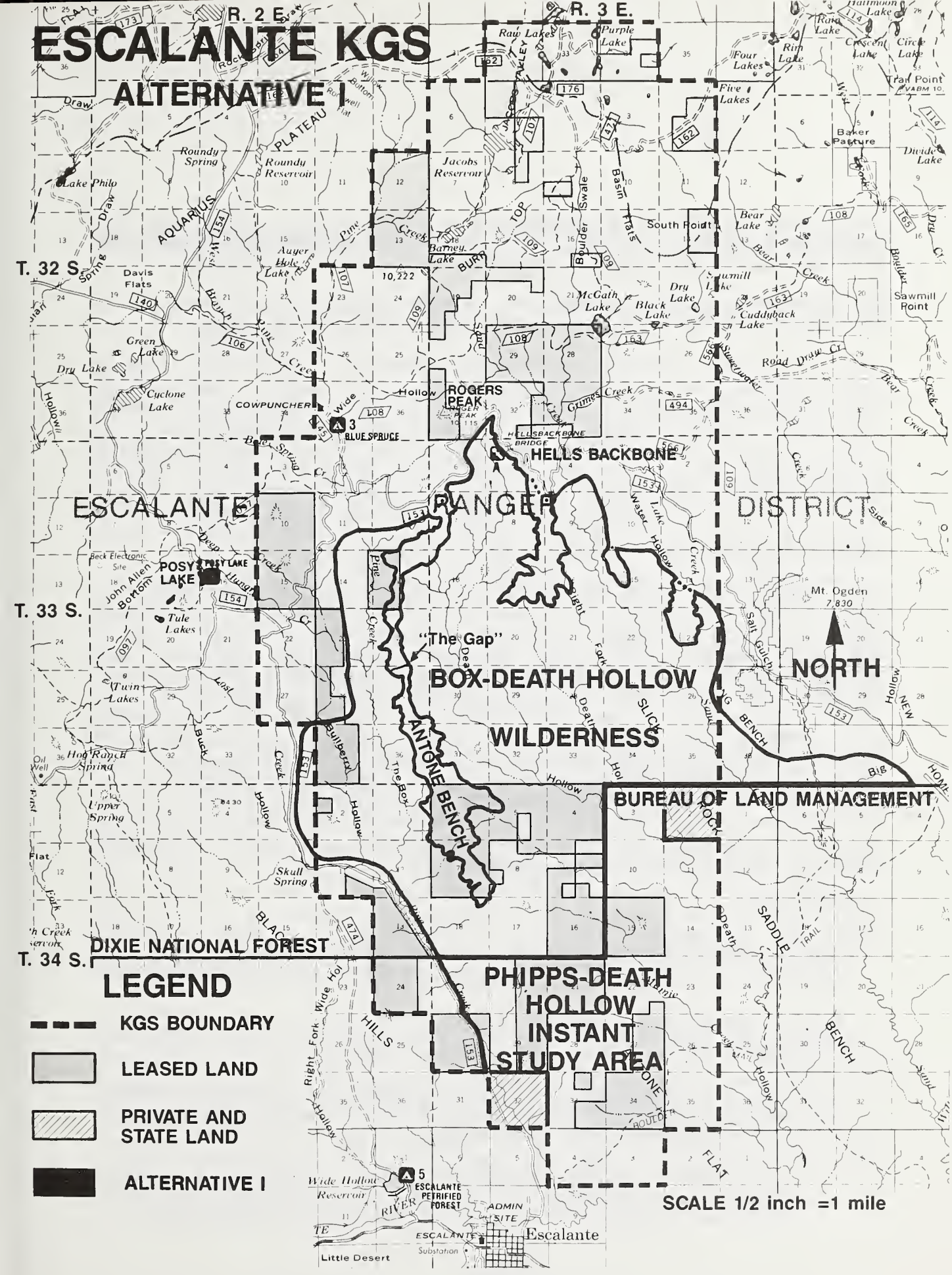
Several existing leases contain "No Surface Occupancy" stipulations that prohibit occupancy of 760 acres within the KGS. An additional 6,243 acres of the leased lands are either inaccessible because of extremely rugged topography or are too steep to occupy. Offsite directional drilling of these lands is not considered to be practicable. In the descriptions of the various alternatives, the "no surface occupancy" or unoccupiable areas are discounted from the total area that will receive surface impacts.

Alternative I, the "no action" alternative, is a projection of what may occur in the KGS if no additional mineral leases are issued. Lands currently under lease comprise approximately 22 percent of the KGS. These leases occur throughout the KGS, including within the Box-Death Hollow Wilderness and the Phipps-Death Hollow ISA. Development under Alternative I can range from none at all to the extraction of oil and gas or CO_2 from every lease, accompanied by the construction of necessary facilities and access roads. It is this variation that makes the establishment of the "no action" baseline condition difficult. For instance, if no development is assumed, then the environmental impacts of future lease development scenarios are improperly minimized. Conversely, if complete development is assumed, environmental impacts can be exaggerated. There is also little basis to project any mid-level development.

It is therefore assumed that the existing leases scattered throughout the KGS do not contain sufficient CO_2 reserves to support development of a commercial CO_2 field, especially since most of the leased lands in the KGS are not located on or near the crest of the Anticline. Two wells capable of commercial CO_2 production have been established within the KGS. Additional drilling for CO_2 may occur to test other areas and depths within the KGS. However, it is not expected or assumed under Alternative I that additional CO_2 wells will be drilled. Compressor plants, CO_2 pipelines, powerlines, and other facilities necessary for the commercial production of CO_2 production will not be constructed if additional leasing does not occur.

Development of oil resources that may be present within the KGS, unlike CO_2, are not dependent on the establishment of sufficient reserves to support compressor plant development and a transportation pipeline. Theoretically, a one-well oil field can be a commercially viable venture. Oil, if present, is expected to occur in a relatively long and narrow band along the western flank paralleling the crest of the Anticline. Alternative I includes approximately 2,360 acres of existing leases that fall within the area projected to contain the greatest potential for oil field development. Assuming a similar type and size of development as that in the Upper Valley oil field, it is estimated that these leases can support up to 10 wells. However, it is not anticipated that all of the leases on the western flank of the Anticline or within the KGS will be productive. An estimated 8 miles of road, 7 miles of pipelines, and 7 miles of powerlines are needed to develop an oil field on existing leases.

Except for 480 acres, the leased lands are serviced by a well-established road system (see map on page II-17). An additional 3 miles of new roads are needed to accommodate oil field development under this alternative. A pipeline from the field to a truck loadout terminal is needed to transport the oil from the field. It is estimated that 55 acres of land are needed to accommodate wellsites, roads, pipelines, and other attendant facilities if producing oil fields are developed on existing leases.


ESCALANTE KGS
ALTERNATIVE I
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE
RANGER
DISTRICT
ROGERS PEAK
HELLS BACKBONE
BOX-DEATH HOLLOW
WILDERNESS
"The Gap"
ANTONE BENCH
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
NORTH
Mt. Ogden 7,830
Escalante
ESCALANTE PETRIFIED FOREST
ADMIN SITE
POSY LAKE
Lake Philo
Jacobs Reservoir
Barney Lake
McGath Lake
Black Lake
Dry Lake
Cyclone Lake
Green Lake
Auger Hole Lake
Davis Flats
Roundy Spring
Roundy Reservoir
Raw Lakes
Purple Lake
Four Lakes
Five Lakes
Rim Lake
Crescent Lake
Circle Lake
Trail Point
Baker Pasture
Divide Lake
Bear Lake
Sawmill Point
South Point
Cuddyback Lake
Tule Lakes
Twin Lakes
Hog Ranch Spring
Upper Spring
Skull Spring
Wide Hollow Reservoir
Little Desert
Escalante Substation
COWPUNCHER
BLUE SPRUCE
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
ALTERNATIVE I
SCALE 1/2 inch =1 mile

Alternative II - Offer New Leases for CO_2 Only Within Antone Bench and Exclusion Areas 2, 3, 4 and 5 and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

The lands proposed to be leased under Alternative II are identified on the map located on page II-25, and contain approximately 2,263 acres.

This alternative considers issuing CO_2 leases for those lands located within Antone Bench and Exclusion Areas 2, 3, 4, and 5. The southern extension of Antone Bench, and a part of Exclusion Area 2 are currently under lease for oil and gas. These leases, containing 994 acres, are valid existing rights. Approximately 184 acres of the 994 acres were identified as being too steep to occupy and physically impossible to develop. The oil field development assumed for Alternative I is also included as a part of the assumed level of development for Alternative II. This is summarized in Table 2, page II-34. A comparison summary of the impacts expected to occur under each alternative is shown in Table 3, page II-35.

Under Section 306 of the Utah Wilderness Act of 1984, Congress designated certain lands adjacent to the Box-Death Hollow Wilderness for special management. The lands were identified as Antone Bench and Areas 2, 3, 4, and 5 (Exclusion Areas). The Exclusion Areas were withdrawn from appropriation under the mining laws and from disposition under the mineral and geothermal leasing acts with the exception that competitive leases for carbon dioxide can be issued for a period of 5 years from the date of the Act. Leases will be issued for a period of 10 years or as long thereafter as carbon dioxide is produced annually in commercial quantities from that lease. The Exclusion Areas will be withdrawn from further leasing if CO_2 production in commercial quantities is not established within the 10 years following lease issuance. Any leases issued within Antone Bench will be subject to the following legal constraints contained in Section 306(a)(3) and (b) of the Utah Wilderness Act.

Sec. 306:

"(a)(3) exploration in the Antone Bench area shall be permitted only by helicopter or other methods which do not involve road construction or other significant surface disturbance.

"(b) In the event development of a lease within the Antone Bench area is proposed, the following provisions shall apply:

"(1) road construction shall be limited to the minimum standards necessary for proper development of the carbon dioxide resource consistent with safety requirements;

"(2) roads, pipelines, electric lines, buildings, compressor stations and other facilities shall, to the maximum extent practicable consistent with economic extraction of the carbon

dioxide resource, be camouflaged, constructed and located in a manner that will minimize visual, noise or other intrusions in the area and in the surrounding wilderness area;

"(3) fill material, gravel and other material used for road and facility construction shall be obtained from outside the wilderness area;

"(4) road or facility construction shall be limited, to the maximum extent practicable, to seasons or periods where there will be minimum impacts on recreation or wildlife uses;

"(5) roads shall be used only in conjunction with carbon dioxide development operations and shall be closed to all other vehicular use, but shall be open for foot or horse travel;

"(6) all roads or other facilities within the area shall, when no longer needed for carbon dioxide production, be removed and reclaimed to a condition of being substantially unnoticeable;

"(7) all waste, debris or other by-products associated with road construction, carbon dioxide production, or other development activities shall be disposed of outside the Antone Bench area and the Box-Death Hollow Wilderness; and

"(8) consistent with State and Federal law no activities shall be allowed within the area which could significantly impair water quality or quantity in the Box-Death Hollow Wilderness and adjacent wilderness or wilderness study areas."

If Alternative II is implemented, it is assumed that sufficient CO_2 reserves will be established to permit development of a commercial CO_2 field. It is also assumed that implementation of Alternative II will result in the development of existing leases that will not be commercially viable to develop if Alternative II is not implemented. Commercial development of the CO_2 will require transportation pipelines, powerlines, compressor plants, and other facilities.

In addition to the 10 oil wells assumed to be drilled under Alternative I, development of the lands that will be made available for CO_2 development under this alternative will result in up to an estimated 29 CO_2 wells being drilled. Considering that there are 83 miles of roads within the KGS, a preliminary engineering analysis indicated that an additional 27 miles of road need to be constructed and 36 miles of roads are needed to support the drilling and subsequent servicing of a producing CO_2 field. There will be 35 miles of new timber sale roads constructed in the KGS. Logging, oil and gas, and other existing roads in the KGS will be used jointly to the extent practicable. It is estimated that 51 miles of

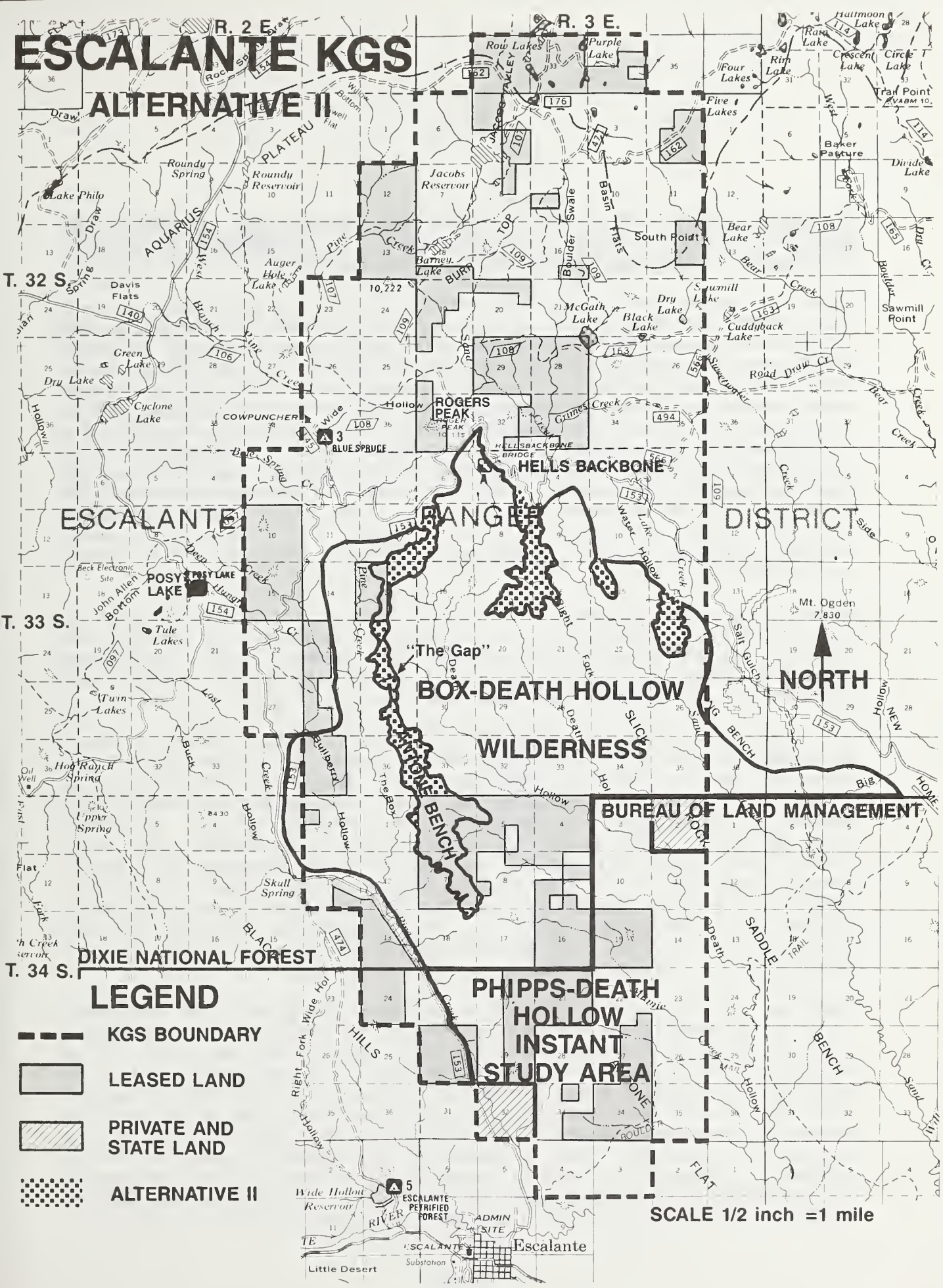
pipelines/powerlines including a transportation pipeline between the KGS and the town of Escalante will be needed to operate a producing CO_2 field. Roadways will also be used for powerline and pipeline routes, with the pipelines being buried in the roadways where practicable.

Once the well spacing patterns have been established, road locations can be planned in detail. An estimated 241 acres will be needed to accommodate both a producing CO_2 field and a producing oil field under the level of development assumed for Alternative II.

Because of the irregular shapes of the Exclusion Areas, wellsites will probably be located off the spacing pattern established for the field to allow for maximum drainage of the CO_2 from under the Exclusion Areas and adjoining Wilderness. Directional drilling, even if it is technically feasible, cannot be approved outside of the leaseholds.

Oil can be developed within the Exclusion Areas only on existing leases. No additional oil and gas leases will be issued under Alternative II, therefore, the assumed level of oil field development, is the same as that assumed under Alternative I.

The competitive lease tracts that will be offered under this alternative have not been delineated. Upon identification of the individual tracts, a field review will be conducted to identify on the ground the environmental conditions analyzed in this EIS. Based on the EIS and field review, the special lease stipulations to be included in the proposed lease for that particular tract will be identified in accordance with the guidelines contained in in the Matrix for Applying Special Lease Stipulations in Appendix B. The environmental conditions and stipulations to be utilized are contained in Appendix B. Special stipulations to implement the requirements of Section 306 of the Utah Wilderness Act of 1984 as applied to Antone Bench, are also located in Appendix B.


ESCALANTE KGS
ALTERNATIVE II
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
HELLS BACKBONE
ROGERS PEAK
10,222
3 BLUE SPRUCE
POSY LAKE
"The Gap"
BOX-DEATH HOLLOW WILDERNESS
NORTH
Mt. Ogden 7,830
BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
5 ESCALANTE PETRIFIED FOREST
ADMIN SITE
Escalante
Little Desert
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
ALTERNATIVE II
SCALE 1/2 inch =1 mile

Alternative III - Offer New Leases for Oil and Gas and CO_2 Within the Area of Greatest Potential for Development and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

This alternative provides for the offering of oil and gas leases on those lands within the KGS that had previously been proposed for unitization and within the area identified as having high potential for oil and gas development. It includes the crest and the western flank of the Escalante Anticline. This alternative also provides for CO_2 leasing in Antone Bench and Exclusion Areas 2 through 5 included in Alternative II. It does not propose offering for lease the lands within the Box-Death Hollow Wilderness or Phipps-Death Hollow Instant Study Area. A map of the lands available for leasing under Alternative III is found on page II-28 and the level of development assumed under Alternative III is summarized in Table 2, page II-34. A comparison summary of the impacts expected to occur under each alternative is shown in Table 3, page II-35. This alternative includes development of the 17,581 acres currently under oil and gas lease in the KGS.

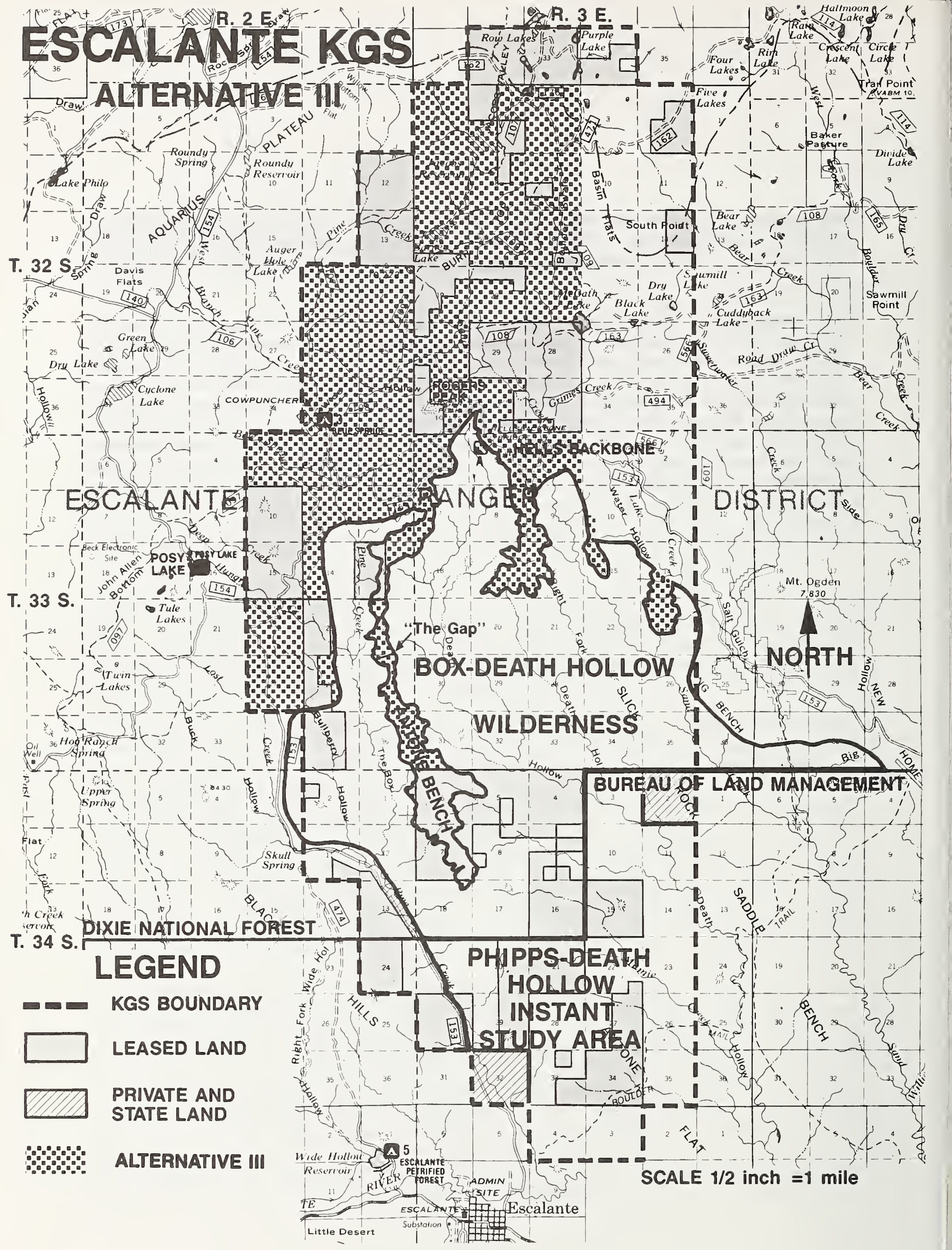
Based on existing information, it is anticipated that implementation of this alternative will permit the full-scale development of the CO_2 and any oil that may be present in the KGS. The assumed level of development resulting from the implementation of this alternative includes the development of existing leases in Alternative I.

If Alternative III is implemented, 17,381 acres will be offered for lease. Combined with the 17,581 acres of existing leases, up to a total of 34,962 acres will be under lease in Alternative III. Approximately 9,579 acres of those lands have been identified as being inaccessible or unoccupiable because of topographic constraints or other resource values. An assumed total of 49 CO_2 wells can be drilled under this alternative. This level of CO_2 development will require utilization of an estimated 69 miles of roads, of which 41 miles will need to be constructed. Construction of an additional 79 miles of pipelines and 79 miles of powerlines will be needed to support a producing CO_2 field. This alternative includes the area considered to contain the greatest potential for the discovery and production of oil from the KGS.

Assuming that Alternative III will be implemented and result in additional lands being leased along the western flank of the Anticline, and assuming a level of development similar to that in the Upper Valley oil field, it is estimated that 32 oil wells will be drilled. An estimated 20 miles of road, and 17 miles of pipelines and powerlines will be needed to support oil field development and production. An estimated 442 acres will be needed to accommodate support facilities if full development of the oil and CO_2 on the additional lands offered for lease under Alternative III is realized. Considered in this estimate are the effects of the presence of the Box-Death Hollow Wilderness located on the south end of the western flank of the Anticline. The Wilderness is expected to limit oil field

development to some extent, although, the extent of this limitation is unknown at this time. There will also be limitations when discounting topographically steep and inaccessible areas from those lands available for lease.

The competitive lease tracts that will be offered under this alternative have not been delineated. Upon identification of the individual tracts, a field review will be conducted to identify the environmental conditions analyzed in the EIS. Based on the EIS and final review, the special lease stipulations to be included in each lease for that particular tract will be identified in accordance with the guidelines contained in the Matrix for Applying Special Lease Stipulations in Appendix B. The Special Stipulations (Appendix B) needed to implement Section 306 of the Utah Wilderness Act of 1984 will also be included in any lease issued on Antone Bench.


ESCALANTE KGS
ALTERNATIVE III
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
BOX-DEATH HOLLOW WILDERNESS
"The Gap"
HELLS BACKBONE
ROGERS PEAK
COWPUNCHER
POSY LAKE
Mt. Ogden 7,830
NORTH
BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
ESCALANTE PETRIFIED FOREST
ADMIN SITE
Escalante
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
ALTERNATIVE III
SCALE 1/2 inch =1 mile

Alternative IV - Offer New Leases for Oil and Gas Within Those Areas Available for Oil and Gas Leasing and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

This alternative addresses the offering of oil and gas leases on those lands within the KGS where oil and gas leasing is not constrained by law. Again, leases cannot be issued within the Box-Death Hollow Wilderness or Phipps-Death Hollow Instant Study Area. Leases will not be offered on Antone Bench or Exclusion Areas 2 through 5 under this Alternative. Under Alternative IV, 29,449 acres will be made available for leasing. The lands proposed for oil and gas lease under this alternative are identified on the map on page II-31. The level of development assumed for Alternative IV is summarized in Table 2, page II-34. A comparison summary of the impacts expected to occur under each alternative is shown in Table 3, page II-35. Under this alternative, an estimated 11,979 acres of the lands are considered topographically too steep to occupy or are inaccessible by road and considered physically impossible to develop. The assumed level of development resulting from the selection of this alternative also includes the development of existing leases considered under Alternative I.

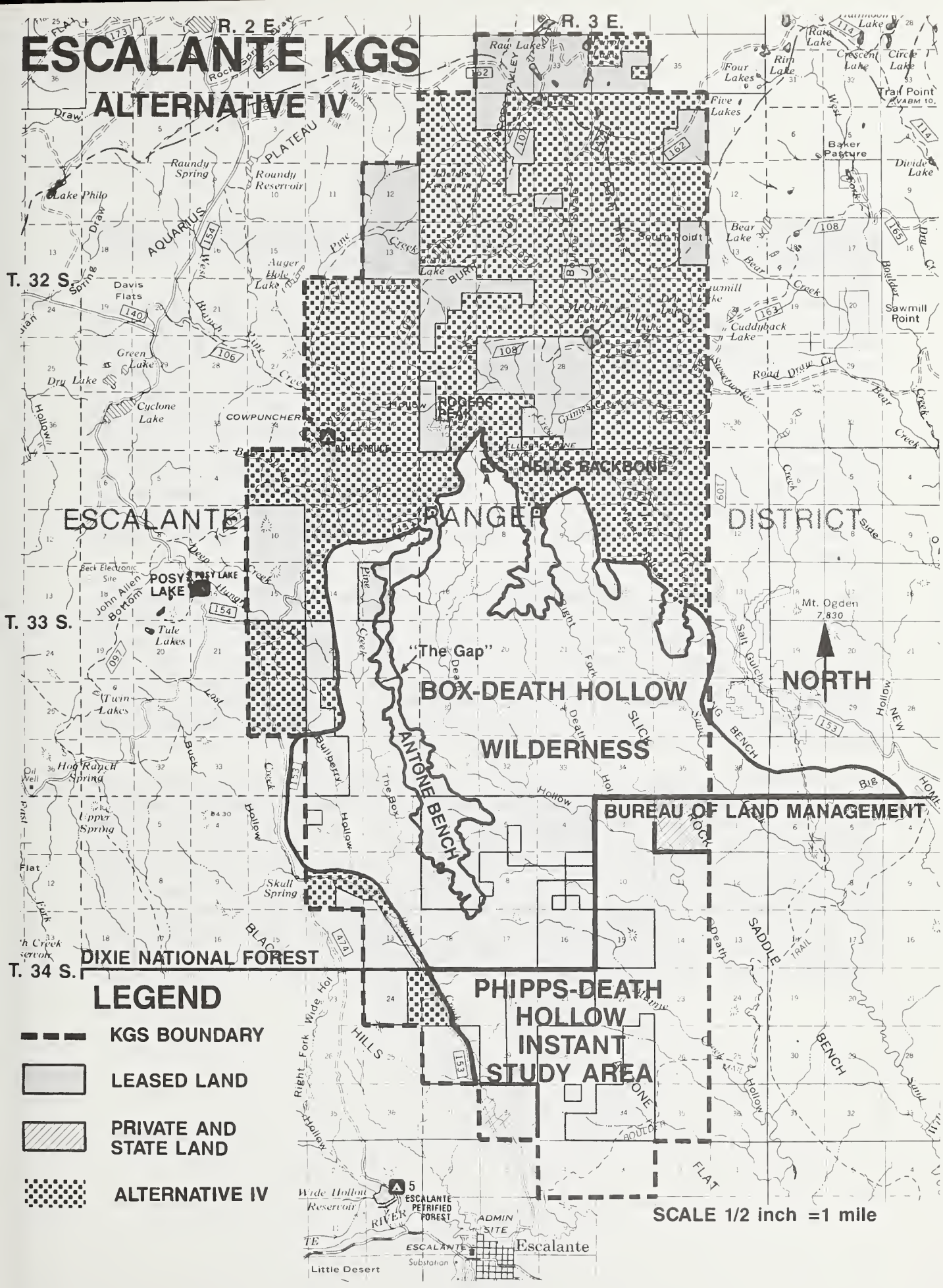
Antone Bench and Exclusion Area 2 will not be made available for leasing under this alternative. A significant portion of the area with the greatest potential for CO_2 development located along the crest of the Anticline will be unavailable for leasing. It is unknown if sufficient reserves of CO_2 can be obtained from the existing leases and lands proposed for leasing under this alternative to permit the development of a commercially viable CO_2 field. However, it is assumed for analysis purposes, that if Alternative IV is implemented commercial CO_2 development will occur.

Up to an estimated 55 CO_2 wells can be drilled under this alternative. It is estimated that an additional 52 miles of road will need to be constructed and 107 miles of road utilized to support the production of CO_2 and oil. A total of 111 miles of pipelines and powerlines and nine compressor-dehydration plants will be needed to service and produce the wells.

As with Alternative III, Alternative IV also includes the area of greatest potential for discovery and production of oil. The same level of development for oil that is assumed under Alternative III is expected to occur under this alternative. The additional acreage proposed for leasing increases the possibility that other hydrocarbons may be found and produced from stratigraphic or structural traps on the eastern side of the Anticline, although this is not considered likely to occur. An estimated 479 acres will be needed to accommodate CO_2 and oil wellsites, roads, pipelines, powerlines, compressor plants, and other facilities under this alternative.

The competitive lease tracts that will be offered under this alternative have not been delineated. Upon identification of the individual tracts, a

field review will be conducted to identify the environmental conditions analyzed in the EIS. Based on the EIS and final review the special lease stipulations to be included in each lease for that particular tract will be identified in accordance with the guidelines contained in the Matrix for Applying Special Lease Stipulations in Appendix B.


ESCALANTE KGS
ALTERNATIVE IV
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
HELLS BACKBONE
BOX-DEATH HOLLOW WILDERNESS
"The Gap"
ANTONE BENCH
BUREAU OF LAND MANAGEMENT
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
DIXIE NATIONAL FOREST
NORTH
Mt. Ogden 7,830
POSY LAKE
Escalante
ESCALANTE PETRIFIED FOREST
ADMIN SITE
Little Desert
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
ALTERNATIVE IV
SCALE 1/2 inch =1 mile

Alternative V - Offer New Leases for Oil and Gas and CO_2 for All Lands Available for Leasing Within the Escalante KGS and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Alternative V, a combination of Alternatives II and IV, represents the maximum leasing alternative, and provides the maximum opportunity for exploration, development, and production within the KGS. This alternative includes those lands under oil and gas lease described under Alternative I and the remaining lands available for leasing within the KGS. A total of 31,700 acres will be made available for leasing, of which 12,163 acres are considered to be either too steep or inaccessible for development or because of other resource values, the lands are not considered occupiable. The lands available for oil and gas and CO_2 leasing in Alternative V are identified on the map on page II-33. The level of development assumed for Alternative V is summarized in Table 2, page II-34. A comparison summary of the impacts expected to occur under each alternative is shown in Table 3, page II-35.

Based on this level of leasing, up to 68 CO_2 and 32 oil wells can be drilled under Alternative V. This level of development may result in the need to construct approximately 64 miles of roads and the utilization of 129 miles of roads in order to drill and produce the CO_2 and oil. An estimated 130 additional miles of pipelines and powerlines and 11 compressor-dehydration plants will be needed to service producing wells if full development is realized. An estimated 559 acres will be needed to accommodate the development and operation of the CO_2 and oil fields.

The competitive lease tracts that will be offered under this alternative have not been delineated. Upon identification of the individual tracts, a field review will be conducted to identify the environmental conditions analyzed in the EIS. Based on the EIS and final review, the special lease stipulations to be included in each lease for that particular tract will be identified in accordance with the guidelines contained in the Matrix for Applying Special Lease Stipulations in Appendix B. As in Alternatives II and III, the Special Stipulations identified as being needed to implement the requirements of Section 306 of the Utah Wilderness Act of 1984 will be included in any leases issued on Antone Bench.

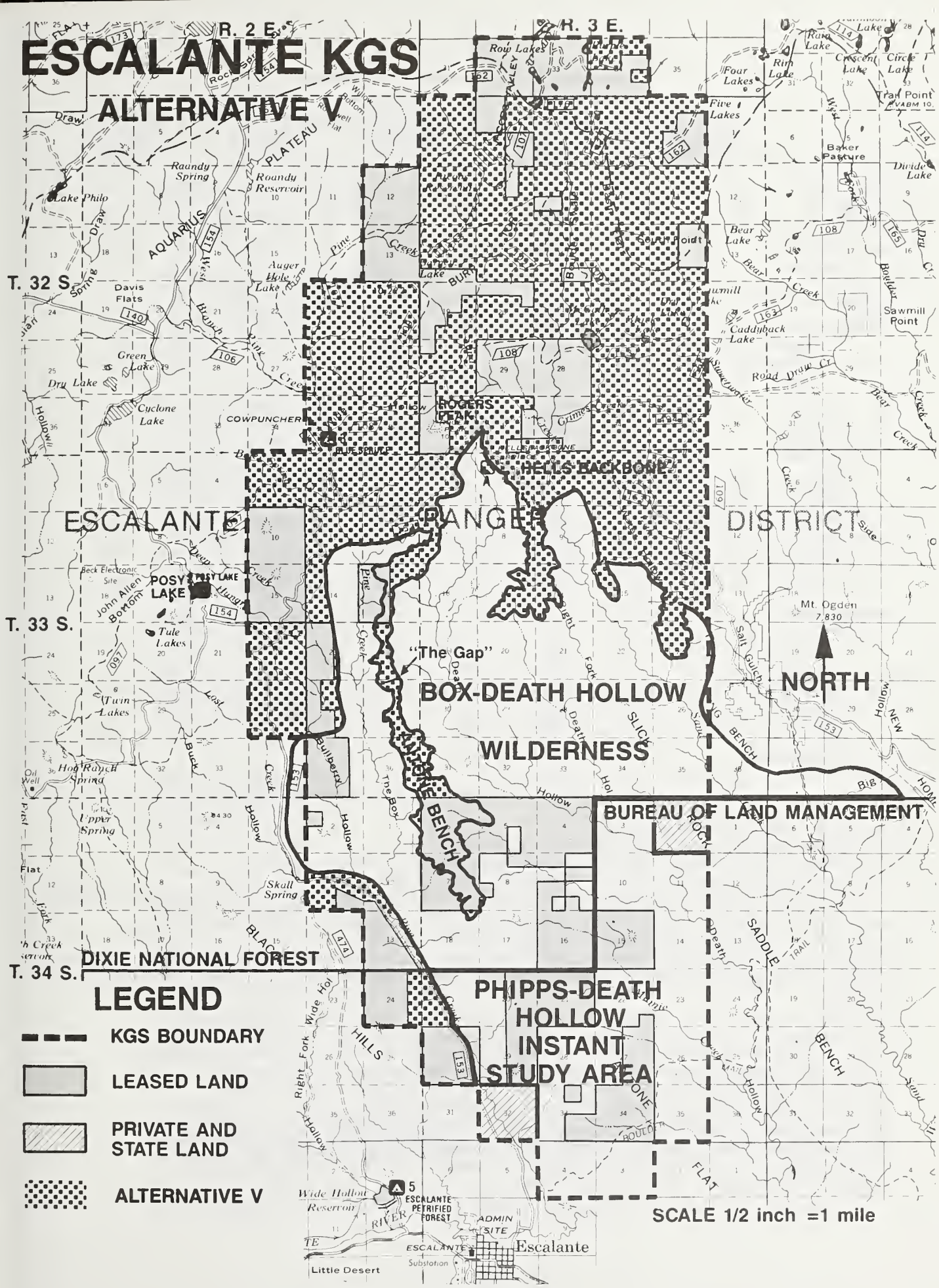

ESCALANTE KGS
ALTERNATIVE V
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
ROGERS PEAK
HELLS BACKBONE
"The Gap"
BOX-DEATH HOLLOW WILDERNESS
BUREAU OF LAND MANAGEMENT
DIXIE NATIONAL FOREST
PHIPPS-DEATH HOLLOW INSTANT STUDY AREA
POSY LAKE
NORTH
Mt. Ogden 7,830
Escalante
ESCALANTE PETRIFIED FOREST
ADMIN SITE
Little Desert
LEGEND
KGS BOUNDARY
LEASED LAND
PRIVATE AND STATE LAND
ALTERNATIVE V
SCALE 1/2 inch =1 mile

TABLE 2

Alternative Levels of Leasing and Development

	Alternative I Cumulative Total	Alternative II Cumulative Total	Alternative III Cumulative Total	Alternative IV Cumulative Total	Alternative V Cumulative Total
1/ Area currently leased (Acres)	17,581	17,581	17,581	17,581	17,581
2/ Proposed for lease (Acres)	0	2,263	17,381	29,449	31,700
3/ Total KGS leased area (Acres)	17,581	19,844	34,962	47,030	49,281
4/ Areas unoccupiable (Acres)	7,003	7,187	9,579	11,979	12,163
5/ Occupiable Area (Acres)	10,578	12,657	25,383	35,051	37,118
6/ CO2 Wells (Number)	(2)	(29)	(49)	(55)	(68)
Acres	4	60	98	110	136
Oil Wells (Number)	(10)	(10)	(32)	(32)	(32)
Acres	30	30	96	96	96
7/ Road Utilization					
CO2 (Miles)	(3)	(36)	(69)	(87)	(109)
Oil (Miles)	(8)	(8)	(20)	(20)	(20)
Total (Miles)	(11)	(44)	(89)	(107)	(129)
8/ Pipe/Powerlines R-O-W's					
CO2 (Miles)	(0)	(51)	(79)	(94)	(113)
Oil (Miles)	(8)	(8)	(17)	(17)	(17)
Total (Miles)	(8)	(59)	(96)	(111)	(130)
9/ Road Construction					
CO2 (Miles)	(0)	(27)	(41)	(44)	(56)
Oil (Miles)	(3)	(3)	(8)	(8)	(8)
Total (Miles)	(3)	(30)	(49)	(52)	(64)
Acres	8	75	122	130	160
10/ Pipe/Powerline Construction (Miles)	(2)	(13)	(20)	(24)	(28)
Acres	5	33	50	60	70
11/Support facilities					
CO2 (Number)	(0)	(5)	(8)	(9)	(11)
Acres	0	35	56	63	77
Oil (Number)	(2)	(2)	(5)	(5)	(5)
Acres	8	8	20	20	20
12/Surface requirements Total Acres	55	241	442	479	559

1/ Total lands under lease within the KGS.
2/ Includes land proposed to be leased under each alternative.
3/ Total lands that will be under lease if alternative is adopted. Includes leased lands in Alternative I, plus lands that will be added by that alternative.
4/ Includes lands that are not occupiable. (Includes NSO Stipulation lands, 45% slopes and inaccessible lands.)
5/ Lands that can be occupied and developed for CO2 and oil.
6/ Assumes the standard 640-acre well spacing for gas fields and 80-acre well spacing for oil fields. Alt. I includes the 2 existing commercial CO2 wells.
7/ Includes the estimated miles of roads that will need to be utilized to operate producing CO2 and oil fields. Estimate includes existing roads, dual use of planned timber management roads, and roads constructed specifically for CO2 or oil field development. Alt. I includes 3 miles of road to existing CO2 wells.
8/ Includes the estimated miles of pipeline and powerline routes or corridors needed for full field development for oil and CO2 based on the development level assumed for each alternative.
9/ Includes the estimated number of miles and surface requirements for new road construction needed for full field development based on the development level assumed for each alternative.
10/ Includes the estimated miles and surface requirements for pipelines/powerlines that will not be located in a roadway and will require a separate route.
11/ Includes the estimated number of CO2 compressor stations plus storage/workyard facilities. Estimated number of CO2 compressor stations based on an assumption that smaller type compressor station will be utilized. Includes the estimated number of oil storage facilities plus storage/workyard for full field development. Estimates are based on the assumed development level for each alternative.
12/ Includes total estimated acres required for wellsites, roads, pipelines, and support facilities.

TABLE 3

Comparison of Impacts Between Alternatives 1/

	Alt. I	Alt. II	Alt. III	Alt. IV	Alt. V
Impacts to Soil Resources					
First Year Soil Loss (Tons)	220	964	1,768	1,916	2,236
Vegetation Disturbed (Acres)	55	241	442	479	559
Qualitative Scale 2/	(1)	(2)	(3)	(4)	(5)
Impacts to Wildlife Resources					
Reduced Habitat Effectiveness					
Acres of Affected Habitat	2,835	10,805	13,700	13,895	14,295
Big Game Equivalents					
Deer (Number)	-26	-97	-123	-124	-128
Elk (Number)	-3	-10	-12	-13	-21
Qualitative Scale	(1)	(2)	(3)	(4)	(5)
Impacts to Visual Resources					
Qualitative Scale	(1)	(3)	(4)	(2)	(5)
Impacts to Recreation Resources					
Change in Recreation Opportunities					
Primitive (Acres) 3/	-0-	-885	-885	-885	-885
(Existing: 34,911 acres)	(34,911)	(34,026)	(34,026)	(34,026)	(34,026)
Semiprimitive (Acres)	-326	-1,373	-4,436	-4,762	-6,065
(Existing: 34,409 acres)	(34,083)	(32,036)	(29,973)	(29,647)	(28,344)
Roaded Natural (Acres)	+326	+3,258	+5,321	+5,647	+6,950
(Existing: 10,680 acres)	(11,006)	(13,938)	(16,001)	(16,327)	(17,630)
Qualitative Scale	(1)	(2)	(3)	(4)	(5)
Impacts to Wilderness					
Qualitative Scale	(1)	(3)	(4)	(2)	(5)
Impacts to Water					
Perennial Streams Subject to Impact (Miles)	6.4	6.4	15.8	23.7	23.7
Stream Sedimentation (Tons)	66	289	530	575	671
Qualitative Scale	(1)	(2)	(3)	(4)	(5)
Socio-Economic Impacts					
Work Force Impacts					
Number of Workers	75	270	480	515	605
Economic Benefits					
Qualitative Scale	(5)	(4)	(3)	(2)	(1)
Socio Impacts					
Qualitative Scale	(1)	(2)	(3)	(4)	(5)
Impacts to CO_2 and Oil					
Lands Unavailable for Development					
(Acres)	67,600	65,500	52,800	43,200	41,100
(Percent of KGS)	85%	82%	66%	54%	51%
CO_2 Production Potential					
Qualitative Scale	(5)	(3)	(2)	(4)	(1)
Oil Production Potential					
Qualitative Scale	(5)	(4)	(3)	(2)	(1)

1/ Table 3 represents impacts that are expected regardless of the mitigation applied.

2/ Qualitative Scale is used to rank the Alternatives in relative order of severity of impact to each resource or environmental component. It is also used to provide a measurement of impacts where quantitative measurements are not available or have not been estimated. On a scale from 1 to 5, a "1" represents the least impact and "5" represents the greatest impact.

3/ See Appendix G for explanation of changes in primitive ROS class in designated wilderness and ISA.

CHAPTER III

CHAPTER III - AFFECTED ENVIRONMENT

The KGS, as addressed in this Environmental Impact Statement, includes 64,200 acres of National Forest lands within the Escalante and Teasdale Ranger Districts, Dixie National Forest; and approximately 14,000 acres administered by the Escalante Resource Area, Cedar City District, of the BLM. The KGS southern boundary is located 1 to 1 1/2 miles north of Escalante, Utah. Previous environmental documents have been prepared that relate to this area. They are: (1) Escalante Management Framework Plan, (2) District-wide Programmatic Oil and Gas Environmental Analysis Record (EAR), and (3) Dixie National Forest Land and Resource Management Plan. These documents may be reviewed at the Escalante Resource Area or Cedar City District Offices of the BLM, Escalante Ranger District, or Dixie National Forest Supervisor's Office.

