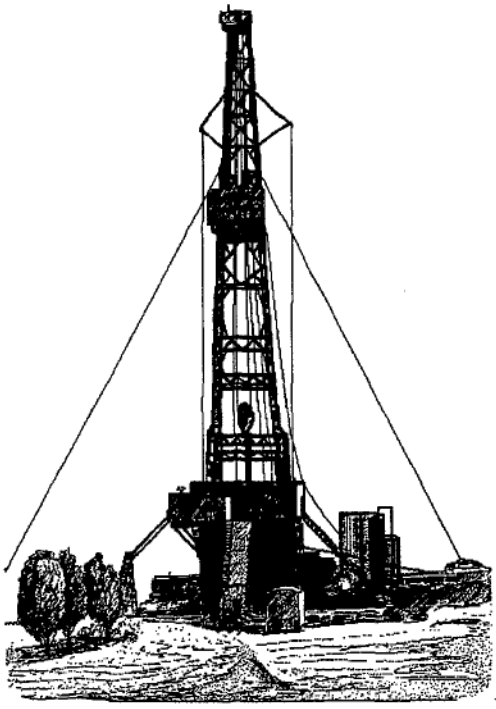
United States Department of the Interior
Bureau of Land Management

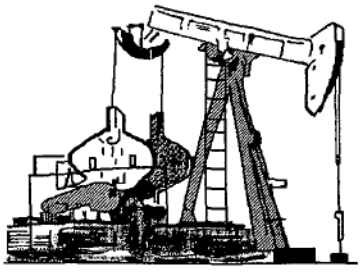
Colorado State Office

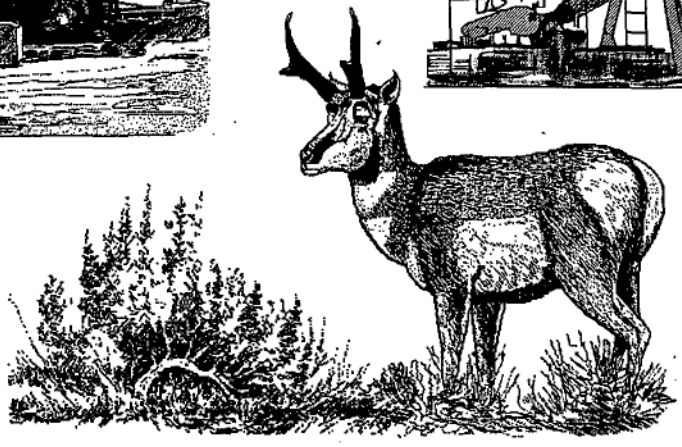
April 1990

COLORADO OIL AND GAS LEASING

DRAFT ENVIRONMENTAL IMPACT STATEMENT







United States Department of the Interior

BUREAU OF LAND MANAGEMENT
COLORADO STATE OFFICE
2850 YOUNGFIELD STREET
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TAKE PRIDE IN AMERICA

Dear Reader:

Enclosed for your review is the Draft Environmental Impact Statement (DEIS) and Draft Resource Management Plan Amendment for the Glenwood Springs, Kremmling, and Little Snake Resource Areas, and the Northeast and San Juan/San Miguel Planning Areas. Public meetings will be held between July 1 and July 15, 1990. We anticipate the meetings will be in Grand Junction, Durango, and Denver. These public meetings will be advertised in the local news media.

Written comments received by August 14, 1990, and comments presented at the public meetings will be fully considered and evaluated in preparation for the Final Environmental Impact S[illegible] (FEIS) and Resource Management Plan Amendment. Those co[illegible] of the impact assessment, or present[illegible]

If changes in the FEIS [illegible] will include only those changes an[illegible] wers are urged to retain this copy of [illegible]

AUTHOR Bureau of Land M.G.T.
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COLORADO

OIL AND GAS LEASING AND DEVELOPMENT

ENVIRONMENTAL IMPACT STATEMENT

Draft (X) Final ( )

Lead Agency: Department of the Interior, Bureau of Land Management

Cooperating Agency: Department of Agriculture, Forest Service

Type of Action: Administrative (X) Legislative ( )

This is the Draft Environmental Impact Statement and Draft Resource Management Plan Amendment for the Glenwood Springs, Kremmling, and Little Snake Resource Areas, and the Northeast and San Juan/San Miguel Planning Areas in the State of Colorado. This EIS contains amendments to the oil and gas leasing and development decisions contained in the Resource Management Plans for the five areas. It analyzes the Proposed Action plus two alternatives: Continuation of Current Management (No Action), and leasing with Standard Terms and Conditions.

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Comments due: August 14, 1990

Date Released: May 14, 1990

SUMMARY

This is a draft Resource Management Plan (RMP) amendment and Environmental Impact Statement (EIS) for five resource management planning areas within the state of Colorado. These areas contain a total of 4.9 million acres of federal mineral estate that could be leased for oil and gas production. The five areas analyzed are the Glenwood Springs, Kremmling, Little Snake, Northeast, and San Juan/San Miguel. The RMPs are being amended to conform to the latest program guidance of the BLM. This program guidance requires the BLM to estimate oil and gas development potential and to base the leasing strategy on this potential. A reasonably foreseeable development (RFD) scenario is also developed for analysis and impact assessment.

The Proposed Action is to categorize lands for leasing as follows:

Open Subject to Standard Terms and Conditions ..... 2,202,700 acres
Open Subject to Seasonal or Other Minor Constraints..... 2,357,400 acres
Open Subject to No Surface Occupancy or Major Constraints ..... 1,655,800 acres
Closed to Leasing ..... 250,800 acres
*Some stipulations overlap, therefore, the total of all six categories may add up to more than the total federal acreage shown next to "Total" for each area.

Both nondiscretionary closures (areas closed by law or regulation) and discretionary closures (areas closed by decision of the responsible BLM official) are described. The areas that are closed to leasing are usually Wilderness Study Areas (WSAs), town sites, military facilities, reservoirs, etc.

If the Proposed Action is approved, the five RMPs would be amended and the lands leased for oil and gas production as described above. The Proposed Action is analyzed along with two alternatives which are the Continuation of Present Management (No Action) and the Standard Terms and Conditions.

Major issues that were expressed during the public scoping period were the protection of WSAs, Areas of Critical Environmental Concern (ACECs), cultural sites,, major highway view sheds, and sensitive areas. Identification of BLM's road network management policy was to be analyzed and also road construction standards.

Cumulative impact assessment is also a requirement of the new guidance. The cumulative impacts of the Proposed Action appear to be insignificant. Wildlife is the resource most subject to impacts but these were determined to be insignificant. The necessity of the constraints on oil and gas production is discussed and rationale given for them.

The Proposed Action assumes that managers will use the standard terms and conditions of the oil and gas lease to the fullest extent allowable by regulation. As an example, the lease allows the BLM to move an operation up to 200 meters and delay operations for up to 60 days. The use of lease stipulations for such items as the protection of wildlife during the winter will not be used if the winter period is less than 60 days. Also, the need to move a field operation to protect an isolated resource will not require the use of a lease stipulation if the 200 meter option is sufficient to prevent the impact. Lease Notices will be used to alert the lessee of possible constraints depending upon his proposed operation and time frames.

Lease stipulations are used when the BLM knows that certain limitations, in addition to standard terms and conditions, are needed to protect other resource values. The BLM states under what situations (exception, modification, or waiver) the lessee may be released from the constraints of the lease stipulations. This provides the local manager flexibility in dealing with such variables as winter weather, shifting big game herds, new information or inventories on sensitive resources, etc.

Conditions Of Approval (COAs) are attached to permits to require the lessee to perform specific actions in a certain manner. COAs are dependent on the actual time frame and proposed operations on the ground.

The Continuation of Present Management (No Action) Alternative analyzes the impact of the way BLM is doing business today.

The Standard Terms and Conditions Alternative would be the minimum that the BLM could legally implement. Leases would not have stipulations but COAs would be imposed on individual permits to protect such resources as big game winter ranges, steep slopes, fragile soils, etc. Resources not already protected by federal laws would be protected by COAs, or in the case of ACECs, no leases would be issued.

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CHAPTER ONE

PURPOSE AND NEED

CHAPTER ONE

PURPOSE AND NEED

INTRODUCTION

This chapter describes why the Bureau of Land Management (BLM) is preparing this Environmental Impact Statement (EIS) and amending the oil and gas leasing decisions in five Resource Management Plans (RMPs). It further describes the purpose and need for leasing federal mineral estate for oil and gas development, locations within Colorado included in this EIS, relationships with other plans and programs, the planning process to be used in reaching leasing decisions, and the issues that have been raised with this Proposed Action.

PURPOSE AND NEED

The BLM, as agent for the Secretary of the Interior, has responsibility for leasing and managing the oil and gas resource where the mineral estate is federally owned. This is referred to as the federal mineral estate. For many years, concern has been expressed that BLM's oil and gas leasing process may not adequately comply with the National Environmental Policy Act (NEPA) requirements to analyze and disclose the cumulative impacts of oil and gas activities. During the last few years, conflicting court decisions have resulted in uncertainty. To resolve this issue, BLM officials consulted with representatives of environmental groups and the oil and gas industry to help revise BLM's environmental analysis standards for oil and gas leasing decisions which are made in the Resource Management Plan (RMP). This resulted in issuance of new BLM manual guidance during the fall of 1987 titled, Supplemental Program Guidance for Fluid Minerals (SPG). At the time this guidance was issued, BLM within Colorado had six RMPs near completion or completed. To achieve compliance with the new standards in a reasonable time frame, it was decided to amend five of the RMPs in this document. The Piceance Basin RMP will be amended separately.

The five RMP/EIS's addressed in this EIS are: Glenwood Springs, Kremmling, Little Snake, Northeast, and San Juan/San Miguel. See Table 1-1. The RMPs encompass approximately five million acres of federal mineral estate, most of which underlies federal lands administered by the BLM. The leasing decisions described in the RMP/EIS's will be revised to conform to current policies and conditions. The most significant change is to incorporate, in a more systematic manner, a cumulative impact analysis which is based on a reasonable foreseeable estimate of future oil and gas activity. This requirement is described in BLM Manual section 1624.2.

TABLE 1-1. RESOURCE MANAGEMENT PLANS/ENVIRONMENTAL IMPACT STATEMENTS (RMP/EIS)

Resource Area	Date of Approval
Glenwood Springs	January 3, 1984
Kremmling	December 19, 1984
Little Snake	April 26, 1989
Northeast	September 16, 1986
San Juan/San Miguel	September 5, 1985

For more than 100 years, it has been federal policy to make lands available for mineral exploration and development. The Arab oil embargo of the early 1970s emphasized the desirability of reducing U.S. dependence on imported oil. Although the federal mineral estate, known reserves, and existing production of oil and gas within the areas depicted in this EIS represent only a small proportion of the U.S. total production, reserves, and owned mineral estate, it is nonetheless important. This is especially true to Colorado. Development of the oil and gas resource has historically been an integral part of the state and local economies in Colorado. Although the rate of development has declined in recent years, it is expected to continue to be an important economic factor,

continue to be an important economic factor, affecting state and local communities and the Rocky Mountain Region.

LOCATION

The Study Area includes all public lands and mineral estate within the Glenwood Springs Resource Area (GSRA); Kremmling Resource Area (KRA); Little Snake Resource Area (LSRA); Northeast Resource Area and a portion of the Royal Gorge Resource Area (referred to as the Northeast Planning Area (NPA)); and San Juan Resource Area and a portion of the Uncompahgre Basin Resource Area (referred to as the San Juan/San Miguel Planning Area (SJ/SMPA)). See Map 1-1.

The Study Area encompasses over 3.2 million acres of BLM-administered surface lands and over 4.9 million acres of federal oil and gas mineral estate. See Table 1-2.

RELATIONSHIP TO BLM POLICIES, PLANS, AND PROGRAMS

The decisions as to which lands will be leased and how they will be leased for oil and gas development are being made through a plan amendment process. This involves the following nine steps: 1) Issue identification. This step was initiated by public notices and included open houses requesting public input to help focus the process on those issues of concern related to BLM's management of oil and gas development. 2) Planning Criteria. Based on the issues identified, appropriate parameters and the scope of the analysis were determined. 3) Inventory. Data necessary to make informed decisions was collected. 4) Management Situation Analysis. The existing situation was described and an analysis prepared to identify management opportunities and limitations. 5) Alternative Formulation. Each alternative analyzed was a complete and implementable set of decisions providing different responses to the issues. 6) Estimation of Effects. The environmental impacts of each alternative are described and possible mitigation measures are identified. 7) Select Alternative. The product of this step was a proposed plan amendment and draft EIS which BLM provides for public review and comment. 8) Select Plan Amendment. Using the public comments received, the State Director selects the amendment, which is then subject to a 60-day Governor's consistency review, and a 30-day protest period. 9) Monitoring and Evaluation. Implementation of the leasing decisions is tracked and their effectiveness is periodically monitored to determine if changes are needed.