Soils and Vegetation

The northern portion of the KGS consists of the Aquarius Plateau which is a high elevation plateau of low rolling hills and swales. This area is dominated by andesite, latite, and basalt rocks. Soils range from moderately deep to deep and support mixed stands of spruce, fir, and aspen with large open areas of silver sage and native grasses and forbs. Stability is good and erosion rates are low.

Below the Aquarius Plateau Rim are mixed colluvial slopes associated with large slump blocks. Topography is undulating and the surface is bouldery in places. Vegetation is dominantly aspen. Soils are generally deep clay loams with some clay subsoils. High shrink-swell potentials and some mass stability problems occur in this area. Erosion rates are low.

Below the aspen belt is a band of ponderosa pine and Gamble oak. This area consists of deep soils formed in bouldery deposits of intermediate volcanic rocks. Slopes are gently sloping to moderately steep. Surface cobbles and stones are typical. Erosion rates are moderate. A few small areas have mass stability problems associated with old landslides and geologic formations containing gypsum.

Antone Bench and Areas 2, 3, 4, and 5 are ridges and benches that extend below and to the south of the aspen belt. These areas are bound to the east, west, and south by high vertical escarpments and long steep slopes. The tops of the ridges and benches are relatively level to gently sloping. The soils are predominantly sandy and vary from a few feet deep to very shallow with many areas of exposed slickrock. Erosion potential is very low. The vegetation is dominated by open stands of ponderosa pine with a manzanita understory.

The southern portion of the KGS contains the Box-Death Hollow Wilderness. This area is dominated by exposures of sandstone slickrock. Vegetation is

sparce. Ponderosa pine and pinyon-juniper plant communities dominate the lower elevations where soils range from shallow to deep and are typically calcareous. Erosion rates are high.

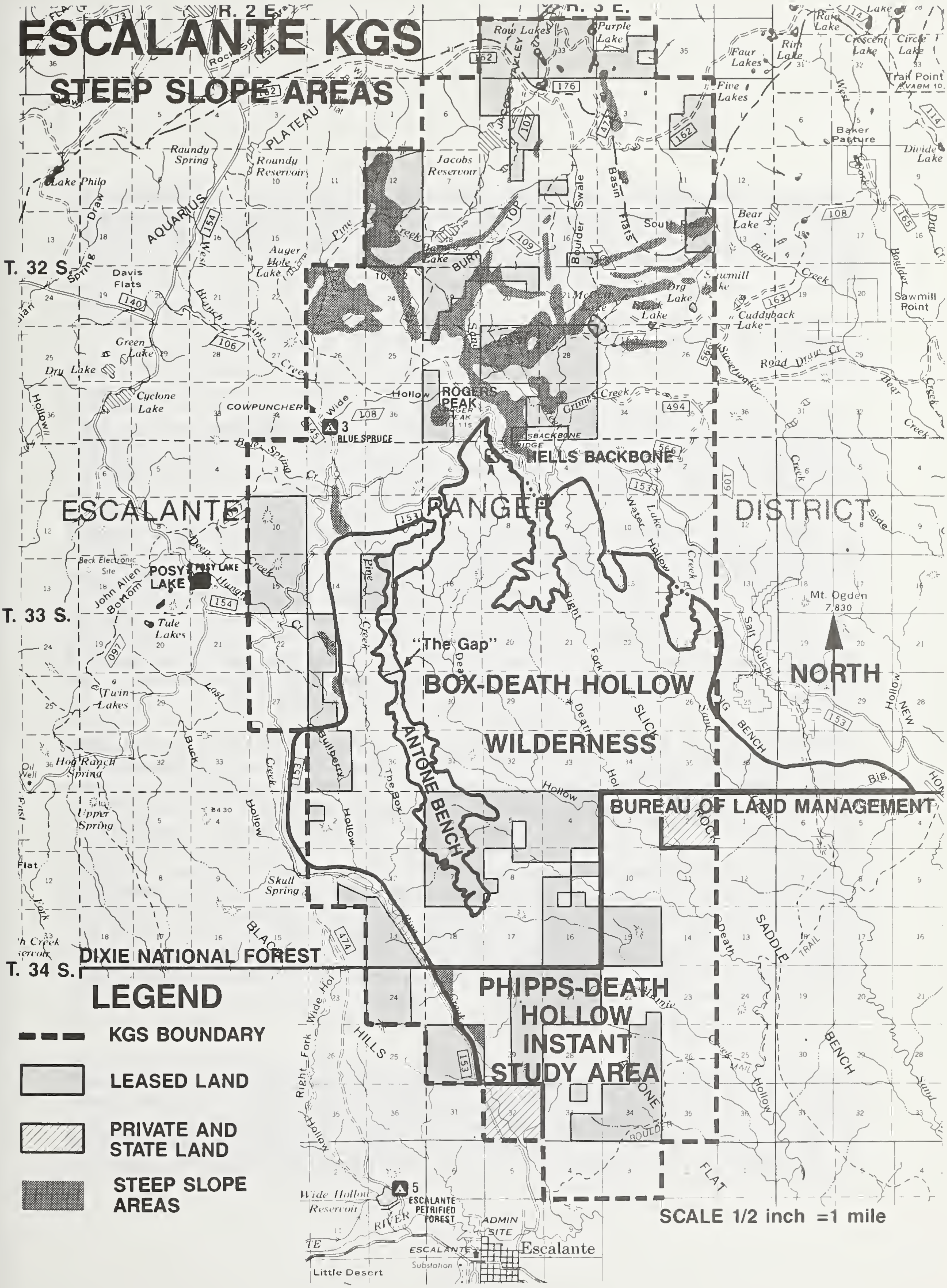
The Escalante Ranger District Land Systems Inventory contains a description of the general soil conditions found within the KGS. This inventory is on file in both the Escalante Ranger District and Dixie National Forest Supervisor's Offices. The land types include steep slopes, shallow erosive soils, steep cliff escarpments, or have soils that either contain gypsum or show evidence of slumping or landslides. A map showing land types that contain sensitive soils is available at the Ranger District Office in Escalante. It should be noted that these are land types only and sensitive soils may occupy only a portion of the type. Sensitive soil areas may not tolerate surface disturbance or may not be capable of supporting structures such as roads, etc. A map of the steep slope areas is located on page III-3.

Wildlife and Fisheries; Sensitive and Endangered Species

The lower elevations of the KGS are generally south of the Hells Backbone Loop Road. Antone Bench and Areas 2 through 5 support open stands of ponderosa pine. The Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area support stands of pinyon juniper in addition to open stands of ponderosa pine. These areas also contain vertical escarpments, narrow steeply walled canyons and extensive sparsely vegetated slickrock areas. Common wildlife species that may be found in these areas are: mule deer, coyotes, badger, wood rats, least chipmunks, red squirrels, common flickers, mountain chickadees, nuthatches, yellow-rumped warblers, mountain bluebirds, western bluebirds, red-tailed hawks, and Swainson's hawks. Some less commonly seen species are: cougar, black bear, elk, wild turkey, goshawk, pronghorn, and the Mexican Spotted Owl.

North of the Hells Backbone Loop Road at the higher elevation, aspen and Douglas fir are more dominant in the overstory. Farther northward in the Jacob's Valley/Boulder Swale/Purple Lake area, overstory vegetation becomes primarily spruce and subalpine fir mixed with some aspen. Dry sagebrush meadows are interspersed with the timber stands. Most of the timber stands have a relatively closed canopy and a correspondingly sparse understory. Wildlife species at these higher elevations are similar to those at lower elevations; elk, bear, and deer being more numerous, wild turkey, less numerous. The Mexican Spotted Owl is not likely to occur. The aspen dominated areas below the rim of the Aquarius Plateau contain elk calving habitat. Deer summer range is located above the 8,000 foot elevation level.

A number of wet meadows and small lakes are scattered throughout the area. Some of them, such as McGath Lake and Purple Lake contain good, but small, fisheries. The Row Lakes have good fisheries potential. Others; i.e., Barney Lake provide good waterfowl habitat. In addition to these lake


ESCALANTE KGS
STEEP SLOPE AREAS
R. 2 E.
R. 3 E.
T. 32 S.
T. 33 S.
T. 34 S.
ESCALANTE RANGER DISTRICT
ROGERS PEAK
HELLS BACKBONE
BLUE SPRUCE
"The Gap"
BOX-DEATH HOLLOW
WILDERNESS
ANTONE BENCH
BUREAU OF LAND MANAGEMENT
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STEEP SLOPE AREAS
SCALE 1/2 inch =1 mile

fisheries, Pine Creek, Sand Creek, Lake Creek, Deep Creek, and Mamie Creek support sport fisheries. Pine Creek is a good fishery and is stocked with rainbow trout by the Division of Wildlife Resources. Brown trout have also been found in this stream. These fisheries are accessed only by primitive roads.

A listing of endangered and sensitive plant and animal species known or suspected to occur in and near the Escalante KGS is presented in Appendix I.

The presence of the endangered peregrine falcon within the KGS has not been confirmed; its occurrence is only suspected. If peregrines use the KGS, they probably confine their activity in the northern portion to hunting. They might nest in the steep, inaccessible cliffs and hunt over the benches or canyons in the southern portion of the KGS.

The areas of the Forest that are frequented by the endangered bald eagle are characterized by a riparian zone containing roost trees and a stream with an adequate fish prey base and open valley bottoms with scattered roost trees and an adequate terrestrial prey base. Preferred roost trees are deciduous, usually cottonwoods, but eagles are occasionally seen on conifer snags. If Eagles are using the KGS, they are probably using the low elevation areas at the southern end, as during the winter months the northern portion is snowed in and most prey species are unavailable. No bald eagle winter roost sites are known to exist in the KGS.

Fifteen sensitive bird species and four sensitive plant species are known or suspected to occur in or near the KGS. The occurrence of the sandhill crane, prairie falcon, merlin, great blue heron, flammulated owl, Williamson's sapsucker, black swift, and Lewis' woodpecker in the KGS is only suspected, as there have been no confirmed sightings. Perhaps the species most susceptible to disturbance from exploration and development is the sensitive Mexican Spotted Owl, which is a cliff nesting owl that prefers narrow, secluded, steep-walled canyons. Two of the sensitive plants, the Aquarius Indian Paintbrush and the Small Beardtongue, are known to exist near the northwestern edge of the KGS (Sec. 27, T. 31 S., R. 2 E., SLM), and may also occur within the KGS. Neeses's Peppergrass and Jones Golden Aster are found along the Hells Backbone Loop Road in the vicinity of the Hells Backbone Bridge.

Visual and Recreation

The KGS is characterized by three separate visual landscapes. The northern area is flat to rolling and heavily vegetated with spruce, fir, and aspen. There are also many large openings with small lakes and reservoirs. Most of the spruce stands have been logged and many remnants of the old road system remain. The area is covered with large rocks and the old roads are rough and difficult to drive.

The central area above the Hells Backbone Loop Road contains country that is steep to rolling. The slopes are heavily vegetated with ponderosa pine, spruce, and aspen. The aspen attracts many people to the area during the fall when the colors of the leaves are changing. Much of this area has been logged to remove trees that were infested with Mountain Pine Beetle or Spruce Bark Beetle.

The southern end contains many outstanding rock formations. The Box-Death Hollow Wilderness, located in the southern portion of the KGS, contains landscapes that are unique in the State.

The Hells Backbone Loop Road over Boulder Mountain to Teasdale is the major through road in the area and is used regularly by tourists and recreationists visiting the area. It is also the major access road to the north end of Box-Death Hollow Wilderness and provides panoramic views of the Wilderness and adjoining areas. The Aquarius-Teadale Road (No. 154), is used quite heavily during the summer as a major travel route in and out of Escalante, and is highly sensitive to landscape modification due to the high amount of recreation use it receives. Posy Lake, which is accessed by this road, is a major attraction for fishermen and campers during the summer.

The Spectacle Lake Road (No. 162), located in the northern portion of the KGS, is a collector route used by fishermen and hunters.

Recreation opportunities vary from developed sites at Blue Spruce Campground to the primitive recreation opportunities in the Wilderness. The areas adjacent to Hells Backbone Loop and Aquarius-Teasdale Roads provide a roaded natural recreation opportunity characterized by modification for conventional motorized recreation opportunities with facilities to accommodate this type of use.

The area north of Hells Backbone Loop Road is characterized by a natural appearing environment. Recreation use in this area is low except during the fall hunting season. Past logging activity is evident. Motorized recreation opportunities exist; however, some of the roads are in poor condition and can only be used during dry weather. Demand for semiprimitive motorized recreation opportunities is increasing as motorcycles and all terrain vehicles become more popular. Much of this area is capable of handling this type use with little resource damage.

There are some areas north of Hells Backbone Loop Road, under the Aquarius Plateau Rim, that are wet slumplands. These areas are characterized by very unstable slopes and are not suitable for road location. The small lakes in this area, like McGath, contain fisheries that cannot support heavy fishing pressure. This area provides an excellent opportunity for backpacking and horseback use.

The KGS was inventoried for recreation potential using the guidelines developed for the Recreation Opportunity Spectrum (ROS). This inventory recognized three separate recreation opportunities (Primitive, Semiprimitive Motorized, and Roaded Natural) in the KGS.

The inventory resulted in the identification of the following recreation opportunity being present within the KGS as expressed in land area.

ROS Class	Acres in KGS
Primitive	34,911
Semiprimitive	34,409
Roaded Natural	10,680
Total	80,000

The primitive area is characterized by an unmodified natural environment. Interaction between users is low and evidence of other users is minimal. There is an extremely high probability that the visitor can experience an isolation from the sights and sounds of others. The user experiences a high degree of challenge and risk while visiting the area.

The semiprimitive motorized area is characterized by a predominately natural or natural appearing environment. Concentration of users is low, but evidence of users is present. The opportunity exists within this area to experience a feeling of isolation from the sights and sounds of other humans. Users of this area have the opportunity to develop self reliance through the application of woodsman and outdoor skills in an area that offers challenge and risk. The McGath Lake area was designated in the Dixie National Forest Land and Resource Management Plan as a No Surface Occupancy (NSO) area and the NSO Stipulation (Appendix B) will be included in all leases issued in this area (see Area 2A, pages I-8 and I-9).

The roaded natural areas are within one-half mile of the Hells Backbone Loop Road, the Spectacle Lake Road, the Aquarius-Teasdale Road, and the road to Row Lakes. The areas are characterized by a predominately natural appearing environment with moderate evidence of the sights and sounds of man. Interaction between users is low to moderate, but evidence of other users is prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment.

Opportunities for both motorized and nonmotorized forms of recreation exist. Activities such as driving for pleasure, viewing scenery, picnicking, fishing, snowmobiling, and cross-country skiing are possible. Conventional use of highway-type vehicles is provided for in design and construction of roads. Motorized travel may be restricted to designated routes to protect physical and biological resources.

There is one established hiking trail in the KGS. The "Old Boulder Mail Trail" traverses the extreme southern end of the KGS in the Phipps-Death Hollow ISA.

Wilderness

Approximately 24,600 acres of the Box-Death Hollow Wilderness lie within the KGS. In addition, there are 10,300 acres of the KGS within the Phipps-Death Hollow Instant Study Area, which is undergoing review by the BLM for possible designation as Wilderness. The Wilderness was created in 1984 by the Utah Wilderness Act, subject to valid existing rights.

Congress included specific language in the Utah Wilderness Act to prohibit the creation of buffer zones. The Act states that the fact that nonconforming activities may be seen or heard from within the Wilderness shall not preclude those activities up to the boundary of the Wilderness.

The number of visitors per year to the Wilderness has not been determined. Therefore, the extent of the recreation use is unknown at this time. The more heavily used travel routes within the Wilderness are down Pine Creek from Blue Spruce Campground to Hells Backbone Loop Road (No. 153), north of Escalante. This is a short two-day trip that provides opportunities for fishing and sight-seeing. A trip down through Death Hollow from the Hells Backbone Loop Road to the Escalante River takes up to five days. The way is narrow and the traveler is required to let his pack down with ropes, wade streams, and even swim to cross some "plunge pools". There are no established trails and the traveler must determine his own travel way. In many places, this is predetermined by the terrain. More and more people are utilizing these areas. However, at the present time, overcrowding is not a problem.

Water

The KGS is located in the headwaters of the Escalante River Watershed at elevations ranging from around 6,000 to over 10,000 feet above mean sea level. Average annual precipitation levels range from 25 inches on the plateau top to 11 inches in the areas adjacent to Escalante. Snowfall is the dominant form of precipitation in the higher elevations. Snow depths in excess of four feet are not uncommon. The area is subject to intense short duration thunderstorms in late summer which account for most of the peak flows in local streams. These summer storms commonly produce flash flooding in dry washes and intermittent streams, particularly in the canyons of the Wilderness and ISA. This region has very high surface runoff due to extensive areas of exposed bedrock and very shallow soils.

Three major tributary streams of the Escalante River cross the KGS. Pine Creek to the west, Death Hollow Creek to the south, and Sand Creek to the east and north. Pine Creek is a perennial stream rising from springs and lakes on the top of the Aquarius Plateau. Below the Hells Backbone Loop Road, it runs in a steepsided sandstone canyon (the Box) where it commonly diminishes in flow due to infiltration. This section of the stream is particularly subject to flash flooding. The average flow of Pine Creek is 4.8 cubic feet per second (cfs) as measured at the USGS gaging station at

the mouth of the Box. The estimated 100-year flood at this point is 1730 cfs. Pine Creek is diverted for irrigation purposes below the mouth of the Box. The water quality in Pine Creek as sampled at the Hells Backbone Loop Road above the Wilderness is generally very good. The stream does, however, carry heavy sediment loads in its lower reaches during storm runoff events. Three of the perennial tributaries of Pine Creek, Hungry Creek, Deep Creek, and Blue Spring Creek, flow across the KGS. These streams flow through the timbered plateau sideslopes above the Wilderness and generally have very good water quality.

Death Hollow Creek arises within another steepsided sandstone canyon which starts below the Hells Backbone Loop Road. Because of its remote location, little flow or water quality data is available for this stream. It is, however, subject to frequent flash flooding and pulses of high sediment concentration. The reaches of the stream on the Forest are not perennial. A few small seeps and "tanks" or "plunge pools" located near the Forest boundary are the only sources of water which are available yearround in these reaches. Springs located within the ISA near the confluence of the main channel and the Right Fork of Death Hollow Creek create perennial flows in the downstream reaches. At least one spring located outside the KGS boundaries but inside the ISA is pressurized. It has been speculated that the pressurized spring is driven by CO_2. However, the CO_2 is located in deep triassic rocks that are isolated hydraulically from the overlying Navajo sandstone by impermeable or semipermeable strata. These impermeable rocks form the trap that retains the CO_2 in the Anticline. All the springs in the bottom of Death Hollow issue from the Navajo sandstone. Death Hollow's major perennial tributary, Mamie Creek, also flows within the ISA. Mamie Creek supports populations of nonsport fish species and some rainbow trout.

Sand Creek has watershed and streamflow characteristics similar to Pine Creek although it is smaller in size. It arises on the forested upper slopes of the Aquarius Plateau and enters its own sandstone canyon in the Wilderness. Water quality as measured at the Hells Backbone Loop Road is very good. Lake Creek and Boulder Swale, perennial tributaries of Sand Creek, also flow through the KGS. They are both dewatered by private irrigation diversions in the Salt Gulch area.

Several small lakes are located within the KGS. They are found primarily on the plateau top and in the slumplands immediately below the Aquarius Plateau Rim. Many of these lakes are quite shallow and subject to considerable seasonal fluctuation in surface area. There are no lakes or perennial streams in Antone Bench or the other Exclusion Areas, and no lakes within the Wilderness or Instant Study Area.

In addition to the riparian areas associated with perennial streams and lakes, there are also several small, isolated areas occupied by riparian vegetation in the northern portions of the KGS. They are generally associated with small springs. These springs are important for wildlife and stock watering.

Socio-Economic

The nearest communities, their proximity to the Escalante KGS, and their estimated populations are shown in the following table.

TABLE 4

Population and Distance to KGS

COMMUNITY	POPULATION	MILES TO BOUNDARY
GARFIELD COUNTY		
Escalante	675	1
Tropic, Henrieville, Cannonville, Bryce Valley area	670	45
Boulder	130	10
Antimony	110	48
WAYNE COUNTY		
Bicknell	329	35
Loa	404	40
Torrey	146	43
Teasdale	97	45

The economic situation of these communities has not been very bright during the past few years. Development of new industry and new job opportunities for local residents has been minimal.

Communities in the area are relatively small with limited resources available for large development or industry. For example, housing and water are critical in many Southern Utah communities.

The economic base for this area is agriculture, a sawmill in Escalante, a few other small ventures, and tourism. Tourism is particularly important to the entire Southern Utah area, since several National Parks are located in this part of the State.

Most of the small towns around Escalante have very deep traditional values that can be traced back to early pioneer settling periods of Utah. These values dictate many of the local activities and viewpoints.

CO_2 and Oil

The CO_2 and oil resources and the potential for commercial development and production are described in Chapters I and II of this EIS.

CHAPTER IV

CHAPTER IV - ENVIRONMENTAL CONSEQUENCES

This Environmental Impact Statement (EIS) evaluates five alternative levels of oil and gas and CO_2 leasing and assumed field development within the KGS. It does not address site-specific development plans. In order to analyze and identify potential impacts resulting from the exploration, development, and production of CO_2 and oil from within the Escalante KGS, the following assumptions are made:

It is assumed that the Escalante Anticline is capable of supporting commercial CO_2 development and production within 10 years of lease issuance.

It is assumed that additional leasing is needed to provide sufficient reserves of CO_2 to permit economic development of the resources.

It is assumed that oil field development similar to that found in the Upper Valley oil field will occur within the KGS.

It is assumed that all areas of the KGS that are currently under lease or proposed for leasing are capable of supporting exploration, development, and resource production.

Although assumed, it is not logical to expect that the entire KGS will be productive of CO_2 or oil. Based on existing information, the major development of the CO_2 resources is expected to occur in a relatively broad band along the crest of the Escalante Anticline (see map on page I-10). The greatest potential for hydrocarbon production is expected to be along the western side of the KGS roughly paralleling the crest of the Anticline. However, there is insufficient information to discount other areas within the KGS as lacking potential to produce CO_2 or oil. Production of CO_2 or oil from structural, stratigraphic, and combination traps from other locations within the Anticline is possible. Therefore, it cannot be assumed that all the CO_2 wells will be drilled along the crest of the Anticline or that all oil wells will be located along the western flank of the Anticline.

A level of development beyond that assumed for each alternative will not likely occur. The actual development of the resources will involve a lower level of development than is assumed and depicted in this EIS. The development scenarios utilized in this EIS are not based on an industry proposal for oil or CO_2 field development, but were constructed solely for the purpose of identifying potential impacts prior to leasing.

The exact location of wellsites, compressor stations, pipelines, powerlines, and other facilities and activities that may be provided by lessees/operators in the future are unknown. Since no site-specific proposals for the exploration or development of either the CO_2 or oil and

gas exist, no attempt was made to measure many of the impacts in quantitative terms. In other words, there is insufficient information to do a detailed site-specific analysis at this time. Such an analysis based on speculation would be premature and the results inaccurate. Therefore, many of the impacts are described in the EIS in general or qualitative as opposed to quantitative terms.

It is expected that existing leases will expire or be terminated prior to the time that exploration or development is undertaken. It is assumed in the analysis of each alternative that the existing leases will support a certain level of development. Except for lands encompassed by existing leases within the Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area, it is assumed that lands encompassed by expired or terminated leases will be offered for lease.

An acceptable plan of operation must be submitted by the lessee or unit operator to the BLM for approval prior to undertaking any surface disturbing activities. Both the BLM and the Forest Service monitor mineral operations on National Forest System lands. The Forest Service's responsibility, as the surface management agency, is for the protection of the surface resources and reclamation of disturbed areas. Site-specific mitigation is developed as a result of the environmental analysis. These will be applied as conditions of approval of the proposed operations. Many of the issues and concerns identified during scoping for this document will be addressed in more detail when a site-specific proposal is submitted to the BLM for approval.

Once a lease has been issued, the right to utilize and occupy the surface of the leased lands to extract the mineral has been granted unless the lease has a no surface occupancy stipulation. During the operating plan environmental analysis, the option of denying all exploration or development on the lease is not an administrative option as long as the operating plan complies with applicable laws, regulations, terms of the lease, and lease stipulations. However, the rate of development may be controlled and certain operations denied or not approved as proposed.

A narrative of probable environmental consequences for each alternative was developed based on the expected scenarios and assumptions presented in Chapter II, Alternatives.

Alternative I (No Action) - Offer No New Leases in the KGS, but Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Soils and Vegetation

If oil field development occurs, there will be an estimated 55 acres of soil disturbance associated with the drilling of 10 wells, construction of the 10 wellsites, 3 miles of additional roads, 8 miles of pipelines/powerlines, and other related facilities. The loss of productive

topsoils and the resulting sedimentation of streams and lakes from erosion are the most common impacts associated with soil disturbance. These impacts are expected to be confined to the western edge of the KGS where the greatest potential for oil development has been identified.

Some of the existing leases contain limited areas of steep slopes, slickrock, and shallow erosive, or unstable soils that contain gypsum and show evidence of slumping or landslides (see map on page III-3). Several leases contain no surface occupancy stipulations which will protect some of the sensitive soil areas from surface disturbance. Site-specific mitigation of impacts to sensitive soil areas is required at the time drilling and other proposals are submitted for approval. Roads and drill pads will be required to be located on the more gentle slopes; however, to access some of the leased areas, soil-disturbing activities on steep erosive soils will be unavoidable. Onsite soil erosion in steep areas with erosive soils can exceed acceptable limits unless special construction techniques are employed and stabilization structures installed to provide ground stability and erosion control.

Approximately 55 acres will be taken out of production for timber, livestock grazing, or wildlife forage by the construction of roads, drill pads, and support facilities. Many of these lands have very low natural productivity. First year onsite soil erosion will result in the displacement of an estimated 220 tons of soil from the 55 acres that will receive surface disturbance. However, reclamation can adequately mitigate most of the long-term impacts by minimizing additional soil loss and loss of site productivity after the first year.

Site productivity is low on most of the leased areas located south and west of the Hells Backbone Loop Road. The loss of site productivity for timber or grazing due to soil loss in this area is not expected to be significant. However, additional sedimentation to Pine Creek and other streams that drain the western portion of the KGS may affect water quality and result in offsite impacts. When development and production activities that may jeopardize water values are proposed, site-specific mitigation will be required to minimize erosion and protect the soil and water resources. These will include the design and installation of proper drainage features such as water bars and culverts in new and reconstructed roads and the reclamation of disturbed areas.

Evidence of slumping in soils containing gypsum is typically found along the northwest boundary of the KGS. Road and drill pad construction on these soils may cause unstable conditions, particularly if gypsum and subsurface water are intercepted on the cutslope. These impacts can be mitigated by employing appropriate geotechnical practices to provide stability.

Soil contamination from oil, fuel, and chemical spills is an unavoidable impact during the life of an oil field. The use of protective dikes around

tank batteries and other facilities where these substances are stored, processed, and handled will contain the spill to the site, minimizing offsite impacts of such spills. Immediate removal of contaminated soils and spill material to approved disposal sites will further reduce the offsite impacts resulting from spills.

The use of existing roads and the burying of oil flowlines in roadways reduce the amount of area exposed to erosion and soil loss, thereby significantly reducing the impacts to the soil resources. Specific survey, design, and construction standards must be met by the lessee/operator in both new road construction and the upgrading of existing roads. Selecting suitable road locations, minimizing road widths, and designing and installing proper drainage features also reduce the impacts on the soil resources.

The major opportunity to mitigate impacts on soil resources arises when surface use programs are submitted for approval in accordance with 43 CFR 3160 and Onshore Oil and Gas Order No. 1. Wellsites, roads, and tank batteries are located on the most level sites available in order to minimize surface disturbance and erosion potential. Construction sites are limited to a size consistent with construction and operational needs for oil extraction and are also oriented or adjusted to best fit the topographic conditions at the selected locations. Deep vertical cut and steep slopes are avoided, if possible, to reduce erosion and preserve slope stability.

Available topsoil is removed from the areas to be disturbed and stockpiled prior to the start of construction activities. After completion of construction and drilling stabilization, reclamation of all areas not required for the continued operation of the well or other facility will be undertaken. Grading and backfilling reduce erosion and enhance revegetation. Contouring, terracing, gouging, scarifying, and installing water bars may be needed to enhance site productivity prior to revegetation.

Upon termination of use and abandonment of wellsites, roads, and other facilities, the surface structures are removed and the site is reclaimed to a stable condition. Some additional soil disturbance occurs during final reclamation; however, the increased stability provided by reclamation outweighs the impacts from the added disturbance.

Wildlife and Fisheries; Sensitive and Endangered Species

No special habitat areas have been identified in this area that will receive direct impacts from oil field development. If Alternative I is implemented, impacts to wildlife habitat are expected to be confined to an area along the west side of the KGS.

If oil field development occurs on the existing leases within the KGS, an estimated 3 miles of roads need to be constructed and 8 miles of road utilized in order to drill the estimated 10 oil wells needed to develop the leases. The average road density in the KGS will be 1.6 miles of road per square mile of habitat. Except for the Aquarius Plateau rim, the areas north and west of the Hells Backbone Loop Road, are already heavily roaded. The increase in road densities that will be created if Alternative I is implemented will not significantly affect wildlife habitat effectiveness because other habitat areas are available to accommodate the loss and because no critical habitat has been identified in the area with the greatest potential for oil development.

During drilling and construction activities associated with the development of an oil field, there will be an increase in human activity, vehicular traffic, heavy construction equipment, and drilling rigs operating in the western portion of the KGS. Traffic along the Hells Backbone Loop Road between Escalante and the western side of the KGS will be relatively heavy during drilling operations. It is expected that there will be an increase in heavy trucks and other vehicles moving drilling rigs, heavy construction equipment, supplies, drilling crews, and service equipment and crews in and out of the field. There will also be a continuous human presence along the Hells Backbone Loop Road and within the areas undergoing drilling and development. The traffic and construction activities will displace wildlife, primarily deer and small nongame species, in the vicinity of the road and in the area of oil field development. It is expected that a corresponding increase of wildlife/vehicle collisions will occur principally along the Hells Backbone Loop Road. There will be a direct loss of habitat and reduction in available wildlife forage on the estimated 55 acres of land that will be directly disturbed to accommodate oil production facilities. It is estimated that the surface disturbance, increased traffic, construction, and drilling activities, and the accompanying increase in human presence will adversely impact wildlife and reduce habitat effectiveness on approximately 2,800 acres (Appendix G). In terms of habitat effectiveness for big game species, this will result in an estimated reduction of 26 deer and 3 elk that the affected habitat will no longer be capable of supporting. It is unknown how many or what small nongame wildlife species may be displaced or affected. Construction and development activities will be relatively short-term and localized and, except for traffic on the Hells Backbone Loop Road, will be relatively confined to construction sites within the leaseholds. Once construction and development activities have been completed, the impacts to wildlife will be greatly reduced. Implementation of this alternative will have the least impact to wildlife resources.

There will be an increase in the use of heavy equipment and human activity again during abandonment and reclamation. The intensity of these activities will be less than that experienced during construction and field development. Abandonment and reclamation activities will be highly localized and of relatively short duration. Many of the same adverse

impacts will occur during abandonment and reclamation as occurred during construction and development, but at a reduced level. It is expected that some wildlife species will again be temporarily displaced to less desirable habitats and possibly adversely affected in the process. Habitat enhancement and divergence built into the reclamation prescriptions will benefit some species of wildlife.

The greatest period of risk for increased sediment loads and oil or chemical spills entering streams and lakes and affecting fisheries is immediately following construction. Pine Creek, which is stocked with rainbow trout can potentially be affected as a result of increased sedimentation. Potential impacts can be reduced by not locating facilities adjacent to Pine Creek or other streams in the area and requiring that all disturbed areas that are no longer needed for the continued operation and production of the field be reclaimed immediately following construction. These mitigating measures will reduce the risk of erosion and sediments being transported offsite to Pine Creek.

Neither the peregrine falcon nor the bald eagle have been confirmed as being present in the KGS, although potential habitat exists for both species. Oil field development on existing leases on the western side of the KGS is not expected to encounter or impact endangered species habitat. If use is made of this area by either the peregrine falcon or bald eagle, it is for hunting or as an occasional visitor. The Box Canyon which exhibits potential nesting habitat for the peregrine falcon has limited area under oil and gas lease. The leased lands in the Box are topographically too steep and rugged to occupy for drilling or other developments.

Improperly designed overhead powerlines represent a danger to larger birds of prey, and raptor deaths from electrocution or collision can occur. Overhead powerlines need to be designed and constructed in accordance with the publication entitled: Suggested Practices for Raptor Protection on Powerlines, the State of the Art, 1981 (Raptor Research Report No. 4, Raptor Research Foundation Department of Veterinary Biology, University of Minnesota.)

Visual and Recreation

Under this alternative an estimated 10 oil wells and 8 miles of access roads will be needed for oil field development. Oil exploration and development activities may create highly visible and objectionable changes to the character of the natural landscape. Most of these changes will result from the construction and presence of roads, wellsites, pipelines, powerlines, oil storage tanks, and similar developments.

The westcentral portion of the KGS is accessed by the Hells Backbone Loop Road. This portion of the KGS includes the crest of the Escalante Anticline and the area with the greatest potential for development of oil.

Oil and gas leases, although not located adjacent to the road, are found within the foreground and middleground view areas of the road. The areas adjacent to and north of the road have been logged (see the map on page II-15). The residual visual evidence of logging is minimal, consisting of logging roads and stumps left from selectively cut trees. A significant amount of tree canopy has been retained that will screen most activities from view.

The most visible and audible activities will occur during construction and drilling of oil wells. Drilling rigs and heavy construction equipment, pipeline trenching, and trucks hauling equipment, supplies, and crews will be highly visible. Except for the increased traffic along the major access roads, these activities will be concentrated on the existing leases on the western side of the KGS. The amount of oil field development activity that will be located in the vicinity of the Hells Backbone Loop Road will be limited. Approximately 2 1/2 miles of the road are located on or adjacent to existing leases with the highest potential for oil field development. Drilling rig masts will tower above the tree line and be visible from some locations along the Hells Backbone Loop Road. However, these will be present only during the exploration and development phases and are not be expected to be a dominant feature in most landscape settings. The adverse impacts to the visual setting associated with the construction and drilling of oil wells are difficult to mitigate and largely unavoidable but of relatively short duration.

In order to accommodate oil and gas activities, the main access roads will need to be upgraded to improve safety and to accommodate the change in type and volume of traffic. The imposition of speed limits and the required use of flag cars will become necessary when large loads are being moved in and out of the KGS. Significant increases in traffic from heavy trucks moving caterpillar tractors, drilling rigs, and other large loads on the Hells Backbone Loop Road represent a hazard to recreation traffic. Traffic along the major access routes will be relatively heavy and continuous. The recreation user will not expect to encounter this type of activity in a mountain-type setting and will tend to avoid areas undergoing oil development. Most casual recreation users will be discouraged from attempting to enter the area. The recreation experience being sought in the National Forest will not be available in the immediate areas of development. The implementation of Alternative I is expected to result in a decrease of 326 acres of semiprimitive recreation opportunity and an increase of 326 acres in roaded natural recreation opportunity.

Burying oil flowlines and powerlines in roadbeds will reduce surface disturbance and visual intrusions. It is expected that some divergence from roadbed locations will be necessary. In this case, the impacts will be partially mitigated, but at least some additional linear intrusions will be created. Some wellsites and access roads will also need to be located on steep terrain. Deep vertical cuts and long steep slopes may need to be constructed to accommodate the roadbeds and well pads. Construction

activities will also be conducted in rocky soil and areas of solid slickrock. Uprooting or dismemberment of solid rock will result in visually contrasting "fresh rock" being exposed. Trees will be removed creating unnatural openings in the tree canopy. These types of developments probably won't meet the visual quality objectives adopted in the Forest Plan. These adverse impacts to the visual resources cannot be entirely avoided or mitigated, and some visual intrusion will remain. Impacts can be mitigated in most situations by avoiding steep slopes and selecting locations that are screened from view along the major access routes or areas of heavy recreation use by topography or vegetation.

It will be difficult to avoid the visibility of some wellsites and other installations from the main access roads. However, a number of alternative sites will be available where topography and vegetative screening will be used to minimize the visual impacts of such structures. Wellhead equipment, pumping units, tank batteries, etc., will be painted a color that will blend with natural background colors of the area. This will minimize the impacts to the visual quality of the natural landscape.

The continued and long term presence of an oil field will be evident to the Forest visitor, but activities will be of low intensity and no significant impacts will be added during production. Activity associated with the production of oil will be significantly less than the activity associated with the construction and development phase. During production, most of the human activity will be concentrated at the compressor plants, oil storage areas, and equipment and supply storage areas. Daily checks of each producing well, accompanied by a periodic increase of activities to repair and maintain wells and other equipment, will occur.

A secondary recovery system will need to be installed after initial oil production declines. This will cause a short-term increase in construction activities such as drilling water injection wells, and installing additional pipelines, tank storage areas, and water treatment, injection, and disposal systems. The impacts associated with these activities will not add significantly to the visual impacts that will already be present in a developed oil field. There will be short-term impacts to the recreation use along the main access roads due to this increase in activity. An occasional well may be drilled to test the productivity of other areas of the KGS as part of the ongoing activities in the developed field.

Increased human activity and use of heavy equipment with an accompanying increase in noise and visibility of activities will also occur upon abandonment and final reclamation of the oil field. However, this will not cause significant impacts to recreation use. Not all of an oil field will be abandoned at the same time. Rather, abandonment occurs as individual wells or areas of a field become unproductive. The process of abandonment and reclamation can extend over several years.

Final abandonment and reclamation will consist of the removal of structures, salvaging of materials, and general cleanup and removal of equipment and waste materials from the wellsites, compressor plants, tank batteries, and similar areas. Wells will be plugged and abandoned. Wellsites, roads, and other unnatural and objectionable features created during construction will be backfilled and graded to conform to the existing topography. Roads that have residual value for future use will be retained. Following final grading and shaping of the landscape, all disturbed areas will be topsoiled and revegetated. Once reclamation has been completed, visual intrusions will be significantly reduced. However, the evidence of activities associated with oil production will not be totally removed, and some evidence of these activities will always be present. This evidence will become less apparent over time as native vegetation becomes reestablished. The overall impacts to the recreation and visual resources will be the least under Alternative I.

Wilderness

Oil cannot be produced within the Wilderness except on existing leases located to the south of Antone Bench. Antone Bench and Exclusion Area 2 provide the only feasible access route to these leases and an access road will need to be located within the Bench and Exclusion Area in order to drill for or produce any oil that may be present. The road will be used to transport construction equipment, drilling rigs, crews, and supplies to these leases and possibly oil from the area. Physical changes will occur on Antone Ridge if a transportation corridor to and from these leases is needed.

The placement and construction of roads, pipelines, and powerlines down the length of Exclusion Area 2 and Antone Bench require a Right-of-Way Authorization. In order to fulfill the Congressional intent of the Utah Wilderness Act of 1984, the requirements contained in Section 306(b) of the Act will be applied as a condition to the granting of a right-of-way. This will reduce the visual and auditory impacts to the adjacent Wilderness. Most of the impacts to the visual and recreation resources along the right-of-way corridor will be localized and confined to the top of the Bench. The low-profile roads and pipelines will not be visible beyond the top of the Bench.

The most heavily used areas within both the Box-Death Hollow Wilderness and ISA are located in the bottoms of the steep-walled narrow canyons. Most activities associated with drilling of oil wells will be located on the ridges and benches above the canyons. The canyon walls and tree cover on the ridges and benches will screen most activities from the more heavily used areas of the Wilderness and ISA reducing the visual and audio impacts. Portions of some existing leases are topographically inaccessible. Exploration and development will not be technically or economically feasible within the inaccessible areas. If any portions of the leases are developed, the activities and facilities associated with the

exploration, development, and production of oil will be evident within the Wilderness and ISA. Although the mitigating measures described earlier will be applied to minimize the visual impacts, the impacts to the present recreation use of the area are unavoidable. The recreation opportunity will be altered from a primitive to a semiprimitive nonmotorized experience on the leaseholds, and some evidence of man's activities will always be present. Activities on or in the vicinity of the "Old Boulder Mail Trail", located in the ISA, will be avoided when possible.

The activities associated with construction and development of the leases will be short-term, and the level of activities associated with the production and maintenance of a field will be significantly lower. However, there will be the continued visible presence of an oil field development within the Wilderness and ISA.

Implementation of Alternative I is expected to have the least impacts on the Wilderness of the alternatives considered.

Water

During the exploration phase, there will be only minor consumption of water for drilling operations. This consumption will probably involve small-scale withdrawals from streams, lakes, or reservoirs in the northern portion of the KGS. Larger quantities of water will be required during the early development stages of an oil field. This consumption can occur over a relatively short period of time. Cumulative water withdrawals for development of a 10-well oil field are unknown but are not expected to significantly affect water availability. Withdrawals from surface waters will be carefully controlled so as not to impact National Forest water rights and other uses. These withdrawals are not expected to significantly reduce water quantity. Water consumption will decline during the production phase.

Erosion rates in the KGS will increase due to soil-disturbing activities associated with oil field development such as the construction of roads, drill pads, etc. Increases in stream sedimentation resulting from this construction and other surface-disturbing activities will be the primary impact on water quality downstream. This alternative includes 6.4 miles of perennial streams. Pine Creek is the major drainage located on the west side of the Escalante KGS that will potentially be affected by any oil and gas exploration and development that may occur. Except for its southernmost extension within the KGS, Pine Creek is an intermittent stream as are its major tributaries. Increased sedimentation resulting from the estimated 55 acres of surface disturbance will occur during spring runoff and high intensity thunderstorms. Assuming 30 percent of the 220 tons of soils lost will reach the perennial streams, an estimated 66 tons of sediments will be added to the existing sediment loads during the first year following construction (Appendix G). Although it is unknown how many tons of sediment enter and are transported by Pine Creek annually, it is

considered to be very high. The increased sedimentation will be masked and insignificant compared to the natural sediment loads that are normally experienced. Posy Lake, located just to the west of the KGS, is located upstream from any oil exploration and development within the KGS. Buffer areas between roads and drainage bottoms and prompt reclamation of road cuts and fills and other disturbed areas will be required to reduce sedimentation of streams. Prior to reclamation and stabilization, the initial increase in soil erosion and sedimentation will be quite high locally, but the overall long term effects on Pine Creek are expected to be quite low.

It is anticipated that most wells will be located at a sufficient distance from drainage bottoms to provide protective buffers where roads and other facilities are located near streams. Special protective measures will be employed to limit the amount of sediment reaching the channels (see Appendix C). Although the sedimentation rate associated with construction activities may temporarily impact some local stream reaches, especially in the northwestern portion of the KGS, the cumulative impact of sedimentation is expected to be minor and will not result in a significant degradation of water quality. Over time, erosion and sedimentation rates should decline to near preconstruction levels. Wellsites will be reclaimed after drilling and construction activities cease. These sites will then produce only minor quantities of sediment. Erosion and sedimentation associated with new roads will decline markedly within three years after construction.

The entire KGS is a groundwater recharge area. The Navajo Sandstone formation which dominates the land surface in the southern portion of the KGS forms a highly permeable groundwater recharge area, supporting a major aquifer. Drilling to deeper strata which contain oil deposits may perforate water-bearing zones in the rock and penetrate the Navajo Sandstone formation as well as other water-bearing strata. The wells can create a number of connections between oil-bearing rocks and aquifers exhibiting differing degrees of water quality. Groundwater quality can, therefore, be adversely affected by drilling unprotected wells. Modern drilling techniques and environmental controls mandated by law should provide adequate protection to groundwater resources. The water-bearing strata can usually be sealed off by use of various mudding and casing techniques, effectively isolating them from contamination or loss of hydraulic head. Drilling muds are normally used during drilling to seal off the wellbore to prevent water from entering the well, prevent loss of drilling fluids, protect the integrity of the wellbore, and prevent the exchange of fluids between strata during drilling. The lessee/operator will be required to install and cement in place sufficient surface casing to reach a depth below all known fresh water levels to prevent the exchange of fluids between various strata within the wellbore and to prevent blowout or uncontrolled flows. This casing is left in place in the producing well. Upon abandonment of the well, the lessee/operator is required to install cement plugs in the well across the fresh water zones. All proposed mud, casing, and well abandonment programs are subject to approval

by State and Federal governments. Disruption of groundwater flow patterns to distant springs is unlikely to occur if cased production wells are widely spaced. Wells drilled on the existing leases in the southern portion of the KGS will be located closest to the springs found in the Phipps-Death Hollow Instant Study Area and the Box-Death Hollow Wilderness and represent a greater risk to the flow in these springs. However, it is anticipated that the wells will be located to the west in the upland areas some distance from the springs. The required mitigation is sufficient to protect the fresh water aquifers, and significant impact to the groundwater and springs is not expected to occur from drilling if the available mitigating measures are properly applied.

Oil spills, drilling muds, chemicals, produced water, and other contaminants can easily enter the surface or groundwater systems. The potential of these types of material entering the groundwater systems is greatest in the highly porous sandstones found in the southern portion of the KGS. Breached or unlined mud or reserve pits, water produced with the oil, sanitary facilities, pipeline ruptures, and fuel spills are potential sources for groundwater degradation. The required use of impermeable reserve pit linings or self-contained mud systems, dikes around oil storage and handling facilities, immediate cleanup of spills and removal of contaminated soil material, and the injection of produced waters into originating formations minimize the adverse impacts to water quality. Although the spillage of oil or other contaminants cannot be totally avoided, significant degradation of water quality is not expected to occur due to the environmental controls provided by State and Federal laws and regulations.

Socio-Economic

It is not expected that sufficient production of CO_2 can be established from existing leases in the KGS to permit the construction of compressor plants and a transportation pipeline. CO_2 wells will probably be shut in until sufficient reserves are established to permit commercial development and production. This will require additional leasing. Oil production can be established from existing leases because a pipeline is not required to market the oil. Under the assumption that oil field development will occur, up to an estimated 10 oil wells will be drilled, which will require the utilization of an estimated 8 miles of road to access the wellsites. It is assumed that two drilling rigs will be employed to drill the wells. This will require an estimated 75 workers during the peak drilling and construction activities. Roads and drill pads are expected to be constructed by local contractors. There will be a short-term economic benefit to the private sector derived from drilling and construction crews and service companies securing local goods and services locally. It is expected that these benefits will be localized to the town of Escalante. Additional benefits to the local community will be created by the short-term employment opportunities on drilling and construction crews. Also, tax revenues from oil development will benefit the local community.

Any influx of workers to the community will create an increased demand on community services and facilities. These adverse impacts to the community will be relatively short-term, but will occur before a significant tax base can be establised from which to mitigate the impacts from this population growth. Consequently, the quality of life for all in the community may be lowered. The adverse impacts are expected to be short-term and are not expected to create significant socio-economic changes in the local community.

CO_2 and Oil

Loss of the potential recovery and beneficial use of the CO_2 and any oil that may be present within the KGS will result from legal and other constraints to the leasing and subsequent development of these resource within the Escalante Anticline. Of the 17,581 acres of lands leased for exploration and development within the KGS, there are 7,000 acres where surface occupancy is not allowed by lease stipulations or that cannot be physically occupied because of steep slopes, unstable soils, or other physical impediments. The remaining 10,600 acres that can be explored and developed for CO_2 or oil represent 13 percent of the total of 80,000 acres encompassed in the KGS. Once these leases have expired or have been terminated, the opportunity to develop any oil and gas within the KGS will be foregone under Alternative I.

It is highly improbable that sufficient reserves will be provided by the existing leases now or in the future to permit commercial development of the CO_2. Therefore, the CO_2 will not be available for use in recovering a significant, but unknown amount, of oil from partially depleted oil fields or for other uses.

Only a very limited amount of land area is leased on the western side of the Escalante Anticline. If oil is found to occur in the same position on the Escalante Anticline as in the Upper Valley Anticline, the effects of designated Wilderness on oil field development is expected to be significant. Assuming that no further leasing will be undertaken, it is estimated that less than one-third of any oil resources that may be present are recoverable and available for beneficial use.

If existing leases expire before commercial production is established, the opportunity for development of any resources within the KGS will be foregone or delayed until and if a future leasing effort is undertaken. The lands available for CO_2 and oil and gas exploration, development, and production under Alternative I are summarized in the table on the following page.

TABLE 5

Summary of Land Availability for CO_2 or Oil Development and Production Under Alternative I

Unavailable Lands	Acres 1/	Percent of KGS
Unleased Wilderness and ISA 2/	28,900	36%
Unoccupiable Leased Lands 3/	7,000	9%
Lands not proposed for leasing 4/	31,700	40%
Lands in KGS unavailable for development	67,600	85%
Available Lands		
Occupiable leased lands	10,600	13%
Other		
NonFederal lands	1,800	2%
Total KGS lands	80,000	100%

1/ Rounded to the nearest hundred (100) acres.

2/ Includes unleased lands in the Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area.

3/ Includes lands where surface occupancy is excluded by lease stipulation and lands that are unoccupiable or inaccessible because of steep topography or unstable soils.

4/ Includes lands available for leasing in the KGS but not proposed for leasing under Alternative I.

Alternative II - Offer New Leases for CO_2 Only Within Antone Bench and Exclusion Areas 2, 3, 4, and 5 and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Soils and Vegetation

It is assumed under Alternative II that by leasing Antone Bench and Exclusion Areas 2, 3, 4, and 5 sufficient reserves will be available to support commercial development of the CO_2. It is also assumed that development of the CO_2 will be extended to existing leases in the KGS. Impacts to soil and vegetative resources will occur on an additional 2,263 acres located on Antone Bench and other Exclusion Areas that will be leased if this alternative is implemented. The impacts resulting from oil field development analyzed under Alternative I are also assumed to occur under Alternative II.

In addition to the 10 oil wells that were considered under Alternative I, it is assumed that an estimated 29 CO_2 wells will be drilled under Alternative II and that field development of the CO_2 will occur. It is also assumed that a total of 44 miles of road, of which 30 miles of road will be new construction, will be needed to support both CO_2 and oil field development and production. In addition, 33 miles of new pipeline and 33 miles of powerline construction and up to eight support facilities, including compressor stations, will be needed.

Development of a productive CO_2 field will adversely affect additional areas of steep slopes and unstable shallow erosive soils. Increased loss of vegetation and accompanying increased loss of soils can be expected to occur. Onsite erosion of sensitive soils can exceed acceptable limits unless the impacts are mitigated by employing stabilization techniques, erosion control structures, and revegetation immediately following construction.

The acreage affected will be increased from 55 acres under Alternative I to an estimated 241 acres under Alternative II resulting in impacts to soils and vegetative resources. This acreage will be unavailable for timber production, livestock grazing, or wildlife forage during the life of the oil and/or CO_2 fields. Onsite soil erosion will increase from an expected displacement of 220 tons of soil under Alternative I to 964 tons under this alternative. The loss of soils from the construction areas will reduce future productivity of the sites after reclamation.

Additional areas containing slumping gypsum soils will be encountered in the central and northwest areas of the KGS. Construction activities on these areas will initiate increased instability and slumping especially if subsurface water is intercepted.

Increased incidence of soil contamination from fuel, chemical, or other spills of deleterious materials can be expected if CO_2 field development is undertaken.

The planned logging of 2,000 acres, in combination with the surface-disturbing activities of oil and gas development, will also result in increased erosion in the northern portion of the KGS. The soil loss resulting from these combined activities cannot be accurately evaluated until site-specific proposals have been made. Scheduled timber sales will be delayed if the loss of soil from the combined activities is determined to be unacceptable. Although an unavoidable impact, soil loss can be adequately controlled for both activities. Soil loss is not expected to be significant after mitigation.

Several of the leases contain no surface occupancy stipulations that are intended to protect sensitive soil areas from surface disturbance. This will reduce the overall impacts to soil resources by confining operations to more stable soil areas. As with oil field development, additional opportunities to mitigate impacts to the soil resources resulting from the development of the CO_2 will be available when proposed operations (surface use programs) are submitted for approval in accordance with 43 CFR 3160, Onshore Oil and Gas Order No. 1, and Section 6 of the lease terms. Depending on the site-specific conditions and consistent with construction and operational needs for CO_2 and oil extraction, wellsites, roads, compressor plants, pipelines, and oil storage facilities will be located on sites where they will be the least impacting to the soil and vegetative resources.

The site-specific mitigation that will be applied to oil field development described in Alternative I will also be applied to oil and CO_2 development under this alternative in order to reduce or avoid impacts to the soil and vegetative resources. Upon completion of construction activities most of the impacts can be adequately mitigated and loss of soil and site productivity minimized. Some soil loss, which is unavoidable, can be expected to occur and land areas needed for the continued operation of a CO_2 and/or oil field will not be available for other productive uses.

Impacts to the soils and vegetation as a result of CO_2 field development will be extended to Antone Bench and Exclusion Areas 2, 3, 4, and 5 if Alternative II is implemented. Soil depths range from slickrock to several feet thick on Antone Bench and the other Exclusion Areas. The soils do not exhibit a developed structure. The onsite erosion and soil loss added will be minimal due to the predominantly sandy soils, gentle slopes, and low runoff potential. The tree cover on Antone Bench and Areas 2, 3, 4, and 5 will protect most disturbed areas from wind erosion. Many of the additional acres that will be taken out of production under this Alternative are noncommercial timber land or commercial timber land with very low productivity. Although limited livestock grazing does occur on

Exclusion Areas 2 through 5, loss of livestock forage will be insignificant because of the limited productivity of these areas.

Impacts to the soil resources may result from spills of contaminating drilling fluids or fuel, waste products, and debris. The required use of self-contained mud systems for storage of drilling fluids, caging of solid wastes, and the safe storage and handling of chemicals, drilling additives, and fuels, and other operational controls will limit the occurrence of these types of impacts. The Utah Wilderness Act requires disposal of all waste, debris, or other by-products associated with road construction, other development activities, and carbon dioxide production occur outside Antone Bench. This will also reduce the possibility of soil contamination.

Impacts to the soil resources on Antone Bench will also be reduced by implementing Sections 306(a)(3) and (b) of the Utah Wilderness Act. Requiring the use of helicopters or other methods that do not involve road building for exploration and limiting CO_2 development road construction to minimum standards will reduce the amount of construction activity and soil disturbance. Obtaining fill material, gravel, and other material for road and facility construction outside Antone Bench will transfer the impacts to other areas but will minimize surface disturbance on Antone Bench.

Wildlife and Fisheries; Sensitive and Endangered Species

General Impacts

An additional 2,263 acres will be made available for CO_2 leasing and development under Alternative II. In addition to the development of an oil field considered under Alternative I, the impacts to wildlife resources will be extended to existing leases that may be developed for CO_2 production if Alternative II is implemented. The adverse impacts to wildlife will be the result of increased road densities and an accompanying increase in vehicular traffic and human activity and will be extended into Antone Bench and the other Exclusion Areas. This alternative will have more impacts on fish and wildlife than Alternative I, but fewer impacts than Alternatives III, IV, and V.

There are 83 miles of roads in the 49,281-acre area available for leasing within the KGS creating a road density of approximately 1 mile of road per square mile of habitat. Planned timber sales will add 35 miles of road to the area and it is estimated that 30 additional miles of road will need to be constructed in order to develop CO_2 and oil fields. If this occurs, average road densities will be increased to 1.9 miles of road per square mile of habitat. Research has shown that this level of road density is disturbing to big game species. Road densities of 2 miles per square mile of habitat have been shown to reduce habitat effectiveness to 85 percent for deer and below 50 percent for elk. Road densities of 3 miles per square mile of habitat further reduce habitat effectiveness to 69 percent for deer and to 35 percent for elk. It is estimated that habitat

effectiveness will be reduced by 90 percent for deer and 60 percent for elk if Alternative II is implemented. The existence of the roads does not, in and of itself, create an impact to wildlife. The adverse impact results from improved access and the accompanying increase of vehicular use and human activity. Not all of the activity will be directly associated with timber harvest or CO_2 and oil field activities. It is expected that significant increases in recreation and hunting use in areas previously unroaded will also occur. Intensive human activity, vehicular traffic, drilling rigs, and other heavy equipment needed to drill the wells and construct facilities will probably displace many of the more sensitive wildlife species in the area to adjacent, and in some cases, less desirable habitat during the development of the oil and gas and CO_2. The distance from the immediate area of impact that wildlife will be affected will depend on topographic and vegetative screening, visibility, noise levels, intensity of activity, and the tolerance of different wildlife species to these activities. Some wildlife species, including deer, will develop a tolerance to the lower levels of activity.

There will also be an increased likelihood of wildlife/vehicle collisions on the major access routes, illegal shooting and other harassment of wildlife. The improved quality of many of the roads in the area will permit access by vehicles not suitable for use on existing lower quality roads. Upgraded roads will also allow increased access during winter, when the area had previously not been accessible. This will extend the period of time when human activity will be disruptive to wildlife. Some wintering wildlife species will be affected. Reductions in big game populations and in the number of species in the affected habitat areas will result.

The activities associated with the production of CO_2 or oil within the KGS are significantly less than construction and development activities. There will, however, be a continued displacement of many wildlife species in the vicinity of roads and compressor plants where continuous vehicular traffic and human activity are concentrated. There will also be a continued reduction of forage available to wildlife, principally big game species, on an estimated 241 acres of land that will be needed to accommodate the production of CO_2 and/or oil. The loss of forage to big game species will not be significant. However, in addition to the 241 acres of habitat that will be directly impacted if Alternative II is implemented, indirect impacts will reduce habitat effectiveness for big game species on an estimated 10,805 acres. This will be equivalent to a reduction in the capabilities of the lands within the KGS to support 97 deer and 10 elk. Except for the critical elk calving grounds in the aspen belt below the Aquarius Plateau Rim, no essential or critical big game habitat areas have been identified within the KGS. It is unknown how many or what small nongame wildlife species may be displaced or otherwise affected by CO_2 or oil field development. Cougar and bear, which tend to avoid any human contact, can be expected to be displaced in the vicinity of any development activities.

Impacts to Wildlife in the Northern KGS Area

Significant impacts to wildlife, especially big game species, will occur if logging and CO_2 and oil field activities take place at the same time and in the same or adjoining areas. Overcrowding and overutilization of adjacent areas by displaced wildlife will result. Traffic on major and minor access roads will increase significantly as logging, drilling, and construction crews move in and out of the area. The intensity of these impacts can be reduced significantly by scheduling timber sales so they do not occur simultaneously with oil and gas field development, or delaying approval of oil and gas operations until logging has been completed. Assuring that logging and oil and gas activities are not conducted in the same or adjoining areas simultaneously will reduce the size of the area being affected at one time and provide more escape area for wildlife.

The long-term impacts resulting from an increase in road density and improved access will be reduced by closing and reclaiming logging and oil and gas roads no longer needed for Forest management. In addition, general access to selected roads will be prevented by installing gates and signs limiting access to that needed by authorized personnel to maintain the CO_2 and oil wells or other facilities.

Significant long-term adverse impacts to fisheries and waterfowl will occur if streams or lakes are entered by large amounts of sediments or oil or chemical spills. Sediments resulting from erosion of disturbed areas, such as road, drill pad, and other construction and introduced to streams will impair trout spawning habitat in the northern portion of the KGS. In addition to the risks posed by increased sedimentation, there will be an increased risk of chemical and oil spills which, if allowed to enter perennial streams, will kill fish and macroinvertibrates. Except for part of Pine Creek, other drainages located on or in the vicinity of the existing leases with the greatest potential for oil field development support only intermittent streams. There are no fisheries that will be directly impacted by oil field development on the existing leases. However, offsite risks to fisheries are posed from sediments or chemical and oil spills being transported offsite during runoff periods and entering surface waters such as Pine Creek. Installation of dikes or berms around tank batteries and areas where oil and chemicals are being processed, handled, and stored will greatly reduce the risk of spills leaving the site and entering surface waters. Locating wellsites, tank batteries, and other facilities away from drainage bottoms will also reduce the possibility of sediments or oil and chemical spills reaching surface waters.

Exploration and development within or near the riparian zones associated with lakes, streams, and wet meadows will be disturbing to terrestrial wildlife and bird species frequenting these areas. The existing roads to McGath, Purple, and the Row Lakes are primitive roads. These lakes cannot support the additional fishing pressure that improved access will put on

them, and the backcountry fishing experience now available will be diminished.

The most significant adverse impacts to fisheries will occur if the proposed logging and CO_2 and oil field development occur simultaneously within the same drainage system in the northern portion of the KGS. The combined area of surface disturbance subject to erosion will result in sedimentation loads that exceed acceptable limits for fish and the maintenance of fish spawning habitat. Limiting the amount of surface disturbance within a drainage system by delaying timber sales or approval of oil and gas operations will reduce the risk of adverse impacts to fisheries.

The impacts resulting from an increase in sedimentation cannot be totally avoided. However, by adopting the mitigating measures described under the Soil and Water Resources Sections of this chapter, significant long-term impacts to the fisheries will be avoided.

Impacts to Wildlife in the Southern KGS Area

Road development has been very limited south and east of the Hells Backbone Loop Road, and essentially no roads exist in the south half of the KGS. Considered under Alternatives I and II is the possibility that a road will be built through Exclusion Area 2 and down the length of Antone Bench in order to develop existing leases at the southern end of the KGS. This is the most logical and feasible access route to these leases (see map on page II-17).

Exclusion Area 2 and Antone Bench form a long narrow peninsula bound by very steep rocky slopes and vertical escarpments creating a topographically confined and isolated area. If a road is extended down through Exclusion Area 2 and Antone Bench, an average road density of 4.2 miles of road per square mile of habitat will be created in this area. Impacts to wildlife will occur during the construction of the road and development of the leases south of the Bench. The CO_2 field development will involve continuous and relatively intensive vehicular traffic; heavy trucks moving drilling rigs, construction equipment, and supplies, and a continuous human presence along the road. On Antone Bench and to the south there is limited area available to buffer the impacts to wildlife from these activities. Big game species do not appear to make significant use of Antone Bench south of the "Gap". The impacts will primarily be to small nongame wildlife species in this area. The number and species of small nongame wildlife that may be displaced or otherwise affected are unknown at this time. The requirements of Section 306 of the Utah Wilderness Act to minimize noise and visual intrusions in the Wilderness will also minimize adverse impacts to wildlife. Section 306(b)(5), which requires that roads on Antone Bench be used only in conjunction with carbon dioxide development operations and be closed to all other vehicle use, but open for foot or horse travel, will also reduce the adverse impacts to wildlife.

Conditions similar to those found on Antone Bench will be encountered in extending the road southward to the existing leases, and the same or similar impacts are expected to occur along the access road. The construction of facilities such as drill pads, pipelines, powerlines, and compressor station, and the drilling of exploratory and development wells on these leases will be expected to significantly increase loss of habitat for small nongame wildlife species. It is unknown how many or what small nongame species will be affected. Some portions of Antone Bench and Exclusion Areas 2 through 5 provide little buffer or escape area during these activities. Continuous traffic during construction and development will probably eliminate many wildlife activities within the confines of the Exclusion Areas. Screening provided by the tree cover will reduce the adverse impacts to some less sensitive species on Antone Bench. Section 306(b)(4) of the Utah Wilderness Act limits road and facility construction to seasons or periods when there will be minimal impact to wildlife. The impacts to wildlife from construction and associated development activities will be relatively short-term, and, once construction and development are completed, human activity will be reduced significantly.

No essential or critical big game habitat areas have been identified on Antone Bench or the other Exclusion Areas. No significant adverse impacts to big game species are expected to be added by this alternative in these areas. There are no fisheries in these areas.

The impacts to wildlife resulting from the development and production of CO_2 on existing leases within the Box-Death Hollow Wilderness and Phipps-Death Hollow ISA will be essentially the same as those from the oil development described under Alternative I. Not all of the leased lands can be accessed by roads because of physical barriers and it is not expected that all of the leased lands will be developed for oil or CO_2. There will be a corresponding decrease in the amount of wildlife habitat affected. The tree cover that exists on Antone Bench and areas southward will provide screening from noise and visual intrusions and reduce the adverse impacts on some wildlife species. Although Section 306 of the Utah Wilderness Act of 1984 does not apply to existing leases issued prior to the Act, many of the same mitigating measures will be applied to operating plans to minimize impacts to wildlife habitat in these and other areas.

Potential Impacts to Endangered and Sensitive Species

Drilling or construction activity and traffic near the cliffs in the southern half of the KGS will be disturbing to nesting bird species such as the endangered peregrine falcon that may be using the cliffs. The presence of these species has not been confirmed in the KGS, but because of certain habitat features, their presence is suspected. It is not clear how much disturbance at what distance nesting peregrines will tolerate. At least some members of the species are quite tolerant of activity, judging from reports of nest locations in metropolitan areas. It is not likely that the peregrine's hunting habitat will be affected to any extent by CO_2 or oil

activities. However, aboveground powerlines will present a hazard to low-flying birds.

Because of the logistic problems of conducting exploration and development during the winter months, it is unlikely that these activities will occur when bald eagles are in the area. Production will occur throughout the year, but production activity will not be disturbing to eagles. Aboveground powerlines present a hazard to low-flying eagles as well as other large birds, and, if not constructed properly, will also present an electrocution hazard to roosting birds.

The Mexican Spotted Owl, a sensitive species, is not protected under the Endangered Species Act (Appendix I). Its nesting sites and other critical habitat areas will be avoided when possible and when alternative locations are available for the proposed activities. A stipulation to protect the Mexican Spotted Owl will be included in leases that are located on or adjacent to areas that may contain suitable habitat (Appendix B).

Of the sensitive plant species known to occur in the area, the two most likely to be impacted are Neese's peppergrass and Jones Golden Aster. Neese's peppergrass is endemic to the Hells Backbone area just east of the Hells Backbone Bridge. A major population of Jones Golden Aster occurs along the road on both sides of the Bridge. Loss of habitat from surface-disturbing activities such as grading or widening the existing road will significantly impact the viability of these species.

As discussed under Alternative I, operations that jeopardize the continued existence of any species or their habitats listed as threatened or endangered under the Endangered Species Act of 1972 will not be approved on leases issued after the date of the Act. If any of these species or their habitats are suspected to be present and/or affected by the proposed operations, the lessee/operator, as a condition of proposal approval, is required to inventory the affected area to determine if the species are present. If these species are found to be present and can be affected, the U.S. Fish and Wildlife Service will be consulted in accordance with Section 7 of the Endangered Species Act. The lessee/operator is required to avoid activities or seasonal use of areas in close proximity to nesting sites or other essential habitat areas. Other mitigation might include the removal of eggs from nests and the artificial incubation and raising of young birds. A Section 7 biological opinion issued by the Fish and Wildlife Service concurred that a "no effect" situation exists for the bald eagle and peregrine falcon in the KGS, because no use within the area by either species has been confirmed. A stipulation requiring protection of threatened and endangered species will be included in any lease issued on or adjacent to areas that may be suitable peregrine falcon or bald eagle habitat (Appendix B).

The Mexican Spotted Owl, a sensitive bird species, is suspected to occur in the area. The owl, a cliff nester which prefers the narrow, secluded,

steep-walled canyons, is susceptible to disturbance from human activity. Activity associated with exploration and development will cause this owl to abandon the immediate area. This disturbance will also affect the nesting success of other bird species.

In order to protect larger birds of prey, aboveground powerlines will need to be designed and constructed in accordance with the publication entitled: Suggested Practices for Raptor Protection on Powerlines, the State of the Art, 1981 (Raptor Research Report No. 4, Raptor Research Foundation Department of Veterinary Biology, University of Minnesota.)

Visual and Recreation

General Impacts

The development of a commercial CO_2 field will result in the same or similar impacts to the visual and recreation resources as will result from oil field development described under Alternative I. Under Alternative II, an additional 2,263 acres located on Antone Bench and Exclusion Areas 2, 3, 4, and 5 will be leased for CO_2. It is assumed that leasing these additional lands will permit development of a commercial CO_2 field. It is also assumed that existing oil and gas leases will be developed for CO_2 production. In addition to the development of an oil field assumed under Alternative I, the drilling of an estimated additional 29 CO_2 wells, construction of 30 miles of new road, 59 miles of pipelines and powerlines, plus oil storage tanks, and compressor station, will change the character of the recreation experience available within the KGS. If this alternative is implemented, there will be a decrease of 885 acres of primitive and 2,373 acres of semiprimitive recreation opportunities within the KGS. Roaded natural recreation opportunity will increase by 3,258 acres.

Implementation of Alternative II will result in increased conflicts with recreation use due to the increased presence of drilling rigs, heavy construction equipment, pipeline construction, and trucks hauling supplies, equipment, and crews. The additional alterations to the natural landscape created under this alternative will be objectionable to some Forest users. As with development of the oil field considered under Alternative I, the most visible and audible activities will occur during construction and drilling associated with the development of a CO_2 field. Drilling rigs and heavy construction equipment, pipeline trenching, and trucks hauling equipment, supplies, and crews will be highly visible. Except for the increased traffic along the major access roads, these activities will be concentrated on the leases. Drilling rig masts will be visible from some locations along the main roads in the KGS. However, these will be present only during the exploration and development phases and are not expected to dominate most landscape settings. Visual impacts associated with the construction and drilling of CO_2 wells will be relatively short-term, but difficult to mitigate, and for the most part unavoidable.

Large compressor plants may be several stories tall and, together with the accompanying major pipeline installations, will dominate the most visible part of the landscape if located in the foreground or middleground of the main access roads. It will be difficult to totally avoid the visibility of large installations from the roads. However, a number of alternative sites are available where topography and vegetative screening will minimize the visual impacts of such structures. As with oil field equipment and facilities, CO_2 compressor stations, wellhead equipment, etc., will be painted to blend with the natural background colors of the area in order to minimize visual impacts.

If Alternative II is implemented there will be an increase in pipelines and powerlines and the creation of unnatural linear-type openings in tree covered slopes. These linear-type installations will be visible from a considerable distance. Burying CO_2 pipelines and powerlines in roadbeds will reduce surface disturbance and visual intrusions and partially mitigate these impacts. Deep vertical cuts and long steep fill slopes may need to be constructed to accommodate some roadbeds and well pads. Construction activities conducted in rocky soil and solid slickrock will result in visually contrasting "fresh rock" being exposed. Trees will be removed from many construction areas creating unnatural openings in the tree canopy. Again, as with oil field development described in Alternative I, these types of developments will probably not meet the visual quality objectives adopted in the Forest Plan. These impacts to the visual resources cannot be entirely avoided or mitigated. In most cases, the impacts can be mitigated by avoiding steep slopes and selecting locations that are screened from view by topography or vegetation.

The recreation experience being sought in the National Forest will not be available in the immediate areas of development. Most casual recreation users will be discouraged from attempting to enter areas that are undergoing development and recreation use will be diverted to other areas. These impacts are not expected to extend over a long period of time. However, long-term recreation opportunities in the areas will be changed from a primitive or semiprimitive to a roaded natural type of recreation. The main access roads may need to be upgraded to improve safety and accommodate the heavier use and change in type of traffic. Speed limits and the use of flag cars will be necessary when large loads are being moved in and out of the area. These mitigating measures will reduce conflicts with recreation users entering and using the area.

The long-term presence of producing CO_2 or oil fields will be evident. Activity associated with the production of CO_2 and oil is of lower intensity than the activity associated with construction and development of a CO_2 field. Production activity, which is concentrated at the compressor plants, consists primarily of daily checks of each producing CO_2 well and repair and maintenance of wells and other equipment. No significant impacts to the recreation use or visual resources will be added during production.

Final abandonment and reclamation of a CO_2 field will be essentially the same as are undertaken in an oil field and will consist of the removal of structures, salvaging of materials from wellsites, compressor plants, tank batteries, and similar areas. CO_2 wells will be plugged and abandoned. Wellsites, roads, and other unnatural features created during construction will be backfilled and graded to conform to the existing topography. Roads that have residual value for future use will be retained. Following final grading and shaping of the landscape, all disturbed areas will be topsoiled and revegetated. There will be an increase in noise and visibility of activities during abandonment of the CO_2 field. Abandonment and reclamation may extend over several years, but are not expected to cause significant impacts to the visual resources or recreation use. Upon completion of the reclamation, visual intrusions will be significantly reduced, although some evidence of the activities associated with CO_2 production will always be present. This evidence will become less apparent over time as native vegetation becomes reestablished.

Impacts in the Northern KGS Area

Leases located in the northern part of the KGS are accessed by the Spectacle Lake Road. This part of the KGS is relatively flat and is easily accessible by vehicles. Most oil and gas activities in the northern portion of the KGS are not expected to significantly affect the visual resources because the topography and vegetation can accommodate significant development. Oil and CO_2 development will not dominate the natural landscape.

If a powerline is needed to supply electricity to the KGS, it will probably cross the northern end of the KGS. An aboveground powerline will require a cleared right-of-way. This will be visually evident in the foreground and middleground where it crosses the Spectacle Lake Road. The large open meadows and rocky soils in the northern portion of the KGS make it difficult to bury pipelines and powerlines without creating visual impacts. The visual impacts produced by turned up rock and crossing open meadows will be difficult to fully mitigate, and some evidence of surface disturbance will be visible for a long time after reclamation.

Two timber sales are scheduled in 1990 and 1991 in the northern portion of the KGS. If logging and CO_2 or oil field exploration and development take place at the same time, there will be an increase in conflicts with recreation use. The visual and auditory impacts resulting from simultaneous logging and oil and gas development activities will be objectionable to those seeking recreation opportunities in the area. The noise from chain saws, drilling rigs, heavy trucks, and construction equipment will cause most recreation users to avoid the area during this time. Also, traffic on the Spectacle Lake Road (No. 162) will increase significantly due to logging and oil field trucks and other vehicles hauling crews, logs, drilling rigs, construction equipment, and supplies in and out of the area. Accidents and conflicts can occur between the slower

moving sightseeing recreationists and large logging/field trucks on the narrow Forest roads. Recreation use will decline as people avoid roads with heavy hazardous traffic. However, the combined logging and field development activities will be of short duration, and later, the traffic associated with the production and maintenance of an oil or gas field will not conflict significantly with recreation use. Conflicts with the recreation use can be minimized by rescheduling timber sales if oil and gas field development is in progress, or by delaying oil and gas activities until logging has been completed. Upgrading the Spectacle Lake Road and installing traffic warning and speed control signs will reduce hazardous conditions.

The construction of new roads and upgrading of existing roads for both logging and oil and gas activities will occur, and joint use of common access roads will be required. There will be an increase in some recreation opportunities as a result of the improved access. The northern portion of the KGS, being relatively flat, is easily accessible to off-road vehicles. Many of the present travel routes in this area were created by vehicles cutting across meadows or flats to reach desired destinations. The tracks became roads as other vehicles followed. More areas will be susceptible to this type of roading as improved roaded access is created by CO_2 or oil field development. Closure of roads no longer needed for either logging or oil and gas activities will reduce these types of impacts.

Impacts to the Central KGS Area

The Hells Backbone Loop Road provides the main access route into the central part of the KGS from Escalante. There will be a significant increase in traffic on the road during development of an oil or CO_2 field. The traffic will be relatively heavy and continuous. Logging activities occurring at the same time will add to the traffic. The expected construction of a CO_2 transportation pipeline between the KGS and the town of Escalante along the Hells Backbone Loop Road will add significantly to the traffic for a short period of time. The traffic and construction activity will conflict with the recreation use in the area. Heavy trucks moving construction equipment, drilling rigs, and other large loads in and out of the KGS will represent a hazard to the casual recreation user on this road. Some recreation users will avoid the area during this time.

The central portion of the KGS includes the crest of the Escalante Anticline and the area with the greatest potential for development of CO_2. Many existing leases although not located adjacent to the road, are within the foreground and middleground view areas. Many of the impacts associated with exploration and oil and CO_2 field development previously described will be greatest along Hells Backbone Loop Road. The areas adjacent to and north of the road have been logged (see map on page II-15). The visual evidence of past logging activities consists of logging

roads and stumps left from selectively cut trees. Tree canopy that has been retained will screen from view most oil and CO_2 field activities except those in close proximity to the road.

The Hells Backbone Loop Road is also the most logical central collection point for pipelines transporting CO_2 to the compressor stations and from the KGS. Pipelines from Antone Bench and the Exclusion Areas will also likely come together along Hells Backbone Loop Road. Pipeline construction will disrupt recreation traffic and may temporarily prevent access to some parts of the Forest during these activities. The gas will be compressed at these stations and placed into a large pipeline for transportation to market. Burying large pipelines in the roadbed will cause significant disturbance to roads and interfere with access to the KGS during construction. Pipeline trenches in roads will have to be blasted through solid rock where there is little or no soil. Large broken rock brought up during excavation will have an impact on the visual quality of the landscape if the material is left along the Hells Backbone Loop Road. This impact will be reduced by either removing excavated rock from along the road and disposing of it at a nonobtrusive location, or by crushing and using it in the roadbed.

Compressor stations, normally large and prominent structures, will probably be located in the vicinity of the Hells Backbone Loop Road. The large size of the buildings housing the compressors and the associated maintenance yards and other facilities make it difficult to completely hide these structures. If compressor stations are several stories tall they will dominate the landscape. It will be required that these structures be painted a color that blends with natural background colors, and be located in areas that provide topographic and vegetative screening if relocation is consistent with the extraction and processing of the CO_2.

Impacts in the Southern KGS Area

Area 2 and Antone Bench are not frequently used by visitors, but, many spectacular scenes of the Box-Death Hollow Wilderness can be viewed from this area.

It is estimated that up to 13 additional wells will be drilled and approximately 17 additional miles of roads, pipelines, and powerlines will need to be located on Antone Bench and the other Exclusion Areas. Wells capable of producing CO_2 already exist within Exclusion Area 2, and it is highly probable that additional development on the existing leases will be undertaken. It is assumed under Alternative I that a road will need to be constructed the length of Exclusion Area 2 and Antone Bench to produce any oil resources that may be present on existing leases located to the south of the Bench. Implementation of Alternative II will increase the likelihood that this road will be built in order to explore, develop, and produce existing oil and gas leases as well as any CO_2 leases that may be

issued under this alternative. Construction of this road will alter the recreation experience from primitive or semiprimitive to roaded natural.

In accordance with the Utah Wilderness Act, exploration for CO_2 on Antone Bench will be permitted only by helicopter or other methods that do not involve construction or other significant surface disturbance. A road will be built on the Bench only in the event that a lease issued under this alternative is proposed for development (assuming the road is not built to access existing leases as discussed previously). In accordance with the Act, vehicular access to Antone Bench will be limited to that needed for the production of CO_2, and only foot or horseback travel will be permitted for other uses. Section 306(b)(3) of the Utah Wilderness Act also requires that "fill material, gravel and other material used for road and facility construction shall be obtained from outside the Wilderness Area". Since topography will prohibit such activities within the Wilderness, it is assumed that the intent of this provision is that such material will be obtained from outside Antone Bench. This will reduce the amount of surface disturbance associated with construction activities and consequently minimize impacts to the visual resources. This is consistent with the intent of the Wilderness Act.

Drilling and construction activities associated with CO_2 development on Antone Bench will create the greatest impacts to the visual and recreation resources. The construction of drill pads, spur roads to wellsites, pipelines, buildings, compressor stations, and other facilities needed to produce the CO_2 will require the presence of a large work force and use of heavy equipment. Installation of pipelines will involve clearing of right-of-ways in order to provide access for construction and maintenance. The top of Antone Ridge is not highly visible from Hells Backbone Loop Road, and low-profile developments such as roads and pipelines will be screened from view by the existing tree canopy. High-profile installations, such as compressor stations and aboveground powerlines, will be visible from some locations along the Hells Backbone Loop Road.

Except for the "Gap" which is located on Antone Bench, Exclusion Area 2 and Antone Bench are characterized by level to gently sloping terrain. Deep vertical cut slopes and long steep fill slopes can be avoided on gentle slopes. This will reduce the amount of earth moving needed to construct well pads, roads, compressor plants, etc., minimizing disruption to the natural landscape. Excavation of mud pits in the sandy soils and rocky terrain will be avoided by using self-contained mud systems for well drilling. This will reduce the area of surface disturbance, and enhance the reclaimability of the wellsites. Once the wells have been drilled, and associated production facilities installed, wellsites will be relatively unobtrusive. Screening provided by trees and the sharp angle of view between the deep canyons and escarpments of Antone Bench and the other Exclusion Areas will minimize their visibility. Noise will be relatively nonexistent at the wellsites once drilling is completed.

A compressor plant will be the most visible permanent facility that may be located on Antone Bench or the other Exclusion Areas. Location of a compressor station will be permitted on Antone Bench only if it is economically or technically unfeasible to locate the facility to the north of the Bench (see Special Stipulations to be Applied to CO_2 Leases Issued on Antone Bench, Appendix B).

It will be difficult to screen a large compressor plant from the Hells Backbone Loop Road if it is located north of Antone Bench. Facilities visible near the Hells Backbone Loop Road will not be in visual harmony with the area and Wilderness when viewed from outside or inside the Wilderness. Although Exclusion Areas 3, 4, and 5 do not extend as far into the Wilderness as Area 2 and Antone Bench, there is the potential for the same or similar impacts to occur. Areas 3 and 5 are also located in the middleground visible from the Hells Backbone Loop Road, and, if wells and compressor plants are visible, they will again be in visual disharmony with the panoramic view of Death Hollow. Priority for screening will be given to views from within the Wilderness. All facilities, including compressor plants, will be painted a color that blends with the natural dominant background color. This will reduce the noticeability of such a structure when viewed from a distance.

Although Section 306(b) applies only to Antone Bench, much of the same mitigation can also be applied to the other Exclusion Areas as part of the normal mitigation of impacts during the review and approval of plans of operation. If a compressor station is proposed to be located on Antone Bench, the lessee will be required to supply information and an analysis to show why alternative locations north of the Bench are not economically and/or technically feasible. Section 306(b)(6) requires that all roads or other facilities shall, when no longer needed for carbon dioxide production, be removed and reclaimed to a condition of being substantially unnoticeable. Reclamation activities will include the removal of facilities and any unnatural features such as construction materials and excavated rock, the grading of disturbed areas to conform to the existing topography, and the planting, transplanting, or revegetating with native species. Similar reclamation will be applied to the other Exclusion Areas (see Special Stipulations to be Applied to CO_2 Leases Issued on Antone Bench, Appendix B).

In summary, impacts to the visual and recreation resources on Antone Bench and other Exclusion Areas will be significant during construction and development activities, but these impacts will be substantially reduced by the implementation of mitigation.

Wilderness

Antone Bench and Exclusion Areas 2 through 5 share a significant portion of the boundaries of the Box-Death Hollow Wilderness. Many of the impacts to the Wilderness will result from the exploration, development, and

production of CO_2 from these areas as well as from the existing leases within the Wilderness and Instant Study Area. As discussed under Alternative I, an access road, pipelines, and powerlines will need to be located on Antone Bench and in Exclusion Area No. 2 to provide access to the existing oil and gas leases in the Wilderness and the Instant Study Area. If the existing leases and the leases offered under Alternative II are explored and developed for CO_2 and possibly oil, there will be a need to transport construction equipment, drilling rigs, supplies, and crews to and from the leases. The drilling of wells, and construction of an access road, pipelines, and powerlines on Antone Bench and Exclusion Area 2, will require a large concentration of human activity, vehicular traffic and heavy equipment. Some of these activities will be visible within the Wilderness and ISA, and will detract from the sense of solitude now experienced.

Drill sites are expected to be located close to the edge of escarpments of Antone Bench and the other Exclusion Areas to provide the greatest opportunity for drainage of the CO_2 from under the Wilderness. Drill masts will be visible from within the Wilderness at these locations. Audio and visual intrusions on the surrounding Wilderness will be the greatest during drilling operations. Drilling will be a relatively short-term activity and, once completed, the subsequent activities will be reduced significantly. Implementation of the mitigating measures required under Section 306(b) of the Utah Wilderness Act will also reduce the impacts on the Wilderness (see Special Stipulations to be Applied to CO_2 Leases Issued on Antone Bench, Appendix B).

Noise resulting from construction and the transportation of drilling rigs, equipment, and supplies will be audible within the Wilderness. Auditory impacts to the Wilderness are also expected to occur from the noise and vibration emitted by the large engines needed to drive compressor plants. Noise levels will be reduced if electric motors are used. However, the feasibility of using electricity has to be established; overhead powerlines will be needed to supply the large amount of electricity required. These lines will be visible from various locations within the Wilderness.

Noise will be partially reduced by vegetation and by virtue of Antone Bench's and the other Exclusion Areas' elevated position above the Wilderness. Requiring that all motorized vehicles and equipment be equipped with mufflers and containing compressor stations within buildings will reduce noise significantly. However, it is not expected to be possible to prevent all noise from intruding into the Wilderness.

Compressor plants will be the most visible permanent structures that may be located on Antone Bench and the other Exclusion Areas. A number of sites that provide topographic screening from the more heavily used areas within the Wilderness are available on Antone Bench on which to locate a compressor station. The sharp angle of view from the canyon bottoms, created by the high escarpments, and vegetative screening will be used to

reduce the visual impacts of a large structure from within the Wilderness. It is expected that only the uppermost portion of the structure will be visible. It is also possible that smaller, less visible, compressor plants are technically suitable for use in the Escalante KGS.

After completion of drilling and construction activities, the activity associated with the production of CO_2 is expected to be relatively unobtrusive outside Antone Bench and the other Exclusion Areas. The periodic maintenance or updating of facilities will result in short-term increases in activity at individual wellsites, and along the pipelines and other facilities during the production of CO_2.

Activity will again increase within Antone Bench and the Exclusion Areas during final abandonment and reclamation of the disturbed areas. Increased noise and visibility of activities will occur during the plugging of wells, dismantling of facilities, and hauling of materials from the sites. The reclamation and abandonment activities associated with workover rigs used to plug and abandon wells, and heavy construction equipment used to remove structures and reclaim disturbed areas, will be seen and/or heard from within the Wilderness. The impacts associated with these activities are unavoidable but are relatively short-term.

Although Section 306(b) of the Utah Wilderness Act applies only to Antone Bench, many of the same mitigating measures will be applied to developments within the other Exclusion Areas. These include using topographic and vegetative screening, camouflaging facilities, and minimizing surface disturbance.

As indicated in the House of Representatives Report (No. 98-109) regarding the Utah Wilderness Act, the Forest Service has been given the responsibility to insure that facilities are designed and located to minimize visual and audio intrusions in the Wilderness. Additional environmental analysis will be conducted on any proposed site-specific operation prior to its approval. In order to meet the requirements of Section 306(b), and to otherwise minimize intrusions into the Wilderness, the lessees will be required to provide studies and analysis to identify locations on Antone Bench where visual and audio intrusions will be minimized within the Wilderness (see Special Stipulations to be Applied to CO_2 Leases Issued on Antone Bench, Appendix B).

The direct impacts from CO_2 field development on existing leases located in the Wilderness and ISA will be in addition to the impacts from possible oil field development analyzed in Alternative I of this Chapter. There will be an increased probability that the existing leases will be developed for CO_2 production if Alternative II is implemented. It is estimated that up to seven CO_2 wells may be drilled and up to 7.5 miles of roads and accompanying pipelines constructed to service and produce these wells. Except for the leases that will be offered on Antone Bench if Alternative II is implemented, the existing leases in the Wilderness and ISA are

isolated both by distance and topography from the other areas of potential CO_2 development. Because of this isolation, it is considered very probable that a CO_2 compressor plant will need to be located in the vicinity of these leases. The impacts to the visual and auditory experiences within both the Box-Death Hollow Wilderness and Phipps-Death Hollow ISA will be similar to those described for Antone Bench and Exclusion Areas 2 through 5 except that these impacts will occur within the Wilderness and will be in closer proximity and more apparent to the Wilderness visitor. Most of the activities associated with the development of CO_2 are expected to be located on the ridges and benches above the heavily used canyons within the Wilderness and ISA. Exploration and development probably will not take place on those portions of the existing leases that are topographically inaccessible. Any activity and facilities associated with the exploration, development, and production of CO_2 will be evident within the Wilderness and ISA. Although the mitigating measures described earlier will be applied to minimize the visual impacts, the direct impacts to the Wilderness values will be unavoidable. Recreation experience will be altered from a primitive unconfined type of recreation to a semiprimitive nonmotorized experience within the leaseholds. Evidence of man's activities will be present and the primeval, untrammeled character of the area will be lost. The level of activity associated with the production and maintenance of a CO_2 field will be significantly lower than the short-term construction and development activities. However, there will always be evidence of CO_2 field development within the Wilderness and ISA. Implementation of this alternative will result in more impacts to the Wilderness values than Alternatives I and IV, and the same impacts as Alternatives III and V.

As with the oil field development described in Alternative I, activity on or in the vicinity of the "Old Boulder Mail Trail" will be avoided if possible.