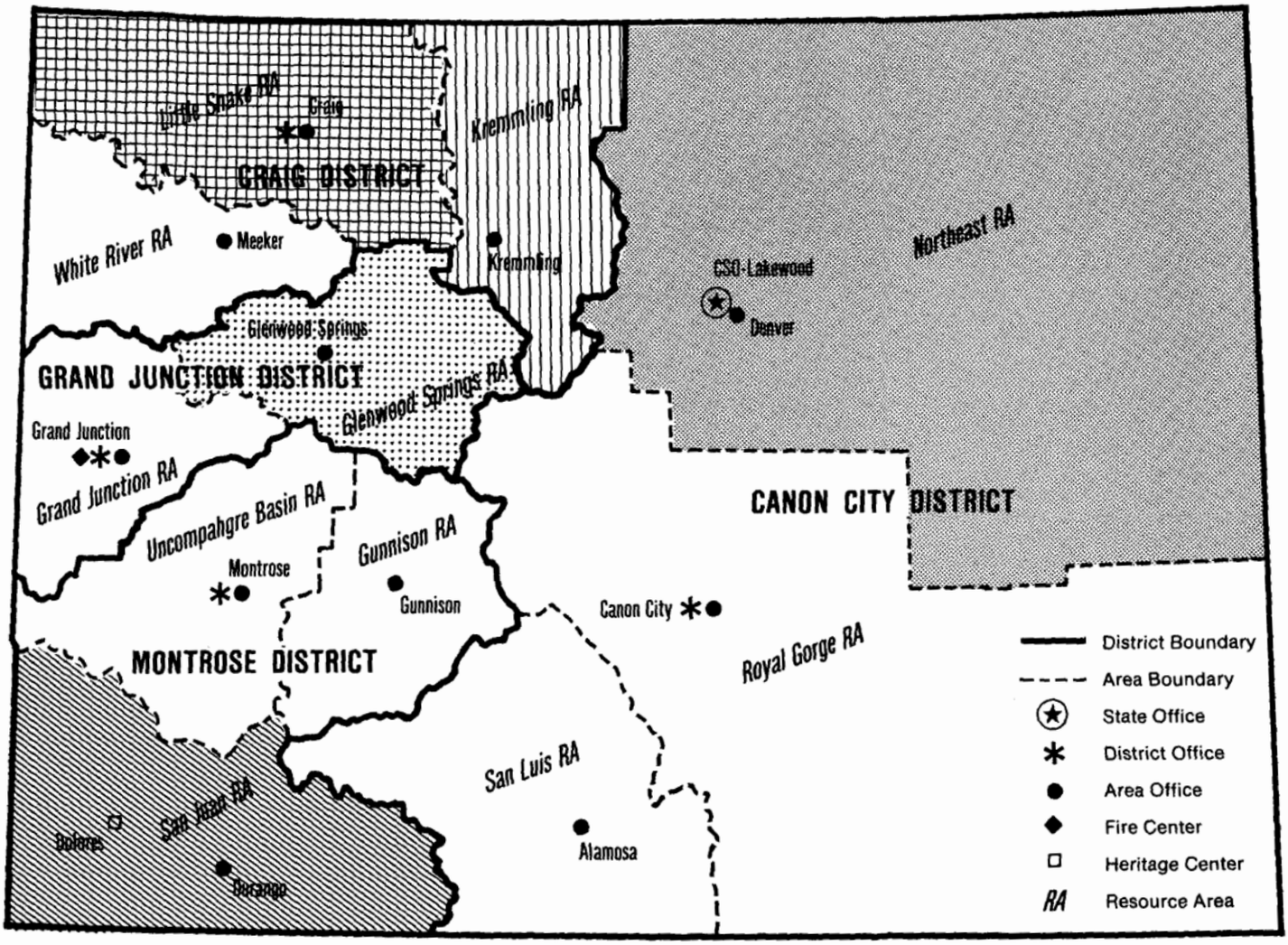
TABLE 1-2. STUDY AREA

	Surface acres	Total Federal Mineral Estate (1)
Glenwood Springs Resource Area	516,000	723,000
Kremmling Resource Area	386,000	651,000
Little Snake Resource Area	1,317,000	1,878,000
Northeast Planning Area	32,000	475,000
San Juan/San Miguel Planning Area	994,000	1,291,000
TOTALS	3,245,000	5,018,000

1) Includes surface acres.

The 1920 Mineral Leasing Act, as amended, authorizes the Secretary of the Interior to lease oil and gas resources on all public domain and acquired lands. Lands excluded from such leasing by legislation or secretarial policy are listed in Code of Federal Regulations (CFR) title 43, part 3100.0-3. The excluded lands include units of the National Park System; Indian reservations; Naval Oil Shale Reserve; incorporated cities, towns, and villages; and lands recommended for wilderness designation, wilderness study area (WSA) and lands within the national Wilderness Preservation System.

The lands excluded from leasing under the Mineral Leasing Act are analyzed in this plan to the extent of cumulative impacts from nearby development on BLM-administered lands, and the issuance of protective leases for drainage purposes. Even though they are excepted from operation by the Mineral Leasing Act, these lands may be leased in cases involving drainage of oil or gas from the restricted area. In order to protect the United States from loss of revenues resulting from the drainage of oil and gas under lands closed to leasing, the Secretary of the Interior has authority to issue protective leases within areas otherwise unavailable for leasing.



Map 1-1
EIS STUDY AREA

These leases are only issued under the special circumstances of having an adjacent lease which drains the oil and/or gas from beneath the closed area.

The WSAs included in this EIS are generally protected by a No Leasing stipulation. Some portions of the WSAs were leased prior to the WSA designation. The pre-WSA leases are still valid and may be developed under the BLM's Interim Management Guidelines. Congress will make a determination on the final designation of the WSAs. If Congress decides not to designate an area as wilderness, it will be managed under guidelines published by BLM in the respective Final Wilderness EIS and Record of Decision for each Resource Area.

The map scale used in this plan is chosen to facilitate public recognition of general resource localities. Each Resource Area Office has the detailed, larger scale maps and/or files that are used for management and inventory purposes. Anyone requiring information about specific localities, or areas too small to be clearly defined on the plan amendment maps, or large areas whose boundaries may be indistinct at this scale, should contact the appropriate Resource Area Office. An additional reason for contacting the Resource Area Office is to check on the latest status of some boundaries. The protective measures discussed in this plan would be applied as required by the plan decisions, and as new inventories show the expansion or contraction of some resources; for example, elk crucial winter habitat, the area of applicability will change. New protective measures may be added when a terminated lease is again offered for lease. No new protective measures can be appended to existing leases without the lessee's consent.

Because this amendment involves five separate RMPs which were approved over a five-year period, there are some differences in how this amendment relates to these existing land use plans. In 1982, a series of Environmental Assessments (EAs) were prepared by BLM which addressed oil and gas leasing on public lands throughout Colorado. These EAs documented leasing decisions for virtually every tract of public land and eliminated the need for reviews at field offices of each proposed lease. This documentation was prepared by each Resource Area Office and provided to the Colorado State Office where leases are issued. The Glenwood Springs and Kremmling RMPs updated these existing EAs, which were retained to provide direction for leasing. The San Juan/San Miguel and the Northeast RMPs revisited all leasing decisions and replaced these earlier EAs. In the case of the Northeast RMP, much of what was pertinent from the 1982 EA was updated and included in what was termed a "Technical Report" to the RMP. For the Little Snake RMP, BLM initially intended to use this same process; however, before this RMP was approved, the new standards, described earlier, necessitated that the RMP be amended. This RMP amendment will replace all earlier planning and environmental documents which serve as a basis for leasing decisions.

RELATIONSHIP TO NON-BLM POLICIES, PLANS, AND PROGRAMS

This plan will not make decisions for lands not administered by BLM within the Study Areas. Leasing decisions for federal lands not administered by the BLM will be made by the appropriate agency in cooperation with the BLM.

To reduce or avoid conflicts between administrative agencies, the planning documents for adjoining lands have been reviewed, and where appropriate, that information has been used in developing the Proposed Action analyzed in this EIS.

Lands administered by the Department of Agriculture, U.S. Forest Service (FS) will have leasing decisions made in a FS Land and Resource Management Plan/EIS. The BLM is a cooperating agency providing oil and gas expertise to the FS EIS Team preparing these plans. BLM provides the FS with projections of future oil and gas activity and impact analyses of subsurface construction.

The FS plans analyze impacts from oil and gas leasing and development to National Forest System Lands and describe where the FS will or will not consent to lease. The BLM plan for a Resource Area will look at the cumulative impacts on all lands within that Resource Area, but the specific impacts

of leasing and development on National Forest Lands will be analyzed in the FS plan.

The BLM is responsible for the leasing and development of lands administered by the National Park Service that are eligible for that purpose. However, all National Parks and Monuments are withdrawn by law, and National Recreation Areas are withdrawn by regulation from mineral leasing. This EIS will not analyze leasing of these lands, but will analyze impacts to these lands from leasing adjacent federal mineral estates. For that reason, the BLM consulted the National Park Service in preparation of this plan.

The BLM is coordinating with the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act. This EIS will serve as the Biological Assessment. When the final EIS is published, the USFWS will issue a final Biological Opinion on the effects of the Proposed Action on threatened and endangered species.

The BLM has a memorandum of understanding with the Colorado Oil and Gas Conservation Commission (COGCC) and a long standing, day-to-day working relationship between the Commission staff and the BLM mineral resource staff. The working relationship consists of staff level communications related to technical requirements for drilling wells in Colorado, spacing of wells and draining oil and gas reservoirs, and analysis and mitigation of impacts to groundwater and other mineral resources (non-oil and gas). The relationship of the BLM and COGCC is based on the COGCC's authority over oil and gas operations in the state of Colorado.

The BLM relationships with county governments in Colorado are based on memoranda of understanding with the local counties and/or with Colorado Counties Incorporated. These memoranda contain such details as what BLM-administered actions the county should be notified of, and when the notification should take place. Necessary county/BLM coordination and joint action may also be defined. Copies of these county/BLM agreements are on file for public review in the appropriate Resource Area Office.

AUTHORIZING ACTIONS

To lease federal oil and gas, a decision must be reached by the BLM as to which lands to lease and whether stipulations are necessary for the protection of the environment and other resources. If a decision is reached to lease under one of the alternatives in this EIS, additional actions will be required before on-ground operations begin. These actions include the submission of Applications for Permit to Drill (APD), Applications for Rights-of-Way (ROW), and Sundry Notices for other field operations. Development activities subsequent to leasing will have additional NEPA documentation prepared to assess site specific impacts within the range of significance identified in the plan. These additional environment documents would also be used to identify significant impacts not analyzed in the plan, or decision changes necessitated by new developments in the future. If such impacts or changes are identified, an analysis will be conducted to determine if a plan amendment is necessary.

EIS SCOPING PROCESS AND ISSUES

The BLM announced their intent to prepare an EIS and solicited comments from the public. The announcement appeared in the *Federal Register* on March 13, 1989, and in local news media.

Public meetings were held during the 30-day comment period in Walden, Craig, Glenwood Springs, Durango, and Denver. Meetings were also held with Colorado Department of Natural Resources agencies and several environmental groups and industry representatives. Ten letters were received during the scoping process. The issues and concerns that were expressed are summarized below. Scoping documents, containing more detail, are on file in each of the five BLM Resource Area Offices participating in preparation of this EIS.

Scoping issues that will be discussed are categorized and shown below.

- Identify impacts on water, visual resources, threatened and endangered species

- Consider buffer zones around sensitive areas

- Identify procedures in the leasing and development of oil and gas
- Analyze rehabilitation program
- Analyze road construction standards
- Discuss road closure policy
- Trace off-site impacts
- Trace impacts to the point of insignificance
- Coordinate planning with neighboring agencies
- Analyze compliance and monitoring programs
- Identify and analyze any hazardous waste issues
- Consider certain areas for No Leasing--This list is available in each Resource Area Office.

CHAPTER TWO

ALTERNATIVES

INTRODUCTION

Three alternatives have been developed to address issues where oil and gas development may be a concern. Using an assessment of the potential of development (POD), the three alternatives, which differ in terms of mitigative requirements, are analyzed to determine the reasonably foreseeable development (RFD) of the oil and gas resource within the Study Area. In turn, the RFD is used to assess impacts expected to occur with each alternative.

Public lands are generally available for oil and gas leasing in accordance with the public policy expressed in the Mineral Leasing Act, and BLM's mandate for true multiple use of the public lands set out in the Federal Land Policy and Management Act. Therefore, an alternative of no leasing over the entire Study Area was considered, but not analyzed. No leasing was considered and analyzed on a more site-specific basis as part of the analyzed alternative. The BLM believes the three alternatives presented provide an adequate range of proposals and options to make a well informed choice.

The alternatives that are legally feasible and technically possible with current drilling and producing equipment are as follows:

• The **Proposed Action Alternative** is to lease oil and gas with Standard Terms and Conditions, and additional leasing stipulations to protect other resources and values. These additional stipulations will be derived from the existing stipulations (those contained in the Continuation of Present Management Alternative) and ones newly developed during this plan amendment. This alternative contains the management prescriptions that local managers believe to be the best balance of past practices, and new prescriptions developed from public and internal suggestions during the scoping for this plan.

• The **Continuation of Present Management Alternative** would lease oil and gas resources with Standard Terms and Conditions, and the stipulations currently in use (Appendix C shows the standard terms and conditions and Appendix E lists stipulations in current use). The purpose of analyzing this alternative is to determine any possible short comings in the present management decisions, and to predict what will occur over the next 20 years in oil and gas development if there were no changes in current management.

• The **Standard Terms and Conditions Alternative** consists of leasing for oil and gas with only the standard terms and conditions. The Standard Terms and Conditions are required by law and regulation and are attached to every oil and gas lease regardless of other considerations. This is the most simplistic alternative that can be reasonably analyzed. This alternative is potentially the least restrictive leasing program the BLM would be permitted by law to implement.

Appendix A gives a detailed description of oil and gas operations from preliminary exploration, through drilling of individual wells and development of a field, to final abandonment of the wells. An understanding of oil field operations and the technical necessities required in oil and gas production is critical to the analysis of environmental impacts.

In addition to this EIS, an environmental assessment (EA) will be completed on each Application for Permit to Drill (APD). If the analysis in the EA determines that the lease stipulations are not required to prevent impacts, exceptions to the stipulations will be developed and added to the APD in the form of COAs. Conformance to this EIS will also be determined in the EA.

THE POTENTIAL OF DEVELOPMENT (POD) FOR OIL AND GAS RESOURCES

Assumptions for the POD of oil and gas resources in the Study Area over the next 20 years (beginning with 1989) are outlined in Appendix B. These assumptions are necessary for a meaningful and reasoned analysis of the cumulative impacts resulting from oil and gas leasing and development. The assumptions are based on statistical analysis of historical development. The historical trends have been increased in some cases to afford a "worst case" analysis.

Table 2-1 shows the numbers of wells projected for each Resource/Planning Area by potential development region. All potential development regions are not present in all Planning or Resource Areas (e.g., Region 1 for Northeast and San Juan/San Miguel Planning Areas). Potential development regions are shown in Appendix B.

Region 1--No potential for oil and gas development: Absence of source rock, thermal maturation, or reservoir rock prohibiting oil and/or gas occurrence.

Region 2--Low potential for oil and gas development: Specific indications that one or more of the following are not present: source rock, thermal maturation, or reservoir strata possessing permeability and/or porosity, and traps.

Region 3-- Medium potential for oil and gas development: Geophysical or geological indication that the following are present: source rock, thermal maturation, reservoir strata possessing permeability and/ or porosity, and traps.

Region 4--High potential for oil and gas development: Contains oil and gas source rock, thermal maturation, reservoir strata possessing permeability and/or porosity, and traps or part of an oil and gas play as defined by the U. S. Geological Survey (Open File Report 88-373 or related publication).

The impacts of geophysical exploration, and oil and gas exploration and development have been analyzed for each resource listed. The cumulative impacts of these operations on any one resource are shown in Chapter 4. Analysis of the rate of development (the number of wells drilled in any given year) was made by the resource specialist based on the greatest expected impact to the resource. Therefore, a worst case scenario was developed from the well numbers, location, etc., that are displaced in the POD (Appendix B) for each area.

Coal-bed methane development has been considered along with other oil and gas development for Glenwood Springs Resource Area (GSRA), Little Snake Resource Area (LSRA), and San Juan/San Miguel Planning Area (SJ/SMPA). At this time, no coal-bed methane development is anticipated for Kremmling Resource Area (KRA) and Northeast Planning Area (NPA).

Fields

Development may also be viewed in terms of the expected concentration of wells. The anticipated number of wells would not be distributed uniformly across the Study Area. Wells would be concentrated in "fields." Table 2-2 shows the anticipated concentration of new field development in each Resource/Planning Area.

TABLE 2-1. PROJECTED NUMBER OF WELLS

	GSRA	KRA	LSRA	NPA	SJ/SMPA
Wildcat Wells					
Region 1	0	0	1	NA	NA
Region 2	2	8	2	1	5
Region 3	4	2	15	10	40
Region 4	22	30	512	106	104
Subtotal	28	40	530	117	149
Development Wells					
Region 1	0	0	0	NA	NA
Region 2	4	14	0	1	8
Region 3	8	4	15	10	60
Region 4	50	50	455	110	136
Subtotal	62	68	470	121	204
TOTAL	90	108	1,000	238	353

NA--Not Applicable - This Potential Development Region is not present in this planning area.

TABLE 2-2. FIELDS

	GSRA	KRA	LSRA	NPA	SJ/SMPA
New Fields	4	6	20	0	17
Average Size (1)	1	3	7	NA	4
Wells Per Section	4	4	3	6	3

(1) Average Size in ideal Sections. A Section is equal to 640 acres, and is one mile square.
NA--Not Applicable - No fields projected.

It should be noted that in NPA, federal land comprises such a small proportion of overall anticipated development that it is unlikely a new field would involve any BLM-administered surface or more than five to 30 percent of the mineral estate. New field development in the NPA would be primarily in the jurisdiction of the state of Colorado.

ALTERNATIVES

Mitigative Measures Common to All Alternatives

Restrictions applied to field operations by federal regulation, based on applicable laws and Section 6 of the lease instrument (See Appendix C), are found in the Code of Federal Regulations (CFR), Part 43 sub-part 3100. These regulations give the Authorized Officer authority to determine how field operations are conducted. Since federal regulation makes these requirements mandatory, they are not repeated in the leasing stipulations. Some requirements may be noted in lease notices for special emphasis. Leasing stipulations developed in this EIS are not applicable to existing leases. Analysis of impacts have taken these existing leases into account.

The various resources and values within each Resource/Planning Area are inventoried (inventory is an ongoing, almost continuous effort) and analyzed to determine what impacts oil and gas development may have. Impacts are viewed both in terms of positive and negative impacts, both to and from oil and gas development. Once impacts are identified, analysis is made to determine what (if any) mitigative or protective measures might be applied to prevent or reduce those impacts. The mitigative and/or protective measures must then be transformed into the necessary legal language to be effectively applied to field operations. Mitigation is accomplished by requiring an oil and gas lessee to do (or not do) certain things, such as building roads in such a way as to decrease soil erosion. This mitigation is accomplished by appending the requirement to the operational field application (such as an Application for Permit to Drill). In this plan, these requirements are referred to as Conditions of Approval (COAs). BLM's authority to impose these requirements is derived from specific legislation (1920 Mineral Leasing Act, as amended) and the resulting federal regulation. In some cases, the only way to adequately protect a resource/value from development impacts is to so severely restrict the operation as to deny the lessee some, or all, of the rights granted in the lease. In these cases, since a lease is a binding contract, it is necessary to stipulate the lease in such a way prior to the sale that the government reserves additional rights over and above those normally reserved in a lease. The stipulations placed on the lease are then carried through the approval of the field operation as part of the lessee's plan of operations.

An example of this process in action might be that observation has shown elk gather, during severe winters, in protected areas that have forage available with minimum digging in the deep snow. Another study shows that elk generally avoid humans and human activity (operating machinery such as drill rigs, for example). Observation of past oil and gas field development may have also shown that when a well is drilled in one of these areas, during a severe winter, the elk are effectively denied that part of the crucial winter range. The impacts of displacing these animals may be: 1) direct--some animals die of starvation or stress induced by the deep-snow migration to another protected area; 2) indirect--animals in adjacent crucial winter range may starve due to the increased feeding pressure from the displaced herd, or the displaced herd may impact other environments, such as a rancher's winter pasture; or 3) cumulative--several drilling operations or a combination of drilling and other (non-oil and gas) operations will displace several groups from their crucial winter range resulting in an even more severe impact to the overall herd or other resources (vegetation, livestock, etc.).

Mitigative measures discussed in this section would be applied to oil and gas exploration and development activities under all of the three alternatives. These mitigative measures, referred to as COAs, are used to mitigate impacts to the environment, public health, and safety. The Authorized Officer would choose among these measures to mitigate environmental impacts identified on a site-specific basis at the field development stage. Authority to apply COAs stems from and must be consistent with the lease rights granted. BLM may not give a lease holder the right to extract minerals, and then at the time of development, require mitigation not specified in the lease that would disallow part, or all of the mineral extraction. Minimum measures under lease rights are defined in CFR 3101.1-2 as allowing the movement of a proposed well up to 200 meters and restriction of timing of the operation by as much as 60 days.

COAs are attached to all surface-disturbing activities. These would most commonly include Applications for Permit to Drill (APDs), Sundry Notices, applications for rights-of-way, and Notices of Intent (NOI) for geophysical operations.. These COAs are used on a site-specific basis at the discretion of the Authorized Officer. COAs are applied to specific sites for the protection of resources that would otherwise be impacted by that operation. A given COA is always applied to protect a resource affected by the specific operation being approved even on existing leases. COAs common to all alternatives are listed in Appendix D.

Stipulations less restrictive than those chosen for the three alternatives were considered and determined to be insufficient to protect the resource. More restrictive stipulations were also considered, but found to be unnecessary for the protection of the resource. An example of these considerations are stipulations in the Proposed Action Alternative to protect wildlife habitat by timing limitations. The habitat could be protected by not leasing the area or by not allowing surface occupancy year round. These levels of restriction do not add to the protection afforded by the timing limitation. The timing limitation stipulation will protect the habitat from impacts associated with drilling, and construction of roads and pads during the season when it is in use by the wildlife. Less restrictive measures might include shorter closure periods, screening operations from view or hearing of the animals, and/or re-location (less than 200 meters) of operations from areas most used by the wildlife. These measures would not protect the habitat as well as the timing limitation.

Proposed Action Alternative

The Proposed Action was developed from analysis of the Continuation of Present Management and the Standard Terms and Condition Alternatives. It provides appropriate mitigative measures for protecting resource concerns and uses, while allowing oil and gas leasing and development with a minimum of restrictions.

Many impacts are adequately mitigated by COAs attached to field operation approvals and by stipulations attached to the lease. If an impact cannot be sufficiently mitigated under the Standard Terms and Conditions, the stipulations used under present management were analyzed for effectiveness. If the existing lease stipulation was sufficient, it was carried forward in the Proposed Action. If the necessary stipulation was not found, or found to be inadequate, a new stipulation or COA was developed for the Proposed Action. Table 2-3 shows the availability of federal lands for leasing within the five Resource/Planning Areas under this alternative.

On lands where the BLM does not have surface management authority, such as Forest Service lands, a plan/EIS is prepared by that agency with BLM input and cooperation. The plan analyzes impacts and makes leasing decisions. These lands are then leased in accordance with these decisions and the consent or concurrence of the surface management agency.

Reasonable Foreseeable Development Under the Proposed Action

The restrictive measures imposed by the COAs and lease stipulations under the Proposed Action Alternative would increase the cost of lease operations (through additional cost of inventories, monitoring, more costly construction methods, use of directional drilling, etc.), but would not change overall development from that predicted in the POD (Appendix B). The

TABLE 2-3. PROPOSED ACTION ALTERNATIVE.
AVAILABILITY OF LANDS (IN ACRES) FOR FLUID MINERAL LEASING

	GSRA	KRA	LSRA	NPA	SJ/SMPA
Standard Lease Terms Only	5,000	371,201	765,610	293,000	767,876
No Surface Occupancy Stipulations	365,419	22,052	65,360	26,606	90,545(2)
Timing Limitation Stipulations	717,657	265,600	860,220	121,830	392,083
Controlled Surface Use Stipulations	670,000	0	409,120	6,712	0
No Lease (WSA)(1)	25,408	8,427	86,257	0	103,152
No Lease (discretionary)	0	0	0	27,608	0
TOTAL(2)	723,000	651,000	1,878,000	475,000	1,291,000

(1) Interim Management for all Wilderness Study Areas is "No Lease" until Congress acts on wilderness designation.
(2) Some stipulations overlap, therefore, the total of all six categories may add up to more than the total federal acreage shown next to "Total" for each area.

projected number of wells to be drilled and the acres disturbed are the same under this alternative as in the POD.

In the Proposed Action Alternative, some total acreage figures have increased from those shown in the Continuation of Present Management Alternative. The increase is due to the fact that some Resource Management Plan/Environmental Impact Statements (RMP/EIS) did not analyze some areas for leasing, preferring to give them "case-by-case" study if interest was shown in leasing. This was particularly true of split-estate lands (private surface/federal minerals). The Proposed Action Alternative analyzes all federal lands within the Study Area except those discussed in Chapter 1.

Lease Stipulations

Stipulations may be attached to oil and gas leases issued under this alternative. New stipulations can not be attached to existing leases without the consent of the lessee; however, stipulations attached to those leases are retained as long as the lease is valid. The majority of federal leases issued in Colorado expire with no operation occurring. If the acreage involved in these expired leases is re-offered for sale, it will be with the new stipulations attached. The Proposed Action stipulations for each Planning Area are listed in Appendix E.