Water

General Impacts

The impacts described under Alternative I for oil field development are also assumed to occur under Alternative II. Larger quantities of water will be required during the early development stages of a CO_2 field under Alternative II. Although the extent of the increased demand that will be created for water is unknown, the cumulative water withdrawals for development of the oil field described in Alternative I and the estimated level of CO_2 development assumed under Alternative II are not expected to significantly affect water availability for other uses. Surface water withdrawals under Alternative II will be controlled so as not to impact National Forest water rights and other uses. Demand for culinary water obtained from the Escalante municipal systems is expected to increase under the Alternative II level of development. There will be a need to develop additional culinary water from the Escalante municipal watershed in the

vicinity of Posy Lake to supply the increased domestic needs in the town of Escalante.

No perennial streams or other surface waters are present on the lands proposed to be offered for lease under Alternative II. There are an estimated 6.4 miles of perennial streams located on existing leases that will be subject to impacts if Alternative II is implemented. Increases in stream sedimentation resulting from construction on 241 acres will likely be the primary impact to downstream water quality. In the northern portion of the KGS erosion rates will increase due to the soil disturbance resulting from the construction of roads, pipelines, powerlines, drill pads, and compressor stations. Most of the new roads in the KGS will be built for timber harvest, however, road extensions and side roads will need to be added to accommodate CO_2 drilling and field development. Buffer areas between roads and streams and prompt reclamation of road cuts and fills and other disturbed areas will be required to reduce potential sedimentation of streams. The initial increase in local soil erosion and sedimentation prior to reclamation and stabilization locally can be quite high. Assuming that 30 percent of the estimated 964 tons of soil that will be displaced will enter perennial streams during the first year following construction, an estimated 289 tons of sediment will be added to the already high silt loads. Although it is unknown how many tons of naturally occurring sediment enter and are transported by Sand Creek and Pine Creek annually, it is considered to be very high. Increased sedimentation resulting from surface disturbance will be insignificant when compared to the natural sediment loads these streams normally carry during the peak runoff.

Impacts to Water in the Northern KGS Area

Pine Creek and Sand Creek are the major drainages that may be affected by CO_2 and oil exploration and development. CO_2 field development activities in the narrow bottom of the Sand Creek drainage can result in significant impacts to the stream's riparian zone. Sufficient room is not available in the drainage bottom to support roads and wellsites without some encroachment into riparian areas. Occupancy of the riparian areas will be avoided to the extent possible if suitable alternative locations are available and activities are not prohibited by authority of Executive Order No. 11990, entitled: "Protection of Wetlands".

Special stipulations in existing leases generally provide for protection of some riparian areas in the KGS. Although wellsites and other facilities cannot be located in the immediate vicinity of streams there will be some loss of riparian habitat at road and pipeline stream crossings. At least two new stream crossings will need to be constructed in the northern portion of the KGS to access existing leases. These crossings will also be needed to access timber lands for logging. Pipelines will be required to cross streams along the road alignment to reduce the impact to the riparian areas. Surface disturbance in riparian areas will be confined to that

needed for the construction of stream crossings. Erosion control structures, riprap, and reclamation of areas disturbed during construction will be incorporated into operating plans to minimize the impacts.

Although the sedimentation rate associated with construction activities may temporarily impact some local stream reaches especially in the northern portion of the KGS, the cumulative impact of sedimentation on stream channels is expected to be minor and not result in a permanent degradation of water quality. The long-term effects on stream sediment loads in Pine Creek, Sand Creek, and the other streams that may be affected are expected to be low. Sedimentation rates are expected to decline over time to near preconstruction levels. The special protective measures employed to limit the amount of sediment reaching the channels are found in Appendix C.

Impacts to Water in the Southern KGS Area

There are no streams or lakes within Antone Bench or the other Exclusion Areas. Antone Bench and the Exclusion Areas are characterized by gentle slopes with sandy soils and bare rock areas. Surface runoff and erosion potential are very low. Roads, pipelines, wellsites, and other developments will be located at the top of the benches and ridges and at approved distances from lakes and streams outside of the Exclusion Areas. One exception will be a road crossing of Lake Creek that will be needed to provide access to Exclusion Area 5. Some sedimentation will enter Lake Creek during construction of the crossing. The mitigating measures and requirements outlined in Alternative I, in addition to those required by Section 306 of the Utah Wilderness Act, will minimize effects on surface water quality. No significant impacts on surface water quality or quantity are expected to occur on Antone Bench, the other Exclusion Areas, or inside the Wilderness if Alternative II is implemented.

Antone Bench, the other Exclusion Areas, Box-Death Hollow Wilderness, and Phipps Death Hollow Instant Study Area, are predominantly surfaced by the Navajo Sandstone formation, with areas of Carmel formation composed of sandstone, gypsum, limestone, and shales. As previously discussed under Alternative I in this Chapter, the Navajo Sandstone is extensively exposed on Antone Bench and in the surrounding Wilderness. It is a major acquifer in this area and forms a highly permeable groundwater recharge area. Springs which emanate from the Navajo Sandstone are present in the canyon bottoms of the Box-Death Hollow Wilderness. At least one of the springs has been reported to be pressurized.

Thirteen CO_2 wells on Antone Bench and the other Exclusion Areas and up to an estimated seven wells on existing leases within the Wilderness and ISA are expected to be drilled if this alternative is implemented. These wells will form potential connections between penetrated formations. Unless protection is provided during the drilling, production, and abandonment of the CO_2 wells, the wells will permit the migration of water, hydrocarbons, or other substances from one strata to another. The

groundwater quality in the Navajo formation and the subsurface water quality in the Box-Death Hollow Wilderness will be adversely affected if this occurs. As with the drilling of oil wells, both Federal and State regulations require protection of fresh water aquifers in drilled wells. Drilling muds are normally used during drilling to seal off the wellbore to prevent water from entering the well and to prevent loss of drilling fluids. Although some drilling mud will invade the formation, it will protect the integrity of the wellbore and prevent interchange of fluids between strata during drilling. The lessee/operator will be required to install and cement in place sufficient surface casing to reach a depth below all known fresh water levels to prevent the interchange of fluids from various strata within the wellbore and to prevent blowout or uncontrolled flows. This casing will be left in place in the producing CO_2 well. Upon abandonment of the well, the lessee/operator will be required to install cement plugs in the well across the fresh water zones. The proposed mud, casing, and well abandonment programs are all subject to approval by State and Federal governments. The available mitigation will be sufficient to protect the fresh water aquifers and significant impacts to groundwater are not expected to occur (see Special Stipulations to be Applied to CO_2 Leases Issued on Antone Bench, Appendix B).

CO_2 wells drilled on existing leases in the Wilderness and ISA will be located closest to the springs found in the Box-Death Hollow Wilderness. These wells represent a greater risk of affecting the flow in these springs. However, it is anticipated that these wells will be located to the west in the upland areas and some distance from the springs in the canyon bottoms. As with the drilling of oil wells in the same area, the required mitigation should be sufficient to protect the fresh water aquifers and significant impact to the groundwater and springs is not expected to occur from the drilling of CO_2 wells if the protective measures are properly applied.

The production of CO_2 from protected wells is not expected to alter or adversely affect spring flows within the Wilderness. The springs and CO_2 occur in different and widely separated formations. There is no evidence that an interconnection between formations exists causing CO_2 to pressurize the springs in the Wilderness. These artesian pressures are most likely created by the sloping beds of the Anticline. In any event, the lessee/operator will be required to inventory and collect baseline data as to the type, source, quantity and quality of the waters on the existing water sources in the Box-Death Hollow Wilderness. The lessee/operator will also be required to establish a monitoring system to assure compliance with Section 306(b)(8) of the Utah Wilderness Act which prohibits activities which significantly impair water quality or quantity in the Wilderness (see Special Lease Stipulations to be Applied to CO_2 Leases Issued on Antone Bench, Appendix B).

Uncontained contaminants spilled on the ground can easily enter the groundwater system because of the highly porous nature of the Navajo

sandstone. Mud or reserve pits used during drilling, water produced with the CO_2, sanitary facilities, and fuel or other miscellaneous chemical spills, are all potential sources of groundwater contamination. The lessee/operator will be required to use self-contained mud systems during the drilling of wells in this area. Immediate cleanup of spills, removal of contaminated soil materials from the area, injection of produced waters, or disposing of these waters outside of the recharge area will minimize the possibility that adverse impacts to groundwater will occur. Section 306(b)(7) of the Utah Wilderness Act requires that all waste, debris, or other by-products associated with carbon dioxide production or other development activities be disposed of outside Antone Bench and the Box-Death Hollow Wilderness. Drilling muds will be removed from the area and disposed of at a location and in a manner acceptable to State and Federal governments. Activities that can potentially degrade the groundwater resources are subject to the approval of both the state and Federal governments. Additional mitigation will be required as a condition of approval to operating plans based on analysis of site-specific proposals.

Because the activities associated with CO_2 development and production will be located several miles from springs and groundwater, and because available mitigating measures will be applied to protect the groundwater resources, significant impacts to water quantity or quality are not expected to occur in the Box-Death Hollow Wilderness or adjacent Instant Study Area if this Alternative is implemented.

Emissions of large quantities of hydrogen sulfide (H_2S) to the atmosphere during the production phase of the CO_2 field may pose a problem to low alkalinity lakes on the Aquarius and Boulder Plateau tops. Although pockets of H_2S have been encountered in exploratory wells drilled to date, there is insufficient evidence that H_2S represents a significant component of the CO_2 reservoir. If H_2S is found to occur in sufficient quantities, air quality controls will be required to minimize the release of H_2S because of the serious safety hazards and air quality problems it will create. Large unavoidable quantities of H_2S being produced with the CO_2 may require a desulfurization plant be installed in conjunction with the compressor plants to remove the H_2S. If it is possible to isolate and seal off zones producing excessive amounts of H_2S, it will be economically advantageous to the production of the CO_2 and the associated risks and potential affects on air quality will be reduced or avoided.

Socio-Economic

It is assumed that sufficient CO_2 production will be established to permit commercial development of the CO_2 if Alternative II is implemented and Exclusion Areas 2 through 5 and Antone Bench are leased. It is also assumed that oil field development, as described under Alternative I, will occur under Alternative II. If this alternative is implemented there will

be a potentially substantial economic benefit derived from the increased production of oil from partially depleted oil fields using CO_2 produced from the Escalante KGS. This will reduce imports and dependency on foreign oil suppliers.

The peak work force required to develop a commercial CO_2 operation will be determined by the size and rate of development undertaken. No formal proposal exists upon which an actual peak work force estimate can be based. However, commercial development of the CO_2, including the drilling of additional wells and construction of pipelines and compressor plants, will result in rapid population influx and economic impacts if rapid development of the CO_2 and oil are undertaken. The impacts will be significant considering the small size of the town of Escalante and other communities in the geographic area and their capacity to accommodate a significant number of workers.

If commercial development of the CO_2 or any oil that may be present is undertaken, up to an estimated 29 CO_2 wells and 10 oil wells will be drilled and 30 miles of road and 59 miles of pipeline and powerline will be constructed. It is assumed that up to three drilling rigs will be employed, requiring an estimated 45 workers. Road and well pad construction and other site preparation work will require an estimated 50 workers. The largest work force will be required to construct the pipeline system, which includes a transportation line to Escalante and construction of the 5 compressor plants assumed under the Alternative II level of development. It is estimated that 175 workers will be needed to construct the pipelines and compressor plants. Well drilling and pipeline and compressor plant construction occur simultaneously during field development. If CO_2 and oil field development occur at the same time, it is estimated that a peak work force of 270 workers will be employed to develop both the CO_2 and oil fields under Alternative II.

If development occurs, all available housing in Escalante will be utilized. This will benefit the sales and service sector of the economy but will also place a great demand on community services and facilities. Tax revenues from CO_2 development will be a significant benefit to local governments. However, most major socio-economic adverse impacts occur during the development of a field, before a significant tax base can be established from which to mitigate impacts from rapid population growth.

Economic benefits to the communities will come in several forms. First, the demand for goods and services which local contractors or individuals can provide will increase dramatically, especially during the development phase. Second, salaries will be spent in local businesses. Third, tax collections are made in the state and county where the workers are located. Fourth, lease rentals, royalties, and taxes from CO_2 and oil production on Federal lands are shared by state and local governments.

A large additional workload will be placed on schools, medical facilities, transportation systems, police and fire protection, and municipal sewer and water systems. Typically, sufficient services lag behind the influx of workers, and the quality of service for all may suffer. Housing and community services will be overextended, which will create a need for temporary housing facilities. The Escalante Town Council has indicated a desire for a worker camp to be established on private ground after local available housing is filled. If a suitable arrangement is located close enough to town, local merchants can supply goods and services to the camp. As development progresses to production, the demand for services will decrease. The short-term economic and social effects may be viewed as adverse, lowering the quality of life within some communities. Traditional community values, which have been influenced by lifelong residence, may be pressured to change. Experiences from the Tenneco oil field near Escalante indicate that outside values and ideas brought in by workers may not blend well with the traditional deeply rooted values of local residents. Another adverse effect that may occur with the development phase is the potential reduction of tourist dollars spent locally. Increased traffic and equipment operating in the KGS may displace hunters and tourists during certain times of the year. This may result in a dollar loss as tourists by-pass the area to visit other areas. However, the opposite effect is also possible, as "curiosity seekers" drive to the area to observe development.

Upon completion of the development, there will be a significant drop in the needed work force, and an out-migration of population can be expected. If services and facilities are provided to meet the needs of the development activities, there is the possibility that local governments will have incurred a large bond debt in order to pay for facilities that are no longer needed. The impacts from rapid CO_2 field development will be most significantly felt in communities such as Escalante that are characterized by a stable rural and tourist-based economy, where mineral-based economies do not exist. However, the development of the CO_2 and oil will generate a sudden and sizable expenditure of capital and will also create secondary employment. The private sector will benefit immediately.

Economic benefits to local communities, primarily Escalante, can be significant. As an example, the cost of drilling one well is estimated to be $1.1 million. Some of this cost is returned to nearby communities as consumer spendable income.

The economic benefits resulting from the royalties, lease rentals, and taxes from CO_2 and oil production which accrue to State and local governments will be more significant in sparsely populated areas with little or no previous mineral economic base.

Upon the eventual depletion of the CO_2 and oil and abandonment of the fields, there will be an additional out-migration of workers, but this will occur over an extended period of time, and the impacts, although less

sudden and severe, will extend into the realm of a long-term impact. This will result in a recession in the local economies which may be long-term and result in a degree of economic hardship if an alternative economic base does not exist.

CO_2 and Oil

If Alternative II is implemented, an additional 2,263 acres will be leased on Antone Bench and the other Exclusion Areas for CO_2 only. The lands within the KGS that are available for CO_2 development will increase from 13 percent under Alternative I to 16 percent, or 12,600 acres, under Alternative II. However, implementation of this alternative will significantly increase the amount of leased lands located adjacent to the crest of the Escalante Anticline. It is assumed that by virtue of their location, these lands will provide sufficient CO_2 reserves to permit commercial development of the CO_2. There will be no change from Alternative I in the amount of lands available for oil development. Most of the lands within the KGS (82 percent) will still be unavailable for exploration and development of either oil or CO_2. An unknown amount of oil and CO_2 will be unavailable for recovery and beneficial use if this alternative is implemented. Generally the same impacts to oil production from the designated Wilderness as described under Alternative I will occur under Alternative II. If existing leases expire before commercial production is established, the opportunity for development and recovery for use of the resources will be foregone or delayed until and if future leasing is undertaken.

The increased cost to develop the CO_2 or oil resources in order to mitigate impacts to the other resources within the KGS is unknown but it is expected to be substantial. These additional costs will detract from the economic viability of both CO_2 and oil field development. The total cost to mitigate the identified impacts to other resources is unknown at this time.

The available land for CO_2 and oil exploration and development under Alternative II are summarized in the table on the following page.

TABLE 6

Summary of Land Availability for CO_2 or Oil Development and Production Under Alternative II

Unavailable Lands	Acres 1/	Percent of KGS
Unleased Wilderness and ISA 2/	28,900	36%
Unoccupiable Leased Lands 3/	7,200	9%
Lands not proposed for leasing 4/	29,400	37%
Total unavailable for development	65,500	82%
Available Lands		
Occupiable leased lands	12,700	16%
Other		
NonFederal lands	1,800	2%
Total KGS lands	80,000	100%

1/ Rounded to the nearest hundred (100) acres.
2/ Includes unleased lands in the Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area.
3/ Includes lands where surface occupancy is or will be excluded by lease stipulation and lands that are unoccupiable or inaccessible because of steep rugged topography or unstable soils.
4/ Includes lands available for leasing in the KGS but not proposed for leasing under Alternative II.

Alternative III - Offer New Leases for Oil and Gas and CO_2 Within the Area of Greatest Potential for Development and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Soils and Vegetation

Under Alternative III, the impacts to the soil resources described under Alternatives I and II will occur, however, an additional 17,381 acres will be available for oil and gas and CO_2 leasing and subsequent development and production. If the additional lands are leased, up to an estimated 49 CO_2 wells and 32 oil wells can be drilled, and 49 miles of additional roads, 20 miles of pipelines, and 20 miles of powerlines will be constructed.

An estimated total of 442 acres will receive surface disturbance and be taken out of vegetative production if Alternative III is implemented. There will be an estimated displacement of 1,768 tons of soil the first year following surface disturbance. Some of the lands proposed for leasing under Alternative III produce commercial timber and high-value livestock forage. The lessee/operator will be required to salvage any commercial timber prior to construction. Forage productivity will be restored to disturbed areas following reclamation. The impacts to livestock forage and timber production are not expected to be long-term or significant impacts because of the limited size of the areas that will be removed from production.

The additional lands available for oil and gas leasing under this Alternative are located in the northwest portion of the KGS. They include the Aquarius Plateau and other areas where slopes are relatively gentle and soils more productive. These areas typically exhibit lower inherent soil erosion hazards than the areas further south and east. Several areas that will be leased contain gypsum and exhibit evidence of slumping or landslides. Any extensive construction activities or surface disturbance will easily destabilize these areas, resulting in the creation of hazardous landslide conditions, increased soil erosion, and soil loss. Surface occupancy will be avoided when possible on areas that have potential for high mass failure. Occupancy may be permitted if further review of the site-specific proposals and construction techniques to be employed indicate that destabilization will not occur.

A number of areas with steep slopes are also present in the area proposed for leasing under Alternative III. Occupancy or surface disturbance on steep slopes will result in accelerated erosion and destabilization of slopes. Surface occupancy will not be allowed on slopes exceeding 45 percent (see map on page III-3 and Stipulation No. 6, Appendix B). Soil loss will be kept within acceptable limits if steep slope areas and areas exhibiting unstable soils are avoided. The impacts resulting from construction and other surface disturbance will be further mitigated by

site-specific requirements such as, but not limited to, installing proper drainage features in roads, using fill to cross unstable areas rather than cutting into unstable slopes, and prompt reclamation.

Wildlife and Fisheries; Sensitive and Endangered Species

If Alternative III is implemented, the impacts associated with the exploration, development, and production of CO_2 and oil will include those already discussed under Alternatives I and II. The impacts to wildlife on Antone Bench and the other Exclusion Areas under Alternative III will be essentially the same as discussed under Alternative II. A total of 17,381 acres will be added to the areas currently under lease. The impacts to wildlife described under Alternatives I and II will be extended to currently unleased areas north and west of the Hells Backbone Loop Road and at the higher elevation within the KGS. Implementation of Alternative III will increase the probability that significant development of CO_2 and oil will occur within the KGS.

It is assumed that many of the roads needed to implement development under this alternative will already be in place. However, it is estimated that 49 miles of additional road will be needed under Alternative III to accommodate CO_2 and oil field exploration and development. This will result in a total of 167 miles of roads being present in the KGS and result in a road density of 2.2 miles of road per square mile of habitat (see Wildlife and Fisheries; Sensitive and Endangered Species Section, Alternative II, in this Chapter). It is expected that this will reduce habitat effectiveness in the KGS to below 90 percent for deer and below 60 percent for elk. The implementation of this alternative will also result in extending roads into areas that are currently unroaded. Again, the impacts to big game and other small nongame wildlife species will be reduced by requiring dual use of existing access roads, closing and reclaiming roads that are no longer needed for management purposes, and restricting access on other roads in order to maintain an average road density of less than 2 miles of road per square mile of habitat within the KGS.

Deer, elk, and wild turkey are more numerous at the higher elevations that are included within the area proposed for leasing under Alternative III. The anticipated impacts to big game species and other wildlife species are essentially the same as discussed under Alternatives I and II, but will be extended into an area supporting greater use by big game animals. Elk calving grounds have been identified in the aspen belt below the Aquarius Plateau Rim, and deer summer range is located above the 8,000 foot elevation. The impacts to these species will be increased under this alternative. Some reduction in game populations will occur as a result of CO_2 or oil field development in these areas.

As was discussed under Alternatives I and II, the greatest impact to wildlife will occur during the field development phase when construction,

drilling, and accompanying human activity will be at their greatest intensity. Not all the wells or other facilities will be drilled or constructed at the same time. Except for the access roads, the areas of immediate impact will be highly localized, and impacts will be confined to the immediate area of activity.

Noise and visibility created by these activities will be expected to extend beyond the immediate area of impact and will displace sensitive wildlife species. There may also be an increase in wildlife/vehicle collisions, illegal shooting and other harassment of wildlife associated with the increased activity that will result from the implementation of Alternative III.

The additional area made available for development in the northern reaches of the KGS will also increase the possibility of logging and CO_2 or oil field development overlapping in time and space. The anticipated impacts resulting from logging and field development activities occurring simultaneously in the same area were discussed in Alternative II. Delaying either oil and gas field development or logging to avoid simultaneous activities in an area will reduce the displacement of wildlife.

The impacts to all wildlife species will be greatest during drilling and construction activities. The more sensitive wildlife species are expected to avoid the areas of greatest activity and thereby be displaced from some of the more desirable habitat areas. It is estimated that as a result of the surface disturbance on 442 acres, increased road densities during CO_2 and oil field development, habitat effectiveness will be reduced on an estimated 17,890 acres within the KGS if Alternative III is implemented. In terms of big game species, it is estimated that there will be a reduction in the existing habitat's capability to support 161 deer and 16 elk. It is unknown how many or what small nongame wildlife species may be displaced or otherwise affected by CO_2 or oil field activities under Alternative III. In general terms implementation of Alternative III will have more impacts to fish and terrestrial wildlife than either Alternatives I or II, approximately the same as Alternative IV, but fewer impacts than Alternative V.

Upon completion of reclamation most of the lost forage will be replaced. The inclusion of wildlife forage species in the reclamation prescriptions will enhance the habitat for some wildlife species, and over time, some wildlife species will benefit. Stipulation No. 7 (Appendix B) will be applied to those leases that include critical elk calving areas located in the aspen belt below the Aquarius Plateau Rim. Once drilling and construction are completed the impacts to wildlife will be reduced considerably. Some wildlife species, such as deer, will develop a tolerance for the lower level of activity. Some wildlife displacement and loss of habitat will continue during the production phase. The increased access to areas of the KGS will not be beneficial to some sensitive wildlife species. However, once abandonment and reclamation have been completed, no significant long-term effects will occur.

McGath, Barney, Purple, and Row lakes, and Pine, Sand, and Deep Creeks support fish and waterfowl habitat and are located within the area proposed for leasing under Alternative III. Several existing leases are located adjacent to or in close proximity to these lakes and streams. The additional leasing provided for under this alternative will increase the leased area located near these lakes and streams. It is anticipated that surface disturbance will occur on the 442 acres needed to accommodate field development, resulting in increased sedimentation of these lakes and streams. In addition, the risk of chemical and oil spills occurring during the life of a CO_2 or oil field will increase. Significant adverse impacts to fisheries and waterfowl will occur if these oil or chemical spills enter lakes or streams. Carbon dioxide or oil field development located near the riparian zones associated with lakes, streams, and wet meadows will disturb terrestrial wildlife and bird species that frequent these areas.

The existing roads to McGath, Purple, and the Row Lakes are primitive trails. The implementation of this alternative increases the likelihood of improved access to these lakes, thereby creating additional fishing pressure which will diminish the backcountry fishing experience now available.

Surface occupancy will be avoided adjacent to or in close proximity to these lakes or streams, with possible exceptions where pipelines, powerlines, and road crossings are needed. Stipulation No.'s 4, 5, and 11 (Appendix B) will be applied as appropriate to leases to protect the streams and lakes. The primitive trails to Purple and Row Lakes will not be used to access CO_2 or oil developments in order to maintain the existing fishing experience at these lakes. In addition, site-specific mitigation applied at the time operating plans are approved will further reduce the possibility of these fisheries and wildlife habitats being directly impacted by CO_2 or oil development. Installation of dikes or berms around tank batteries and areas where oil is being processed, handled, or stored will reduce the risk of spills leaving the site and entering surface waters. Locating facilities at a sufficient distance from streams and lakes and prompt reclamation of disturbed areas, using special construction techniques at stream crossings will reduce the possibility of sediments or oil and chemical spills reaching surface waters.

Under Alternative III, there is a significant increase in the lands available for development located adjacent to the escarpments that form the northern boundaries of the Box-Death Hollow Wilderness. There will be an accompanying increase in the possibility that nest sites and other areas inhabited by the peregrine falcon and Mexican Spotted Owl will be encountered and affected by CO_2 and oil development activities.

There will also be an increased number of aboveground powerlines to service compressor stations and other facilities under this alternative. Improperly designed overhead powerlines will pose a hazard to larger birds of prey as discussed in Alternatives I and II.

Two sensitive plant species, Aquarius Indian Paintbrush and Small Beardtongue, are known to occur near the northwestern edge of the KGS. Much of this area has not been surveyed for sensitive plant species and other sensitive species may be present. Neese's Peppergrass is endemic to areas along the Hells Backbone, and Jones Golden Aster occurs along the road at the Hells Backbone Bridge. There is an increased possibility that these plant species may be affected if Alternative III is implemented. However, surface occupancy will not be allowed within 600 feet of Hells Backbone Bridge (see Stipulation No. 4, Appendix B).

The lessee/operator of any leases issued in areas where endangered species are suspected to occur is required to conduct a survey to determine if these species are present. Protection of endangered and sensitive species is discussed in detail under Alternatives I and II. The stipulation requiring the protection of threatened and endangered species contained in Appendix B will be applied to all leases issued in areas where these species are suspected to be present.

Visual and Recreation

If Alternative III is implemented and CO_2 and oil are developed, the same or similar impacts to the visual and recreation resources discussed under Alternative I will be extended to an additional 17,381 acres within the KGS. Alternative III includes lands proposed to be leased for CO_2 under Alternative II and will result in essentially the same impacts to the visual and recreation resources on Antone Bench, Exclusion Areas 2 through 5, Box-Death Hollow Wilderness, and the ISA as described in Alternative II.

Under this alternative, an estimated 32 oil and 49 CO_2 wells will be drilled and 49 miles of access road and 96 miles of pipelines and powerlines will be constructed, of which an estimated 20 miles of pipelines/powerlines will be constructed outside established roadways. It is also expected that 8 gas compressor plants will be needed, assuming that all of the lands leased are capable of producing CO_2. The impacts to the visual and recreation resources resulting from the implementation of Alternative III are in addition to those that will occur on the existing leases discussed under Alternatives I and II.

Although not all of the lands that will be offered for lease under this alternative are expected to be developed for oil and CO_2 production, there is a higher probability that the major developments of a CO_2 or oil field will occur. An increase in the number of CO_2 and oil wellsites, roads, pipelines, powerlines, oil storage tanks, compressor plants, and in drilling, construction, and other associated human activity is expected if this alternative is implemented. The leasing of the additional lands under Alternative III will extend the impacts to the visual and recreation resources to areas that will not be affected under Alternatives I and II.

Less than 10 percent of the leased lands within the KGS traversed by the Hells Backbone Loop Road (No. 153), and approximately 35 percent traversed by the Spectacle Lake Road (No. 162), are currently under lease. If Alternative III is implemented, the amount of lands under lease adjacent to these roads will increase to approximately 80 percent of the total length of the Hells Backbone Loop Road and 65 percent of the Spectacle Lake Road. This represents a significant increase in the lands available for CO_2 and oil field development within the foreground and middleground view areas of these roads. Because implementation of this alternative is assumed to provide for the major portion of any development of CO_2 or oil in the KGS, the intensity of activity and scale of operations in close proximity to the Hells Backbone Loop and Spectacle Lake Roads will increase.

The Hells Backbone Loop Road is the major access road to the KGS and it is expected to be the main corridor and collection point for powerlines and pipelines under this or any of the alternatives. Many of these types of facilities will be highly visible and will change the natural landscape along the road. Unnatural openings in the tree canopy will be created by the removal of trees at construction sites. When viewed from higher elevations, these openings will be an impact to the natural landscape. The selection of the least visible locations, the use of vegetative screening, and camouflage painting will mitigate these adverse visual impacts so that the oil or CO_2 developments do not dominate the landscape adjacent to the road. Except for aboveground powerlines, compressor stations, drilling rig masts, and in some cases, oil storage tanks, most facilities are low-profile. The tree cover and topographic relief that exist along the Hells Backbone Loop Road provide an opportunity to screen most oil and gas and CO_2 facilities from view. The facilities that will remain the most visible in close proximity to the road are linear-type facilities such as pipelines, powerlines, and side roads. Where side roads, pipelines, and powerlines cross major roads, "dogleg" turns will be used when possible to reduce the visual impact of long straight corridors visible from the roads.

The impacts to the visual and recreation resources along the major access roads and the mitigation that will be applied under Alternative III are discussed under Alternatives I and II of this chapter.

In accordance with the Standards and Guidelines in the Dixie Forest Plan for Management Area 2B (see map on page IV-56), stipulations will be included in new leases located adjacent to the Hells Backbone Loop and Spectacle Lake Roads (see Stipulation No. 4, Appendix B). The visual distance requirements will vary depending on topography and vegetation. However, pipelines, powerlines, and possibly other facilities will be permitted to be located in the roadway or adjacent to the roads. Requiring that these types of facilities be located away from the roadways will result in greater visual and other resource impacts. A site-specific analysis will be conducted to evaluate the proposal and avoid these impacts when possible. Stipulation No. 10 (Appendix B) will be applied to leases

issued under Alternative III. This stipulation requires that all surface facilities be painted a color that blends with the natural background of the area. Although the impacts along Hells Backbone Loop Road and Spectacle Lake Road cannot be totally avoided, many of the impacts will be reduced to the extent that oil and CO_2 field development, although present and visible, does not dominate the landscape.

The Hells Backbone Loop Road provides panoramic views of the Wilderness and the colorful and unusual rock formations from several locations along the road. Facilities visible from these locations, when viewed together with the Wilderness, will conflict with the visual harmony of the area. The Hells Backbone Bridge area provides one of the more scenic views of the Wilderness. Stipulation No. 4 (Appendix B) will be used to prohibit surface occupancy within 600 feet of the Bridge. Although the Utah Wilderness Act of 1984 requires that no buffer areas be created adjacent to the Wilderness, there is usually enough latitude available to locate wellsites, powerlines, and other facilities so as to screen them from view or reduce their visibility without interfering with the development and production of CO_2 or oil. In many cases, only minor relocation of facilities will reduce the impacts, thereby avoiding unnecessary disruption to the primitive recreation experience or detraction from the scenic views of the Wilderness from the Hells Backbone Loop Road.

Implementation of Alternative III will result in essentially the same type of impacts to the recreation use as described under Alternatives I and II. It is expected that this alternative will permit the expansion of the development of CO_2 and oil resources to other areas within the KGS. If this occurs, the estimated increase in the number of wells will require a significant increase in the construction of pipelines, roads, and other CO_2 and oil field facilities. These activities will increase in intensity, be extended over a longer period of time, and affect additional areas within the KGS. During field development there will be a significant increase in opportunities for conflicts with recreation use. Traffic hazards along the major roads will increase, and there will be a greater displacement of recreation use to other areas. It is expected that the primitive recreation opportunity will be decreased by 885 acres and the semiprimitive opportunity by 4,436 acres. The roaded natural recreation opportunity will be increased by 5,321 acres.

If the development of CO_2 or oil extends to the northern portion of the KGS, there will also be a greater possibility that logging and oil and gas development will coincide as to time and space within this area.

The Blue Spruce Campground located in the central section of the KGS is available for leasing under this alternative. The campground is located in the Pine Creek drainage which has steep slopes and a narrow drainage bottom. The campground is small but heavily used during the summer by fishermen and sightseers. Carbon dioxide or oil field development adjacent to the campground, or even access roads running through it, will reduce its

popularity and eliminate the utility of the existing facilities. Stipulations prohibiting surface occupancy will be used to avoid direct impacts to the campground, minimize conflicts with the current use of the area, and preserve the utility of the facility for future use. However, not all conflicts or impacts to the recreation use of the campground can be avoided.

The Roger's Peak area is steep and pine covered. Past logging activities in this area have established a number of roads which provide sufficient access to the area for exploration and field development activities. However, wellsites, pipelines, or other facilities located on the steep slopes will create unnatural and objectionable landscape features. Surface occupancy of the steeper slopes will be avoided, and Stipulation No. 6 (Appendix B) will be applied for soil and watershed protection. The avoidance of steep slope locations will reduce the visual impacts.

In summary, the implementation of Alternative III will increase the impacts resulting from the number of wellsites, pipelines, roads, and other facilities associated with CO_2 or oil field development to visual and recreation resources. The major area of impact to these resources is in the vicinity of the Hells Backbone Loop Road. There will be highly visible changes to the character of the natural landscape. Conflicts with recreation use will be greatest during the development of the CO_2 or oil resources when drilling and construction activities are at their greatest intensity. Recreation use will be displaced during this time. These impacts will only be partially mitigated but will be of a relatively short duration. Once construction has been completed, the continuous activities associated with the production of CO_2 or oil will be reduced and will not represent a serious conflict with casual recreation use.

The mitigation available through lease stipulations and conditions of approval to operating plans will reduce the visual impacts to an acceptable level; however, there will be a continued visible presence of a CO_2 or oil field within the KGS during the life of the field. The recreation opportunities in many areas will be changed from primitive or semiprimitive to roaded natural. After field abandonment, removal of facilities and reclamation of the disturbed area, the visual evidence of past activities will be relatively unobtrusive. However, evidence of past activities cannot be totally removed and some evidence of these activities will always remain.

Wilderness

It is assumed that the impacts to the Wilderness and ISA described under Alternatives I and II will also occur under Alternative III. If Alternative III is implemented, there will be a significant increase in the amount of land made available for development along the escarpments that form the northern boundaries of the Box-Death Hollow Wilderness.

It is anticipated that an increased number of wellsites will be located near the edge of the escarpments to provide maximum drainage of CO_2 or oil from under the Wilderness. During drilling, the drilling rig masts will be highly visible from within the Wilderness. However, the visual impacts will be of short duration. After drilling is complete, the wellhead facilities are low-profile and, with the use of available vegetative screening and camouflage painting, will not be highly visible at a distance. These types of facilities will not be visible from the viewing distance of the more heavily used portions of the Wilderness. High-profile facilities such as powerlines, and compressor stations located near the edge of the escarpments will also be visible from within the Wilderness. These will be relatively long-term facilities and will continue to detract from the primitive recreation experience. The sharp upward angle of view created by the escarpments will also screen such facilities from view from some areas.

Implementation of Alternative III will create a greater probability that impacts on the Wilderness and ISA will occur than under Alternatives I and IV, and approximately the same probability as under Alternatives II and V.

Water

Water consumption for CO_2 and oil field development under Alternative III is expected to be significantly greater than under Alternatives I or II. Although the amounts of the withdrawals are unknown at this time, they are not expected to affect overall water availability within the KGS. Withdrawals of surface water will be controlled at various locations so as not to impact other water uses. The extent of increased demand that will be created for water is unknown. However, if Alternative III is implemented, it is expected that there will be an increased demand for culinary water from the Escalante municipal watershed and additional culinary water will need to be developed to accommodate the influx of workers.

There will be an increase from 6.4 miles of perennial streams under Alternatives I and II to an estimated 15.8 miles of perennial streams located on leased or lands proposed for lease that will be subject to impacts if this alternative is implemented. Under this alternative, additional lands adjoining Pine Creek, Sand Creek, and Deep Creek, as well as McGath, Purple, Barney, and Row Lakes will be leased. The probability that wells and other facilities will be located in the vicinity of these streams and lakes will increase. Erosion from construction sites and other surface-disturbing activities located close to these streams will increase sediments entering surface waters. Some of the more narrow drainages, such as Sand and Pine Creeks, have only limited room to accommodate roads and other developments without encroaching on the riparian areas bordering the streams. In order to provide access to the additional lands being proposed for lease under this alternative, at least two stream crossings for roads, pipelines, and powerlines need to be constructed. These crossings are in

addition to those identified under Alternatives I and II. The construction of these crossings will result in sediments entering directly into streams. The type of crossings needed is unknown since no site-specific proposals have been made. The type of crossings can range from bridge or culvert installations to low water crossings. The impacts to water quality at stream crossings will be reduced by limiting surface disturbance during construction of the crossings, installing riprap, and reclaiming the disturbed areas adjacent to streams.

Stipulation No.'s 4 and 5 (Appendix B), prohibiting occupancy or other surface disturbance near lakes or streams will be included in any lease that contains lakes or streams. The distance from lakes or streams within which occupancy will be allowed depends on site conditions and other resource protection considerations. This distance may be modified at the time operations are proposed depending on available alternative mitigation and the site-specific proposal.

Increases in stream sedimentation resulting from surface-disturbance on an estimated 442 acres will be the primary impact to water quality. If Alternative III is implemented, there will be an increase in the amount of construction associated with wellsites, roads, and pipelines, and other surface-disturbing activities. Erosion rates will be the highest from new construction. Assuming that 30 percent of the 1,768 tons of displaced soils will reach perennial streams the first year after surface disturbance, an estimated 530 tons of sediments will be added to the existing sediment loads the first year following construction. Similar to Alternatives I and II, the increased sedimentation is expected to be masked and insignificant compared to the natural loads normally experienced. However, local reaches of some streams may be impacted by the increased sedimentation. Surface occupancy will not be allowed on steep slopes or unstable soils where higher erosion potentials are encountered. This will reduce sedimentation to surface waters. Stipulations No.'s 6 and 11 (Appendix B), prohibiting occupancy of steep slopes or unstable soils, will be applied to leases containing these conditions.

Many of the lands included in Alternative III have been logged or are scheduled for timber sales. The established road system services much of the area. If upgraded, most of these roads will be suitable for oil and CO_2 field development. Requiring dual use of the existing and planned road systems and utilizing the roadbeds for pipeline and powerline right-of-ways will reduce surface disturbance and associated sedimentation. Surfacing of roads for all weather use, installing culverts and other drainage structures on roads, installing waterbreak structures on pipelines, and reclaiming disturbed areas will significantly reduce sediment yields. Within three years after construction activities, induced erosion and sedimentation should decline to near background levels. Although sedimentation rates associated with construction activities will adversely impact some local stream reaches in the northern portions of the KGS, the cumulative impacts of sedimentation downstream are expected to be

insignificant. Any induced sedimentation will be masked by the high natural downstream sedimentation rates in such drainages as Sand Creek or Pine Creek.

The likelihood of accidental spillage or release of oil, chemicals, water produced with oil and CO_2, and other materials will increase if Alternative III is implemented. The greater number of wells expected to be drilled under Alternative III will also increase the number of connections between acquifers that exhibit differing water qualities. The mitigation described in Alternatives I and II will also be applied under this alternative. These measures will be sufficient to protect both surface and groundwater quality from significant degradation.

Socio-Economic

There will be a substantial increase in the lands available for oil and gas and CO_2 production if Alternative III is implemented. Based on existing geological information, implementation of this Alternative is expected to result in a significant increase in the development of the CO_2 and any oil that may be present in the Escalante Anticline. The economic benefits to be derived from no only the possible increased production of oil in the KGS, but also from the increased production of oil from partially depleted oil fields using CO_2 produced from the Escalante KGS may be significant.

Assuming simultaneous development of oil and CO_2 fields, it is estimated that up to 81 wells can be drilled under this alternative. Six drilling rigs and a total of 90 workers will be needed to drill the wells. If the wells are drilled, up to 8 compressor plants and 96 miles of pipelines and powerlines will need to be constructed, along with the construction of other related facilities and roads. The estimated peak work force needed to develop the oil and CO_2 fields is 480 workers. The same positive and negative socio-economic impacts that were described under Alternative II apply to Alternative III. However, increasing the potential work force from 270 under Alternative II to 480 under Alternative III will result in a corresponding increase in the impacts. Escalante and the other small towns in the vicinity will receive significant socio-economic impacts from the large influx of workers.

CO_2 and Oil

Implementation of Alternative III will permit the offering of leases in those areas having the greatest potential for both CO_2 and oil development and production. The lands available for oil and CO_2 development and production will increase from 10,600 acres or 13 percent of the KGS under Alternative I to 25,400 acres or 32 percent of the KGS under Alternative III. Approximately, 14,300 acres located along the eastern side of the KGS are not proposed for leasing under Alternative III. Although, this area is anticipated to contain somewhat lower potentials than the area being proposed for leasing, the opportunity to

explore, develop, and recover any resources that may be present will be foregone. In addition, 9,600 acres of the lands being offered for lease are not occupiable and 28,900 acres of lands remain within the Wilderness that are not available for leasing. An unknown amount of CO_2 and oil will be unrecoverable from these lands.

Similar to Alternative II, the added cost to mitigate impacts to the other resources within the KGS will be substantial and detract from the economic benefits of CO_2 and oil development and production. These costs are unknown at this time.

The land availability for CO_2 and oil and gas exploration development under Alternative III is summarized in the following table.

TABLE 7

Summary of Land Availability for CO_2 or Oil Development and Production Under Alternative III

Unavailable Lands	Acres 1/	Percent of KGS
Unleased Wilderness and ISA 2/	28,900	36%
Unoccupiable Leased Lands 3/	9,600	12%
Lands not proposed for leasing 4/	14,300	18%
Total unavailable for development	52,800	66%
Available Lands		
Occupiable leased lands	25,400	32%
Other		
NonFederal lands	1,800	2%
Total KGS lands	80,000	100%

1/ Rounded to the nearest hundred (100) acres.
2/ Includes unleased lands in the Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area.
3/ Includes lands where surface occupancy is or will be excluded by lease stipulation and lands that are unoccupiable or inaccessible because of steep rugged topography or unstable soils.
4/ Includes lands available for leasing in the KGS but not proposed for leasing under Alternative III.

Alternative IV - Offer New Leases for Oil and Gas Within those Areas Available for Oil and Gas Leasing and Recognize Potential Development of Existing Oil and Gas Leases in the KGS.

Soils and Vegetation

Under Alternative IV, the impacts described for Alternative III, except on Antone Bench and Areas 2, 3, 4, and 5, will occur. Up to an additional 29,449 acres will be available for oil and gas lease. The additional areas exhibit essentially the same characteristics as the lands discussed under Alternative III. There will be an additional 500 acres of unstable soils and steep slopes included in leases issued under this alternative. The mitigating measures, including stipulations protecting steep slopes and unstable soils, described under Alternatives I and III will also be applied under Alternative IV. It is estimated that a total of 479 acres will be disturbed under this alternative. It is also estimated that soil displacement resulting from surface disturbance will be 1,916 tons the first year following construction. The exclusion of Alternative II from this alternative does not significantly reduce the overall effects on soil loss. It is expected that the increased soil loss after mitigation will be within acceptable limits if this alternative is implemented.

Wildlife and Fisheries; Sensitive and Endangered Species

Although it is recognized that commercial CO_2 development may not be feasible if the lands proposed for leasing under Alternative II are excluded from consideration under Alternative IV, it is assumed for analysis purposes that both CO_2 and oil field development will be undertaken. Approximately 52 miles of roads will need to be constructed to support oil and gas activities. If Alternative IV is implemented, it is estimated that an average road density of 2.2 miles of road per square mile of habitat will be created within the KGS. The impacts to wildlife under this alternative from increased road densities will be similar to those described under Alternative III, except Antone Bench and the other Exclusion Areas will not be affected by CO_2 field development activities.

Impacts of leasing the entire northern portion of the KGS will be similar to those discussed for Alternatives I and III, but additional wildlife habitat will be affected because of the additional area that will be available for oil and gas development. The improved access within the additional area proposed for leasing under Alternative IV will decrease habitat effectiveness for big game species, including wide-ranging species such as cougar and bear. Habitat quality for other wildlife will also be adversely affected as a result of the improved access and increased human activity in the areas proposed for lease under this alternative. The impacts to wildlife on Antone Bench and the other Exclusion Areas resulting from CO_2 exploration and development as described under Alternatives II and III will not occur since no CO_2 leases will be issued under Alternative IV.