Appendix E represents the mitigation determined to be necessary to protect resource uses or values by modifying or limiting the standard rights granted to a lessee. With respect to the timing of operations, for example, necessary mitigation measures are closures for surface use and occupancy exceeding 60 consecutive days. Because such closures exceed the reasonable measures the Authorized Officer may take at the time operations are proposed (see section 6 of the lease form, Appendix C, and 43 CFR 3101.1-2), a stipulation is required to modify the lease rights.

Conditions of Approval

The mitigative measures common to all alternatives (Appendix D), will be considered in determining well site locations and developing COAs to attach to NOIs, APDs, and associated rights-of-way before approval under the Proposed Action. These measures and the COAs shown in Appendix F will be applied by the Authorized Officer as appropriate on a case-by-case basis. Not all COAs would apply to every field operation. Only those needed in a particular case will be used. COAs could be modified or created to meet specific needs, but the protection level envisioned in these COAs would be maintained.

TABLE 2-4. CONTINUATION OF PRESENT MANAGEMENT ALTERNATIVE. AVAILABILITY OF LANDS (IN ACRES) FOR FLUID MINERAL LEASING

	GSRA	KRA	LSRA	NPA	SJ/SMPA
Standard Lease Terms Only	19,991	467,984	671,360	369,912	469,251
No Surface Occupancy Stipulations	45,046	8,589	74,740	15,340	18,818
Timing Limitation Stipulations	646,260	166,000	929,170	88,606	55,180
Controlled Surface Use Stipulations	0	0	409,120	0	0
No Lease (WSA)(1)	25,408	8,427	86,257	0	103,152
No Lease (discretionary)	0	0	0	27,608	0
TOTAL(2)	723,000	651,000	1,878,000	475,000	1,291,000

(1) Interim Management for all Wilderness Study Areas is "No Lease" until Congress acts on wilderness designation.

(2) Some stipulations overlap, therefore, the total of all six categories may add up to more than the total federal acreage shown next to "Total" for each area.

The COAs in Appendices D and F include timing limitations of 60 days or less. Such reasonable measures are enforced at the time operations are proposed under the authority of the regulations and lease terms (see section 6 of the lease form, Appendix C, and 43 CFR 3101.1-2). No lease stipulation is required to ensure mitigation where timing is limited by 60 days or less, and location is moved 200 meters or less. However, as a matter of policy, where resource uses or values requiring short timing limitations exist on the ground such that overlap would result in a closure of the lease exceeding 60 consecutive days, the Colorado BLM will develop a lease timing stipulation identifying all the known resource use/value conflicts. If a COA is used to mitigate for certain resources such as wildlife limitations, a lease notice may be used to identify such known restrictions at the time of lease issuance (see Appendix E).

Continuation of Present Management Alternative

The Continuation of Present Management Alternative would manage oil and gas leasing, exploration, and development in accordance with decisions and mitigative measures presently in use in the applicable Resource Management Plan (RMP). Table 2-4 shows federal lands available for leasing by Planning Area under the Continuation of Present Management Alternative. This alternative is considered a "no action" alternative because there would be no change from the way the oil and gas resource is currently managed.

Reasonable Foreseeable Development Under the Continuation of Present Management Alternative

The projected number of wells to be drilled and acres disturbed are the same under this alternative as in the POD. The projected number of wells are displayed in Table 2-1 (See Appendix B for the POD).

Lease Stipulations

Where necessary, the appropriate stipulation is attached to leases when they are offered for sale. The stipulations presently in use are listed by Resource/Planning Area in Appendix G.

Conditions of Approval

In addition to those mitigative measures common to all alternatives, COAs will be considered in determining well site locations and developing mitigation to be attached to NOIs, APDs, and associated rights-of-way before approval under this alternative. These measures will be applied by the Authorized Officer as appropriate on a case-by-case basis. Not all COAs would apply to every field operation. Only those needed in a particular case will be used. The wording of a COA could be modified to meet the needs of local situations, but the protection level envisioned in these COAs will be maintained. The COAs are displayed in Appendix H.

Standard Terms and Conditions Alternative

The Standard Terms and Conditions Alternative analyzes environmental impacts of leasing all federal oil and gas mineral estate within the affected Resource/Planning Areas, with the exception of those lands withdrawn by law. A copy of the oil and gas lease (Form 3100-11, June 1988), which contains the standard terms and conditions, is provided in Appendix C. Under this alternative, no special stipulations would be attached to new oil and gas leases.

BLM lease form 3100-11, Offer to Lease and Lease for Oil and Gas, contains lease terms and conditions. The terms cover such items as bonding, rental and/or royalty, inspections, safety, and protection of other resources. Specifically, Section 6 of the lease terms establishes general requirements for conducting operations on the lease and is referred to as the "Standard" lease term for protection of surface resources. This section, in conjunction with the regulations in 43 CFR 3100 and applicable Notices to Lessees and Oil and Gas Onshore Orders, provides latitude for modification of siting (i.e., relocation of the proposed well up to 200 meters), facility design, timing of operation (i.e., no operations up to 60 days), and requirements for interim and final reclamation measures. The standard lease term specifically requires that prior to conducting any surface-disturbing activities, the lessee/operator will contact and receive approval from the BLM, and the lessee may be required to complete minor inventories and/or short-term special studies.

It is not possible to anticipate the entire spectrum of activities which could be proposed; therefore, other practices not identified in specific mitigation could be applied in particular situations. In addition, new advances in technology and reclamation practices are continually being developed. These advances could result in providing the needed resource protection through means other than those identified in this plan. The BLM will take whatever action it deems necessary for the protection of other resources so long as such protection is reasonable and does not infringe upon the rights granted to the lessee. Reasonableness is defined by the relative importance of the resources in question and the propriety of the mitigation required. Reasonableness is determined in each case on its merits and in accordance with the decisions from this plan and the Resource Area RMP/EIS. The rights granted to the lessee are only those necessary for the extraction of the oil and/or gas resource.

RFD Under the Standard Terms and Conditions Alternative

The RFD would not change from that predicted in the POD (Appendix B). The projected number of wells to be drilled and the acres disturbed are the same under this alternative as in the POD.

Conditions of Approval

In addition to those mitigative measures common to all alternatives for each Planning Area, COAs will be considered in determining well site locations and developing mitigation to be attached to NOIs, APDs, and associated rights-of-way. These measures would be applied by the Authorized Officer on a case-by-case basis. Not all COAs would apply to every field operation. Only those needed in a particular case would be used. The wording of a COA may be modified to meet the needs of local situations, but the protection level envisioned in these COAs will be maintained. The

TABLE 2-5. STANDARD TERMS AND CONDITIONS ALTERNATIVE. AVAILABILITY OF LANDS (IN ACRES) FOR FLUID MINERAL LEASING

	GSRA	KRA	LSRA	NPA	SJ/SMPA
Standard Lease Terms	697,592	642,573	1,791,743	447,392	1,187,848
No Lease (WSA)(1)	25,408	8,427	86,257	0	103,152
No Lease (discretionary)	0	0	0	27,608	0
TOTAL	723,000	651,000	1,878,000	475,000	1,291,000

(1) Interim Management for all Wilderness Study Areas is "No Lease" until Congress acts on wilderness designation.

COAs are displayed in Appendix I.

ALTERNATIVE COMPARISON

Proposed Action

Overall vegetation loss could be 19,200 acres which is 1/2 of one percent of the BLM lands in the Study Area. Less than 1/2 of one percent of the livestock forage would be lost. Minor amounts of livestock disturbance could cause a slight drop in calf/lamb crops. There will be a slight loss of forage--1/2 of one percent. Minor amounts of human disturbance are not considered significant. Raptors may be subjected to minor amounts of human disturbance. If the disturbance occurs during the nesting season, minor amounts of losses could occur to the population. Human disturbance would have short-term impacts on the wild horses. Soil erosion will increase but is not considered to be significant. The increased erosion will result in increased sediment and salinity. These increases will be long-term and minor.

Small increases in vehicle traffic and manmade intrusions will degrade the aesthetics to a slight degree. Cultural resources will be subject to increased vandalism due to the improved access, but at at the same time, more information will be made available due to the increases in surveys. Exploration and development costs will increase for the oil and gas operators due to the constraints placed upon them. The rate of development may be slightly slower but the overall effort will not be impacted. Coal recovery may be slightly reduced due to the safeguards required for the oil and gas development. The amount of reduction is not considered significant and is not quantifiable at this time.

Continuation of Present Management Alternative

The impacts of this alternative are in addition to those listed for the Proposed Action. The impacts to the wildlife may be slightly more due to human disturbances. Impacts to wild horses would be slightly more under this alternative as compared to the Proposed Action.

Standard Terms and Conditions Alternative

The impacts of this alternative are in addition to those listed above the Continuation of Present Management Alternative. The impacts to wildlife would be more substantial. Disturbances during various critical periods would cause losses of fawns/calves and new roads into isolated areas will increase the overall human disturbance factors. Disturbances to raptors during some portion of their critical periods are more probable. High erosion would occur on fragile soil areas which will also increase sedimentation and siltation.

Table 2-6 provides a summary of impacts by resource for each alternative.

TABLE 2-6. ALTERNATIVE COMPARISON

Resource	Alternative		
	Proposed Action	Continuation of Present Management	Standard Terms and Conditions
Climate and Air Quality	Very minor, local	Very minor, local	Minor, local
Vegetation	19,200 acres	19,200 acres	19,200 acres
Livestock Grazing	Minor disturbance	Minor disturbance	Minor disturbance
Wildlife	Minor disturbance to big game & raptors	Minor disturbance to big game & raptors	Minor losses due to disturbances, significant impacts
Wild Horses	Short-term loses	Short-term losses	Short-term losses
Soils	Minor erosion and runoff	Minor erosion and runoff	Moderate erosion and runoff
Water	Minor increases in sediment and salinity	Minor increases in sediment and salinity	Minor increases in sediment and salinity
Forestry	Minor losses	Minor losses	Minor losses
Recreation	Minor disturbances	Minor disturbances	Minor disturbances
Visual	Minor, short-term	Minor, short-term	Minor, short-term
Cultural	Increased vandalism	Increased vandalism	Increased vandalism
Paleontology	Minor losses	Minor losses	Minor losses
Wilderness	Minor disturbances	Minor disturbances	Minor disturbances
Lands and Realty Actions	None	None	None
Transportation	Increased access	Increased access	Increased access
Social and Economic	Insignificant	Insignificant	Insignificant
Areas of Critical Environmental Concern	None	None	None
Minerals	Loss of resource, higher recovery costs, loss of coal recovery	Loss of resource, higher recovery costs, loss of coal recovery	Loss of resource, loss of coal recovery

CHAPTER THREE

AFFECTED ENVIRONMENT

CHAPTER 3

AFFECTED ENVIRONMENT

INTRODUCTION

This chapter describes the affected environment in the Study Area. The Study Area consists of the five areas described in Chapter 1 that correspond to coverage of the five Resource Management Plan/Environmental Impact Statements (RMP/EIS) being amended: Glenwood Springs Resource Area (GSRA), Kremmling Resource Area (KRA), Little Snake Resource Area (LSRA), Northeast Planning Area (NPA), and the San Juan/San Miguel Planning Area (SJ/SMPA).

Generally, the environmental resources described are those that may be affected by the Proposed Action or one of the other alternatives. At times, an environmental resource will be described to give the reviewer a clearer picture of the setting, or to make a link between two affected resources. Several environmental resources will not be discussed because they will not be impacted and are not necessary for a clear picture of the Study Area.

Descriptions of environmental resources are organized with an overview section containing a general description applicable to the entire Study Area. This is followed by more detailed descriptions tied to specific areas when necessary for an understanding of impacts or mitigating measures.

Readers interested in details of a particular environmental resource or wishing additional information about a particular Resource Area, should consult with Resource Area Offices. These offices have the current (maintained) and more detailed RMP/EIS's which are available for public review.

CLIMATE AND AIR QUALITY

Climate Overview

The Study Area is comprised of a highland climatic type in the mountainous regions and a continental, cold steppe climate type in the remainder of the Study Area (where most BLM-administered lands are located.)

The highland climatic type is dominated by its mountainous topography. This complex topography causes considerable variation in site-specific temperature, precipitation, and surface winds. Temperatures are much colder than lowlands at similar latitudes, and may become frigid when cold air drains into mountain valleys. Freezing temperatures are possible throughout the year. Annual precipitation is highly variable, due primarily to the orographic effect of local topography. Precipitation is greatest on the windward side, with amounts increasing dramatically with elevation. Snowfall is possible throughout the year, with accumulation increasing with elevation. Diurnal up- and down-valley winds predominate. Mountain inversions may form and last for several days.

The continental, cold steppe climate type is typified by low to moderate precipitation which occurs mostly in summer. The amount of precipitation varies greatly from year to year. Evaporation is moderate to high. There is a wide temperature variation from cold winters and hot summers. There are four distinct seasons; spring occurs suddenly and warms quickly. Extremely frigid conditions and blizzards can occur, but severe weather conditions such as floods and damaging hail are rare. Tornadoes occasionally occur in the eastern most portion of the Study Area. Winter inversions are common and may last for several days.

Although atmospheric mixing varies throughout the Study Area, dispersion is normally good in spring and summer, but limited in the winter. Inversions are formed under stable conditions, trapping pollutants within a layer of air. Moderate summer inversions are typical during the evening and dissipate at dawn. Winter inversions are stronger and last longer. Inversions are enhanced by weak pressure gradients, cold clear nights, snow cover, and basin topography.

Climate Condition by Resource/Planning Area

The following Resource/Planning Area descriptions are necessarily broad generalizations of very complex climatic conditions (PEDCO Environmental, Inc. 1981). Tables J-1, J-2, and J-3 (Appendix J) provide monitored data for specific locations within each area. However, this data can not be extrapolated throughout the Study Area. Map 3-1 shows annual average precipitation throughout Colorado. Site-specific monitoring is necessary to determine local climatic conditions.

Glenwood Springs Resource Area

Average annual precipitation ranges from ten to 30 inches, which may occur anytime throughout the year. January temperatures range from an average minimum temperature of ten degrees Fahrenheit (F) to an average maximum temperature of 35 degrees F. July temperatures typically average from 45 (minimum) to 85 (maximum) degrees F. Frost-free periods normally last two to three months. Winds occur mostly along the river drainages, and winter inversions are common in the mountain valleys.

Kremmling Resource Area

Average annual precipitation is ten to 25 inches, with a small peak due to summer thundershowers. January temperatures range from an average minimum temperature of zero degrees F to an average maximum temperature of 32 degrees F. July temperatures typically average from 35 (minimum) to 80 (maximum) degrees F. Frost-free periods normally last less than two months. Cold air drainage makes the mountain valleys frigid in winter, and enhances strong winter inversions.

Little Snake Resource Area

Average annual precipitation varies from ten to 16 inches, occurring uniformly throughout the year. January temperatures range from an average minimum temperature of zero degrees F to an average maximum temperature of 32 degrees F. July temperatures typically average from 45 (minimum) to 85 (maximum) degrees F. Frost-free periods normally last two to three months. Pressure gradient (synoptic) winds predominate, and large-scale, persistent inversions may occur in winter.

Northeast Planning Area

Average annual precipitation is ten to 20 inches along the plains, and up to 30 inches in the foothills, occurring mostly due to summer thunderstorms. January temperatures range from an average minimum temperature of 15 degrees F to an average maximum temperature of 45 degrees F. July temperatures typically average from 60 (minimum) to 90 (maximum) degrees F along the plains, and 45 to 80 in the foothills. Frost-free periods normally last three to five months. In winter, heavy snows may occur during up-slope storms, and unusually warm temperatures may occur due to down-slope (Chinook) winds.

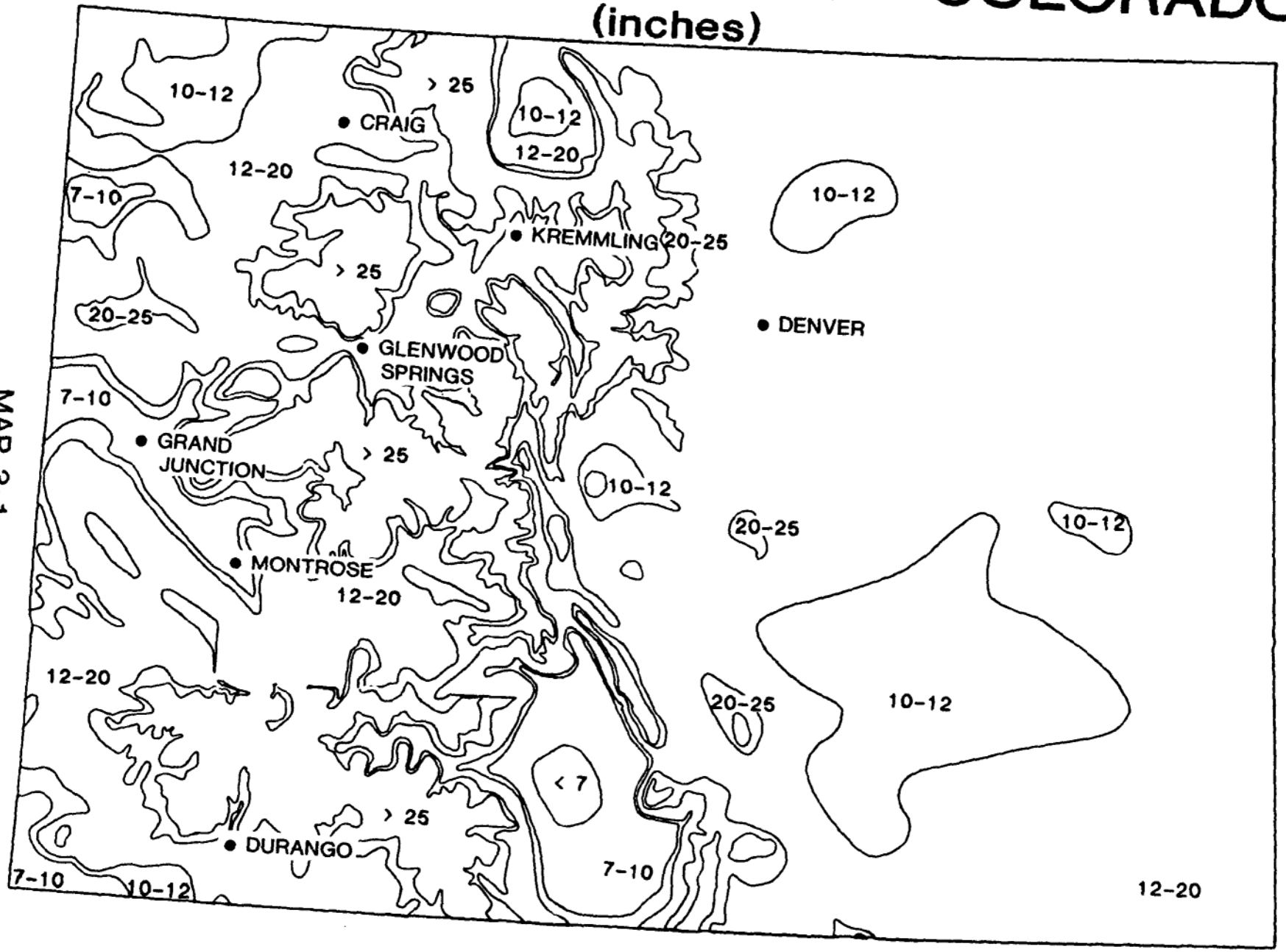
San Juan/San Miguel Planning Area

Climatic conditions are highly variable, ranging from desert conditions in the extreme southwest to alpine conditions in the high mountain locations. Average annual precipitation ranges from eight to 30 inches, occurring mostly in the summer due to convective thunderstorms. January temperatures range from an average minimum temperature of zero to ten degrees F, to an average maximum temperature of 40 degrees F. July temperatures typically average from 50 (minimum) to 90 (maximum) degrees F at lower elevations, and from 40 (minimum) to 75 (maximum) degrees F in the mountains. Frost-free periods vary from less than one to three months.

Air Quality Overview

The existing air quality throughout much of the Study Area is unknown; little monitoring data are available for most pollutants.

ANNUAL PRECIPITATION - COLORADO
(inches)



MAP 3-1

However, in the undeveloped regions of the western United States, ambient pollutant levels are expected to be near or below the measurable limits. Locations vulnerable to decreasing air quality from extensive development include immediate operation areas (mining operations, power plants, etc.) and local population centers (automobile exhaust, residential wood smoke, etc.). Noise levels are site-specific and vary continuously.

Air Quality Regulations

National ambient air quality standards (Table J-4, Appendix J) limit the amount of specific pollutants allowed in the atmosphere: carbon monoxide (CO), lead (PB), nitrogen dioxide (NO2), ozone (O3), sulfur dioxide (SO2), and particulate matter (total suspended particulates-TSP and inhalable particulates-PM10). State standards include these parameters, but may also be more stringent. The standards protect health (primary standards) and welfare (secondary standards).

Areas which consistently violate federal standards because of man-caused activities are classified as "nonattainment" areas, and must implement a plan to reduce ambient concentrations below the maximum pollution standards. Under EPA's "Fugitive Dust Policy," areas which violate the TSP standards, but lack significant industrial particulate sources and have a population less than 25,000, are designated as "unclassified" (neither "attainment" nor "nonattainment"). "Unclassified" areas are generally exempt from following the Clean Air Act offset provisions, retrofit controls, and new source control requirements established for "nonattainment" areas.

Through the Clean Air Act Amendments of 1977, Congress established a system for the Prevention of Significant Deterioration (PSD) of "attainment" and "unclassified" areas. Areas are classified by the additional amounts of NO2, SO2, and TSP degradation which would be allowed. PSD Class I areas, predominantly National Parks and certain Wilderness Areas, have the greatest limitations; virtually any degradation would be significant. Areas where moderate, controlled growth can take place were designated as PSD Class II. PSD Class III areas allow the greatest degree of impacts. The state of Colorado has established a similar system of Category 1, 2, and 3 areas. PSD Class I regulations also address the potential for impacts to Air Quality Related Values (AQRVs). These AQRVs include visibility, odors, and impacts to flora, fauna, soils, water, geologic, and cultural structures. A possible source of impact to AQRVs is acid precipitation. Map 3-2 shows the locations of PSD Class I, Colorado Category 1, and nonattainment areas in Colorado.

Existing Air Quality

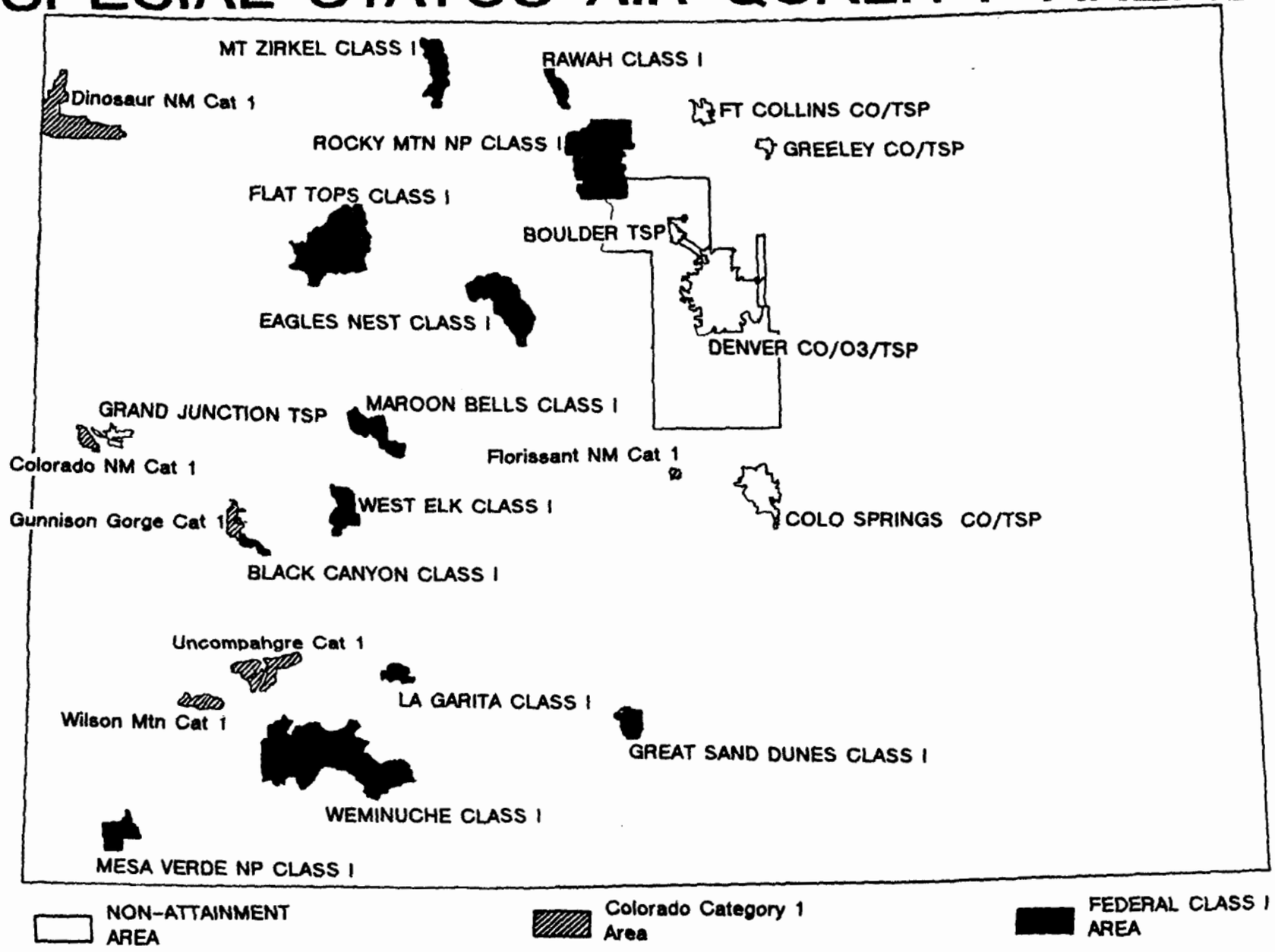
A discussion of existing air quality conditions in the Study Area is necessarily a broad generalization of very complex air quality conditions. Since this information can not be extrapolated throughout each Resource/Planning Area, site-specific monitoring is necessary to determine local conditions. Estimates of air pollutant concentrations are provided in Table J-5, Appendix J (Chick 1989).