It is estimated that the effectiveness of wildlife habitat will be decreased on an estimated 19,035 acres if Alternative IV is implemented. This will result in an estimated reduction in big game species equivalent to 171 deer and 17 elk that the affected habitat will no longer be capable of supporting. The reduction in the small nongame wildlife population as a result of the impacts to their habitat is unknown. Implementation of Alternative IV will result in fewer potential impacts to fish and wildlife than Alternative V, but more impacts than Alternatives I and II. The magnitude of impacts will be about the same as Alternative III, however these impacts will be shifted from Antone Bench and the other Exclusion Areas to the northeastern part of the KGS.

If the existing leases to the south of Antone Bench are developed, a road will need to be constructed the length of the Bench and Exclusion Area No. 2 as previously discussed under Alternative I. However, the impacts resulting from the construction of a road, pipeline, and powerline will not be as great as the impacts resulting from full development of the CO_2 on Antone Bench and Area No. 2 if Alternative II or III is implemented. The primary difference in impacts to wildlife between Alternatives III and IV is that some impacts to Antone Bench and Exclusion Area 2 will be reduced, and the impacts to wildlife will be increased in the northeastern portion of the KGS if Alternative IV is implemented. Additional lands will be leased along the escarpments south of Hells Backbone Loop Road that may support peregrine falcon habitat, however, the potential impact to falcon habitat will be less than under Alternative III because Antone Bench and the other Exclusion Areas are not proposed for leasing under this alternative.

In general, the mitigating measures described under Alternatives I and III will be applied in the same manner to leases issued under Alternative IV. Stipulation No. 7 (seasonal restriction stipulation), Appendix B, will be included in leases issued under this alternative to protect elk calving areas. After mitigation, the impacts to wildlife added by this alternative will not be significantly different than those under Alternative III.

Visual and Recreation

Although commercial development of the CO_2 may not occur if Alternative IV is implemented, it cannot be entirely discounted. It is, therefore, assumed that Alternative IV will result in similar impacts as described under Alternatives I and III, with the exception that under Alternative IV development of Antone Bench and Exclusion Areas 2 through 5 will only occur on existing leases. If Alternative IV is implemented, the entire length of both the Spectacle Lake and Hells Backbone Loop Roads, and the escarpments south of the Hells Backbone Loop Road will be offered for leasing. The same impacts described under Alternatives I and III will be extended to these areas. If Alternative IV is implemented it is expected that there will be a decrease of 885 acres of primitive recreation opportunity and 4,762 acres of semiprimitive recreation opportunity. The roaded natural

recreation opportunity will increase by 5,647 acres. Pipelines, roads, powerlines, and wellsites located on the steep topography in these areas will likely not meet the visual objectives stated in the Forest Plan. The impacts resulting from a collector pipeline being located along the Hells Backbone Loop Road will be extended into the east end of the KGS under this alternative. The mitigating measures (excluding those stipulations that specifically apply to Antone Bench) described under Alternatives I and III will also be applied under this alternative.

Additional lands adjoining McGath Lake will be leased if Alternative IV is implemented. The McGath Lake area is a heavily used dispersed recreation area, providing a primitive recreation experience. Roads constructed for CO_2 or oil field development will improve accessibility of the area but will change the available recreation experience from primitive or semiprimitive to roaded natural. In order to retain the primitive recreation values, Stipulation 3 (Appendix B), which will prohibit surface occupancy within the McGath Lake area, will be applied to any leases issued in that area (see Area 2A, Dixie Forest Plan, and page I-8).

Wilderness

If commercial CO_2 development is undertaken under Alternative IV, the same or similar impacts to the Wilderness described in Alternatives I through III will occur, except CO_2 leases will not be issued on Antone Bench and the other Exclusion Areas. It is expected that the potential impacts to the Wilderness will be reduced significantly since less land area adjoining the Wilderness boundaries will be available for development. Except for Alternative I, implementation of Alternative IV will have fewer impacts to the Wilderness than the other alternatives because fewer areas adjacent to the Wilderness will be available for development of CO_2. Implementation of Alternative IV will also reduce the possibility that existing leases within the Wilderness and ISA will be developed for CO_2 production since Antone Bench and Exclusion Area No. 2 will not be leased and commercial CO_2 development may not occur.

Water

The impacts resulting from the implementation of this alternative will be similar to those described in Alternative III. The increase in area available for development of CO_2 and oil will result in minor increases in water consumption, sedimentation, and risk of accidental contamination of surface and subsurface waters over that considered in Alternative III. There are a total of 23.7 miles of perennial streams located on the lands under lease and proposed for lease under Alternative IV that potentially can be impacted by CO_2 or oil field development. Stipulation No. 4 (Appendix B) will be included in any new leases issued. No surface occupancy will be allowed within 400 to 500 feet of perennial streams unless other special site-specific mitigation can be employed.

Assuming that 30 percent of the 1,916 tons of expected soil loss will reach perennial streams the first year following surface disturbance, a total of 575 tons of sediments will be added to the existing sediment loads. The increase in sediments as a result of disturbing 479 acres is expected to be masked or lost and be insignificant when added to the loads normally experienced. In addition to the stream crossings identified as needed in Alternatives I, II, and III, two stream crossings in the Grimes Creek-Lake Creek area will be needed if Alternative IV is implemented. No increase in the degradation of water quality or quantity within the Wilderness or ISA is expected to result from implementing this alternative.

Socio-Economic

The peak work force needed to develop the oil and CO_2 fields under Alternative IV is estimated to be 515 workers. The socio-economic benefits and adverse impacts under Alternative IV will differ little from those described under Alternative III.

CO_2 and Oil

Except for 2,263 acres located on Antone Bench and Exclusion Areas 2 through 5, all of the lands available for leasing within the KGS will be offered for lease if Alternative IV is implemented. The lands available for oil and gas exploration, development, and production within the KGS will increase from 10,600 acres or 13 percent of the KGS under Alternative I to 35,000 acres or 44 percent under Alternative IV. Although implementation of this alternative will result in significantly more lands being made available for leasing, the lands with the greatest potential for CO_2 development and production will be excluded from leasing. A major section in the vicinity of the crest of the anticline will be unavailable for development of the CO_2 resource. This will jeopardize the possibility that a viable low-pressure commercial CO_2 field can be developed from the existing leased lands and lands that will be offered for lease under this alternative. In any event, if Antone Bench and the other Exclusion Areas are not leased, the opportunity to recover and utilize an unknown amount of CO_2 from the Escalante KGS will be foregone and will not be available for enhanced recovery of oil from partially depleted oil fields in other areas.

Antone Bench and the other Exclusion Areas can be leased for CO_2 only. Implementation of Alternative IV, the same as Alternative III is expected to provide the maximum opportunity to develop any oil that might be present in the Escalante Anticline.

As under Alternatives II and III, substantial costs will be incurred to mitigate the impacts to other resources within the KGS. These will detract from the economic benefits derived from the CO_2 or oil resources. The cost to mitigate the identified impacts to other resources is unknown.

The land availability for CO_2 and oil exploration and development under Alternative IV is summarized in the following table.

TABLE 8

Summary of Land Availability for CO_2 or Oil Development and Production Under Alternative IV

Unavailable Lands	Acres 1/	Percent of KGS
Unleased Wilderness and ISA 2/	28,900	36%
Unoccupiable Leased Lands 3/	12,000	15%
Lands not proposed for leasing 4/	2,300	3%
Total unavailable for development	43,200	54%
Available Lands		
Occupiable leased lands	35,000	44%
Other		
NonFederal lands	1,800	2%
Total KGS lands	80,000	100%

1/ Rounded to the nearest hundred (100) acres.
2/ Includes unleased lands in the Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area.
3/ Includes lands where surface occupancy is or will be excluded by lease stipulation and lands that are unoccupiable or inaccessible because of steep rugged topography or unstable soils.
4/ Includes lands available for leasing in the KGS but not proposed for leasing under Alternative IV.

Alternative V - Offer New Leases for Oil and Gas and CO_2 for All Lands Available for Leasing Within the Escalante KGS and Recognize the Potential Development of Existing Oil and Gas Leases in the KGS.

Soils and Vegetation

Under this alternative, there will be a total of 49,281 acres available for lease of which an estimated 559 acres will undergo surface disturbance and a displacement of 2,236 tons of soil. This alternative will add very little to the soil loss over that which was identified under Alternatives III or IV. The 2,263 additional acres available for lease on Antone Bench and Exclusion Areas 2, 3, 4, and 5 under Alternative V have low productivity and low erosion potential.

Wildlife and Fisheries; Sensitive and Endangered Species

This alternative provides for the maximum amount of leasing possible within the KGS and therefore has the greatest potential for impacting wildlife and wildlife habitat if the leased lands are developed for CO_2 and oil production. If exploration and full field development occur, it is possible that a road system will be developed that will create an average road density of up to 2.4 miles of road per square mile of habitat. Wildlife habitat effectiveness will be significantly reduced if roads are not closed or abandoned upon termination of use. In addition to the estimated 559 acres that will be directly impacted if Alternative V is implemented, indirect impacts will reduce habitat effectiveness on an estimated 23,275 acres. This will be equivalent to a reduction in the capabilities of these lands to support 209 deer and 21 elk. Although small nongame species of wildlife will be adversely impacted, it is unknown what species or how many will be displaced or otherwise affected. Implementation of Alternative V will potentially result in the greatest impacts to fish and wildlife of any of the alternatives considered. The primary increase in impacts to the wildlife resources from Alternative V over Alternative IV is the result of CO_2 leasing on Antone Bench and the other Exclusion Areas. These impacts are discussed under Alternative II. The relative impacts to wildlife and mitigation that will occur under Alternative V have been discussed under Alternatives I, II, III, and IV.

Visual and Recreation

The impacts to the visual and recreation resources that will occur if Alternative V is implemented have been addressed under Alternatives I through IV. As with those Alternatives, the greatest impact to recreation use will occur during the drilling and construction activities, and recreation opportunities will be changed from semiprimitive or primitive to roaded natural. Implementation of Alternative V will extend the impacts from oil and CO_2 exploration and field development to all the lands available for leasing within the KGS. Without road closures, improved

access created by road development and the influx of workers will result in heavy recreation pressure on many of the campgrounds and small lakes and streams in the the KGS and adjoining areas.

If Alternative V is implemented, it is expected that roaded natural recreation opportunity will increase by 6,950 acres and primitive and semiprimitive recreation opportunities will decrease by 885 acres and 6,065 acres respectively.

Wilderness

The impacts to Wilderness were discussed in Alternatives I, II, III, and IV. The potential for impacts to the Wilderness is increased under Alternative V over Alternative IV, since Antone Bench and the other Exclusion Areas will be proposed for leasing. This will increase the amount of lands adjoining the Wilderness that will be available for development of the CO_2 resources. These impacts were analyzed under Alternatives II and III. Implementation of Alternative V will potentially result in the greatest impacts to Wilderness of any of the alternatives considered.

Water

The impacts of this alternative are expected to be very similar to those previously analyzed under Alternatives I, II, and III. The primary difference between Alternatives IV and V is the additional lands offered for CO_2 leasing located on Antone Bench and Exclusion Areas 2 through 5 under Alternative V. The impacts of additional CO_2 development on these areas is described in detail under Alternative II. The increase in the miles of roads and number of drillsites, etc., will result in a minor increase in erosion, sedimentation, and risk of accidental contamination of surface and ground waters over that considered in Alternative IV. The same as Alternative IV, there will be a total of 23.7 miles of perennial streams located on leased lands or lands proposed for leasing that potentially may be impacted by CO_2 or oil field development if Alternative V is implemented. No perennial streams or lakes exist on Antone Bench or the other Exclusion Areas.

An estimated 671 tons of sediments will reach perennial streams the first year following surface disturbance assuming that 30 percent of the estimated 2,236 tons of displaced soil will be transported to the stream channels the first year following construction. No significant long-term increase in the degradation of water quality or quantity within the Wilderness or ISA is anticipated under this alternative.

Additional culinary water will need to be developed to accommodate the expected increase in demand for domestic use.

Socio-Economic

This alternative will allow the maximum development of the CO_2 and oil resources within the KGS. Essentially all the areas available for CO_2 or oil and gas leasing will be offered for lease under this alternative.

Implementation of Alternative V can result in highly desirable economic benefits to the Nation. These benefits will not only be derived from any oil that may be produced but also from the increased oil production resulting from enhanced recovery of oil from partially depleted oil fields using CO_2 from the Escalante Anticline. Any increase in the production of oil will reduce imports and reduce the balance of payments abroad. In addition, it will increase employment opportunities.

It is estimated that eight drilling rigs will be needed in to develop the CO_2 and oil fields under Alternative V. Approximately 120 people will be needed to operate these rigs. An estimated 250 people will be needed to construct the dehydrator-compressor plants and 145 people will be needed to develop and construct the interior field roads and pipelines. Temporary housing and facilities will probably be brought in for the majority of these people. Some workers from Escalante and surrounding communities will probably be hired to work on the rigs and in plant, road, and pipeline construction, lessening the demand for housing while increasing the economic benefit to the communities. Local expertise in oil and gas field development gained from the Upper Valley oil field is available in Escalante and the surrounding communities. Local merchants and contractors will notice economic benefits from the services required to support the additional drilling rigs and workers.

An estimated 400 workers and their families could impact Escalante and other local communities for 5 or more years during the development phase of the CO_2 field. An additional influx of 200 workers may occur during the construction of the transportation pipeline. This additional impact of 605 workers will probably only affect the local communities for approximately 2 years. These numbers are purely speculative. The number of workers moving into and living in the area will depend on the plan of development submitted by the lessee/operator. Under a long-term plan of development fewer workers will impact the local communities but for a longer period of time. As the field is developed and switches to the production phase an out-migration of workers will occur and the production work force will probably stabilize at approximately 10-12 workers. There will be a significant increase in socio-economic impacts with the expected influx of the estimated 605 workers that will be needed to develop the resources under Alternative V.

Some adverse social impacts may be felt in the communities as people with new ideas and different lifestyles associate with community members that have traditional deeply rooted values. Escalante and surrounding communities experienced similar social impacts during the development of

the Upper Valley oil field in the mid 1960's. It is anticipated that economic benefits derived from development in the area will outweigh the adverse social impacts.

CO_2 and Oil

Alternative V provides for oil and gas or CO_2 leasing of all the lands within the KGS on which leasing is allowed by law. Approximately 37,100 acres or 46 percent of the lands within the 80,000-acre KGS will be available for exploration, development and production of CO_2 or oil under Alternative V.

The remaining impacts to the recovery and beneficial use of the CO_2 and any oil that may be present will result from the 28,900 acres of unleased lands within the Box-Death Hollow Wilderness and the Phipps-Death Hollow ISA where further leasing is prohibited by law and the 12,200 acres on which the there are either physical constraints on surface occupancy or surface occupancy will be prohibited by lease stipulations. These impacts will be partially mitigated by leasing Antone Bench and Exclusion Areas 2 through 5 and developing existing leases within the Wilderness and ISA. At least partial drainage and recovery of the CO_2 from under the Wilderness and ISA and other unoccupiable lands will occur if these lands are leased and developed. The amount of CO_2 or oil that will be unavailable for recovery and beneficial use is unknown. Essentially, the same impacts to the recovery of any oil that may be present in the KGS will occur if Alternative V is implemented as described under Alternative III. The land available for CO_2 and oil exploration and development under Alternative V is summarized in the table on the following page.

TABLE 9

Summary of Land Availability for CO_2 or Oil Development and Production Under Alternative V

Unavailable Lands	Acres 1/	Percent of KGS
Unleased Wilderness and ISA 2/	28,900	36%
Unoccupiable Leased Lands 3/	12,200	15%
Lands not proposed for leasing 4/	0	0%
Total unavailable for development	41,100	51%
Available Lands		
Occupiable leased lands	37,100	46%
Other		
NonFederal lands	1,800	2%
Total KGS lands	80,000	100%

1/ Rounded to the nearest hundred (100) acres.
2/ Includes unleased lands in the Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area.
3/ Includes lands where surface occupancy is or will be excluded by lease stipulation and lands that are unoccupiable or inaccessible because of steep rugged topography or unstable soils.
4/ Includes lands available for leasing in the KGS but not proposed for leasing under Alternative V.

Unavoidable Impacts

Implementation of any one of the alternatives will involve adoption of the mitigation measures described under that alternative. The major impacts that will remain are described in this section of the EIS.

Soils and Vegetation

The estimated first-year soil loss, pending implementaion of reclamation and other mitigating measures, will be an unavoidable impact under all alternatives. This will vary from 220 tons under Alternative I to 2,236 tons under Alternative V (see Table 3, page II-35). Soil loss is expected to return to near predisturbed levels within 3 years following surface disturbance and reclamation/stabilization. Loss of livestock forage or timber production is not expected to be a long-term or significant impact.

Up to 559 acres will be removed from vegetative production under Alternative V. This is approximately one-half of one percent of the total land area within the KGS. However, the loss of timber or forage production will be unavoidable on the sites occupied and used for the production of oil or CO_2 during the life of the field. Upon final abandonment and reclamation, productivity will be restored and the impacts to forage and timber production are not expected to be significant over the long term.

Wildlife and Fisheries, Sensitive and Endangered Species

The greatest adverse impacts to wildlife species found within the KGS, under all alternatives will be during drilling and construction activities. These impacts will be unavoidable, but of relatively short duration. However, there will be a reduction in habitat effectiveness for most wildlife species during the life of the CO_2 or oil field. The extent of these impacts on big game species as well as non-game species such as cougar and bear which are sensitive to human activity can be only partially mitigated and for the most part will be unavoidable during the life of a CO_2 or oil field. After final abandonment and reclamation, habitat effectiveness is expected to return to predevelopment levels.

The potential adverse effects to elk calf survival in the elk calving grounds located below the Aquarius Rim can be significantly reduced but not totally eliminated by avoiding drilling and field development activities during elk calving season. However, the activities associated with production of oil or CO_2 will continue to adversely affect elk calving activities during the life of the fields. This impact will be unavoidable during the productive life of the field(s).

The impact to fisheries from increased sedimentation resulting from surface disturbance is not expected to be significant considering the present sediment loads carried by streams during peak runoff periods. The increase in sediments available to streams the first year following construction is unavoidable, but will be of relatively short duration.

An increase in road density and associated increase of human activities, together with the drilling and construction activities, will create the greatest impact to big game as well as other wildlife species. Although these impacts can be partially mitigated, they will be unavoidable during the life of a CO_2 or oil field. Reducing the road density under Alternatives III, IV and V to 2.0 miles of road per square mile of habitat will reduce these impacts to an acceptable level. There will still be a reduction in habitat effectiveness for deer, elk, and other sensitive wildlife species after mitigation. The table on the following page depicts the estimated impact created by increased road access to big game species before and after mitigation.

TABLE 10

Estimated Reduction in Habitat Effectiveness for Deer and Elk

Avg Road Densities (Mile/mile^2)					
Projected needs	1.6	1.9	2.2	2.2	2.4
Post-mitigation	1.6	1.9	2.0	2.0	2.0
Affected Habitat (Acres)					
Projected impact	2,835	10,805	17,890	19,035	23,275
Residual impact	2,835	10,805	13,700	13,895	14,295
Big Game Equivalents					
Deer (Number)					
Projected impact	-26	-97	-161	-171	-209
Residual impact	-26	-97	-123	-124	-128
Elk (Number)					
Projected impact	-3	-10	-16	-17	-21
Residual impact	-3	-10	-12	-13	-13

The impact created by an average road density of 4.2 miles of road per square mile on Antone Bench and the other Exclusion Areas cannot be avoided. However, limiting vehicle access to that needed to produce CO_2 will reduce the effects on wildlife in these areas.

Visual and Recreation

The most significant impact to the visual resources and recreation use of the KGS will occur during the drilling of wells and construction of wellsites, pipelines, roads, compressor plants and other facilities associated with CO_2 or oil field development. The type of impacts experienced will generally be the same under all alternatives but will increase in magnitude and significance from a low level of development under Alternatives I and II to a high level under Alternatives III, IV and V. The major areas of impact to the recreation resources is expected to be in the vicinity of the Hells Backbone Loop Road and Antone Bench. There will be highly visible changes to the character of the natural landscape in areas of field development. Conflicts with recreation use will be greatest during the development of the CO_2 or oil resources when drilling and construction activities are at their greatest intensity. Recreation use will be displaced during this time. These impacts can only be partially mitigated and are generally unavoidable. Once construction and field development have been completed, the activities associated with the production of CO_2 or oil will be greatly reduced and will not conflict significantly with most casual recreation uses made of the area.

The available mitigation that is described in Chapter IV under each alternative will be applied either through lease stipulations or as conditions of approval to operating plans to reduce the visual impacts to an acceptable level. There will, however, be the continual visual presence of a CO_2 or oil field within the KGS during the life of the field under all alternatives (see Table 3, page II-35). Upon abandonment, removal of facilities, and final reclamation, the visual evidence of their past activities will be relatively unobtrusive. However, evidence of past activities cannot be totally removed and some evidence of the CO_2 or oil field will remain. This evidence will become less apparent over time as native vegetation reestablishes itself. Recreational opportunities will again change from roaded natural to semiprimitive nonmotorized in some areas of the KGS as a result of the closing and reclamation of roads.

Wilderness

Direct impacts to Wilderness will result from CO_2 exploration and development and production on existing leases within the Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area. Activities associated with the drilling of wells and construction of facilities will create visual and auditory impacts within the Wilderness. Recreation opportunities will be altered from a primitive unconfined opportunity to a roaded but semiprimitive nonmotorized recreational opportunity on 885 acres within the Wilderness and ISA. Noise from the production and maintenance of a CO_2 field will be heard within some part of the Wilderness. Although mitigating measures described earlier in Chapter IV, such as using topographic and vegetative screening and camouflage of facilities, will be applied to minimize visual and auditory impacts to the Wilderness. These impacts will be largely unavoidable and significant. Removal of facilities and reclamation during final abandonment will reduce the visual intrusion significantly. However, there will always be some evidence of man's activities and the primeval, untrammeled character of the area will be lost.

Indirect impacts to Wilderness will occur as a result of the activities associated with the development and production of CO_2 on Antone Bench, Exclusion Areas 2 through 5, and other land located along the escarpments that form the boundaries of Box-Death Hollow Wilderness. Drilling and construction activities associated with the development of CO_2 will be audible and visible from various locations within the Wilderness. High profile drill rigs, powerlines, and compressor stations, if located near the edge of the escarpments, will be visible and the associated activities heard within the Wilderness. Topographic screening provided by the canyon bottoms and sharp viewing angles created by the high escarpments, vegetative screening, camouflaging, and other mitigating measures described in Chapter IV, will reduce, but not totally eliminate, the visual and auditory impacts. The impacts associated with drilling and construction activities will be unavoidable, but of relatively short duration. It is also not expected to be possible to prevent all noise from intruding and

being heard within the Wilderness. However, after mitigation, it is not expected that the visual and auditory impacts resulting from activities outside the Wilderness will be significant.

Water

Significant adverse impacts to water quality are not expected to result under any of the five alternatives considered in this EIS after mitigation described in Chapter IV has been applied. Sediment yields from disturbed lands are expected to be high the first year following construction and some local stream reaches will be adversely affected. This impact cannot be totally avoided. The estimated sediments available to surface water the first year following construction are presented in Table 3, page II-35. It is expected that induced sediment will be masked and become insignificant when added to the high natural sediment loads that are experienced downstream during peak runoffs. Erosion rates and sedimentation will decline significantly after the first year following construction and after reclamation and stabilization. The impacts to water quality and increase in sediments can be only partially mitigated, however, the increase in sedimentation rates are not expected to be significant over the life of a CO_2 or oil field.

Spills of oil and other potential contaminants can be expected to occur several times during the life of a CO_2 or oil field. In some incidents, these materials may enter surface waters and are a potential source of groundwater contamination. Spills and/or the release of potential other contaminating material affecting water quality cannot be entirely avoided during the life of a CO_2 or oil field. Impacts to groundwater during the drilling of wells or the production of CO_2 or oil are not expected to be significant since protection of fresh water aquifers is required. The environmental controls provided by State and Federal laws and regulations to protect water quality should prevent any significant deterioration of ground and surface waters within the KGS and Wilderness. The residual long-term impacts to water quality are not expected to be significant.

Socio-Economic

If large-scale development of a CO_2 field is undertaken as assumed under Alternatives III, IV, and V, there will be a sudden influx of a large number of workers into the town of Escalante and surounding communities. The increased demand for goods and services will greatly exceed the ability of these communities to supply the needs of the workers as well as the communities themselves. This will result in a significant but relatively short-term impact to the town of Escalante as well as to the workers. There are a number of measures available to the local communities and oil and gas operators to mitigate or reduce the adverse socio-economic impacts that will result from rapid large-scale development. The socio-economic impacts cannot be totally avoided and some adverse short-term changes in the community will occur. Once the field has been developed and production

of the CO_2 is undertaken, the long-term effects are not expected to result in significant changes to Escalante and other communities in the surrounding areas.

CO_2 and Oil

The existing legal constraints to leasing within the Box-Death Hollow Wilderness and Phipps-Death Hollow ISA adversely affect the availability and recovery of the CO_2 and any oil that may be present within the KGS. Impacts to the recovery of these resources can be partially mitigated by maximizing the opportunities to drain CO_2 or oil from under the Wilderness and ISA from sites outside the boundaries of these areas. The adverse affects of the legal constraints to the maximum recovery of CO_2 or oil are unavoidable at this time and a significant amount of CO_2 and oil will not be available for recovery and beneficial use at this time.

Other Considerations

The following factors were not evaluated under each alternative either because the environmental consequences were considered to be the same under all alternatives or sufficient information is not available to analyze the environmental consequences until a proposal for exploration and/or development is submitted by a lessee/operator.

The standards and guidelines for visual resources in the Forest Plan or the direction contained in special provisions of the Utah Wilderness Act will be met in all alternatives.

Cultural Resources

In accordance with the National Historic Preservation Act of 1966, the Antiquities Act of 1906, and the Archaeological Resource Act of 1979, the Federal surface management agency must assure that operations on oil and gas leases for lands under its jurisdiction are conducted with due regard for survey evaluation and mitigation of disturbances to cultural resources. Identified cultural resource sites will be avoided whenever possible or, when avoidance is not possible, recovery of the cultural resource data will be undertaken. All cultural resource surveys for oil and gas operations in Utah are conducted in accordance with Notice to Lessees UT-01-85, and Section 6 of the lease terms.

Several cultural resource surveys have been conducted on sites near the KGS and on previous timber sales within the KGS. To date no significant sites have been located within the KGS. The following is a general description of cultural sites and activities that occur by vegetation type. These sites and activities can possibly occur in similar vegetation types within the KGS.

a. Pinyon-Juniper Zone (5,000-7,000 ft.). At the lower elevations of this zone, especially near or along perennial water sources, Anasazi or blended Anasazi-Fremont structural sites can be expected to exist. Similar sites in Boulder, Utah, located 5 miles east of the KGS, are a good example. Less than 1/4-mile south of the Forest boundary, the Coombs Village site (Anasazi Village State Park) was excavated in the 1950's and is a major agricultural village. One-half mile north of the Park is a rectangular, aboveground structure radiocarbon-dated to A.D. 850. This site is being excavated and indications are that there could be more than one structure. Corn granaries are found north of Boulder which are probably associated with the villages below. Cave and rock shelters have been found north of Escalante.

At higher elevation ranges in the pinyon-juniper zone, high site densities are expected to occur. These sites are probably hunting and plant gathering sites left by the Formative Period (ca. A.D. 400-1300) cultures. These people are the Fremont and Anasazi farmers who otherwise lived in small-to-large sedentary villages near agricultural lands. Considering the extent of the Anasazi inhabitation along the lower reaches of the Escalante River and Lake Powell area, several hunting and gathering camps left by the farmers (horticulturalists) can be expected to be found.

Sites left by Archaic peoples (6,500 B.C. - A.D. 400) and Numic groups (A.D. 1,250 - Present) are also expected to be common in the pinyon-juniper forests.

b. Ponderosa zone (7,000-9,000 ft.). From previous observations on the Dixie National Forest, site density starts to drop once the ponderosa pine zone is entered. Sites that are found indicate hunting and some plant processing. This seems to suggest mixed groups of men and women. Chert outcrops were found near the KGS. These provided quarry material for stone tool construction and were heavily used by all prehistoric peoples. Sites can be found most anywhere in the ponderosa pine forest, as a variety of good campsites are available.

c. Spruce-fir-aspen (+9,000 ft.). Sites at these elevations and vegetative associations are less common, and appear to be small overnight camp sites or kill/butcher locations left by hunting parties. These hunting parties were probably made up of small groups of mostly males. Sites are generally found along tree and meadow margins or around springs. Sites are not easily recognized beneath the heavy duff found in these areas. There are, however, notable exceptions that have been found outside the KGS. In general, if the site densities were graphed by vegetation and elevation, the result would resemble a pyramid, the higher the elevation, the lower the site densities.

Due to the low site densities encountered outside of the KGS, the relative

high elevations, and the extremely dissected country, cultural resources are not expected to be an issue in the development of a CO_2 or oil field.

Threatened, Endangered, and Sensitive Species

A Biological Evaluation and Section 7 consultation with the Fish and Wildlife Service has been completed. Since neither the peregrine falcon nor the bald eagle are documented as occurring in the KGS, a "No Effect" determination has been made. However, potential nesting habitat for the peregrine falcon has been identified within the KGS. The Endangered Species Act requires that, before any surface disturbance occurs which may adversely affect the continued existence of threatened or endangered species, a site-specific survey be completed. Appropriate mitigating measures, including denying approval of any action that would jeopardize continued existence of a threatened or endangered species, will be taken to protect those species that might be adversely affected by the proposal.

Air Quality

The primary sources of emissions that can significantly affect air quality and can be expected are: (1) fugitive dust from construction sites and increased vehicle traffic on unpaved roads, and (2) H_2S and other gases, such as nitrous oxides and CO_2, that can be released from wells, pipeline ruptures, and gas plant operations. Although the possibility exists that significant air quality impacts can occur, all operations will be required to comply with the Prevention of Significant Deterioration (PSD) Class II increments for H_2S, fugitive dust and other gases, and the Utah Ambient Air Quality Standards. Until a development plan is submitted and site locations are proposed, the potential impacts to air quality cannot be thoroughly evaluated.

Research Natural Areas (RNA's)

No RNA's exist within the KGS. During the scoping process and public involvement for the Dixie National Forest Land and Resource Management Plan, a possible RNA was identified. The RNA was identified too late to be included in the final Forest Land and Resource Management Plan.

The proposed RNA is located in Exclusion Area 3. If this area leased, and a development plan is submitted for CO_2, the area will be avoided if possible. If avoidance is not possible, disturbance will be kept to a minimum. If a conflict arises between the proposed RNA and CO_2 development and production plans, the production of the CO_2 will be given priority.

Reclamation

Lease stipulations, site-specific evaluations of proposals, and conditions of approval attached to operating plans and special-use permits and bonds will be used to assure that adequate reclamation of disturbed areas is accomplished. The Utah Wilderness Act of 1984, in regards to CO_2 development of Antone Bench, requires that all roads or other facilities within the area be reclaimed to a condition of being "substantially unnoticeable".

Hydrogen Sulfide (H_2S)

The primary concern for human health and safety will occur if H_2S is released into the environment in significant (harmful or lethal) amounts. Analysis of the potential effects of a blowout or rupture will need to be completed together with an analysis of gas plant operations.

Because of the presence of H_2S, a contingency safety plan including electronic monitoring and alarm systems, escape and area evacuation plans, safety equipment, etc., will be required at each drillsite and at other facilities where potential H_2S hazards exist. Zones producing excess amounts of H_2S may be sealed off in the producing wells to reduce or eliminate the hazard. Any proposal for development of CO_2 will be required to incorporate H_2S safety controls including monitoring and shutdown systems and emergency response procedures into the site, design, and operation of any trunk pipelines and gas plants.

The potential impacts from H_2S cannot be properly evaluated until more is known as to the extent that H_2S occurs in association with the CO_2, specific proposals for wells, pipelines and gas plant facilities, topographic conditions, and prevailing meteorological conditions. If a significant presence of H_2S is found in association with the CO_2, a detailed analysis of the potential effects of H_2S on air quality and health and safety will be required.

Noise

The major noise-generating activities will be well drilling, construction activities, vehicular traffic, and the operation of compressors and other equipment at the gas plant. The greatest amount of noise is expected to be generated during the drilling and construction activities. Noise impacts from development of the CO_2 field and construction of the gas plant and pipelines will be insignificant at population centers. However, the town of Escalante will probably be affected by increased vehicular traffic, especially by heavy trucks moving through town. Certain activities within Antone Bench, Exclusion Areas 2 through 5, and on existing leases within the Wilderness and ISA, will be heard in the Wilderness and detract from the Wilderness experience. Noise is also expected to be disruptive to

sensitive wildlife species. After completion of construction and development activities, production-related noise will be reduced significantly.

A site-specific analysis of the effects of noise will be undertaken when specific information as to site locations and types of activities is available.

The Environmental Protection Agency (EPA) 1974 established guidelines for noise levels requisite for the protection of public health and welfare. Long-term outdoor noise levels not exceeding 55 dBA are felt to provide for an adequate margin of safety. Noise in excess of this level will have significant impacts on the affected population.

Economics of CO_2 Development

Section 306(b)(2) of the Utah Wilderness Act of 1984 was interpreted by some during the scoping process as requiring the Government to prepare an economic and commercial viability study of CO_2 development within the Escalante KGS prior to leasing. Section 306(b)(2) states that to the maximum extent practicable, roads, pipelines, electric lines, buildings, compressor stations, and other facilities be camouflaged, constructed, and located in a manner that will minimize visual, noise, and other intrusions in the Antone Bench area and must be ". . . consistent with the economic extraction of the carbon dioxide resource. . . ." The inclusion by Congress of the requirement for consideration of economics in the Act was intended to provide a guard against the imposition of unrealistic requirements that would foreclose economic extraction of the CO_2 resources.

The determination of whether the demand for CO_2 is sufficient to warrant development and whether development will be economically feasible is the responsibility of the lessee. It is also the lessee's responsibility to show that the requirements imposed in compliance with Section 306 (b)(2) will foreclose economic extraction of CO_2 in the Antone Bench area.

In this regard, an economic study prior to leasing is premature. It also does not appear that it was Congress' intent in Section 306(b)(2) that a study of the commercial viability of CO_2 development be conducted prior to any decision to issue leases in the Antone Bench Area. The economic situation regarding CO_2 development will probably change considerably within the initial 10-year term of any CO_2 lease that may be issued. If a study of the economic effects of the requirement to minimize visual, noise, or other intrusions in the area is needed, it will have to be based on a site-specific proposal for CO_2 development within the Antone Bench area. Under these circumstances it is not the responsibility of either the Forest Service or the Bureau of Land Management to do such as study. It is incumbent upon the lessee to show that the requirements being imposed will

prevent the economic extraction of the CO_2. This will become an issue only if the lessee considers the requirements as foreclosing economic development of the CO_2.

Section 306(b)(2) requires only that visual, noise, and other intrusions in the area be minimized to the maximum extent practicable. The Act does not mandate that intrusions be eliminated--only minimized. The requirements of Section 306(b)(2) are not foregone by virtue of lease issuance. Any lease issued in the Antone Bench area will be subject to Section 306(b)(2) requirements. There is no compelling reason that an economic analysis be done prior to leasing.

What may be uneconomic to one lessee/operator may be a viable and economic opportunity to another because of technical capabilities, economic abilities, and efficiency of operations.

Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of resources as used in this analysis is when the commitment cannot be changed once it occurs. An irretrievable commitment means that the resource cannot be recovered or reused. Except for Alternative I, the irreversible and irretrievable commitments of resources is the same for all alternatives, differing only in amounts or degree of commitment based on the level of leasing addressed under each alternative. Irreversible and irretrievable commitments of resources were identified and are presented in Table 11 which follows.

TABLE 11

Irreversible and Irretrievable Commitments of Resources

Resource	Irreversible Commitment	Irretrievable Commitment
CO_2 and Oil and Gas	Yes	Yes
Air Quality	No	No
Soils	No	Yes
Vegetation	No	Yes
Visual	No	Yes
Cultural	Yes*	Yes*
Recreation	No	Yes
Wilderness	No	Yes
Timber	No	Yes
Wildlife	No	Yes
Water	No	Yes

* Although cultural resource information can be retrieved as a result of the excavation and study of specific sites that may be impacted. The sites will be lost for future study and analysis and thereby be an irreversible and irretrievable commitment of resources at the time of excavation.

Short-Term vs. Long-Term Commitments of Resources

All alternatives considered involve short and long-term commitments of resources. The short-term commitments are related to the exploration and development of the CO_2 and oil resources. The long-term commitments are related to those activities associated with production of the CO_2 and beyond.

Most of the short- and long-term commitments will be mitigated by reclamation of disturbed lands to a productive condition. Committing more lands to CO_2 or oil production through leasing will create additional short- and long-term commitments of resources. An evaluation of the short- and long-term commitments is presented in Table 12 below.

TABLE 12

Short-Term vs. Long-Term Commitments of Resources

Resource	Short-Term	Long-Term
Air Quality	The emissions resulting from oil and CO_2 development production will reduce the existing air quality in the project area. These can be partially mitigated.	Upon depletion of the oil and CO_2 and final reclamation of disturbed areas, no continued effects on air quality should remain.
Soils	Soil erosion is expected to occur during and immediately following construction and until reclamation is completed.	Soils lost to erosion will affect long-term productivity. Soil loss above the normal rates endemic to the area are not expected continue after reclamation
Vegetation	Vegetative production will be lost during construction and operation of the oil and CO_2 fields. The loss will occur until final abandonment and reclamation.	Significant long-term impairment of vegetative productivity following reclamation is not expected. Some reduction in long-term vegetative productivity can be expected due to soil loss.

Visual	Impacts to the natural setting will exist throughout the life of the CO_2 or oil field.	Most visual impacts should be eliminated upon removal of structures and and reclamation of the landscape to a natural appearance.
Recreation	Short-term recreation opportunities and uses will be altered significantly during oil and CO_2 field development and production. There will be an increased demand for recreation opportunities as a result of increased population.	Following depletion of the oil and CO_2 resources many existing recreation opportunities will become available again. However, primitive and semiprimitive recreation opportunities will be lost as a result of the evidence of man's past activities.
Wilderness	The quality of the Wilderness experience will be decreased in the short term from activities adjacent to and within the Wilderness and ISA. The potential for increased human presence in the Wilderness as a result of increased population during field development will also affect the sense of solitude in primitive type recreation areas.	Decreased activities after construction and production and reclamation of sites to substantially unnoticeable conditions should reestablish most primitive values. If CO_2 or oil is developed on existing leases in the Wilderness and ISA, some evidence of these activities will always remain and the primeval character will be lost.
Timber	Removal of timber to accommodate roads, wellsites, and other facilities will be a temporary impact. Increased incidences of fire can be expected.	Long-term productivity will not be significantly impaired.

Wildlife	The short-term impacts to wildlife will be from loss of habitat, poaching, road kills, and a reduction in big game production.	Long-term losses in wildlife productivity following reclamation and reduction of human activities are not expected to be significant.
Socio-Economic	Short-term impacts will be two-fold. There will be a sudden increase in economic benefits accompanied by an increased demand for public services, and an adverse effect on the quality of life and established values.	Long-term economic benefits will accrue and continue throughout the life of the project as a result of increased employment and other economic benefits from resource production.
Water	Short-term impacts to water resources will result from increased stream sedimentation and water being diverted from other uses to accommodate CO_2 or oil field development and for culinary purposes.	Long-term impairment of water resources is not anticipated.
CO_2 and Oil	The CO_2 and oil will be committed for immediate beneficial uses.	CO_2 and oil will not be available for future uses.

CHAPTER V

CHAPTER V - PREPARERS

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CHAPTER VI

CHAPTER VI - SCOPING

A Scoping Statement was sent to agencies, organizations, and individuals interested in the Escalante KGS in May of 1986. Comments on the original scoping were received from 105 people and were used to identify issues, concerns, and opportunities. They were also used for evaluating possible alternatives and developing mitigating measures.

A news release was also published in the following newspapers:

Garfield County News
Cedar City "The Spectrum"
Richfield Reaper
Salt Lake Tribune
Deseret News
Iron County Review
Las Vegas Review Journal
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After the original scoping process was completed, a preliminary Environmental Assessment was made available for public comment.

The Content Analysis of the comments received on the Scoping Statement and preliminary Environmental Assessment for Oil and Gas Leasing in the Escalante Known Geological Structure (KGS) follows:

The majority of respondents were easily divided into two categories; those in favor of full leasing and development and those in favor of limited or no leasing and development in the KGS. Public comment showed little support of any "compromise" alternatives.

Comments of those responding in favor of limited or no leasing

Need for an EIS

Respondents felt that an EIS should be prepared as required by the National Environmental Policy Act (NEPA) because oil and gas leasing is a major federal action. Several court cases (Sierra Club vs. Peterson, Conner vs. Burford, and Bob Marshall Alliance vs. James Watt) were noted as legal precedence. Several respondents stated that a multi-staged analysis is unlawful where leases irretrievably grant development rights, and an EIS is needed now, not after the leases have been issued. The Utah Wilderness Act of 1984, in establishing the Exclusion Areas, stated that leasing must comply with NEPA and an EIS should be prepared. Commenters stated it was Congress' intent that an EIS be prepared. Many reviewers doubted the legality of the EA because it failed to study the impacts of leasing on the existing and proposed Wilderness. They argued that the document was flawed and an EIS should be prepared. Other reasons endorsed by respondents for completing an EIS included: (1) stipulations and mitigation measures cannot take the place of a thorough EIS, (2) the cumulative impacts of exploration and development staggered over a 15 to 20-year period and the cumulative impacts studied with timber and other resource use need to be analyzed in accordance with NEPA, (3) one of the factors in determining the intensity of a proposed action is geographic characteristics and Exclusion Areas quality, and (4) the controversial nature of proposed leasing.

Alternatives

Respondents suggested a strict "no leasing" alternative be considered. They felt even Alternative I was not restrictive enough by allowing

development on existing leases. The Utah Wilderness Act does not mandate the Exclusion Areas or Antone Bench be leased, just that a decision be made about opening up the area to competitive CO_2 leases. One respondent questioned the validity of leases in the area because the 1974 Aquarius Plateau Land Use Plan recommended no leasing in the area.

Recreation/Visuals

Respondents felt any development on Antone Bench was incompatible with recreation and visual qualities. Additional roads could increase fishing pressure on backcountry lakes. There would be a loss of pristine qualities in this primitive setting. The noise level of the development should not be judged against EPA's standard for "public health and safety" but within the context of a Wilderness setting. Development of the area would mar this most unique setting with roads, processing plants, pipelines, and storage facilities which would dominate the landscape for years, if not indefinitely. The EA states that road building in certain areas might necessitate blasting through rock, leaving permanent scars in the environment. Because Antone Bench could never be reclaimed to the point that blasted roads would be "substantially unnoticeable", it cannot be developed because of Section 306 in the Utah Wilderness Act. The National Park Service felt any alternative except Alternative I would be detrimental to the watershed and airshed of the Aquarius Plateau which are major focal points from vistas at Bryce Canyon.

Soil/Water

Many respondents were concerned that the discussion of impacts on the water resource was incomplete and the analysis insufficient. A major concern was the disruption that the development could have on the hydrology of the area, because the entire area is fed by springs. The scoping document states that little data is available on groundwater resources, thus any development could be in direct conflict with the Utah Wilderness Act because the Act states that nothing can impair water quality or quantity. The potential contamination of surface water and underground aquifers by hydrogen sulfide from processing plants in this pristine area was a concern to many. The scoping document incorrectly reaches the conclusion that increased sedimentation would cause few or no impacts in riparian areas. Commenters felt statements about possible adverse impacts contradict one another throughout the document. Increased requirements for culinary water in Escalante could lead to conflicts with existing land uses.

Wildlife

Most respondents felt any development in the KGS would degrade wildlife habitat. Because of steep canyon walls, wildlife using the area would have no escape routes in certain corridors. The protection of threatened, endangered and sensitive species needs to be more thoroughly addressed. The Fish and Wildlife Service was not consulted for a wildlife inventory.

A pre-leasing assessment for the peregrine falcon and the bald eagle needs to be completed. Road density is a critical factor for determining habitat sensitivity of the area. Again, respondents cited contradictory statements or insufficient data, yet conclusions of little impacts. Sedimentation from road and pad construction could impair or destroy trout spawning areas.

Cultural Resources

Appropriate studies should be conducted before any recommendation is made to ensure compliance with the National Historic Preservation Act.