For most pollutants, the Study Area has been designated as either "attainment" or "unclassified." The primary exception is urban pollution around isolated tracts within the NPA, and high inhalable particulate levels due to residential wood burning in some urban and rural towns. Except for these areas, BLM-administered lands are classified PSD Class II.

Particulate matter concentrations are expected to be higher near industrial areas, towns, and unpaved roads. Inhalable particulate levels are high in areas with significant combustion sources (urban areas, industrial facilities, residential wood smoke). Throughout Colorado, six areas are believed to exceed the inhalable particulate standards, and 11 additional areas are conducting monitoring to determine if the standards are exceeded.

Similarly, total suspended particulate levels may be high due to wind blown dust in arid locations, or from combustion sources. Eight areas exceed the public health standard; 11 areas exceed the public welfare standard. Carbon monoxide levels exceed the standard along the Front Range, and nitrogen dioxide and ozone standard are exceeded in the Denver metropolitan area. Lead and sulfur dioxide levels are well within the standards throughout the state. Visibility and acid

SPECIAL STATUS AIR QUALITY AREAS



MAP 3-2

precipitation are monitored at isolated locations in the Study Area.

VEGETATION

A wide range of vegetative types occur on public lands and surface lands overlying the federal mineral estate within the Study Area. The potential of locating threatened and endangered plant species in each of the areas will increase as inventories are completed. Presently, three of the five areas contain listed species and all but one, the NPA, contain federally-listed candidate species.

A candidate species is one that is being studied to determine if it is eligible to be listed as either threatened or endangered. Species that are listed as threatened or endangered are protected under the Endangered Species Act. Candidate species are not protected by the Endangered Species Act but it is BLM policy to protect them the same as listed species. The Colorado Natural Areas Program (CNAP) maintains a list of plant species of special concern to the state of Colorado. These species are not protected by state statute but are provided appropriate protection by the BLM.

The major vegetative types on public lands are described by Resource/Planning Area below. Known plant species requiring protection are also described.

Glenwood Springs Resource Area

Major vegetative types occurring in this area include: mountain shrub--20 percent, semi-desert shrub--27 percent, conifer woodland--39 percent, conifer forest--six percent, and broadleaf tree/riparian--seven percent. Grasslands and riparian areas also occur on public lands, but they make up only a small percentage of the total.

The mountain shrub community is composed primarily of oakbrush and service berry. It provides a very important source of food and cover especially during the fall, winter, and spring months for many species of livestock, wildlife, and nongame species. This habitat type is currently being lost to housing development.

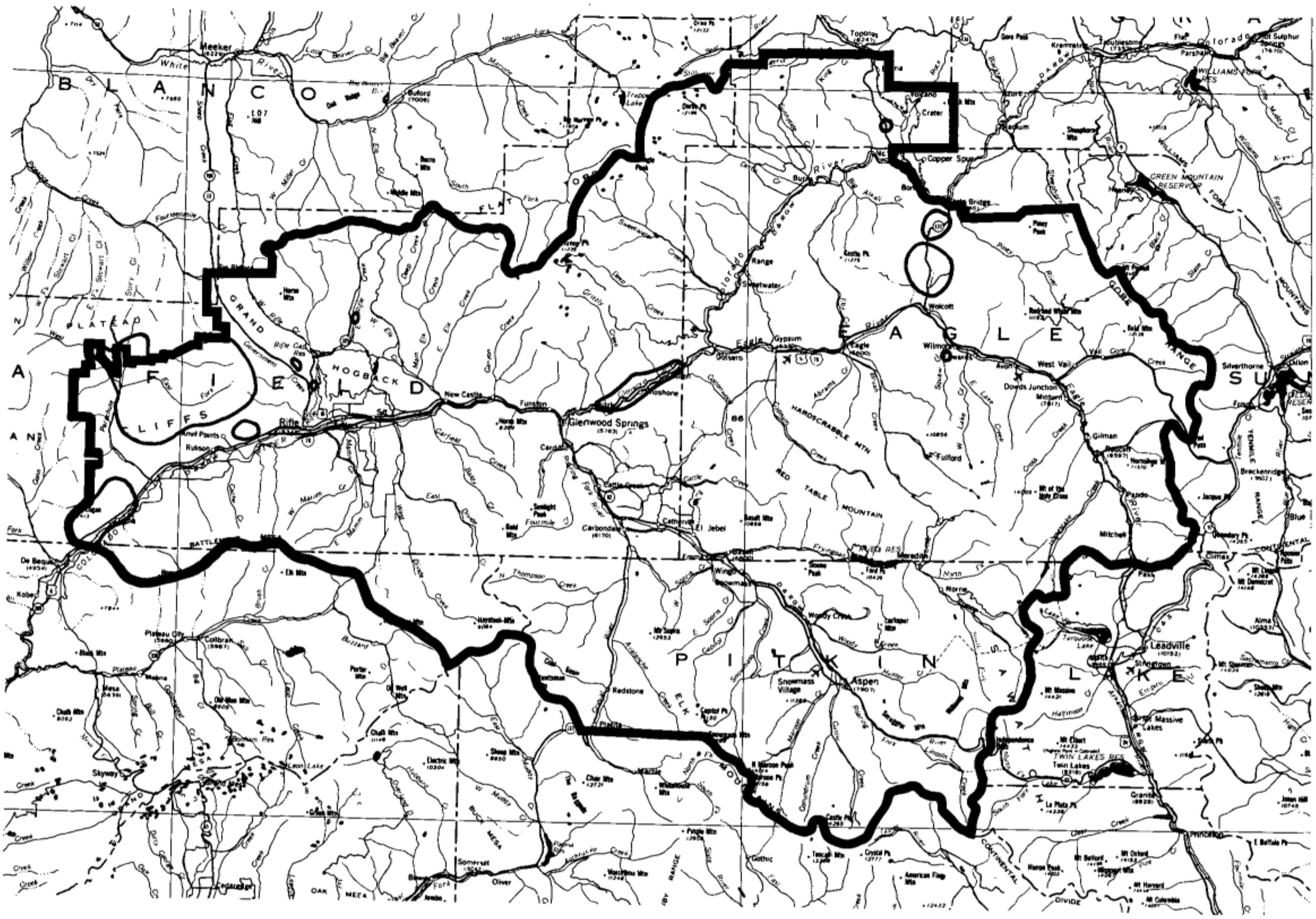
The semi-desert shrub community is composed primarily of sagebrush, with lesser amounts of greasewood and saltbush.

The conifer community is composed of two distinct habitat types--conifer forest (spruce-fir) and conifer woodland (pinyon-juniper). The conifer forest provides thermal and hiding cover and some food during the summer months for wildlife, and nesting habitat for a variety of birds and small mammals. The conifer woodland habitat type provides very important winter thermal and hiding cover and food for many wildlife species. Changes occur in the conifer habitats as a result of fuel wood cutting, timber harvesting, pine beetle infestations, and urban development.

Aspen stands and riparian-related species such as cottonwood, willow, grass, and forb are a small but significant vegetative type. Aspen stands provide food and cover for a wide variety of wildlife and livestock. Elk calving areas in this Resource Area are almost always associated with aspen benches. Riparian-related vegetation provides essential food, cover, and nesting habitat for many aquatic and semi-aquatic wildlife species. Although insignificant in overall acreage, it is used by about 75 percent of the wildlife species sometime during their life cycle and prides soil stabilization.

In this Resource Area, most of the riparian habitat occurs on private land along the major rivers and their tributaries. The most important riparian habitat on public land occurs along the Colorado River from Glenwood Springs west to the Resource Area boundary. Throughout the Resource Area, some riparian habitat has been severely impacted by road construction, gravel extraction, water diversions, and livestock grazing.

The following plant species are known or suspected to occur in the Resource Area. All of the listed plants are protected by the BLM. Appendix K contains a complete list of all federal and state species. They are shown on Map 3-3. An Ex-Candidate species is one that was previously considered by the U.S. Fish and Wildlife Service (USFWS) as a candidate for either threatened or endangered status but was found to be abundant and not in immediate danger.



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Major Plant Concentrations

Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-3 Major Concentrations of T&E and Candidate Plants

TABLE 3-1. SENSITIVE PLANTS--GLENWOOD SPRINGS RESOURCE AREA

Name	Status
Uinta Basin hookless cactus (Sclerocactus glaucus)	Federal--Threatened
Parachute beardtongue (Penstemon debilis)	Federal--Candidate
Harrington beardtongue (Penstemon harringtonii)	Federal--Candidate
Phacelia (Phacelia submutica)	Federal--Candidate
Clay blazing star (Mentzelia argillosa)	Federal--Ex-Candidate
Piceance bladderpod (Lesquerella parviflora)	Federal--Ex-Candidate
Sedge fescue (Festuca dasyclada)	Federal--ExCandidate
Sun-loving meadowrue (Thalictrum heliophilum)	Federal--Ex-Candidate

Kremmling Resource Area

There are 13 distinct vegetative types, four of which account for more than 90 percent of the total vegetative cover in the Resource Area. These four types include sagebrush (58 percent), irrigated meadow (14 percent), lodgepole pine (13 percent), and quaking aspen (7 percent). There is a consistent trend in the distribution of the four major vegetative communities throughout North Park and Middle Park. The lower elevation basins are dominated by steppe vegetation, consisting primarily of rolling sagebrush hills and alluvial terraces formerly converted from sagebrush to irrigated meadow. At the higher elevations, this steppe vegetation gives way to expansive forested areas dominated by lodgepole pine. Sagebrush communities constitute the most characteristic vegetation of the drier valley, terrace, bench, and foothill terrain, which ranges between 7,000 and 10,000 feet in elevation.

One vegetative community of special note is the mountain shrub community which constitutes only one percent of the total vegetative cover in the Resource Area. Despite its thinly scattered distribution, it is one of the most vital rangeland types in terms of nutrient and cover value for wildlife and livestock. The most common areas where mountain shrub types are found are on northern exposures in snow pockets and along drainages where moisture is not a limiting factor. These areas are frequently located about midslope and may be associated with rough or steep topography.

Although riparian vegetative types account for only about one percent of the total land coverage, they are one of the most important ecological components of the local environment. They provide water and shade for domestic livestock, valuable nesting areas for raptors and other birds, and food and cover for many species of riparian communities. They often form a complex biotic network with the streams along which they are found. This riparian/stream interaction is necessary to maintain acceptable water quality and suitable habitat for fish and other aquatic organisms.

Poisonous plants are prevalent throughout the Resource Area, although few areas contain concentrations of poisonous species large enough to seriously threaten livestock or wildlife.

Little Snake Resource Area

Eleven different vegetative types, based on major plant communities, have been identified within the Resource Area. Estimated acreages for these are shown in Table 3-3. Improved pastures, sprayed areas, burns, and other manipulated (treated) sites are included in the acreages for each vegetative type.

TABLE 3-2. SENSITIVE PLANTS--KREMMLING RESOURCE AREA

Name	Status
North Park phacelia (Phacelia formosula)	Federal--Endangered
Osterhout milkvetch (Astragalus osterhoutii)	Federal--Threatened
Penland beardtongue (Penstemon penlandii)	Federal--Threatened
Harrington beardtongue (Penstemon harringtonii)	Federal--Candidate
*NCN (Eutrema penlandii)	Federal--Candidate
*NCN (Ptilagrostis porteri)	Federal--Candidate
Coaltown sagebrush (Artemisia argillosa)	Federal--Ex-Candidate

*No Common Name.

TABLE 3-3. ESTIMATED PLANT COMMUNITY ACREAGES

Community Type	Acres
Sagebrush	711,900
Salt Shrub	137,400
Pinyon-Juniper	244,700
Greasewood	28,100
Conifers	23,700
Aspen	14,300
Mountain Shrub	16,100
Grasslands	5,600
Riparian	3,000
Badlands	22,000
Miscellaneous Landforms	48,400

Note: acreage figures are approximate.

No federally-listed endangered or threatened plant species are known to occur in the Resource Area. However, four species that are candidates for listing as endangered occur in Moffat County.

The Resource Area also contains a number of plants on the Colorado BLM sensitive plants list, all of which are usually found in somewhat remote, isolated, and relatively inaccessible areas (see Table L-1, Appendix L). Potential habitat for these sensitive plants is not fully known, but the known existing sites have not been appreciably declining. Extensive surface disturbance in any of these potential habitat areas could lead to a decline in habitat.

TABLE 3-4. SENSITIVE PLANTS--LITTLE SNAKE RESOURCE AREA

Name	Status
Hamilton milkvetch (Astragalus hamiltonii)	Federal--Candidate
*NCN (Astragalus wetherillii)	Federal--Candidate
Owenby thistle (Cirsium ownebeyi)	Federal--Candidate
Gibbin's beardtongue (Penstemon gibbensii)	Federal--Candidate

*No Common Name.

Northeast Planning Area

The specific vegetation existing on public lands or subsurface estate in the Planning Area has never been completely inventoried and mapped. Major vegetative types occurring are plains grasslands, foothills grasslands, riparian, and forest lands. Croplands are widespread. The plains grasslands are primarily shortgrass in the western portion dominated by blue grama and buffalo grass. Eastward the vegetation changes to a sandsage-bluestem prairie of medium tall grasses with small shrubs. Dominate species include bluestems, prairie sandreed, and sand sage. Foothills grassland and mountain shrub lands occupy the transition zones between plains grassland and forest types. They are typified by various wheatgrasses, brome, needlegrass, and several forbs. Various shrubs are also common, including mountain mahogany and Gambel's Oak. Riparian vegetation occurs along streams, drainage ways, and around reservoirs. Large streams and flood plains support overstories of cottonwoods and understories of willows, water tolerant grasses, and sedges. Willows are also found along narrow stream channels and in the foothills. Alder often occurs in association with willows.

No known threatened or endangered species exist on public lands in the Planning Area. The extent to which such plants may occur on private or state lands overlying federal mineral estate is unknown.

San Juan/San Miguel Planning Area

This area contains seven major vegetative types (see Table 3-5). Of these, three types account for 87 percent of the vegetation present--(1) pinyon-juniper woodland (60 percent), (2) sagebrush-grassland complex (18 percent), and (3) salt desert shrub (nine percent).

Riparian vegetation is present throughout the Planning Area in association with river bottoms and other perennial and intermittent streams. Totalling less than one percent of the land acreage in the area, riparian vegetation still is a vital ecological component of the environment. It provides many valuable and diverse habitat features essential to many species of terrestrial and aquatic wildlife. Overall, the riparian vegetative type has a high potential for recovery and improvement following disturbance.

Sagebrush-grassland communities comprise 18 percent of the total land coverage in the Planning Area. They are the major vegetative

type in the upper valley and basin terrain that range between 5,000 feet and 7,500 feet in elevation. Large areas in this vegetation complex are classified as crucial winter range for several big game wildlife species. Areas at higher elevations with higher precipitation and deeper soils have a good potential for recovery and revegetation subsequent to disturbance.

Salt desert shrub communities constitute nine percent of the total area and are confined to the western basins and valleys, with elevations between 4,500 feet and 6,000 feet. These communities are characterized by soils with high salt content and have a limited potential for vegetation production, recovery, and revegetation following disturbance.

Mountain shrub communities comprise three percent of the Planning Area and are confined to the upper foothill zone and the lower edge of higher mountain topography. Elevation ranges between 6,000 feet and 9,000 feet. The mountain shrub type is typified by vegetative species that are important forage and cover for many wildlife species. Most mountain shrub communities are located on steep slopes within a broken topography; thus, the revegetation potential is limited.

Pinyon-juniper woodland comprises 60 percent of the total land coverage and 93 percent of the forest land base in the Planning Area. These communities, found between 5,000 feet and 7,800 feet in elevation and containing important cover and forage values for many wildlife species, are a distinct ecosystem to be managed and perpetuated for producing multiple resource values. Large contiguous blocks of operable pinyon-juniper woodland pose a reclamation problem because of the long growing rotation (150 years). Stands of poor commercial value typically occur on more marginal soils and in areas of lower precipitation, which limits the revegetation and reclamation potential.

Conifer forest, predominantly ponderosa pine and Engelmann spruce-subalpine fir, constitutes five percent of the total land acreage in the Planning Area. Ponderosa pine, found from 7,800 feet to 9,000 feet in elevation, is a valuable timber resource and also important habitat for many wildlife species. Because it occurs on deeper soils and higher precipitation areas, the reclamation potential in ponderosa pine type is good. Spruce-fir occurs from 9,000 feet to 11,000 feet in elevation. However, the high elevation and difficult access limited the use of the forest type in the past, but it is presently emerging as one of the more important timber resources.

Alpine tundra communities provide important big game summer forage. They constitute four percent of the Planning Area and are found between 11,000 feet and 14,000 feet in elevation. Alpine tundra communities consist of many high altitude species of sedges, grasses, forbs, and shrubs. Many areas above timberline are steep, rocky, and essentially devoid of vegetation. Due to the

Table 3-5. VEGETATION TYPES AND SUBTYPES--SAN JUAN/SAN MIGUEL PLANNING AREA

Type	Acreage (percent of total vegetation)	Subtype
Pinyon-juniper woodland	*599,800 (60)	Pinyon pine & juniper
Conifer forest	52,800 (5)	Ponderosa pine, Engelmann spruce-subalpine fir, & Douglas-fir
Sagebrush-grassland	181,800 (18)	Big & black sagebrush, winterfat, short, mid, and tall grass spp.
Salt desert shrub	88,400 (9)	Shadscale, mat & four-wing saltbush, & black greasewood
Mountain shrub	24,400 (3)	Oakbrush, mountain mahogany, service berry, willows, & bitterbrush
Alpine tundra	40,000 (4)	Sedges & high altitude grass spp. & forb spp.
Riparian	6,800 (1)	Sedges, rushes, willows, cottonwood alder, and birch
Total acreage	994,000	

*This figure includes 4,500 acres of aspen.
Source: BLM Data, 1989.

TABLE 3-6. SENSITIVE PLANTS--SAN JUAN/SAN MIGUEL PLANNING AREA

Name	Status
Mancos milkvetch (Astragalus humillimus)	Federal--Endangered
Knowlton's miniature cactus (Pediocactus knowltonii)	Federal--Endangered
Spineless hedgehog cactus (Echinocereus triglochidiatus)	Federal--Endangered
Mesa Verde cactus (Sclerocactus mesae-verdae)	Federal--Threatened
Unita Basin hookless cactus (Sclerocactus glaucus)	Federal--Threatened
Mancos columbine (Aquileqia micrantha)	Federal--Candidate
Cronquist milkvetch (Astragulus cronquistii)	Federal--Candidate
Schmoll milkvetch (Astragulus schmolliae)	Federal--Candidate
Four corners saltbush (Atriplex pleiantha)	Federal--Candidate
Kachina daisy (Erigeron kachinensis)	Federal--Candidate
Pagosa gilia (Ipomopsis polyantha)	Federal--Candidate
Pagosa bladerpod (Lesquerella pruinosa)	Federal--Candidate
Paradox lupine (Lupinus crassus)	Federal--Candidate
Dolores skeleton plant (Lygodesmia doloresensis)	Federal--Candidate
NCN* (Hackelia gracilenta)	Federal--Candidate
Grand Junction milkvetch (Astragulus linifolius)	Federal--Ex-Candidate

*No Common Name.

high altitude, short growing season, and poorly developed soils, the reclamation potential in the alpine tundra type is seriously limited.

Table 3-6 lists the plant species of special concern within the Planning Area.

LIVESTOCK GRAZING

Livestock grazing is an important use of the public lands. Although most western Colorado ranchers obtain only a small proportion (20 percent or less) of their annual forage requirements from the public lands, these lands fill an important niche in their operations. Typically, public lands are used for spring and fall grazing. Ranchers winter their livestock on their private property and then move them onto public lands in the spring enroute to higher elevation National Forest lands where they graze during the summer. In fall, the livestock are moved back again onto public lands enroute to private land for the winter season. Some BLM lands are used for grazing in the summer and others are used as winter grazing. Use of public lands is critical because they allow ranchers to use their privately-owned irrigated meadows for hay production during the growing season, and they provide a place for the livestock before and after they are permitted on National Forest lands.

In northwest Colorado, the public lands are used mostly as winter sheep and cattle ranges. Sheep are usually moved to Forest Service permits after lambing on public lands, while cattle generally remain on summer BLM permits.

The following table displays the numbers of operators, animal unit months (AUMs), acres of public land grazed, and numbers of livestock grazed. The numbers of livestock are approximate and will vary considerably depending on length of seasons.

TABLE 3-7. LIVESTOCK GRAZING

	Glenwood Springs	Kremmling	Little Snake	Northeast	San Juan/ San Miguel
Acres of Public Land Grazed	516,000	355,798	1,317,000	5,308	937,000
Number of Operators	172	148	254	26	176
Total AUMs	56,885	42,395	166,895	936	64,233
Number of Livestock					
Cattle	12,889	30,000	17,000	90	13,328
Sheep	9,326	200	95,000	0	12,847
Horses	7	70	990	0	161

As indicated in Table 3-7, a significant amount of sheep use occurs within the GSRA, LSRA, and SJ/SMPA. In these areas, public lands provide spring lambing areas. These are areas where the livestock operator can distribute sheep herds in a manner conducive to lambing. These lambing areas range from 500 to 34,000 acres. In the LSRA, for example, there are about 440,000 acres used for lambing.

WILDLIFE

For terrestrial wildlife, BLM emphasizes habitat management determined by legal status (T&E species) or commercial value for species of interest to federal and state agencies. Where resources are determined to be deteriorating due to excessive numbers of wildlife and improvements in habitat cannot compensate for this in the short term, requests may be made to the Colorado Division of Wildlife (CDOW) to reduce wildlife populations through increased hunting.

In order to fully understand the description of big game habitat, several definitions are needed. The two important terms and their definitions are shown below.

Severe Winter Range--An area where 90 percent of the animals are located when the annual snowpack is at its maximum in the two worst winters out of ten.

Crucial Habitat--A biological feature, that if lost, would adversely affect the species.

Glenwood Springs Resource Area

Big Game

Mule deer and elk are of significant importance to the local economy; therefore, they are discussed separately in this section. Population estimates used in this document are based on CDOW population modeling efforts.

Mule Deer

Mule deer populations dependent upon public lands in the Resource Area are generally healthy. Loss of crucial habitat and competition with elk, which have increased by an estimated 58 percent in the past 20 years, has contributed to a downward trend. Urban developments in the upper Eagle and Roaring Fork valleys started in the early 1960s; however, significant population and associated development increases began to occur in the early 1970s.

In 1979, there was an estimated 676 square miles of deer winter range on public lands in the Resource Area, 401 square miles of which were considered to be severe winter range. These estimates have been revised by the CDOW. Based on new wildlife mapping, current estimates are as follows: winter range--612 square miles, severe winter range--239 square miles, and crucial habitat--326 square miles on public lands (see Map 3-4).

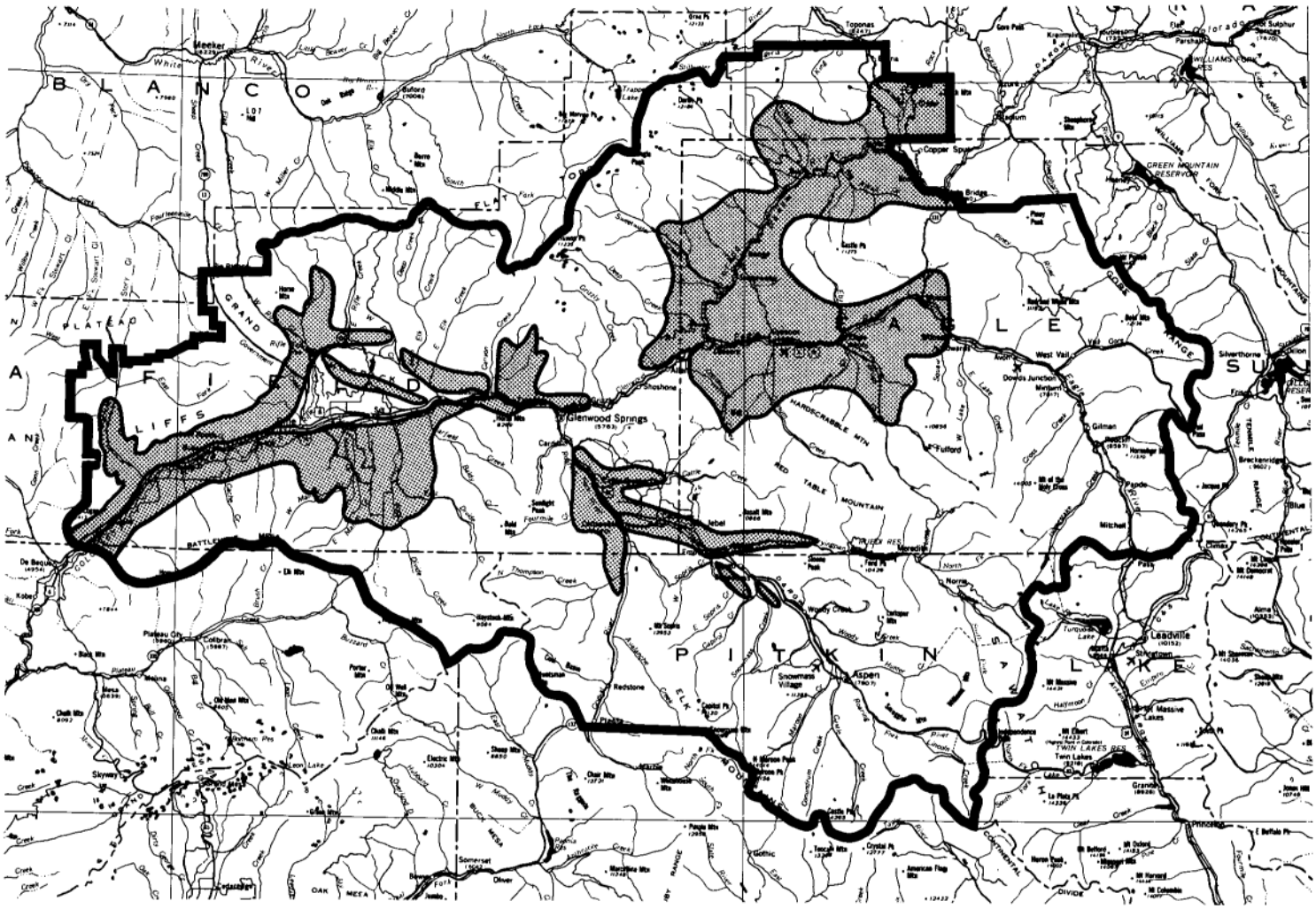
Based on 1979 county zoning maps, it was estimated that 60 to 83 square miles of the severe winter range on private land (8-11 percent of the total) could be lost to development in the next ten years. Growth within the Resource Area has slowed significantly since the collapse of oil shale development and a slowdown in ski area development; therefore, the rate of development and zoning for development has slowed to less than one percent per year since 1984. Less than one percent of the area zoned has been built on in the last ten years.