Vegetation/RNA

One respondent was concerned about the protection of rare or sensitive plants. He encouraged the FS to include in the stipulations of APDs, protection for any rare plants in the area. He also recommended that the Sand Creek site be protected from development as a potential RNA candidate for moderate site ponderosa pine.

Socio/Economic

Several commenters were concerned that analysis in the EA did not include the dollar loss to local communities and the State for fishing, hunting or tourism decline during the life of the project. Planners need to remember tourists spend their dollars locally and have a positive economic benefit to the community. Heavy traffic on Highway 12 during the project could negatively impact tourism. Long-term impacts to local communities need to be addressed.

Need for Project

Respondents were concerned that the issue of the demand for CO_2 and oil in a saturated world market was overlooked. The scoping document reaches conclusions which address quality and commercial viability of CO_2, yet do not address the economic tradeoffs between the mineral resource and the surface resource. They felt that the Forest Service relied upon questionable and biased sources for their information on the extent of CO_2 reserves, making the boundaries of the KGS inaccurate.

Comments from those in favor of full leasing and development

Need for an EA/EIS

One respondent questioned the need for any environmental document in light of the impending Dixie National Forest Plan. Another respondent thought an EA should only include Antone Bench and Exclusion Areas 2 through 5; the remaining KGS should be evaluated through the Forest Planning process. The State of Utah thought there was no need for an EIS, although additional

geological information may change the State's outlook. Several thought this document should not be used as a guide for the Intermountain Region as had been proposed.

Inaccuracies in EA

Oil and gas industry representatives stated it is unlikely that every lease would be developed; research should be conducted as to what percentage of leases experience drilling. Assuming that drilling will occur on every lease implies a worst case scenario. Recent policy of CEQ is that no "worst case analysis" should be completed where too many unknowns exist. They felt that, because of this assumption, the amount of acreage described

in the environmental consequences section is exaggerated. Impacts would be minimal if acreage requirements were more realistically projected. They felt the alternatives and the impacts needed to be revised. They also thought impacts to the environment are not created just because leasing takes place, only when development does. The NEPA document should clarify that mitigation measures will lessen the adverse impacts, and that the development proposal is the stage where site-specific stipulations and impacts are determined.

Issues

Issue D, "should only CO_2 leases be offered in Antone Bench and Exclusion Areas 2-5 as provided in the Utah Wilderness Act of 1984?", is not relevant because only CO_2 can be offered in Exclusion Areas by decree of the Utah Wilderness Act. Industry representatives wanted an issue developed relating to opportunities for oil and gas and CO2 exploration and development resulting from each alternative.

Socio/Economic

Garfield County representatives felt mineral development would bring economic stability to the area and raise income levels of the County. They felt that any impacts due to increased population levels could be resolved, given proper preparation.

Leasing Concerns

The State of Utah had several concerns about the leasing process itself. The market usually drives the amounts of the bids, but floors should be established to ensure administrative costs are covered. Current leaseholders in the KGS should not be given any advantage over new lessees. The NEPA document needs to clarify that leases will be issued in the future within or adjacent to the KGS even if they are not issued at this time. An industry representative was concerned that 40 percent of the time to lease in the Exclusion Areas had elapsed, yet not one lease had been issued.

Resource Concerns

The State encouraged coordination with Utah Department of Transportation and Division of Wildlife Resources in transportation planning to reduce a "cobweb" effect of road locations. One industry representative wanted the impacts on threatened and endangered species more definitively explained, such as the seasons of use and the reason for the species' sensitivity. The NEPA document needs to explain further that laws and regulations will not allow the degradation of water quality.

In addition to contacting news media, State and Federal agencies, individuals, and industry representatives, an "open house" was held in Cedar City, Utah on June 18, 1986, to further discuss the KGS preliminary EA. The open house was attended by Douglas Austin and Bill Sheehan of the Forest Service, Jed Meyers, Josh Kardon and Clive Kincaid of the Southern Utah Wilderness Alliance and George and Jerry Minot.

In November 1986, a Forest Service decision was made to prepare an Environmental Impact Statement. The comment period was from December 1986 to March 1987. The following is a summary of the substantive comments received:

a. An analysis should be made of the economic viability of developing the CO_2 field considering the low CO_2 well pressures and the current low oil prices.

b. Can the existing leases support economic development if no further leasing is allowed in the KGS?

c. Antone Bench and Exclusion Areas 2, 3, 4, and 5 were released for CO_2 leasing and should be developed.

d. Concern was expressed that the Exclusion Areas will not be reclaimed following exploration and development.

e. Lease only areas of high probability of development.

f. Only exploration using helicopters for transportation will be allowed on Antone Bench.

g. The EIS should consider the impacts of facilities.

h. The EIS should include an in-depth analysis of each alternative considered.

i. Antone Bench may not be reclaimable to a substantially unnoticeable condition.

j. Impacts to the visual resources as viewed from within the Wilderness should be evaluated.

k. All impacts should be quantified.

l. Development may degrade quality of water and wildlife habitat inside the Wilderness.

On January 9, 1987 a public meeting was held in Escalante, Utah to discuss local issues and concerns about the KGS. The meeting was attended by approximately 25 people, including members of the Utah Wilderness Association.

Issues and concerns raised at this meeting follow:

a. If it benefits Garfield County financially, lease it.

b. Garfield County is in a state of economic depression. a significant amount of leasing can be done without disturbing the KGS environmental condition. We support Alternative V. Lease all available leases.

c. Support Alternative V: give Industry a chance to explore and prospect the outer limits of the KGS.

d. We traded land off in the High Unitas for these fingers. We must support Alternintas V.

e. The Exclusions are highly vulnerable and we must analyze them to see if they can be protected.

f. Go ahead and open it up for leasing. We support Alternative V. Time for using CO_2 is, now not 4 years down the road.

g. Consider areas that might be more useful for leasing.

h. Escalante town supports Alternative V. Escalante is depressed and can use Industry to come to this area.

i. We need more analysis for the 5 areas so that we can reduce controversy over whether those areas are or are not being suitable for leasing. How much CO_2 is in these areas and how do they effect the KGS as a whole?

j. Garfield County residents have to live with the decisions that are made, thus, they need to have the results favor Garfield County.

During the first week in January, the Forest Service requested input from the Escalante Town Council concerning leasing alternatives in the KGS.

Forest Service District Personnel attended the Town Council meeting to discuss potential impacts on the town.

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Eagle River, AK 99577

Ms. Donna Wilson
Box 341
Escalante, UT 84726

Mr. Glen Wilson
Box 341
Escalante, Utah 84726

Mr. Greg Woodall
P.O. Box 1100
Hurricane, UT 84737

Mr. Henry G. Wright
Attorney at Law
P.O. Box 2312
1911 Main Avenue
Durango, CO 81301

ENVIRONMENTAL GROUPS

American Wilderness Alliance
ATTN: Clifton R. Merritt
7600 East Arapahoe Road
Suite 114
Englewood, CO 80112

Aspen Wilderness Workshop, Inc.
Ms. Dottie Fox, Chairman
P. O. Box 9025
Aspen, CO 81612

Environmental Defense Fund
ATTN: Mr. David B. Roe
Senior Attorney
2606 Dwight Way
Berkeley, CA 94704

Sierra Club
ATTN: Mr. Rudy Lukz
P.O. Box 3580
Logan, UT 84321

Sierra Club
ATTN: Mr. Andrew Mauck
601 Canyon
Boulder, NV 89005

Sierra Club, Utah Chapter
ATTN: Mr. James Catlin
Conservation Chairman
615 South 300 East
Salt Lake City, UT 84111

Southeast Resource Council
ATTN: Ms. Jane Whalen
P.O. Box 1182
Hurricane, UT 84737

Southern Utah Wilderness Alliance
Metro Field Office
436 E. Alameda
Salt Lake City, UT 84111

The National Parks and
Conservation Association
ATTN: Ms. Terri Martin
P.O. Box 1563
Salt Lake City, UT 84110

The Wilderness Society
Central Rockies Region
1720 Race Street
Denver, CO 80206

The Wilderness Society
ATTN: Michael Medberry, Utah
Representative
436 East Alameda Avenue
Salt Lake City, UT 84111

The Nature Conservancy
ATTN: Mr. Joel S. Tuhy
Utah Public Lands Coordinator
2225 South Highway 89-91
Wellsville, UT 84339

Utah Farm Bureau
ATTN: Mr. Vic Sanders
Utah Public Lands Mutiple Use Cor.
5300 South 360 West
Salt Lake City, UT 84723

Utah Wilderness Association
ATTN: Mr. Gary Macfarlane
Conservation Director
455 East 400 South, #306
Salt Lake City, UT 84111

Utah Wilderness Coalition
615 S. 300 E.
Salt Lake City, UT 84111

Wasatch Mountain Club
Conservation Committee
ATTN: Christopher A. Biltoft
529 10th Avenue
Salt Lake City, UT 84103

INDUSTRY

Amoco Production Company
ATTN: Mr. D. R. Brown
Regional Admin. Compliance Coord.
P.O. Box 800
Denver, CO 80201

Beard Oil Company
ATTN: Ms. Cheryl Reese
2000 Classen Center
Oklahoma City, OK 73106

Exxon Company, USA
ATTN: Ms. Lynda Chenoweth
P.O. Box 1600
Midland, TX 79702

Exxon Company, USA
ATTN: Mr. H. W. Praetorius, Manager
Exploration Dept., Western Division
P.O. Box 120
Denver, CO 80201

Marathon Oil Company
ATTN: Mr. Bradley G. Penn
Land/Environmental Coordinator
P.O. Box 120
Casper, WY 82602

Mid Continent Oil Company
ATTN: Mr. John Slawter, President
12700 Park Central Place, Suite 1404
Dallas, TX 75251

Rocky Mountain Oil
and Gas Association, Inc.
ATTN: Ms. Alice Frell Benitez
Public Lands Director
1860 Lincoln Street, Suite 404
Denver, CO 80295

GOVERNMENT

Honorable Norman H. Bangerter
Governor of Utah
Office of the Governor
Salt Lake City, UT 84114

Director, Office of Environmental
Project Review
Office of the Secretary
Depart. of the Interior, Room 4256
Washington, DC 20240

Management Information Unit
Office of Federal Activities (A-104)
Environmental Protection Agency
Room 2119 Mall
401 M Street, SW
Washington, DC 20460

Environmental Protection Agency
Appropriate Regional Offices

Executive Director
Five-County Organization
Iron County Courthouse
Parowan, UT 84761

Mr. Thomas V. Hatch, Chairman
Garfield County Commission
Garfield County Courthouse
P.O. Box 77
Panguitch, UT 84759

Ms. Sandra H. Key
Superintendent
Bryce Canyon National Park
Bryce Canyon, UT 84717

Resource Development
Coordinating Committee
116 State Capitol Building
Salt Lake City, UT 84114

Executive Secretary
Six-County Commissioners Org.
Federal Building
Richfield, UT 84701

Utah State Planning Coordinator
Office of the Governor
State Capitol Building
Salt Lake City, UT 84114

APPENDICES

APPENDICES

APPENDIX A

Standard Lease Form (BLM Form 3100-11)

Stipulation for Lands of the National Forest System Under Jurisdiction of Department of Agriculture

Form 3100-11*
(March 1984)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB No. 1004-0008
Expires January 31, 1986

Serial No.

OFFER TO LEASE AND LEASE FOR OIL AND GAS

The undersigned (reverse) offers to lease all or any of the lands in item 2 that are available for lease pursuant to the Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq.), the Mineral Leasing Act for Acquired Lands (30 U.S.C. 351-359), the Attorney General's Opinion of April 2, 1941 (40 OP. Atty. Gen. 41), or the

Read Instructions Before Completing

1. Name

   Street

   City, State, Zip Code

2. This offer/lease is for: (Check Only One) ☐ PUBLIC DOMAIN LANDS ☐ ACQUIRED LANDS (percent U.S. interest _____)

   Surface managing agency if other than BLM: _____ Unit/Project _____

   Legal description of land requested:

T.	R.	Meridian	State	County

Total acres applied for _____

Amount remitted: Filing fee $ _____ Rental fee $ _____ Total $ _____

DO NOT WRITE BELOW THIS LINE

3. Land included in lease:

T.	R.	Meridian	State	County

Total acres in lease _____

Rental retained $ _____

In accordance with the above offer, or the previously submitted simultaneous oil and gas lease application or competitive bid, this lease is issued granting the exclusive right to drill for, mine, extract, remove and dispose of all the oil and gas (except helium) in the lands described in item 3 together with the right to build and maintain necessary improvements thereupon for the term indicated below, subject to renewal or extension in accordance with the appropriate leasing authority. Rights granted are subject to applicable laws, the terms, conditions, and attached stipulations of this lease, the Secretary of the Interior's regulations and formal orders in effect as of lease issuance, and to regulations and formal orders hereafter promulgated when not inconsistent with lease rights granted or specific provisions of this lease.

Type and primary term of lease:

☐ Simultaneous noncompetitive lease (ten years)

☐ Regular noncompetitive lease (ten years)

☐ Competitive lease (five years)

☐ Other _____

THE UNITED STATES OF AMERICA

by _____
(Signing Officer)

_____ (Title) _____ (Date)

EFFECTIVE DATE OF LEASE _____

*(Formerly 3110-1, 2, 3, 3120-1, 7, 3130-4, 5, and 7)

4. (a) Undersigned certifies that (1) offeror is a citizen of the United States; an association of such citizens; a municipality; or a corporation organized under the laws of the United States or of any State or Territory thereof; (2) all parties holding an interest in the offer are in compliance with 43 CFR 3100 and the leasing authorities; (3) offeror's chargeable interests, direct and indirect, in either public domain or acquired lands do not exceed 200,000 acres in oil and gas options or 246,080 acres in options and leases in the same State, or 300,000 acres in leases and 200,000 acres in options in either leasing District in Alaska; and (4) offeror is not considered a minor under the laws of the State in which the lands covered by this offer are located.

(b) Undersigned agrees that signature to this offer constitutes acceptance of this lease, including all terms, conditions, and stipulations of which offeror has been given notice, and any amendment or separate lease that may include any land described in this offer open to leasing at the time this offer was filed but omitted for any reason from this lease. The offeror further agrees that this offer cannot be withdrawn, either in whole or part, unless the withdrawal is received by the BLM State Office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has been signed on behalf of the United States.

This offer will be rejected and will afford offeror no priority if it is not properly completed and executed in accordance with the regulations, or if it is not accompanied by the required payments. 18 U.S.C. Sec. 1001 makes it a crime for any person knowingly and willfully to make to any Department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

Duly executed this _____ day of _____, 19 _____. _____

(Signature of Lessee or Attorney-in-fact)

LEASE TERMS

Sec. 1. Rentals—Rentals shall be paid to proper office of lessor in advance of each lease year. Annual rental rates per acre or fraction thereof are:

(a) Simultaneous noncompetitive lease, $1.00 for the first 5 years, thercafter, $3.00;
(b) Regular noncompetitive lease, $1.00;
(c) Competitive lease, $2.00; or
(d) Other, see attachment.

If all or part of a noncompetitive leasehold is determined to be within a known geological structure or a favorable petroleum geological province, annual rental shall become $2.00, beginning with the lease year following notice of such determination. However, a lease that would otherwise be subject to rental of more than $2.00 shall continue to be subject to the higher rental.

If this lease or a portion thereof is committed to an approved cooperative or unit plan which includes a well capable of producing leased resources, and the plan contains a provision for allocation of production, royalties shall be paid on the production allocated to this lease. However, annual rentals shall continue to be due at the rate specified in (a), (b), (c), or (d) for those lands not within a participating area.

Failure to pay annual rental, if due, on or before the anniversary date of this lease (or next official working day if office is closed) shall automatically terminate this lease by operation of law. Rentals may be waived, reduced, or suspended by the Secretary upon a sufficient showing by lessee.

Sec. 2. Royalties—Royalties shall be paid to proper office of lessor. Royalties shall be computed in accordance with regulations on production removed or sold. Royalty rates are:

(a) Simultaneous noncompetitive lease, 12½%;
(b) Regular noncompetitive lease, 12½%;
(c) Competitive lease, see attachment; or
(d) Other, see attachment.

Lessor reserves the right to specify whether royalty is to be paid in value or in kind, and the right to establish reasonable minimum values on products after giving lessee notice and an opportunity to be heard. When paid in value, royalties shall be due and payable on the last day of the month following the month in which production occurred. When paid in kind, production shall be delivered, unless otherwise agreed to by lessor, in merchantable condition on the premises where produced without cost to lessor. Lessee shall not be required to hold such production in storage beyond the last day of the month following the month in which production occurred, nor shall lessee be held liable for loss or destruction of royalty oil or other products in storage from causes beyond the reasonable control of lessee.

Minimum royalty shall be due for any lease year after discovery in which royalty payments aggregate less than $1.00 per acre. Lessee shall pay such difference at end of lease year. This minimum royalty may be waived, suspended, or reduced, and the above royalty rates may be reduced, for all or portions of this lease if the Secretary determines that such action is necessary to encourage the greatest ultimate recovery of the leased resources, or is otherwise justified.

An interest charge shall be assessed on late royalty payments or underpayments in accordance with the Federal Oil and Gas Royalty Management Act of 1982 (FOGRMA) (96 Stat. 2447). Lessee shall be liable for royalty payments on oil and gas lost or wasted from a lease site when such loss or waste is due to negligence on the part of the operator, or due to the failure to comply with any rule, regulation, order, or citation issued under FOGRMA or the leasing authority.

Sec. 3. Bonds—Lessee shall file and maintain any bond required under regulations.

Sec. 4. Diligence, rate of development, unitization, and drainage—Lessee shall exercise reasonable diligence in developing and producing, and shall prevent unnecessary damage to, loss of, or waste of leased resources. Lessor reserves right to specify rates of development and production in the public interest and to require lessee to subscribe to a cooperative or unit plan, within 30 days of notice, if deemed necessary for proper development and operation of area, field, or pool embracing these leased lands. Lessee shall drill and produce wells necessary to protect leased lands from drainage or pay compensatory royalty for drainage in amount determined by lessor.

Sec. 5. Documents, evidence, and inspection—Lessee shall file with proper office of lessor, not later than 30 days after effective date thereof, any contract or evidence of other arrangement for sale or disposal of production. At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing amounts and quality of all products removed and sold, proceeds therefrom, and amount used for production purposes or unavoidably lost. Lessee may be required to provide plats and schematic diagrams showing development work and improvements, and reports with respect to parties in interest, expenditures, and depreciation costs. In the form prescribed by lessor, lessee shall keep a daily drilling record, a log, information on well surveys and tests, and a record of subsurface investigations and furnish copies to lessor when required. Lessee shall keep open at all reasonable times for inspection by any authorized officer of lessor, the leased premises and all wells, improvements, machinery, and fixtures thereon, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or in the leased lands. Lessee shall maintain copies of all contracts, sales agreements, accounting records, and documentation such as billings, invoices, or similar documentation that supports costs claimed as manufacturing, preparation, and/or transportation costs. All such records shall be maintained in lessee's accounting offices for future audit by lessor. Lessee shall maintain required records for 6 years after they are generated or, if an audit or investigation is underway, until released of the obligation to maintain such records by lessor.

During existence of this lease, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 6. Conduct of operations—Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-ways. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee shall contact lessor to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects.

Sec. 7. Mining operations—To the extent that impacts from mining operations would be substantially different or greater than those associated with normal drilling operations, lessor reserves the right to deny approval of such operations.

Sec. 8. Extraction of helium—Lessor reserves the option of extracting or having extracted helium from gas production in a manner specified and by means provided by lessor at no expense or loss to lessee or owner of the gas. Lessee shall include in any contract or sale of gas the provisions of this section.

Sec. 9. Damages to property—Lessee shall pay lessor for damage to lessor's improvements, and shall save and hold lessor harmless from all claims for damage or harm to persons or property as a result of lease operations.

Sec. 10. Protection of diverse interests and equal opportunity—Lessee shall: pay when due all taxes legally assessed and levied under laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; and take measures necessary to protect the health and safety of the public.

Lessor reserves the right to ensure that production is sold at reasonable prices and to prevent monopoly. If lessee operates a pipeline, or owns controlling interest in a pipeline or a company operating a pipeline, which may be operated accessible to oil derived from these leased lands, lessee shall comply with section 28 of the Mineral Leasing Act of 1920.

Lessee shall comply with Executive Order No. 11246 of September 24, 1965, as amended, and regulations and relevant orders of the Secretary of Labor issued pursuant thereto. Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 11. Transfer of lease interests and relinquishment of lease—As required by regulations, lessee shall file with lessor any assignment or other transfer of an interest in this lease. Lessee may relinquish this lease or any legal subdivision by filing in the proper office a written relinquishment, which shall be effective as of the date of filing, subject to the continued obligation of the lessee and surety to pay all accrued rentals and royalties.

Sec. 12. Delivery of premises—At such time as all or portions of this lease are returned to lessor, lessee shall place affected wells in condition for suspension or abandonment, reclaim the land as specified by lessor and, within a reasonable period of time, remove equipment and improvements not deemed necessary by lessor for preservation of producible wells.

Sec. 13. Proceedings in case of default—If lessee fails to comply with any provisions of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation. Lessee shall also be subject to applicable provisions and penalties of FOGRMA (96 Stat. 2447). However, if this lease includes land known to contain valuable deposits of leased resources, it may be cancelled only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Sec. 14. Heirs and successors-in-interest—Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to the heirs, executors, administrators, successors, beneficiaries, or assignees of the respective parties hereto.

The following stipulation is attached to all leases which include National Forest System lands.

STIPULATION FOR LANDS OF THE NATIONAL FOREST SYSTEM UNDER JURISDICTION OF DEPARTMENT OF AGRICULTURE

The licensee/permittee/lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the license/prospecting permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of the Interior, (2) uses of all existing improvements, such as Forest development roads, within and outside the area licensed, permitted or leased by the Secretary of the Interior, and (3) use and occupancy of the NFS not authorized by a permit/operating plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed

to: Forest Supervisor
Dixie National Forest
at: 82 North 100 East
P.O. Box 580
Cedar City, UT 84720

telephone: (801) 586-2421

who is the authorized representative of the Secretary of Agriculture.

_____
Signature of Licensee/Permittee/Lessee

APPENDIX B

Matrix for Applying Special Lease Stipulations

Special Stipulations for Oil and Gas Leases

Special Stipulations to be Applied to Carbon Dioxide (CO_2) Leases Issued on Antone Bench

Leasing Matrix

The following matrix will be used by the line manager to determine which special stipulations should be recommended for inclusion in leases issued for any parcel of land within the KGS.

In instances where more than one stipulation is indicated for the protection of a particular resource, the line manager will select the appropriate stipulation based on the surface resource.

No.	Stipulation Summary	Area/Environmental Condition	Primitive Recreation Areas	Retention and Partial Retention Areas	Developed Recreation Sites	High Mass Failure Hazard	Steep Slopes 45% and Greater	Riparian Areas	Seasonal Wildlife Habitat	T&E and Sensitive Species Habitat	Administrative Sites	Unique Geological Landforms 2/	Antone Bench 3/	Significant Cultural Area 1/	Culinary and Nonculinary Springs	All Areas
1	No Surface Occupancy - entire lease											X				
2	Visual - No road, structure, etc., if visible from road			X	X											
3	No Surface Occupancy - All or portions (legal subdivision) of lease			X								X		X		
4	No surface occupancy within ____ feet of road, river, trail, etc.			X	X			X							X	
5	No drilling or storage within ___ feet of reservioirs, archaeological sites			X	X			X						X	X	
6	Steep slope occupancy limitations						X									
7	Seasonal occupancy limitations - Wildlife								X							
8	Prohibit activity - muddy or wet periods															X
9	Prohibit use of Trail/Road as access															X
10	Visual - painting or camouflage	X	X	X									X			
11	No surface occupancy - (May be used in place of Stipulation No.'s 1, 3, or 6)			X	X	X					X	X			X	
12	No drilling, storage, surface disturbance within feet of		X	X			X				X			X		
13	Activity allowed only during _____ (May replace Stipulation No. 7)	X				X		X	X							
14	Controlled or Limited Surface Occupancy	X	X													
15	Activity Coordination	X						X	X							
16	Protection of T&E Species									X						X
	Conditions found in Sec. 306 of the Utah Wilderness Act of 1984												X			

1/ A cultural resource survey is required prior to surface disturbance.
2/ Prior to surface disturbance, slick rock portions of Sand Creek drainage located east of Hells Backbone Bridge.
3/ Antone Bench and Exclusion Areas 2, 3, 4, and 5 as designated by the Utah Wilderness Act.

SPECIAL STIPULATIONS FOR OIL AND GAS LEASES

Following are the special stipulations listed on the matrix that may be used to supplement the terms and conditions of the lease, and are necessary to protect specific resource values on the lease area. If found to be in the public interest, these stipulations may be made less restrictive when specifically approved in writing by the authorized officer, Bureau of Land Management, with the concurrence of the Federal surface management agency.

Supplemental Stipulation No. 1

All of the land in this lease is included in (recreation or special area, etc), Therefore, no occupancy or disturbance of the surface of the land described in this lease is authorized. The lessee, however, may exploit the oil and gas resources in this lease by directional drilling from sites outside this lease. If a proposed drilling site lies on land administered by the Bureau of Land Management, or by the Forest Service, a permit for use of the site must be obtained from the BLM District Manager or the Forest Service District Ranger, before drilling or other development begins.

Supplemental Stipulation No. 2

No access or work trail or road, earth cut or fill, structure or other improvement, other than an active drilling rig, will be permitted if it can be viewed from the (road, lake, river, etc.).

Supplemental Stipulation No. 3

No occupancy or other activity on the surface of (legal subdivision) is allowed under this lease.

Supplemental Stipulation No. 4

No occupancy or other surface disturbance will be allowed within _____ feet of the _____ (road, trail, river, creek, canal, etc.). This distance may be modified when specifically approved in writing by the authorized officer, Bureau of Land Management, with the concurrence of the Federal surface management agency.

Recommendations:
400' from non-culinary spring sources.
600' from Hells Backbone Bridge.
1000' from culinary sources.
500' from riparian areas.

Supplemental Stipulation No. 5

No drilling or storage facilities will be allowed within _____ feet of (live water, the reservoir, the archaeological site, the historical site, the paleontological site, etc.) located in (legal subdivision). This distance may be modified when specifically approved in writing by the authorized officer, Bureau of Land Management, with the concurrence of the Federal surface management agency.

Recommendations:
1000' from culinary sources.
600' from non-culinary sources.

Supplemental Stipulation No. 6

No occupancy or other surface disturbance will be allowed on slopes in excess of 45 percent, without written permission from the authorized officer, Bureau of Land Management, with the concurrence of the Federal surface management agency.

Supplemental Stipulation No. 7

In order to (minimize watershed damage, protect important seasonal wildlife habitat, etc.), exploration, drilling, and other development activity will be allowed only (during the period from _____ to _____, during dry soil periods, over snow cover, on frozen ground). This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer, Bureau of Land Management, with the concurrence of the Federal surface management agency.

Supplemental Stipulation No. 8

In order to minimize watershed damage during muddy and/or wet periods, the authorized officer of the Federal surface management agency, through the authorized officer of the Bureau of Land Management, may prohibit exploration, drilling, or other development. This limitation does not apply to maintenance and operation of producing wells.

Supplemental Stipulation No. 9

The _____ (Trail/Road) will not be used as an access road for activities on this lease, except as follows: (No exceptions, weekdays during recreation season, etc.).

Supplemental Stipulation No. 10

To maintain esthetic values, all semi-permanent and permanent facilities may require painting or camouflage to blend with the natural surroundings. The paint selection or method of camouflage will be subject to approval by the authorized officer of the Bureau of Land Management, with the concurrence of the Federal surface management agency.

Supplemental Stipulation No. 11

No occupancy or other activity on the surface of the following described lands is allowed under this lease:

Reasons for this restriction are:

Examples of appropriate reasons for this restriction are:

1. Steep slopes.
2. Specific ecosystem, ecological land unit, land type, or geologic formation which presents hazards such as mass failure.
3. Special management units such as: Recreation Type I, water supply, administrative site, etc.

Approximately ____% of the lease.

Note: This stipulation can be used in place of Stipulation No. 1, 3, or 6

Supplemental Stipulation No. 12

No. _____ will be allowed within _____ feet of the _____ This area contains _____ acres and is described as follows:

Reasons:

First blank to be filled in with one or more of the following: drilling, storage facilities, surface disturbance, or occupancy. Second and third blanks to be filled in with one or more of the following:

1. ___ feet of wildlife habitat essential to specific species.
2. ___ feet of peripheral or unique vegetative type.
3. 200 feet of either side of centerline of roads or highways.
4. 500 feet of normal high waterline on all streams, rivers, ponds, reservoirs, lakes.
5. 600 feet of all springs
6. 400 feet of any improvements.

Note: Stipulation No. 12 can be used in place of Stipulation No. 4 or 5.

Supplemental Stipulation No. 13

In order to (minimize) (protect) _____,
_____ will
be allowed only during _____.
This does not apply to maintenance and operation of producing wells and facilities. Lands within leased area to which this stipulaiton applies are described as follows:

Reason:

First blank to be filled in with one or more of the following:

1. Watershed damage.
2. Soil erosion
3. Seasonal wildlife habitat (winter range, calving/lambing area, etc.).
4. Conflict with recreaion.

Second blank to be filled in with one or more of the following:

1. Surface disturbing activities.
2. Exploration.
3. Drilling.
4. Development.

Third blank to be filled in with one or more of the following:

1. Period from _____ to _____
2. Dry soil periods.
3. Over the snow.
4. Frozen ground.

Note: Stipulation No. 13 can be used in place of Stipulation No. 7, giving greater definition as to restriction.

Supplemental Stipulation No. 14

Controlled or Limited Surface Use Stipulation

This stipulation may be modified when specifically approved in writing by the authorized officer, Bureau of Land Management, with concurrence of the Federal surface management agency. Distances and/or time periods may be made less restricteve depending on the actual on ground conditions.

The lessee/operator is given notice that all or portions of the lease area may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Any surface use or occupancy within such special areas whill be strictly controlled. Use or occupancy will be authorized only when the lessee/operator demonstrates that the special area is essential for operations in accordance with a surface use and operations plan which is satisfactory to the BLM and Federal surface management agency for the protection of such special areas and existing or planned uses. Appropriate modifications to imposed restrictions will be made for the maintenance and operation of producing oil and gas wells; however, in extremely critical situations, occupancy may only be allowed in emergencies.

After the Federal surface management agency has been advised of specific proposed surface use or occupancy on these lands, and on request of the lessee/operator, the agency will furnish more specific locations and additional information on such special areas which now include:

Description:

Reason for Restriction:

Duration of Restriction: (yearround, months)

Supplemental Stipulation No. 15

Activity Coordination Stipulation

This lease includes lands within _____ which has resource values sensitive to high levels of activity. In order to minimize impacts to these resources, special conditions, such as unitization prior to approval of operations, and/or other limitations to spread surface disturbance activities over time and space, may be required prior to approval and commencement of any operations on the lease.

Visually sensitive areas, Areas of Threatened and Endangered Species.

Supplemental Stipulation No. 16

Stipulation for the Protection of Endangered or Threatened Species

(Common name), (Scientific name), a (plant)(animal) species which is (officially listed) (proposed for listing) as a(n) (endangered) (threatened) species has been identified as occurring on or in the vicinity of the lease area. The lease area may contain essential habitat for the continued existence of this species.

The Federal surface management agency is responsible for assuring that the leased lands are examined, prior to undertaking any surface disturbing activities on lands covered by this lease, to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened or their habitats.

In accordance with Section 6 of the lease terms and in order to comply with the Endangered Species Act of 1972 the lessee/operator, either individually or in conjunction with other lessees, may be required to conduct an examination on the lands (including access routes to the leased area) to be affected by the proposed action to determine if threatened or endangered species are present or may be affected by the proposed action. This examination must be conducted by or under the supervision of a qualified resource specialist approved by the surface management agency. A report identifying the anticipated effects of the proposed action on endangered or threatened species and their habitat is to be submitted for approval to the surface management agency. If the examination determines that the action may detrimentally affect a species listed or proposed for listing as an endangered or threatened species, restrictions to the lessee/operator's proposal or even denial of any beneficial use of the lease may result. The lessee/operator shall take such measures as may be required by the authorized officer, surface management agency, to protect such species.

SPECIAL STIPULATIONS TO BE APPLIED TO CARBON DIOXIDE (CO_2) LEASES ISSUED ON ANTONE BENCH

The following stipulations are required to implement Section 306(b) of the Utah Wilderness Act of 1984.

1. Any proposal to locate a compressor station or other gas processing facility on Antone Bench shall include sufficient technical and economic information to support the need to locate such a facility on Antone Bench. The information shall include an analysis of available and applicable compressor station and field design technology, in addition to an economic and technical evaluation of alternative sites, including a location north of Antone Bench. The lessee/operator may be required by the authorized officer of the surface management agency to furnish additional information necessary to determine if a compressor station or other gas processing facility needs to be located on Antone Bench. It is understood by the lessee/operator that proprietary information will be protected in accordance with existing regulations; except that the information provided may be made available at the discretion of the Federal government to an independent contractor of the government for review and confirmation of the analysis.

2a. In order to implement Section 306(b)(2) of the Utah Wilderness Act of 1984, the lessee shall, in conjunction with any proposal to locate roads, pipelines, electric lines, buildings, compressor stations or other facilities on Antone Bench, provide studies containing sufficient detail so that an evaluation of the proposed site and available alternatives can be made to determine those locations which would minimize visual, noise, or other intrusions in the area and the Wilderness. The study shall include a "seen area" study and must account for visual and audio screening provided by topography and vegetation. The study must be acceptable to the authorized officer of the surface management agency. The lessee shall incorporate into the design of the compressor plant or other facilities measures to minimize noise.

2b. Permanent structures shall be designed to be the least intrusive to the natural landscape. The height of structures, locations, and the surface area occupied shall be kept to the minimum consistent with operation needs. The lessee/operator shall employ screening techniques which utilize the area's natural topography and vegetation to the maximum extent possible to reduce impacts to the natural surroundings. All permanent and semi-permanent structures shall be painted or camouflaged to blend with the natural background colors. The paint selection or method of camouflage will be subject to approval by the authorized officer. All powerlines used in conjunction with operations conducted under the terms of this lease shall be constructed using non-specular materials.

2c. Construction practices resulting in alterations or modifications to the existing topography shall be accomplished in such a manner that the modified landscape shall be compatible with and graded into the adjoining landform. The creation of unusual, objectionable, or unnatural landforms and vegetative features shall be avoided.

3. The lessee/operator shall inventory ground and surface waters within the Box-Death Hollow Wilderness and the Phipps-Death Hollow Instant Study Area to establish baseline data as to water quality and quantity. The inventory shall identify the location of springs, and other surface waters, contain an analysis of the geologic influences, identify unusual features such as hydraulic pressures, and source of pressurization. The lessee shall establish a monitoring system to measure and quantify any effect that the drilling for and production of carbon dioxide may have on the quality and quantity of these waters. The monitoring shall be an extension of the baseline data. The inventory and monitoring shall be conducted by methods approved by the authorized officer, surface management agency. All information resulting from the inventory and monitoring shall be submitted to the authorized officer.

4. The peregrine falcon, an officially listed endangered species under the Endangered Species Act of 1972, is suspected to occur on or within the vicinity of the leasehold.

The Federal surface management agency is responsible for assuring that the leased lands are examined, prior to undertaking any surface disturbing activities on lands covered by this lease, to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened or their habitats.

In accordance with Section 6 of the lease terms and in order to comply with the Endangered Species Act of 1972 and Section 306(b)(4) of the Utah Wilderness Act of 1984, the lessee/operator, either individually or in conjunction with other lessees, shall conduct an examination on the lands (including access routes to the leased area) to be affected by the proposed action to determine if the peregrine falcon, or other endangered or threatened species, are present and may be affected by the proposed action. This examination must be conducted by or under the supervision of a qualified resource specialist approved by the surface management agency. A report identifying the anticipated effects of the proposed action on endangered, or threatened, species or their habitat is to be submitted for approval to the surface management agency. If the examination determines that the action may detrimentally affect an endangered or threatened species, restrictions to the lessee/operator's proposal or even denial of any beneficial use of the lease may result. The lessee/operator shall take such measures as may be required by the authorized officer, surface management agency, to protect such species.

All aboveground powerlines used in conjunction with the extraction and processing of carbon dioxide from this lease shall be constructed so as to conform with the publication Suggested Practices for Raptor Protection on Powerlines, The State of the Art 1981 (Raptor Research Report No. 4, Raptor Research Foundation c/o Dept. of Veterinary Biology; University of Minnesota).

5. The Mexican Spotted Owl, a sensitive species, is suspected to occur on or within the vicinity of the leasehold. In accordance with section 6 of the lease terms and in order to comply with section 306(b)(4) of the Utah Wilderness Act of 1984, the lessee/operator, either individually or in conjunction with other lessees, shall conduct an examination on the lands to be affected, including access routes to the leased area, to determine if the Mexican Spotted Owl is present or may be affected by the proposed action. This examination must be conducted by or under the supervision of a qualified resource specialist approved by the surface management agency. A report identifying the anticipated effects of the proposed action on endangered or threatened species or their habitat is to be submitted for approval to the surface management agency. If the examination determines that the action may detrimentally affect the Mexican Spotted Owl, the lessee/operator may be required to conduct construction activities during seasons or periods when there would be minimum impacts to the sensitive species.

APPENDIX C

Mitigating Measures

Road Design Standards - Escalante KGS

Mitigating Measures

The following and other necessary site-specific mitigating measures will be included as conditions of approval of APD's on leases in the KGS.

1. Coordinate developments with the natural landscape.

2. Locate roads on topography to reduce cuts and fills.

3. Match road surfacing to color of native materials on Antone Bench.

4. Use non-reflective materials on all metal surfaces to reduce visual impacts.

5. Paint metal buildings and other facilities to blend with natural surroundings. Also use color to break up the solid shapes of the buildings.

6. Scatter rock and other debris along pipelines to break up linear patterns.

7. Feather corridor edges of right-of-ways so they do not appear as straight lines.

8. Revegetate disturbed areas to native grass and shrubs.

9. Paint all exposed pipelines that are visible from major roads to blend with natural colors in the area.

10. Locate pipelines and powerlines to prevent long straight corridors adjacent to major roads.

11. Seed disturbed areas with appropriate seed mix and application rate to meet vegetation objectives of specific areas.

12. Design adequate drainage in all roads.

13. Avoid construction of any facilities on or across areas showing evidence of past land instability (slumps, landslides) and areas of geologic formations showing evidence of gypsum, particularly where water may be intercepted. If roads, drill pads, etc., must be constructed on such areas, minimize resource damage by either (1) filling rather than cutting across the area, or (2) making only minimum-sized cuts.

14. Survey area of proposed activity to determine presence of and impacts of proposal on any plant or animal species listed or proposed for listing as threatened or endangered, or their habitats. Conduct similar survey for species considered as sensitive by the Forest Service and/or the Utah Division of Wildlife Resources.

15. All road, drill pad, and other facility location and design will be subject to approval by the authorized officer of the Federal surface management agency.

16. Close roads to public use as needed.

17. Reclaim disturbed areas when no longer needed to as near the natural conditions as possible.

18. Construct drill sites and other facilities so as to protect them from flooding.

19. Assure reserve pits are large enough to hold all drilling fluids and produced waters with sufficient freeboard to contain all anticipated precipitation inputs.

20. Assure that reserve pits are properly sealed to eliminate leakage.

21. Assure that all surface runoff from drillsites is contained onsite and is properly disposed of.

22. Develop emergency spill plans. Contain all chemicals onsite in the event of spillage. Promptly report any release of wastes or chemical spills to proper authorities and to the representative of the surface management agency.

23. Dispose of all waste and wastewaters offsite unless approved by proper authorities with the concurrence of the surface management agency.

24. Take measures to increase the retention of sediment onsite and minimize the transport of sediment to streams and lakes when setback limits and erosion control measures are insufficient to protect stream channels from significant increases in sedimentation.

25. Monitor quality of surface and/or groundwater resources when the possibility of contamination is sufficient to warrant such action.

Road Design Standards - Escalante KGS

Objectives

The roads to be planned in the KGS would initially serve as access for exploration and, if the field is developed, may need to be reconstructed to provide access and mobility for operating and maintaining the field.

All roads will be planned, developed, and operated (maintained and managed) for their intended purposes considering safety, cost of transportation, and impacts to the land and resources.

The intended purpose of some roads may include pipeline and/or powerline burial.

Location and Design

Guidelines for road design and layout are outlined in the following Road Design Standards.

1. Roadway Template and Dimensions

   a. Single lane. Traffic volumes would be low enough that single lane would be sufficient on most roads.

   b. Outslope. Most roads should be constructed as an outslope road. However, this should be considered on a case-by-case basis, and ditch sections should be constructed when soils, grades, and slopes dictate.

   c. Subgrade width. Minimum subgrade width should be 14 feet. Additional width will be required when gravel surfacing is needed.

2. Curve Widening

   Curve widening will be included in the design sufficient to accommodate the design vehicle.

3. Turnouts

   Turnouts will be located to minimize the safety hazard and provide for flow of mixed traffic.

4. Slope Ratios

   a. Fill slopes. Fill slopes should be designed to provide for road stability.

b. Cut slopes. Cut slopes will vary depending on soil types and sideslope.

- 1/4:1 cut slopes would be used where roads are constructed across solid rock.
- 1:1 cut slopes would be used on outslope roads where minimal sloughing is expected.
- Flatter than 1:1 cut slopes should be used on roads using a ditched template so as to minimize maintenance costs due to sloughing banks.

5. Horizontal/Vertical Alignment

a. Horizontal alignment should be located to follow the contour and minimize the amount of cuts and fills. Minimum radius should be 60 feet.

b. Vertical Alignment. Grades should be rolled where possible to provide adequate drainage and minimize cuts and fills. Where sustained grades are required, grades should not exceed 8 percent unless special design considerations such as surfacing and ditching are used. Short pitches up to 15 percent may be considered, but these should not exceed 200 feet in length and proper drainage should be provided. These are maximums and should be considered on a case-by-case basis, depending on soils, drainage, and cross slope.

6. Clearing and Grubbing

Clearing limits for the road right-of-way should be from the top of the cut to the toe of the fill, or a minimum of 2 feet beyond the road shoulder. This should provide adequate clearing to maintain the roadway shoulder.

Slash should receive complete disposal to avoid slash concentrations and minimize visual impacts.

7. Drainage

Dips should be used on outsloped roads and should be placed at intervals sufficient to minimize the erosion potential. Spacing should be considered on a case-by-case basis, depending on soils and grade.

Live streams will be crossed with pipe structures. This will minimize the impact on the streams and provide for a stable road bed. Bridges should be considered where span, flow rate, etc., dictate.

Ditch relief culverts should be spaced at proper intervals where inslope/ditch template is required.

8. Aggregate Surfacing

Where subgrade soils are not of sufficient strength to accommodate the anticipated traffic, a surface coarse should be applied to provide adequate strength. A surface coarse can also be used, to provide an "all-weather" surface and can also be placed on the steeper grades to increase traction. Either pit run or crushed aggregate could be used depending on availability of material, quality of material available, and traffic. Load vs. soil strength analysis and sources should be approved on a case-by-case basis.

9. Location and Design

Roads should be located so as to avoid slopes over 40 percent. Roads constructed on slopes over 40 percent require large cuts and fills which may create adverse visual impacts and stability problems.

Wet areas should be avoided wherever possible. Wet areas create road stability problems which cause rutting and erosion problems. When wet areas must be crossed, proper engineering measures must be followed to minimize impacts.

Roads located on flat rocky ground will require borrow construction to provide a stable road prism above the natural ground surface to eliminate the problem of creating a ditch.

APPENDIX D

Scoping Analysis

Scoping Analysis

Leasing Recommendations for Escalante Known Geological Structure (KGS)

Project Name. Forest Service recommendations to the BLM relative to oil and gas, and CO_2 Leasing on the Escalante Known Geological Structure, Dixie National Forest.

Size. Approximately 80,000 Acres.

Timing. FS Recommendations needed by 7/1/87

Who wants the Environmental Analysis? The BLM has been asked by industry to issue competitive leases and needs the Regional Forester's recommendations for stipulations to lease or for no lease. Issuance of leases by the BLM is a Federal action which requires an environmental analysis to be in conformance with the National Environmental Policy Act of 1969 (NEPA), its implementing regulations (40 CFR 1500-1508), and agency direction. The Interagency Agreement between BLM and the FS for Mineral Leasing, signed 06/19/84, establishes the policy and procedures by which the proposal for competitive leasing in the Escalante KGS will be processed. Wherein the leasing proposal primarily involves the National Forest System lands and NFS issues, the FS will have the lead for environmental analysis and documentation for the leasing document.

Who is the Responsible Official? The State Director of BLM is the responsible official for the actual lease issuance. However, the Regional Forester is the responsible official for the USFS recommendations to lease, with stipulations proposed to cover any disturbance of the surface resource if leasing is decided by the Secretary of Interior.

Existing Documents that address activities within the area (KGS):

Utah Wilderness Act of 1984
Dixie National Forest Land and Resource Management Plan and Environmental Impact Statement
BLM's Environmental Analysis Documents (coordination)

Characteristics of the Proposed Action. The purpose of the analysis and the decision is to recommend whether oil and gas, or CO_2 leases should be offered or not; and, if a lease is offered, what the protective stipulations will be. Issuance of a lease will not impact the land or resources; however, because the lease grants a right to explore and develop the resource leased, the lease recommendations and stipulations should consider the reasonable effects of the exploration and development.

Possible Environmental Effects. The environmental analysis will consider the following environmental effects that might occur if the leases are developed.

a. Physical Environment: geology and minerals, soils, air quality, water quality and quantity.

b. Biological Environment: vegetation, wildlife and fish.

c. Cultural Environment: archaeological and historical, research natural areas.

d. Socio-Economic Environment: Wilderness and unroaded areas, timber, recreation, land use, transportation, energy use, livestock grazing, minerals and energy development.

e. Human Health and Welfare: safety, fire hazard, noise, scenic beauty.

f. Other factors: short-term uses vs. long-term productivity, adverse effects which cannot be avoided, irreversible and irretrievable commitment of resources, wetlands and floodplains, indirect effects, and cumulative impacts.

Public Involvement. In September of 1985, the public involvement process started when an announcement of the proposed action was made and public comments were requested. Those contacted can be found listed in the scoping document, also found in this appendix.

A public notice was given to the following Newspapers:

Cedar City Spectrum	Desert News
Richfield Reaper	Salt Lake Tribune
Garfield County News	Las Vegas Review/Journal
Iron County Record	Las Vegas Sun

Environmental Assessment for Oil and Gas Leasing in the Escalante KGS

Following the initial public scoping process, the Dixie National Forest prepared a preliminary Environmental Assessment for public review in May 1986. Additional comments were received, many requesting an EIS. A draft EIS was then prepared for public review.

APPENDIX E

Bureau of Land Management (BLM)Technical Report - Escalante KGS

BLM Technical Report
The Escalante KGS

The Escalante Field was discovered by the Phillips Petroleum Company in 1960 (1 Escalante Unit SWNW 32-32S-3E). That well found CO_2 but had mechanical problems and was abandoned. A second well (2 Escalante Unit SESW 29-32S-3E) was drilled, also finding substantial amounts of CO_2 from 1,360 feet in the Shinarump Conglomerate down to 3,612 in the Cedar Mountain Formation. Due to the lack of a market, that well was abandoned November 1, 1961.

An undefined KGS determination was made, effective November 1, 1961, by letter dated March 7, 1962. The land included was conservatively placed on only the top of the anticline, although maps then available would have allowed a larger KGS.

Skyline Oil drilled a well farther down the anticline, completed September 19, 1969, (12-44 Escalante, SESE 12-33S-2E). Although the well was plugged as dry, our records indicate flows in excess of 10 MMCFPD of CO_2 from 3,450' to T.D. of 4,166', corresponding to the base of the Kaibab through the Coconino Formation. This indicates that the area overlying proven CO_2 reserves was much larger than the KGS even in 1969, but the KGS was not enlarged due to the lack of a market at that time.

Another significant test was drilled by Gulf Oil in 1972 (1 Garfield, SESE 10-35S-3E), 2 miles east of the Town of Escalante. This well confirmed the Formations. There was no CO_2 or hydrocarbon, however, and the well was abandoned. The significance of the porosity is that it shows that the trap may extend that far, although it is not filled to that depth.

Porosity in the Kaibab is especially important as this limestone generally has small amounts of oil, but usually lacks sufficient porosity within which to accumulate commercial quantities of oil. The Upper Valley oil field produces large amounts of oil from the Kaibab. It had a very small CO_2-rich gas cap above the oil. As this field is directly downdip in a similar but smaller anticline (about 10 miles southwest of the Town of Escalante), it implies a good potential for oil in the Escalante anticline, located downdip from the gas, possibly in a ring.

The boundaries of the KGS expansion are based upon the surface expression of the anticline (see UGMS Map 30, Structure of the Escalante-Boulder area by C.C. McFall, 1971) and subsurface seismic work by Phillips Petroleum and Arco. The structure on the north end is

covered by volcanics and is poorly known. The KGS is being drawn larger than the limits of closure on the Kaibab as I interpret it, due in part to the uncertainties of the structure on the north end. It also reflects the similarities with the Upper Valley field which produces from Kaibab porosity which extends down the axis of the Upper Valley anticline much further than the limits of the closed structure. The Gulf well shows that there is a similar porosity in the Escalante anticline. Although we will not know the actual limits of production until further drilling is done, we do know that a substantial portion is now proven. The boundaries are set on the area which is presumptively productive, and may require future modification.

The effective date of this KGS expansion, March 12, 1984, is the date of this review. This review reflects a new interest in the area, as reflected in the initial well drilled by Mid-Continent in the Death Hollow Unit. This well (1 Charger SESW 29-32S-3E) completed September 24, 1983, reconfirmed the nearby second test well of Phillips Petroleum. It tested 124 MMCFPD from approximately 1,100 feet of effective pay from 1,354 feet to 3,400 feet. The Death Hollow Unit was made too small because the lands south of the unit were not available for leasing; the geology of the unit proposal was not directly used for the KGS.

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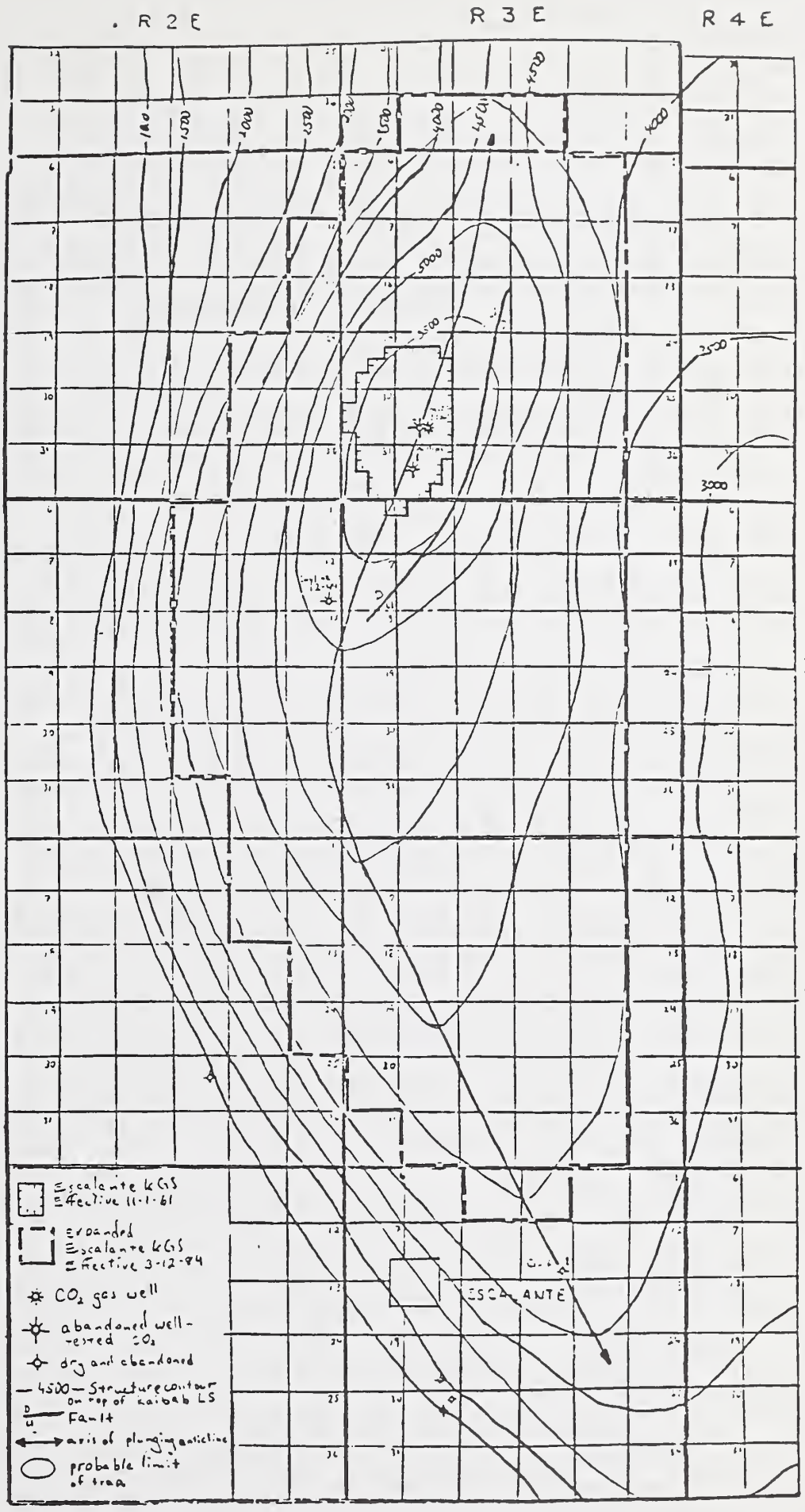
R 2 E
R 3 E
R 4 E
T 31 S
T 32 S
T 33 S
T 34 S
T 35 S
Escalante KGS Effective 11-1-61
Expanded Escalante KGS Effective 3-12-84
CO_2 gas well
abandoned well - tested CO_2
dry and abandoned
4500 Structure contour on top of Kaibab LS
Fault
axis of plunging anticline
probable limit of trap
ESCALANTE

APPENDIX F

The Oil and Gas Potential of the Escalante Known Geologic Structure
Open-File Report No. 102

THE OIL AND GAS POTENTIAL OF THE ESCALANTE KNOWN GEOLOGIC STRUCTURE

WRITTEN BY

CYNTHIA BRANDT

PETROLEUM GEOLOGIST

UTAH GEOLOGICAL AND MINERAL SURVEY

SUBMITTED ON

JANUARY 7, 1987

OPEN-FILE REPORT NO. 102

THE OIL AND GAS POTENTIAL OF THE ESCALANTE KNOWN GEOLOGIC STRUCTURE

Introduction

Escalante Known Geologic Structure (KGS) is located in southern Utah in Garfield County (see Figure 1). The 80,000 acres which comprise the Escalante KGS are located just north of the town of Escalante, Utah (see Figure 2), the southernmost part of the Escalante KGS being only approximately 1 mile to the northeast of the town of Escalante.

Carbon Dioxide (CO_2) has been found and has flowed in all 6 wells drilled on the Escalante Anticline, the anticlinal structure which falls partially within the Escalante KGS (Figure 3). However, to date, no commercial quantities of hydrocarbons, oil or gas, have been found in the Escalante KGS. Nonetheless, there is oil and gas potential in the Escalante KGS which has not been adequately tested.

Unless specified otherwise, all information used for this report has come from public records of the Utah Oil, Gas, and Mining Division and from Petroleum Information well information.

Drilling History

In 1960 the Phillips #1 Escalante Unit was drilled (Z on Figure 4). CO_2 flowed in the #1 Escalante from the Shinarump and the Moenkopi, but mechanical difficulties and lost circulation problems forced the operators to abandon the well at 3384 ft. in the Kaibab formation. This test also had an oil show in the Kaibab.

In 1961 Phillips drilled the #2 Escalante Unit (Y on Figure 4). CO_2 gas flows were reported from the Shinarump, Moenkopi, Timpoweap, Kaibab, (White Rim-?) Toroweap, and Cedar Mesa. Corrected flow rates were as high as 24.8 million cubic feet of gas per day (MMCF/D). The well was drilled to 6062 ft. in the Devonian, but influx of salt water and severe lost circulation problems from 3900 ft. (Cedar Mesa or Elephant Canyon?) to total depth (TD) resulted in the hole being plugged and abandoned. Again oil shows were encountered in the Kaibab.

The Skyline #12-24 Escalante Federal (X on Figure 4) was drilled in 1969. The Kaibab flowed CO_2, but at 4166 ft. the "hole was flowing too much gas to continue drilling without mudding up" (UGMS file report, Geologic Report, Escalante Anticline, Garfield County, Utah, undated and unsigned). Although an attempt to mud up was made, lost circulation occurred. Consequently, the Skyline #12-24 Escalante Federal was plugged and abandoned. No hydrocarbon shows were reported.

A re-entry of the Phillips #2 Escalante Unit was attempted by Arco in 1980 (Y on Figure 4). Information for this well comes from Arco's Final Report on the #2 Escalante Unit, which is part of the UGMS files. Circulation was lost when the bridge plug set at 2500 ft. was drilled out. The well was plugged back to 2550 ft. and the casing was perforated from 2370 ft. - 2430 ft. (Kaibab) to test for CO_2. A pressure test run on the perforated interval registered a CO_2 pressure of 120 p.s.i. at the surface 3 hours after perforating. A drill stem test (DST) of the perforated interval recovered 820 ft. of water and, in the sample chamber, 2200 cc of gas at less that 10 p.s.i. Therefore, Arco concluded that the interval perforated failed to recover significant quantities of CO_2. The well was plugged and abandoned. No additional shows were reported, although the 1961 Phillips #2 Escalante Unit reported an oil show in the Kaibab.

Mid-Continent Oil and Gas Reserves, Inc. (Mid-Continent) drilled the #1 Charger in 1983 (W on Figure 4). As Figure 5 indicates, the #1 Charger was drilled just to the northeast and within 50 ft. of the location of the Arco (Phillips) #2 Escalante Unit. Mid-Continent's Wellsite Geologist's Report, which was contributed to the UGMS files, provided the information about this well. CO_2 flowed from the Shinarump, Kaibab, Toroweap, and what is believed to be the Organ Rock Shale during the testing. The highest calculated absolute open flow was stated to be 112.2 MMCF/D. This well was completed as a CO_2 well in June, 1986, but the results of that completion are confidential for 1 year from the date of completion. Hydrocarbon shows were encountered in the Moenkopi, Timpoweap, Kaibab, White Rim, and Toroweap, and reported in the non-confidential Wellsite Geologist's Report in the UGMS files.

Mid-Continent drilled the #2 Charger (V on Figure 4) in August of 1984 and found CO_2 in the Shinarump and Moenkopi. CO_2 flowed from both intervals on flow tests. The largest calculated open flow was reported to be 38 MMCF/D. Unfortunately, the well was not completed in a timely manner, so the lease was lost before the casing could be perforated and the

completion test could be run. However, hydrocarbon shows were encountered in the Timpoweap.

In October and November of 1984 the Mid-Continent #4 Charger was drilled (U on Figure 4). Petroleum Information reported that CO_2 was tested in the Shinarump at a flow of 59.5 MMCF/D. In June of 1986 the #4 Charger was completed and tested, but, as in the case of the #1 Charger, the results are confidential for 1 year from the date of completion. No hydrocarbon shows from the #4 Charger were reported by Petroleum Information.

Hydrocarbon Potential

The presence of hydrocarbon shows in the Moenkopi, Timpoweap, Kaibab, and White Rim-Toroweap from wells drilled within the Escalante KGS is indeed a good sign that commercial quantities of oil or gas may be present within the KGS.

Furthermore, the fact that CO_2 is flowing from many other intervals indicates the presence of many favorable reservoir rocks: rocks which are both porous and permeable.

The Escalante anticline could be a trapping mechanism for both CO_2 and hydrocarbons. However, it is altogether possible that the CO_2 is trapped near the crest of the anticline, and that the hydrocarbons have been pushed off the crest and westward by the CO_2 cap and possibly by hydrodynamic drive.

A similar situation occurs approximately 24 miles to the southwest of the wells drilled in the Escalante KGS at Upper Valley Field (Figure 6). Upper Valley is the only economic oil field in the Kaiparowits Basin Area and has cumulatively produced about 22 million barrels of oil, 130 million barrels of water, and no natural (hydrocarbon) gas (Petroleum Information Oil and Gas Production Report for Nevada and Utah, September 1986). A CO_2 cap is presumed to exist because of the presence of CO_2 in wells. Moreover, water filled strata have been found at the crest of the anticline at the Kaibab and Timpoweap intervals, whereas downdip and on the west flank of the anticline oil has been found in commercial quantities (Figure 7 and Figure 8).

Although by analogy with Upper Valley Field the Escalante KGS could be most prospective for hydrocarbons downdip and to the west of the anticlinal crest, the structure and nature of the subsurface is poorly known in the 80,000 acres which comprise the Escalante KGS. Only 6 wells have been drilled to date and 1 of the 6 wells did not penetrate farther than the Timpoweap. Therefore, much of the Escalante KGS should be considered

prospective for hydrocarbon exploration. Both structural, stratigraphic, and combination traps should be considered likely because of the anticlinal feature, and the presence of rocks which may exhibit porosity and permeability changes over short distances, leading to stratigraphic trapping.

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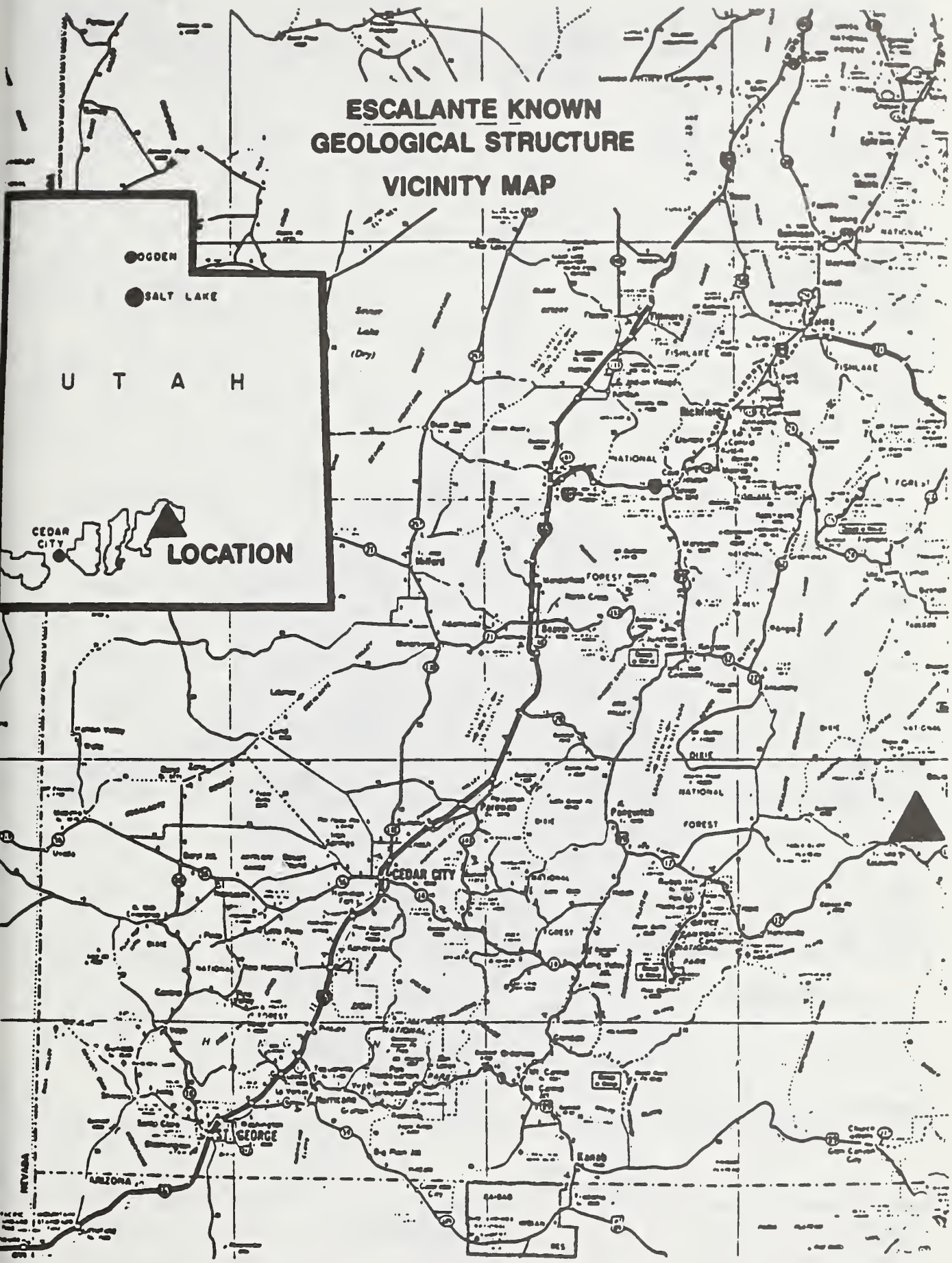


FIGURE 1 : LOCATION of ESCALANTE KNOWN GEOLOGICAL STRUCTURES (KGS)

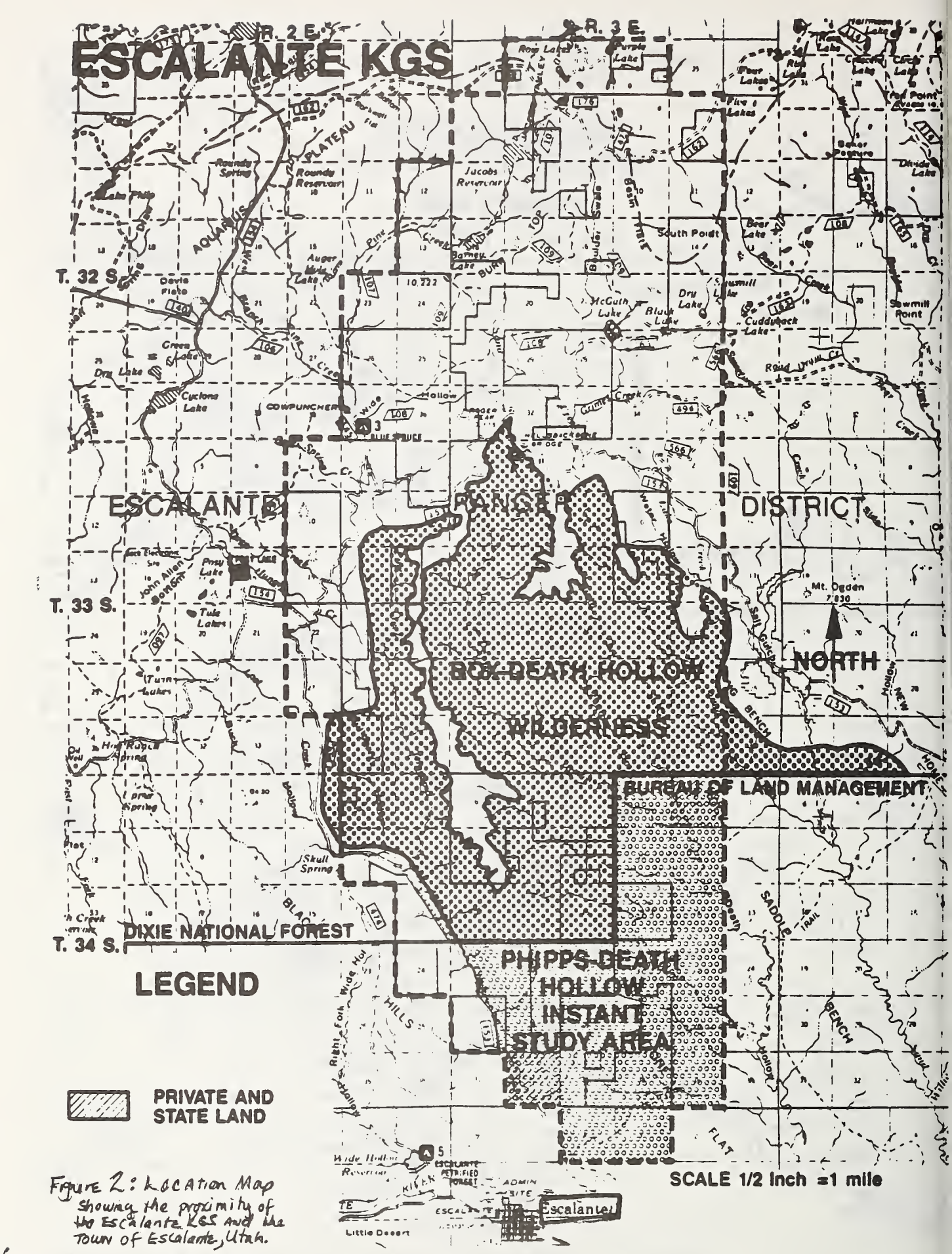
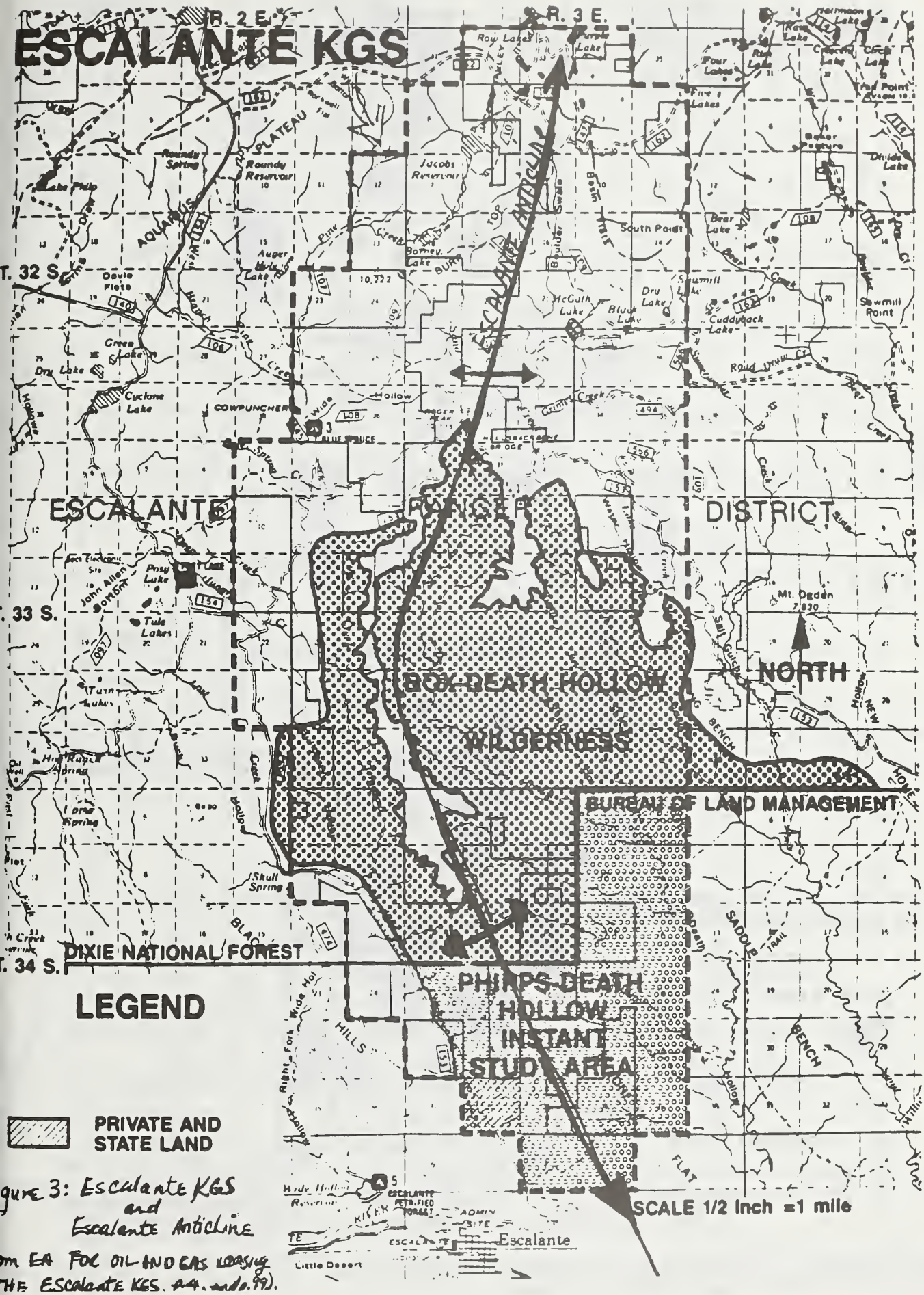


Figure 2: Location Map showing the proximity of the Escalante KGS and the Town of Escalante, Utah.

(From EA for Oil and Gas Leasing in the Escalante KGS, p. 5)



gure 3: Escalante KGS and Escalante Anticline

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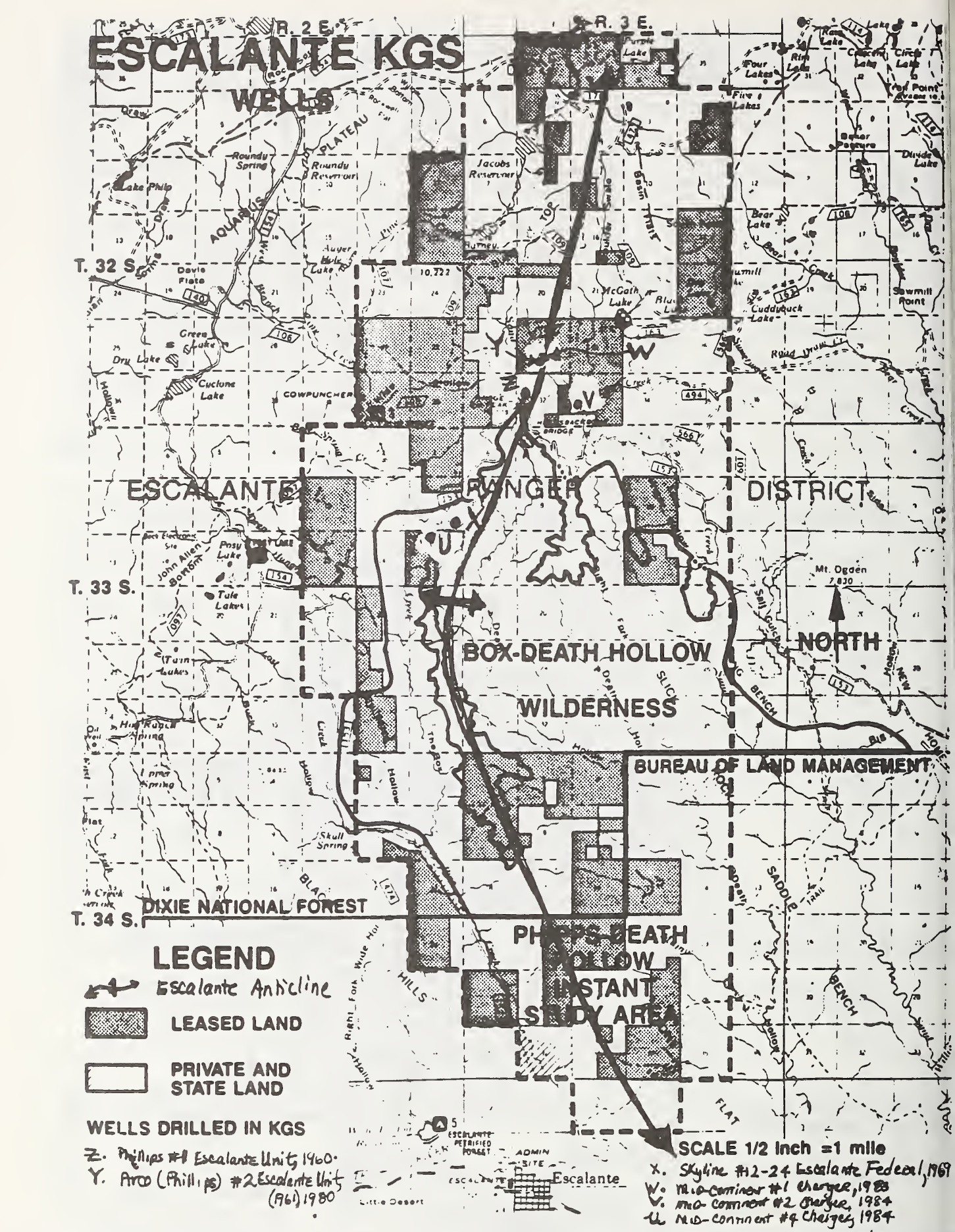


FIGURE 4: LOCATION OF 6 WELLS DRILLED IN ESCALANTE KGS (modified from EA FOR OIL & GAS LEASING IN THE ESCALANTE KGS, p. 8 AND 9)

EXHIBIT "F"
Radius Map of Area

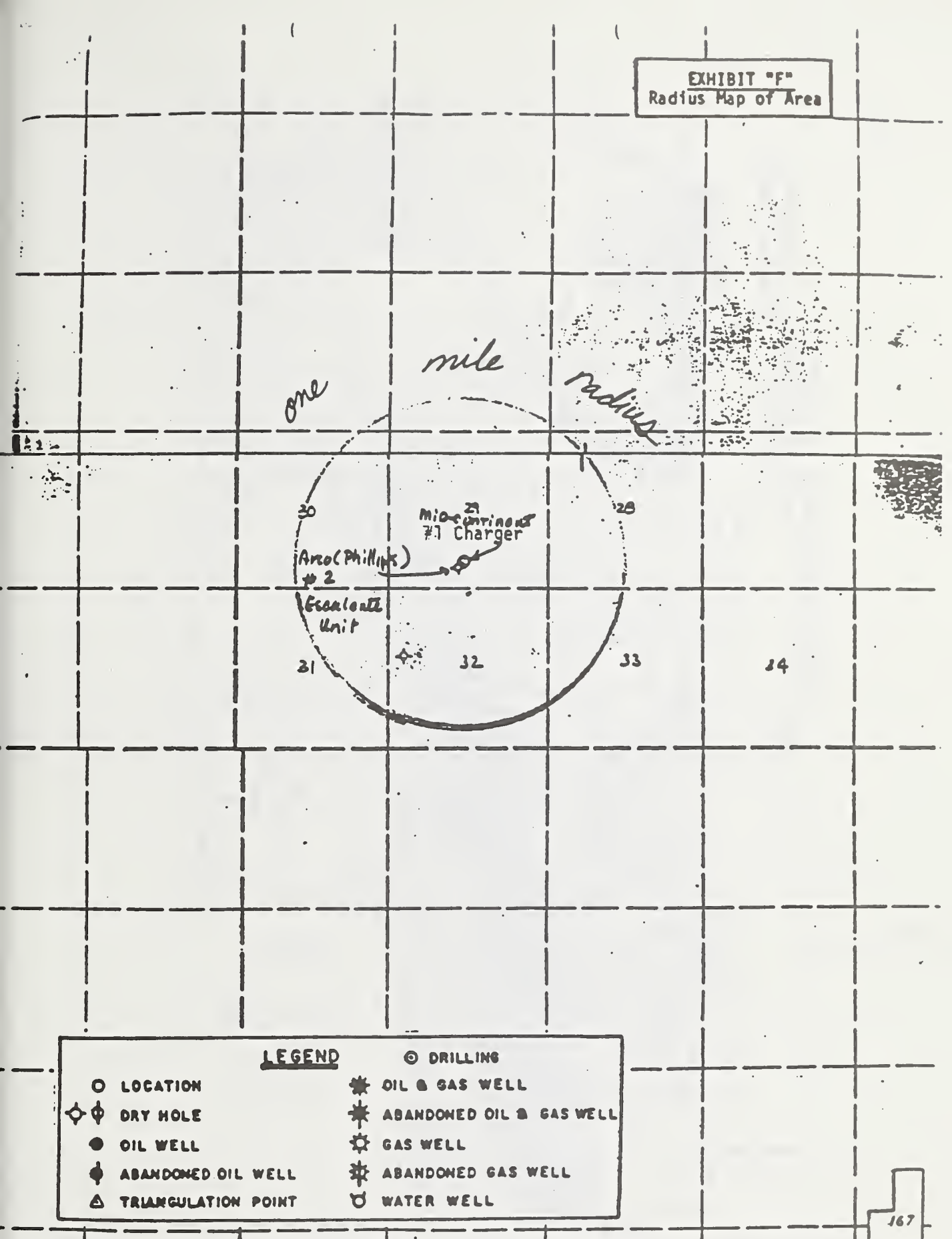


Figure 5: Location of the Mid-Continent #1 Charger Relative to the Anco(Phillips) #2 Escalante Unit (from Utah Oil & Gas Records)

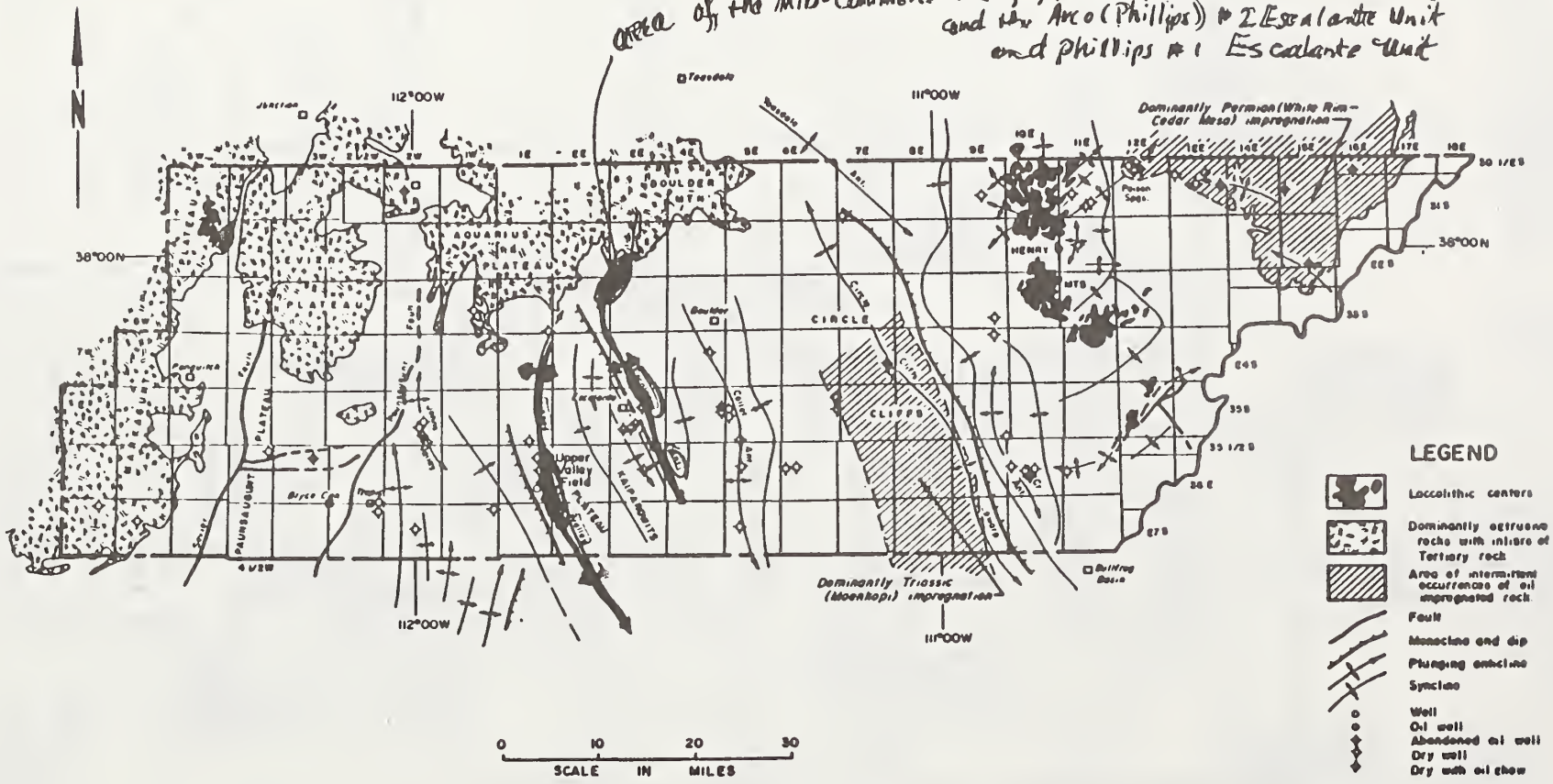


Figure 6 Generalized structure and hydrocarbon map of Garfield County, Utah (after Doelling, 1975, Figure 67, p. 94).

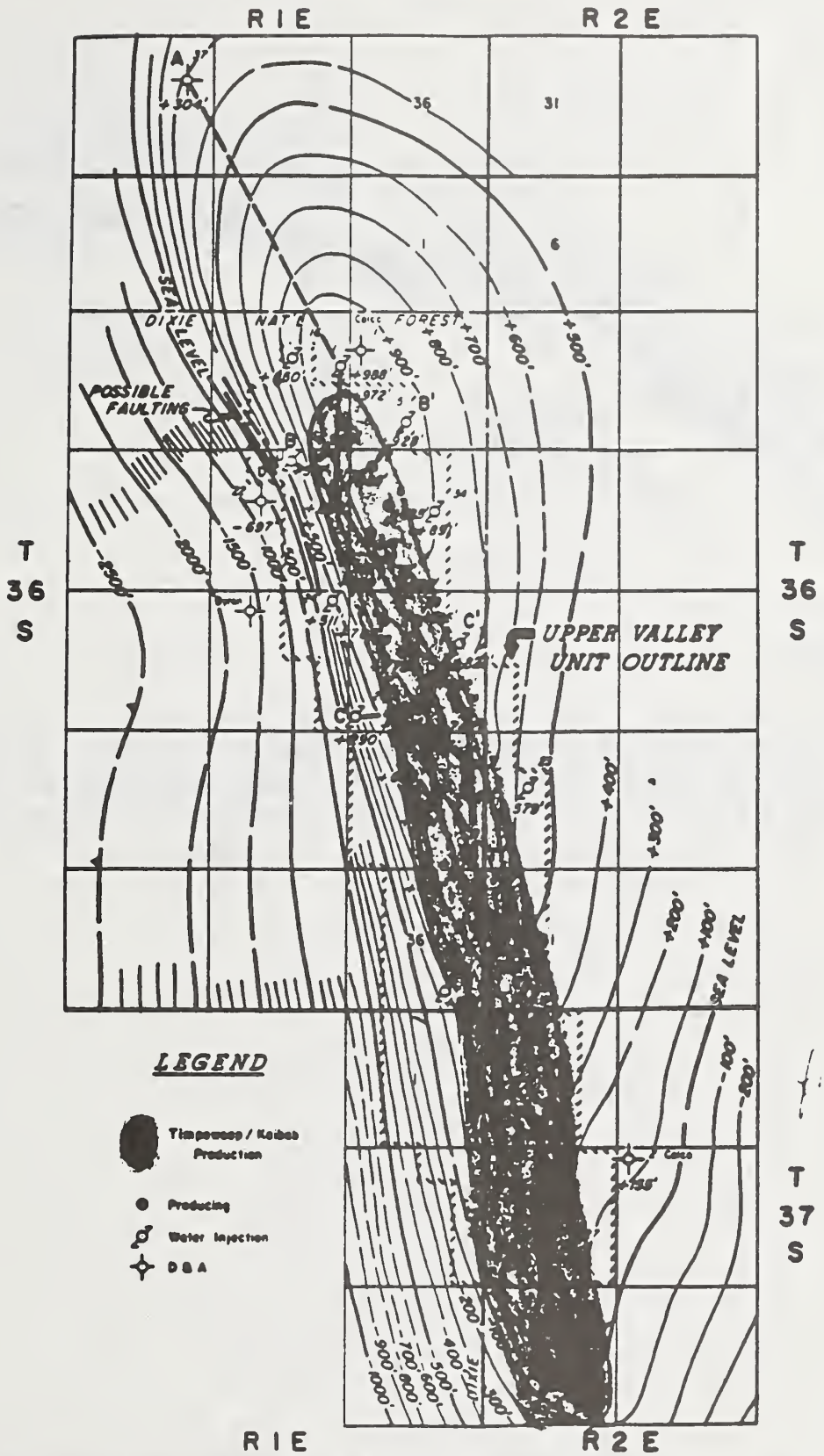


Fig. 7— Structure map contoured on top of K-4δ zone (Kaibab Formation), Upper Valley field. Contour interval — 100 ft.

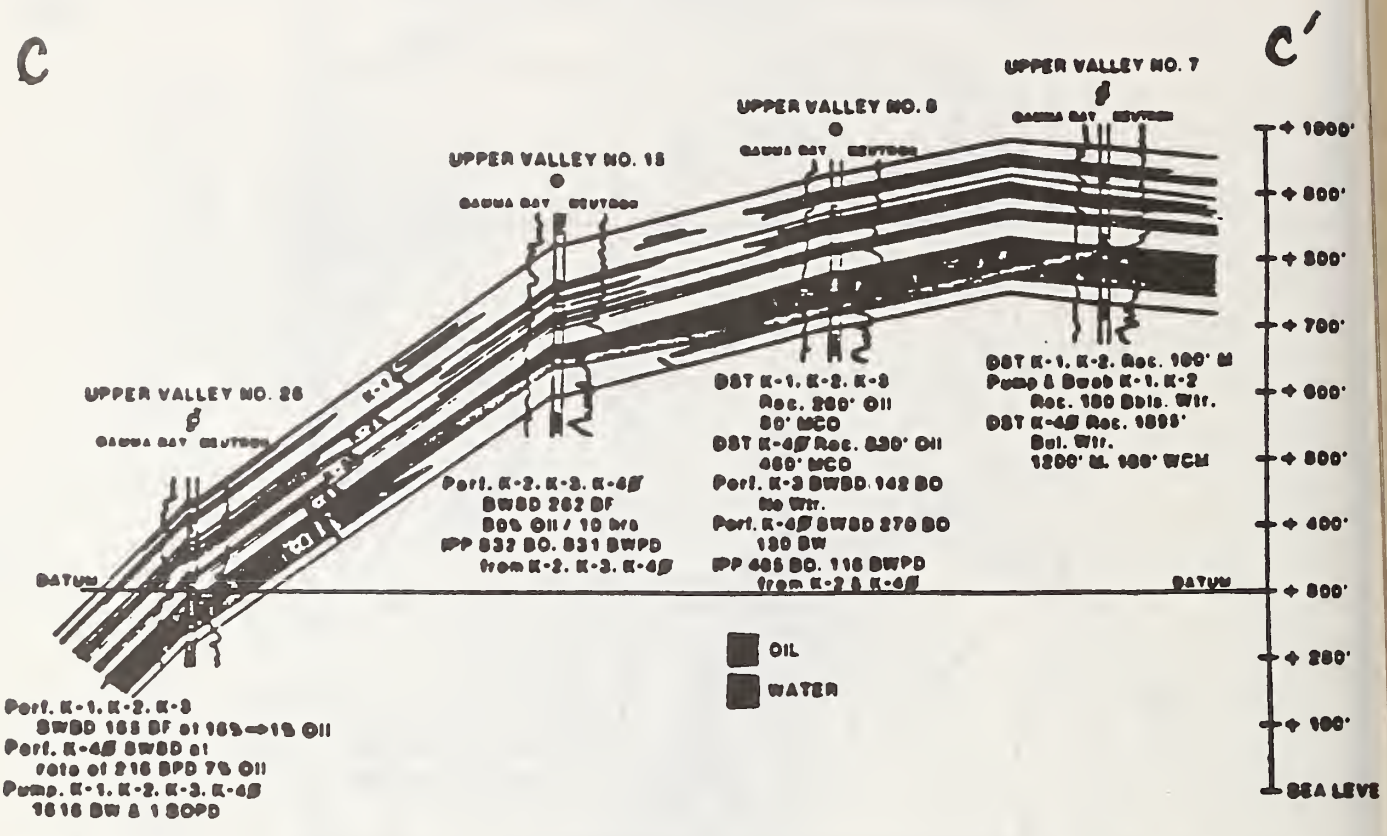


Fig. 8 — Structural cross section C-C' showing tilted oil-water contacts in Timpoweap and Kaibab reservoirs, Upper Valley field. Note that U.V. No. 7 tested wet, yet is structurally higher than producing wells U.V. Nos. 9 and 15. See Fig. 7 for location of cross section (Sharp, 1976, figure 15).

APPENDIX G

Surface Requirements for CO_2 and Oil Field Development in the Escalante KGS

Big Game Habitat and Population Reduction By Alternative

Changes to Recreation Opportunities

Soil Displacement and Sedimentation Estimates

Peak Work Force Estimates

Surface Requirements for CO_2 and Oil Field Development
in the
Escalante Known Geological Structure (KGS)

In order to estimate the surface requirments for each alternative level of CO_2 and oil field development, the following assumptions are made.

Basic Assumptions

Item	CO_2 Field	Oil Field
1. Well spacing pattern (acres per wellsite)	640 acres	80 acres
2. Land area occupied (acres per wellsite)	2 acres	3 acres
3. Road (Miles per well)	1.25 miles	.75 miles
4. Pipeline and Powerline (Miles per well)	1.1 miles	.6 miles
5. Land area occupied Per mile of road/pipeline/powerline	2.5 acres	2.5 acres
6. Ratio of Wells per Compressor Plant or Tank Battery/Storage Yard	6 each	6 each
7. Land area occupied (Acres per Compressor Plant or Tank Battery/Storage Yard)	7 acres	2 acres

- Forty percent of the roads needed to support CO_2 and oil field exploration and development will require new construction.

- Sixty percent of the roads needed to support CO_2 and oil field exploration and development will be provided by existing or planned roads.

- Pipeline and powerline needs will be approximately 85 percent of the length of road needed per well.

Other Assumptions

The following assumptions were used to determine an estimated surface use requirement for specific situations.

- It is estimated that 13 CO_2 wells will be located on Antone Bench and Exclusion Areas 2 through 5. In order to maximize recovery of the CO_2 from under the Wilderness and because of the irregular shape of the those lands CO_2 wells will not be located on the standard well spacing pattern.

- In addition to 2 miles of existing roads 16.8 miles of new road construction will be needed in order to develop and operate a 13-well field on Antone Bench and Exclusion Areas 2-5.

- Existing leases located within the Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area will support up to 7 CO_2 wells and require 7.5 miles of new road construction.

- A 20-mile CO_2 transportation pipeline will be constructed from the CO_2 field in the vicinity of Roger's Peak to the town of Escalante utilizing a corridor paralleling the Hells Backbone Loop Road.

- Oil field development in the Escalante KGS will be approximately the same size as the Upper Valley oil field (a 32-well oil field is assumed).

Big Game Habitat and Population Reduction in the Escalante KGS by Alternative

In order to make estimates of how available habitat and populations may be affected by project activities, several assumptions will be necessary:

1. Open roads influence the use of the wildlife habitat on both sides of the road. The distance from the road that wildlife use will be decreased depends on several factors, including amount of hiding cover, topography, amount and speed of traffic, etc., and the amount of disturbance is different for different species. For this exercise, assume that habitat effectiveness is decreased by 30% for one-quarter mile on each side of all roads. This means that for each mile of road, habitat effectiveness will be decreased by 30% on 320 acres.

For areas that are not linear; i.e. facility or well locations, the assumption will be that habitat effectiveness will be decreased by 30% on 5 times the number of acres that are actually disturbed. The reasoning for this is as follows: A one acre circle has a diameter of 236 feet. A belt one-quarter mile wide around this one acre circle would encompass 22 acres. Therefore, for each one acre plot in a well site, 22 acres could be considered to have decreased habitat effectiveness. This has been arbitrarily decreased to five acres of decreased habitat effectiveness for each acre disturbed to account for differences in topography and the actual sizes of the disturbed areas.

Habitat effectiveness needs to be defined. "Habitat effectiveness" is a term which has been developed to lump all wildlife habitat factors and measure how effectively a given wildlife species can utilize them. For example, a certain drainage might have all the necessary habitat factors (food, cover, water) to support a herd of deer, and these factors may be available in just the right proportions--habitat effectiveness is 100%. However, if a summer home development is plunked down right in the middle of this habitat area, then habitat effectiveness would naturally be decreased. Near the development, habitat effectiveness may be zero, while a mile away it may be 75%. As you might imagine, the effects are different for different species. Even in the middle of the summer home area, habitat effectiveness for American robins might still be near 100%. For grizzly bears, however, habitat effectiveness a mile away could still be zero.

2. For this exercise the habitat effectiveness and subsequent population reduction will only be examined for deer and elk. It is recognized that there are many other species present, but with the current time frame, it is not possible to search out the data to make meaningful estimates for other species. Even for deer and elk, it must be emphasized that these are very rough estimates, and may bear very little relationship to what will actually happen on the ground.

3. Assume that current habitat effectiveness for both deer and elk within the KGS is 90%.

4. Assume that deer density within the KGS is 0.03 deer per acre (19.2 per square mile) and elk density within the KGS is 0.003 elk per acre (1.9 per square mile).

5. Assume that if habitat effectiveness decreases by 30% (from the current 90% to 60%) in the affected areas, then deer and elk populations will also decrease by 30%.

ALTERNATIVE 1

-8 miles of road will be built. If 320 acres have decreased habitat effectiveness as a result of the construction of one mile of road, then 2,560 acres will be disturbed by roads. 55 acres will be directly affected by facilities. If 5 acres have decreased habitat effectiveness for each acre directly affected, then 275 acres will be disturbed. 2,560 + 275 = 2,835 acres will have habitat effectiveness decreased from 90% to 60%. At densities of 0.03 deer/acre and 0.003 elk/acre, there would be 85 deer and 9 elk on the 2,835 acres at 90% habitat effectiveness At 60% habitat effectiveness, there would be 59 deer and 6 elk on those same acres, for a reduction of 26 deer and 3 elk.

ALTERNATIVE 2

-30 miles of road built disturbing 9,600 acres.
-241 acres of facilities disturbing 1,205 acres.
-10,805 acres with decreased habitat effectiveness
-324 deer at 90% habitat effectiveness
-32 elk at 90% habitat effectiveness
-227 deer at 60% habitat effectiveness
-22 elk at 60% habitat effectiveness
-reduction of 97 deer by this alternative
-reduction of 10 elk by this alternative

ALTERNATIVE 3

-49 miles of road disturbing 15,680 acres
-442 acres of wells & facilities disturbing 2,210 acres
-17,890 acres with decreased habitat effectiveness
-537 deer at 90% habitat effectiveness
-54 elk at 90% habitat effectiveness
-376 deer at 60% habitat effectiveness
-38 elk at 60% habitat effectiveness
-reduction of 161 deer by this alternative
-reduction of 16 elk by this alternative

ALTERNATIVE 4

-52 miles of road disturbing 16,640 acres
-479 acres of wells & facilities disturbing 2,395 acres
-19,035 acre total with decreased habitat effectiveness
-571 deer at 90% habitat effectiveness
-57 elk at 90% habitat effectiveness
-400 deer at 60% habitat effectiveness
-40 elk at 60% habitat effectiveness
-reduction of 171 deer by this alternative
-reduction of 17 elk by this alternative

ALTERNATIVE 5

-64 miles of road built disturbing 20,480 acres
-559 acres of wells & facilities disturbing 2,795 acres
-23,275 acre total with decreased habitat effectiveness
-698 deer at 90% habitat effectiveness
-70 elk at 90% habitat effectiveness
-489 deer at 60% habitat effectiveness
-49 elk at 60% habitat effectiveness
-reduction of 209 deer by this alternative
-reduction of 21 elk by this alternative

Changes to Recreation Opportunities

The capacity of the Escalante KGS to accommodate dispersed recreation was calculated using the Recreation Opportunity Spectrum (ROS). Changes in recreation opportunities are measured by the ease of access. The easier the access and the more available an area, the more opportunity for dispersed recreation to occur. Changes in the amount of roading will, therefore, change the recreation opportunity class. Three recreation opportunity classes have been identified as existing within the KGS based on the ROS. They are primitive, semiprimitive, and roaded natural recreation opportunities. the base acreage,or current situation, from which changes in recreation opportunities will be measured as a result of oil or CO_2 development are based on information within the Dixie National Forest Plan (see page II-8, Dixie Forest Plan).

ROS	Acres KGS
Primitive	34,911
Semiprimitive	34,409
Roaded Natural	10,680
Total	80,000

Based on the assumptions contained in the Dixie Forest Plan, it is estimated that for every mile of new road construction, 118 acres of land will change from the present ROS class to another class such as from a semiprimitive to a roaded natural class.

It should be noted that by ROS definition, designated Wilderness and the ISA are classed as primitive recreation opportunities. Although it is assumed under several of the alternatives that a road will be extended into the Wilderness and ISA, this will, in and of itself, not change the ROS class, since it will not affect the designation of the lands as Wilderness or Instant Study Area.

However, in order to display quantitatively the impact to the primitive recreation opportunity, changes in the ROS that may occur within the Box-Death Hollow Wilderness and Phipps-Death Hollow Instant Study Area as a result of new road construction will be displayed as a change from a primitive recreation opportunity to a semiprimitive nonmotorized recreation opportunity. By law, no motorized recreation will be permitted from Antone Bench southward into the Wilderness or ISA (see section 302(b), Utah Wilderness Act of 1984).

Soil Displacement and Sedimentation Estimates

Onsite erosion rates cannot be calculated with any accuracy until a site-specific proposal is submitted and soil types proposed to be occupied are known. However, it is estimated and assumed for analysis purposes in the EIS that the first year average soil loss will be 4 tons per acre. This is a relatively high erosion rate and will probably occur only during the time period immediately following surface disturbance. Erosion rates are expected to be much lower after the first year and following reclamation and other mitigation.

Quantitative estimates of sediments delivered to streams also cannot be accurately estimated based on existing data and absent site-specific proposals. Considering the variation in topography, vegetation, and that most development will not be allowed in close proximity to streams, it is estimated that a first-year delivery ratio of between 20 and 30 percent of the estimated erosion rate of 4 tons of soil loss per acre is not unreasonable. It was assumed for analysis purposes that 30% of the soils displaced will be delivered to the streams.

It is assumed that the jobs identified in the following table will be created from the development and production of a CO_2 field. These figures are estimates only, obtained from local contractor information and "Natural Carbon Dioxide Resource of Colorado: An Overview". Although the figures are estimates, they indicate the possible effects of field development.

Peak Work Force Estimates

		ALT. I	ALT. II	ALT. III	ALT IV	ALT. V
Wells	Number of Wells	(12)	(39)	(81)	(87)	(100)
	Drilling Rigs	(2)	(3)	(6)	(7)	(8)
	Work Force	30	45	90	105	120
Roads	Miles of Road	(3)	(57)	(90)	(96)	(120)
	Work Force	10	50	100	100	120
Pipelines	Miles of Pipelines	(2)	(13)	(20)	(24)	(28)
	Work Force	15	15	20	20	25
CO_2	Compressor Station	(0)	(5)	(8)	(9)	(11)
	Work Force	0	100	180	200	250
Oil	Support Facilities	(2)	(2)	(5)	(5)	(5)
	Work Force	20	20	50	50	50
Transpipeline	Work Force	0	40	40	40	40
	Total Work Force 1/	75	270	480	515	605

1/ Annual salary $20,000/year. The development and production of a commercial operation is expected to take at least 3 years; however, development and production may extend for many years.

APPENDIX H

McElmo Dome CO_2 Field Operations

McElmo Dome CO_2 Field Operations

The EIS Interdisciplinary Team visited the McElmo Dome field located near Cortez, Colorado. The field is operated by Shell Western Exploration and Production, Inc. CO_2 is produced in this field from a geologic structure similar to the Escalante Anticline. Recoverable reserves in McElmo Dome are estimated to be over 10 trillion cubic feet of carbon dioxide and the field is estimated to have a lifespan of 25 years. Peak production is expected to be one-billion cubic feet per day with average well production estimated at 15 to 20 million cubic feet per day.

Advanced CO_2 recovery technology has evolved from the development and production of CO_2 from the McElmo Dome field. The technology developed from this field may be applicable to the production of CO_2 from the Escalante Anticline. Well depths range from 8,000 to 8,400 feet in the McElmo Dome field. Carbon dioxide is produced from this field using well cluster facilities, which consist of a dewatering facility situated near a cluster of wells. These facilities separate the free water that is produced with the CO_2 and compress the CO_2. A maximum of six production wells are located within 1,000 feet of the well cluster facilities in the McElmo Dome field. From the cluster facilities, CO_2 is piped to the central compressor plant facility where the CO_2 is further dehydrated and compressed to 2,000 psi. The compressor plants are 400'x500' by approximately 25' in height. After dehydration and compression, the CO_2 is delivered to a transportation pipeline for shipment.

Earlier CO_2 production systems included a dewatering facility at each production well. This system proved uneconomical and/or was not the most efficient method of CO_2 recovery. The earlier design required more miles of pipeline than are required with the cluster facilities system.

APPENDIX I

List of Endangered and Sensitive Plant and Animal Species in and near the Escalante KGS

Fish and Wildlife Service Section 7 Consultation

Endangered and Sensitive Plant and Animal Species
In and Near the Escalante KGS

Species	Status
Peregrine Falcon	E 1/
Mexican Spotted Owl	S 2/
Western Bluebird	S
Bald Eagle	E
Sandhill Crane	S
Golden Eagle	S
Prairie Falcon	S
Cooper's Hawk	S
Ferruginous Hawk	S
Great Blue Heron	S
Merlin	S
Flammulated Owl	S
Band-tailed Pigeon	S
Williamson's Sapsucker	S
Black Swift	S
Grace's Warbler	S
Lewis Woodpecker	S
Jones Golden Aster (Heterotheca jonesii)	S
Neese's Peppergrass (Lepidium montanum var. aeeseae)	S
Aquarius Indian Paint Brush (Castilleja aquariensis)	S
Small Beardtounge (Penstemon parvus)	S

1/ E=Endangered species
2/ S=Sensitive species

United States Department of Agriculture | Forest Service | R-4

Reply to: 2670 Date: January 5, 1987

Subject: Section 7 Consultation on the "Escalante Known Geological Structure"

To: Forest Supervisor, Dixie NF

Enclosed is the response from the Fish and Wildlife Service concerning Section 7 consultation on the "Escalante Known Geological Structure." In summary, they concur with your "no effect" biological evaluation on the bald eagle and peregrine falcon.

Please continue your process of informal consultation on a case-by-case basis. Management of other species covered in your biological evaluation will be directed by your Forest Plan and existing FSM direction.

This concludes the Section 7 consultation process for this project DEIS. If you have any questions, contact the Fish and Wildlife Service office in Salt Lake City directly.

Sincerely,

WILLIAM R. BURBRIDGE
Director
Wildlife Management

Enclosure

United States Department of the Interior
FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES OFFICE
2078 ADMINISTRATION BLDG.
1745 WEST 1700 SOUTH
,SALT LAKE CITY, UTAH 84104

IN REPLY REFER TO

December 31, 1986

William R. Burbridge
Director, Wildlife Management
Intermountain Region
USDA-Forest Service
324 25th Street
Ogden, Utah 84401

Dear Mr. Burbridge:

This responds to your letter of December 4, 1986, reference 2670, concerning a biological evaluation for the Draft Environmental Impact Statement recommending leasing in the "Escalante Known Geological Structure" north of Escalante, Utah. Your office concluded that a "no effect" situation existed for the bald eagle and the peregrine falcon since no use has been confirmed within the Known Geologic Structure by these species.

We have reviewed your evaluation and concur with your conclusion of no effect for the bald eagle and peregrine falcon. If future activities in the Known Geologic Structure would result in a "may effect" situation for any listed species your office should then initiate Section 7 consultation with this office.

Your attention is also directed to Section 7(d) of the Endangered Species Act, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

We are prepared to assist you whenever you have questions which we may be able to answer. If we can be of further assistance, please advise us. The Service representative who will provide you technical assistance is Robert Benton (801)524-4430; FTS 588-4430.

Sincerely,

Robert G. Ruesink
Field Supervisor

United States Department of Agriculture | Forest Service | Intermountain Region | 324 25th Street Ogden, UT 84401

Reply to: 2670

Date: December 4, 1986

Mr. Robert Ruesink
Field Supervisor
Fish and Wildlife Service
2078 Administration Bldg.
Salt Lake City, UT 84104

Dear Bob:

Enclosed is the biological evaluation for the Draft Environmental Impact Statement recommending leasing in the "Escalante Known Geological Structure." Two federally-listed species may seasonally be present. They are the bald eagle and peregrine falcon. The evaluation also includes species which the Forest considers sensitive in the proposed area.

We feel the proposal represents a no-effect situation with the planning and mitigation measures outlined. As potential activities occur, future formal consultations will be handled on a case-by-case basis as necessary. Basic direction for these procedures are in the Dixie Forst Plan.

Please advise us if you concur with our position of no effect in regard to formal or informal consultation. Skip Griep is the technical representative for the Forest. He can be reached at 801-586-2421. Glen Contreras is our Regional contact. He can be reached at FTS 586-5664.

We appreciate your assistance in this matter.

Sincerely,

WILLIAM R. BURBRIDGE
Director
Wildlife Management

Enclosure

DIXIE NATIONAL FOREST
Biological Evaluation of
Endangered, Threatened and
Sensitive Species
for the

ESCALANTE KNOWN GEOLOGICAL STRUCTURE

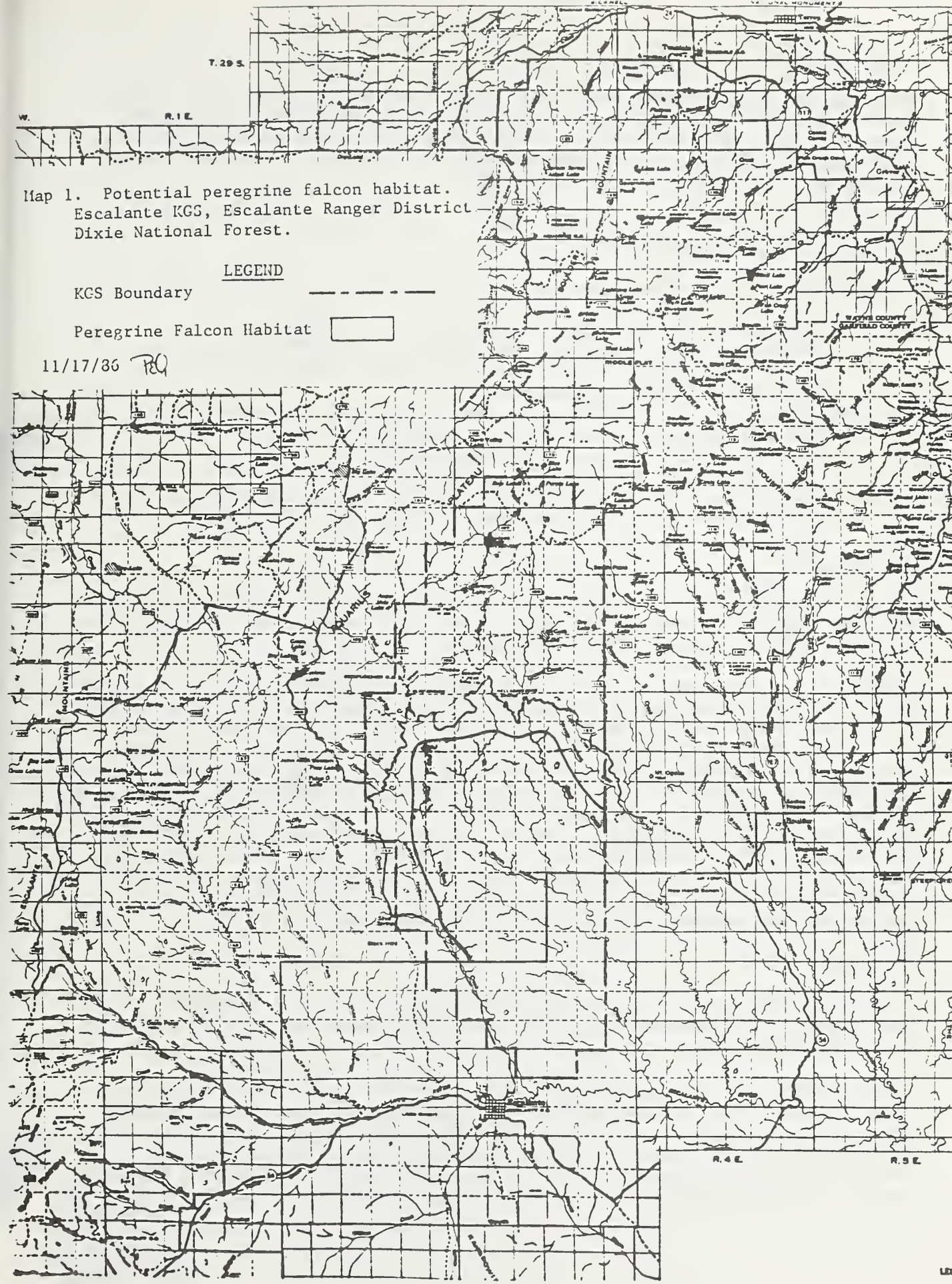
SPECIES	CLASSIFICATION	REMARKS
Peregrine Falcon *Falco peregrinus anatum*	Endangered	Birds are known to nest in Bryce Canyon and Capitol Reef National Parks near the KGS.
Bald Eagle *Haliaeetus leucocephalus*	Endangered	Small numbers of birds winter sporadically in several areas of the Forest.
Mexican Spotted Owl *Strix occidentalis lucida*	Sensitive	Responded to taped owl calls near Hells Backbone Bridge.
Western Bluebird *Sialia mexicana*	Sensitive	Known to nest within the KGS.
Sandhill Crane *Grus canadensis*	Sensitive	Uncommon transient.
Golden Eagle *Aquila chrysaetos canadensis*	Sensitive	Fairly common resident.
Prairie Falcon *Falco mexicanus*	Sensitive	Uncommon. May be a resident at lower elevations in KGS.
Cooper's Hawk *Accipter cooperii*	Sensitive	Uncommon resident.
Ferruginous Hawk *Buteo regalis*	Sensitive	Uncommon resident.
Merlin *Falco columbaris*	Sensitive	Uncommon transient.
Great Blue Heron *Ardea herodias treganzai*	Sensitive	Fairly common summer visitor.

Flammulated Owl *Otus flammeolus flammeolus*	Sensitive	Uncommon resident.
Bandtailed Pigeon *Columba fasciata fasciata*	Sensitive	Uncommon resident.
Williamson's Sapsucker *Sphyrapicus thyroideus nataliae*	Sensitive	Uncommon resident.
Black Swift *Cypseloides niger borealis*	Sensitive	Uncommon summer resident.
Grace's Warbler *Dendroica graciae graciae*	Sensitive	Fairly common summer resident.
Lewis Woodpecker *Asyndesmus lewis*	Sensitive	Uncommon resident.
Jones Golden Aster *Heterotheca jonesii*	Sensitive	Rare inhabitant of the ponderosa pine/ *Arctostaphylos* community.
Neese's Peppergrass *Lepidium montanum*	Sensitive	Endemic to Hells Backbone area.
Aquarius Indian Paintbrush *Castilleja aquariensis*	Sensitive	Possible in the northern portion of the KGS.
Small Beardtounge *Penstemon parvus*	Sensitive	Known from near the western edge of the KGS.

DESCRIPTION OF HABITAT WHICH MAY BE AFFECTED

Peregrine Falcon

No historic peregrine eyries are known on the Dixie National Forest. Peregrines are currently nesting in Bryce Canyon and Capitol Reef National Parks; on the west and east side, respectively, of the KGS. It is likely that there is some peregrine activity in the area of the KGS. Map 1 shows the portion of the KGS that appears to provide suitable hunting habitat and nesting sites for peregrines. This area was not identified because of specific bird sightings, but because of the apparent suitability of the habitat.



Map 1. Potential peregrine falcon habitat. Escalante KGS, Escalante Ranger District Dixie National Forest.

LEGEND

KGS Boundary

Peregrine Falcon Habitat

11/17/86 PEQ

Bald Eagle

Bald eagles are only seen in the area of the Dixie during the winter. Map 2 shows areas near the KGS where wintering bald eagles are consistently seen. Even in these areas, winter eagle use is dependent on snow depth and prey availability. There does not appear to be any "traditional" winter bald eagle habitat on the Dixie.

EVALUATION OF POTENTIAL EFFECTS

There are five alternatives addressed in the EIS for this project. They are:

1. Alternative 1 - "No Action" Alternative
2. Alternative II - Offer new leases for CO_2 only within Antone Bench and exclusion areas 2 through 5. No oil and gas leases would be issued under this alternative.
3. Alternative III - Offer new leases for oil and gas and CO_2 within the are of greatest potential for development.
4. Alternative IV - Offer new leases only for oil and gas within those areas available for oil and gas leasing.
5. Alternative V - Offer new leases for oil and gas and CO_2 on all land available for leasing within the Escalante KGS.

Alternative I

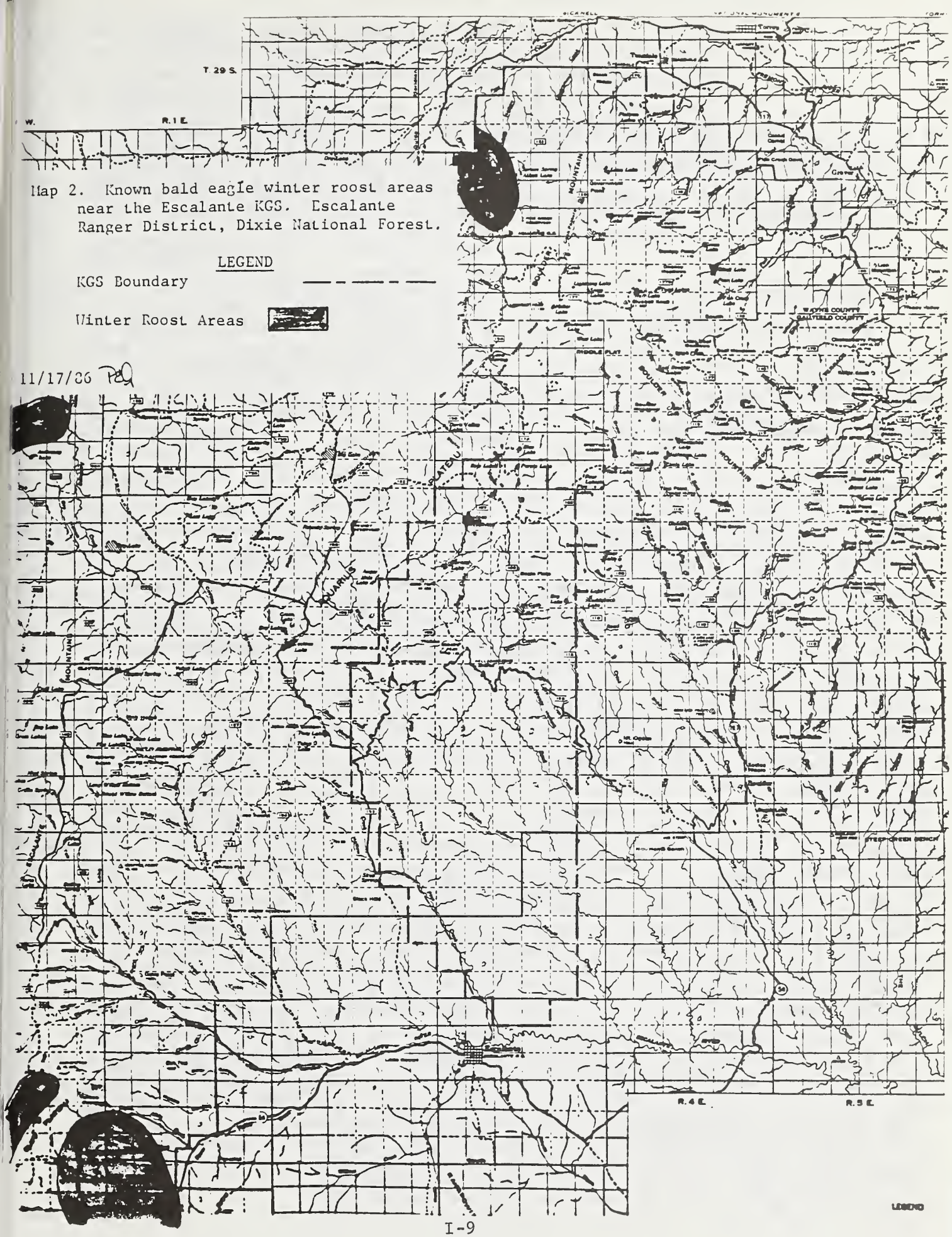
This alternative offers no new leases. Only lands that are currently leased could be explored or developed. Approximately 18,300 acres of the 80,000 acre KGS are currently leased. The leased land is shown on Map 3.

A major impact of this alternative would be the possible roading of the full length of Antone Bench to access the existing lease at the southern end of the bench. Presently the road goes down the bench about 2 miles. Antone Bench and the other Wilderness Exclusion areas are essentially "peninsular" in nature; bounded on three sides by steep cliffs. Any roads on these peninsulas would be especially detrimental since wildlife would have no escape routes. Drilling or road activity near the cliffs would be disturbing to nesting bird species such as the sensitive Mexican spotted owl or the endangered Peregrine Falcon that could potentially be using the cliffs. In addition to the roads, facilities such as drill pads, pipelines, powerlines, compressor stations, etc. would compound the disturbance and habitat loss. Populations of sensitive or listed plants could be destroyed by construction of these facilities.

Alternative II

This alternative calls for leasing of the wilderness exclusion fingers (approximately 2,300 acres) only. No additional leases would be offered north of the exclusion areas.

Effects discussed for Alternative 1 would be realized under this alternative as well. In addition, exploration and development on the rest of the exclusion areas could be expected. It is estimated that there would be 3 well clusters on Antone Bench and 1 well cluster on each of the other exclusion areas. A well cluster will consist of up to six gas wells, all within about a 2,000 foot radius of a dehydration/compression facility. Each well site will consume



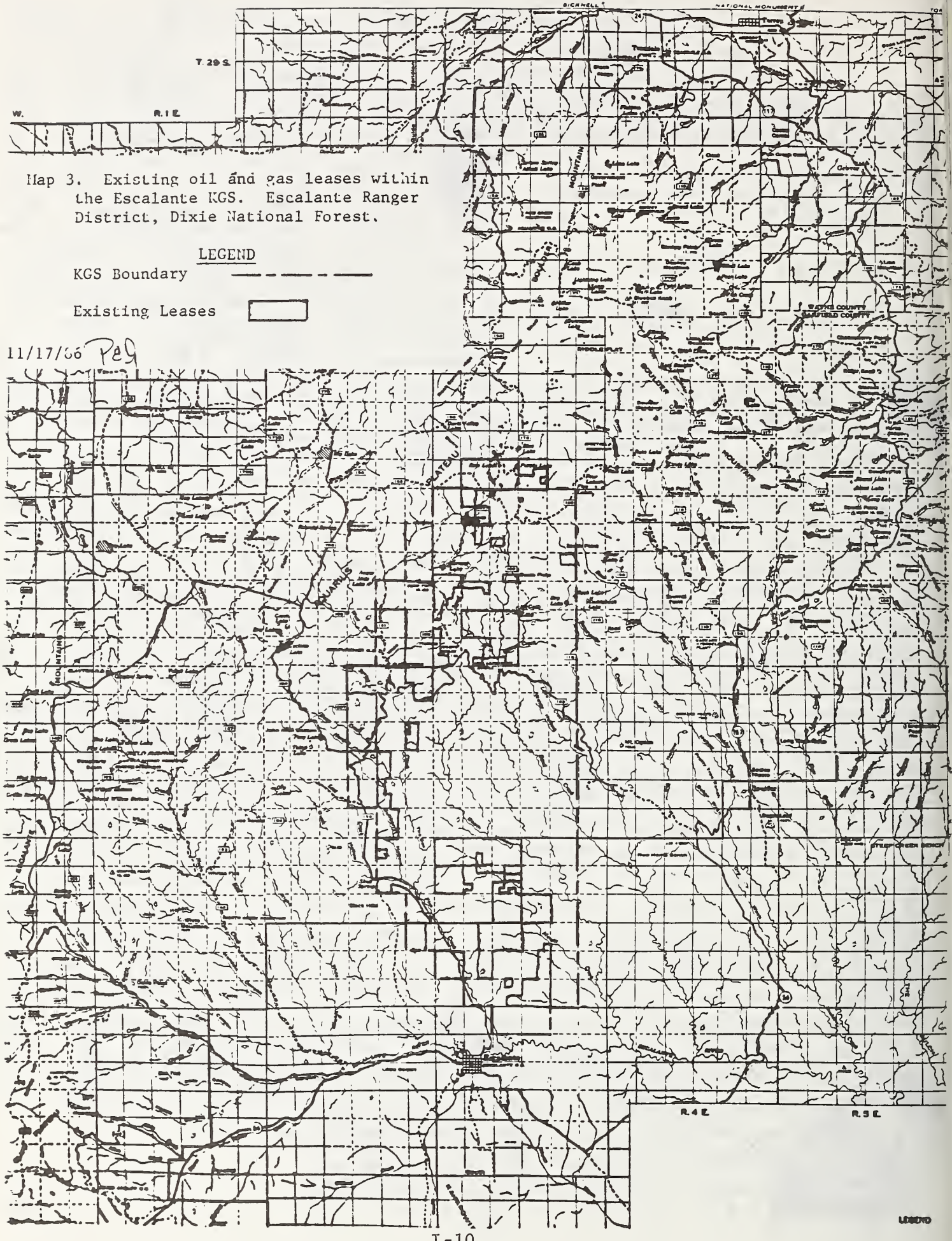
Map 2. Known bald eagle winter roost areas near the Escalante KGS. Escalante Ranger District, Dixie National Forest.

LEGEND

KGS Boundary

Winter Roost Areas

11/17/86 PEQ



Map 3. Existing oil and gas leases within the Escalante KGS. Escalante Ranger District, Dixie National Forest.

LEGEND

KGS Boundary

Existing Leases

11/17/86 PEG

about an acre. The dehydration/compression facility will consume about 7 acres. The wells and compression facility of each cluster would be connected with all-weather roads, and all clusters would be interconnected with a road system. The increase in development over that realized in Alternative I means proportionately increased impacts on all wildlife and plant species.

Alternative III

This alternative calls for leasing of the exclusion fingers plus 14,400 acres of the north western portion of the KGS. Impacts on the exclusion areas would be identical to those of Alternative II. Impacts north of the Hells Backbone Road would probably be less on the listed species. The peregrine falcon, if present, would find few suitable nest sites in this area, but probably would hunt here. Wintering bald eagles probably would not use the upper area at all; all of the lakes would be frozen and snow would severely limit prey availability.

Alternative IV

This alternative calls for leasing of the northern portion of the KGS and no addition leasing on the exclusion areas. The potential impacts on exclusion areas 3, 4, and 5 would be avoided by this alternative; however, the impacts on Antone Bench and Exclusion Area 2 would be the same as discussed under Alternative I. The impacts discussed for the northern portion of the KGS under Alternative III can be expected to increase under this alternative, because the area leased would double (from 14,400 to 28,800 acres offered for lease). Peregrine falcon hunting habitat could be affected.

Alternative V

This is the maximum leasing alternative. All of the area offered for lease by Alternatives II and IV would be offered under Alternative V. The combined impacts discussed for Alternatives II and IV would be realized under Alternative V.

The Preferred Alternative

Alternative V has been selected as the preferred alternative. As discussed above, this is the maximum leasing alternative. All of the unleased land within the KGS above the Hells Backbone Road plus all of the unleased land in the exclusion fingers would be offered for lease, totaling 31,018 acres. If all the leases were picked up and explored and developed as the EIS and this evaluation assumes they may be, 72 wells would be drilled which would directly affect 144 acres. Thirty miles of road would be constructed, which when added to the miles of road to be constructed for other purposes, and the miles currently existing, would total 140 miles. This would result in a road density of 2.6 miles per square miles, based on a calculation of 32,000 acres in the northern part of the KGS and 2,300 acres in the exclusion fingers. The thirty miles of road would directly affect 72 acres. Roads used for CO_2 exploration and development would be of an all weather standard and at least 14 feet wide. They would be driveable by most 2 wheel drive vehicles. In the event that all wells drilled were developed (probably unlikely), the support facilities necessary (dehydration and compression station, power substations, etc.) would

take up about 110 acres. Pipelines would be buried in the road and would take up no additional acreage. Powerlines would follow road alignments so they would consume little or no additional acreage. In total, wells, roads, and facilities associated with this alternative will directly consume 326 acres.

Potential Effects on Listed and Sensitive Species

Listed Species

Peregrine Falcon. Presence of the peregrine falcon has not been confirmed within the KGS; its occurrence is only suspected. If peregrines are using the KGS, they would probably confine their activity in the northern portion to hunting. In the southern part they might nest in the steep, inaccessible cliffs and hunt over the benches or canyons. Nesting birds could be disturbed by activity near their nest sites. It is not clear how much disturbance, at what distance nesting peregrines will tolerate. At least some members of the species are quite tolerant of activity, judging from reports of some nest locations. It is not likely that hunting habitat for peregrines would be affected to any extent by CO_2 activity. Powerlines could present a hazard to low flying birds.

Bald eagle. No winter roost sites are known from the KGS. Those areas on the Forest that are frequented by bald eagles are characterized by a riparian zone containing roost trees and a stream with an adequate fish prey base and open valley bottoms with scattered roost trees and an adequate terrestrial prey base. Preferred roost trees are deciduous, usually cottonwoods, but eagles are occasionally seen on conifer snags. If eagles are using the KGS, they are most likely to be using the low elevation areas at the southern end, as during the winter months the northern part would be snowed in and most prey species would be unavailable. Because of the logistic problems of conducting exploration and development work during the winter months, it is unlikely this activity will occur when eagles are in the area. Production would occur on a year around basis, but this activity would not be disturbing to eagles, other than in the immediate area of a compression/dehydration station. Powerlines could present a hazard to low flying birds and if not constructed properly, could be a hazard to roosting birds.

Sensitive Species

Fifteen sensitive bird species and four sensitive plant species occur within the KGS. In the case of several of the birds, occurrence is only hypothetical; we are not aware of any confirmed sightings. These species are: The sandhill crane, the prairie falcon, the merlin, the great blue heron, the flammulated owl, Williamson's sapsucker, the black swift, and Lewis' woodpecker. Two of the plants; the Aquarius indian paintbrush and the small beardtounge are known from near the north western edge of the KGS (sec. 27, T31S R2E, SLM), and may occur within the KGS. Of the sensitive bird species known to occur in the area, perhaps the one most susceptible to disturbance from exploration and development is the Mexican spotted owl. This owl seems to prefer narrow, secluded, steep-walled canyons (Woyda 1982) and is a cliff nester. The activity associated with exploration and development could cause owls to abandon the immediate area, should they be present. These disturbances would also be likely to affect nesting success in any of the other bird species if the nests were near activity centers. Outside of the breeding and nesting

DETERMINATION OF EFFECTS

The following mitigating requirements and/or special stipulations have been recommended for use with the Preferred Alternative:

1. Protection of threatened, endangered, or sensitive species: Prior to any surface disturbing activity, a survey must be accomplished to determine presence of and effects upon any plant or animal species listed or proposed for listing as threatened or endangered, or their habitats. Similar survey work should be done for species considered as sensitive by the Forest Service and/or the Utah DWR, or species on the U.S. Fish and Wildlife Service's list of Migratory Birds of High Federal Interest. A list of species in these categories which may occur within or near the KGS is attached to this report.

2. Use of a No Surface Occupancy stipulation or a Seasonal Use Restriction should be considered if any species in the above categories are present.

3. All road, drill pad and other facility location and design will be subject to approval by the Forest Service.

4. All new roads and existing roads which are providing access primarily for exploration and development activites should be closed to public use.

5. All facilities (including roads) that are not needed for the production phase of the project should be reclaimed to as near the natural pre-project conditions as possible.

6. No surface disturbance will be allowed within 500 feet of the normal high waterline of all streams, lakes, ponds, and reservoirs.

7. No drilling or surface disturbance will be allowed within 400 feet of springs or other naturally occurring water sources.

Peregrine Falcon

Based on this evaluation, if the peregrine falcon is found to occur within the KGS, a "may effect" determination is concluded.

Bald Eagle

If bald eagles are found to occur within the KGS, they will only be there during the winter. The exploration and development phases are the portions of a CO_2 project that have potential to disturb eagles, but they will not overlap with the period of the year when the eagles are present. Based on this information and other information in the evaluation a "no effect" determination is concluded for the bald eagle.

Sensitive Species

As discussed in the Potential Effects section, occurrence of several of the bird species is not confirmed. Based on this evaluation, a "no effect" determination is made for the sandhill crane, the merlin, the great blue heron, the flammlated owl, the Williamon's sapsucker, the black swift, and the Lewis' woodpecker. A "may effect" determination is concluded for the prairie falcon. For the species whose occurrence is confirmed, a "no effect" determination is concluded for the western bluebird, the golden eagle, the Cooper's hawk, the ferruginous hawk, the bandtailed pigeon, and Grace's warbler. A "may effect" determination is concluded for the Mexican spotted owl. A "may effect" determination is concluded for the four sensitive plant species.

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