In the Castle Peak and Eagle-Vail areas, a major migration route, also classified as crucial habitat, serves an estimated 3,500 mule deer that move from summer range in the Gore Mountain Range to winter range in the Gypsum and Eagle areas.

Elk

Elk populations have increased from the early 1960s to 1987. There was an overall increase of 128 percent in the last 30 years. The provisional objectives set by the CDOW for elk in the Resource Area are 100 percent over the 1960s population but a reduction of 12 percent from current populations.

In 1979, there was an estimated 518 square miles of elk winter range on public lands in the Resource Area, of which 206 square miles were considered severe. These figures have recently been revised and now, 476 square miles of public land have been classified as winter range, 169 square miles as severe winter range, and 242 square miles as crucial habitat (see Map 3-5). Based on



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Muledeer Crucial Habitat

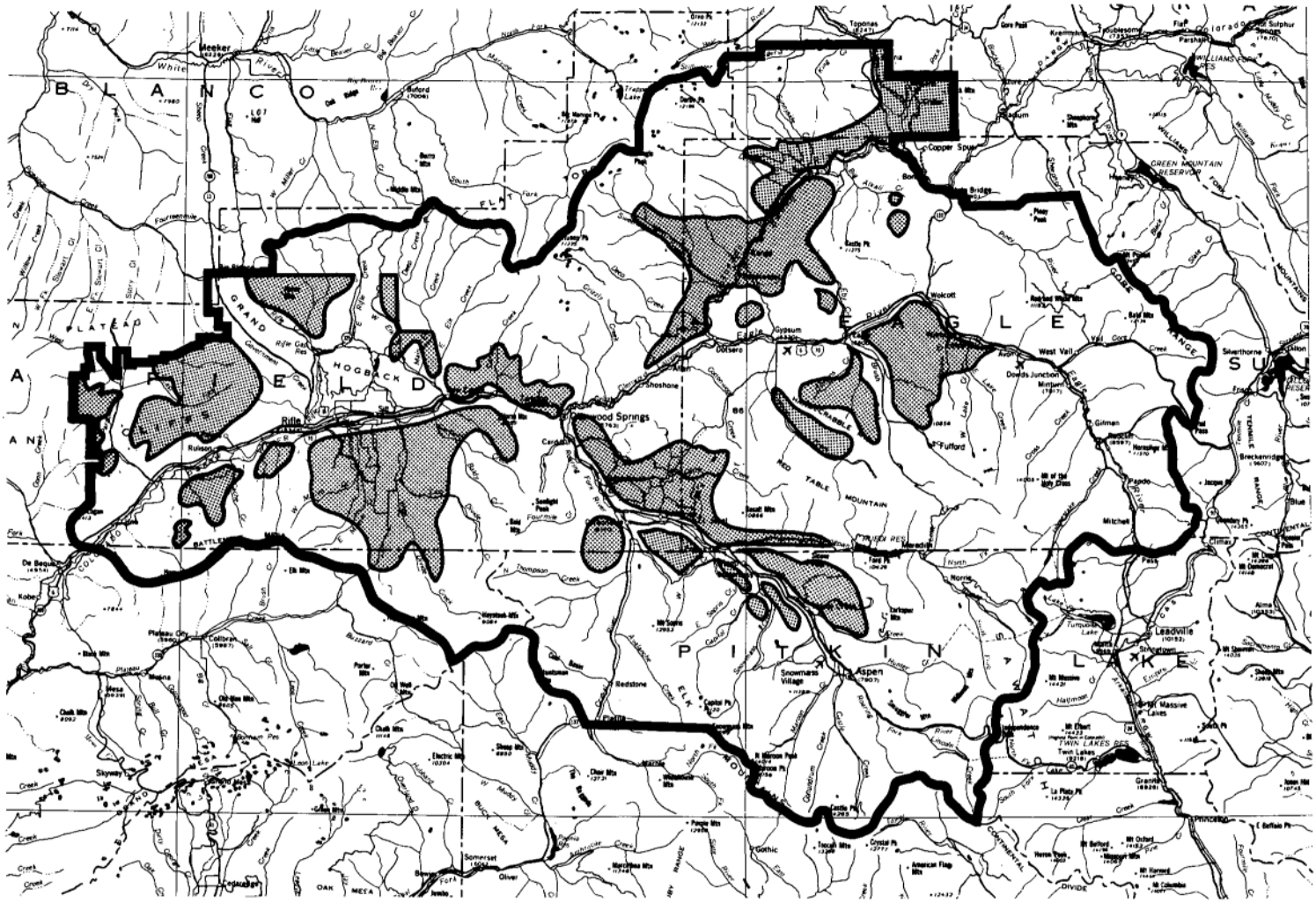
Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-4 Muledeer Crucial Habitat



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Elk Crucial Habitat

Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-5 Crucial Elk Habitat

1979 county zoning maps, it was estimated that 22 to 35 square miles of the privately-owned severe elk winter range (five-eight percent of the total) could be lost to development by 1989.

It should be noted that most of the 47 percent of severe deer winter range and 54 percent of the severe elk winter range occurring on private land are supplied by the ranching community. This, along with the spring ranges these ranches provide, is crucial to the survival of big game herds; and therefore, to the economic health of the local communities.

Bighorn Sheep

Reintroduction of bighorn sheep began in 1975. Releases of sheep have taken place several times and in several different locations. Approximately 26,000 acres of public lands are, or could be, used by bighorn sheep (see Map 3-6). A major reintroduction program was begun in 1989, and therefore, bighorn sheep will become more important in the overall land management program.

Upland Game Birds

Sage Grouse

Sage grouse can be found in the GSRA near Debeque, in much of Eagle County, and in southern Routt County (see Map 3-7). The CDOW estimated the sage grouse population in Eagle County as stable. The majority of the population in Eagle County is totally dependent on public lands for all of their habitat requirements.

The most crucial habitats are the wintering, strutting (leks) and brood rearing habitats. Limiting factors to the population are a loss/declining condition of the winter and brood rearing habitat. This results from increased sagebrush eradication and poor condition/lack of brood habitat stemming in part from fire control in these areas.

Turkey

Turkey were released in the GSRA during the late "sixties" and early "seventies." Several populations were established in the Roaring Fork Valley and the area west of Glenwood Springs. Hunting seasons were also established. These populations severely declined, as did most populations throughout the state during the late "seventies."

Turkey are almost totally dependent upon the oakbrush and pinyon juniper habitat types in this area. Populations are not thought to be limited by habitat, but by disease, predation, and severe winter conditions (see Map 3-8). A major reintroduction program is underway and the turkey will become more important in the wildlife management scheme on BLM land.

Waterfowl

Waterfowl are primarily found in wetland areas. Most wetlands in the GSRA occur as river bottoms, resulting in waterfowl populations being closely associated with riverine systems (see Map 3-9).

Raptors

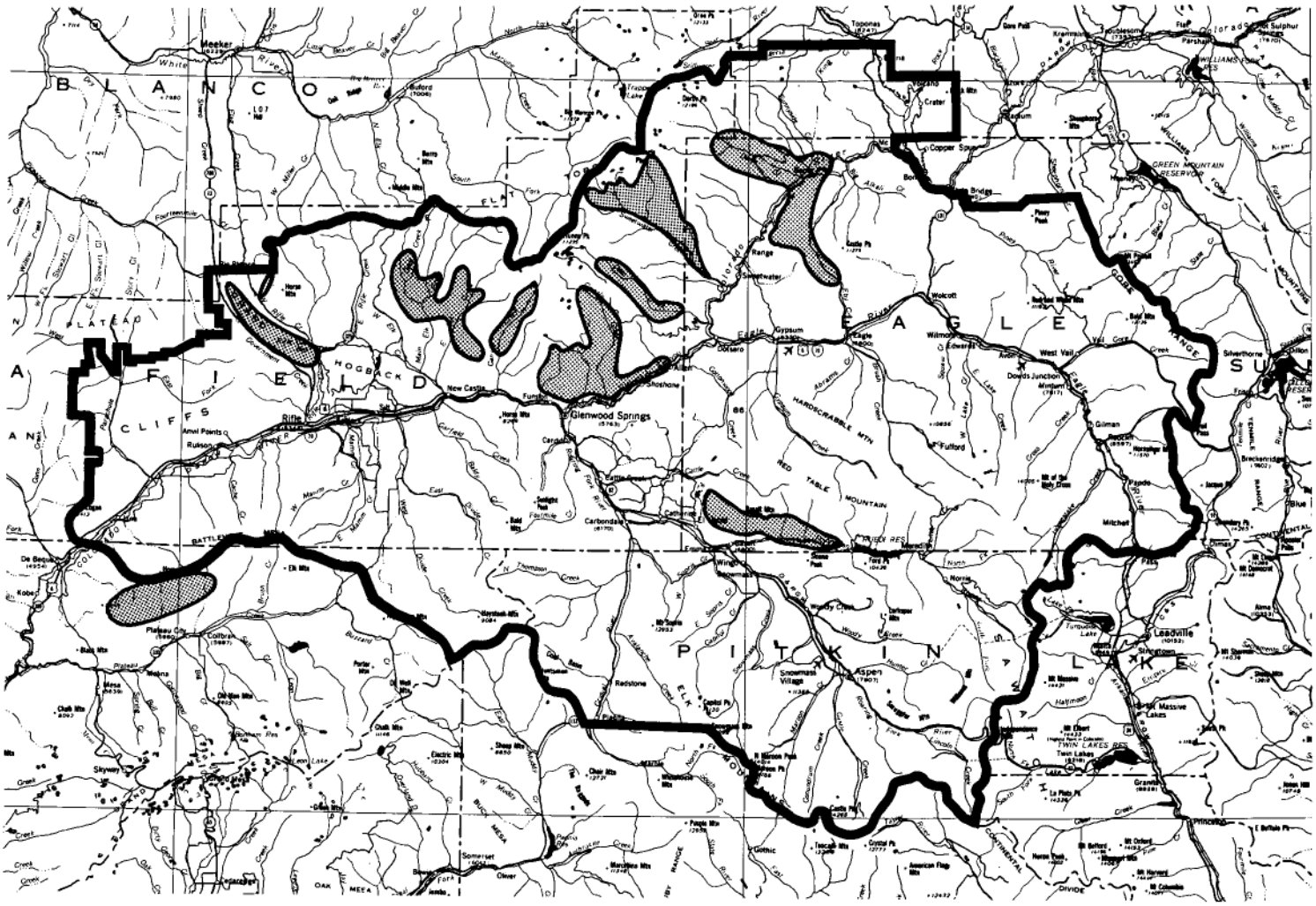
Raptors (birds of prey) are abundant. Prairie falcons, red-tailed hawks, marsh hawks, and golden eagles are the more common raptors breeding and nesting in the area. Precipitous rock formations, large trees, and mountain meadows provide suitable nesting habitat for these species. The numerous songbirds and small mammal populations provide the prey base available to these raptors. Woodland nesting species such as goshawks, Coopers hawks, and sharp-shinned hawks are common in the forested area.

The following is a summary of the documented nests for various raptor species (see Map 3-10).

Golden eagle	94
Red-tailed hawk	54
Prairie falcon	7
Great horned owl	4
Unknown species	55
Total	214

Aquatic Wildlife

Sixty-seven streams and five lakes support fish in the Resource Area. The BLM manages the aquatic and riparian habitat of portions of fifty-six streams (totaling 126 miles) and five lakes. In addition, six streams (5.1 miles of public land frontage) that do not presently support a fishery have potential for introducing a fishery.



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Bighorn Sheep Area

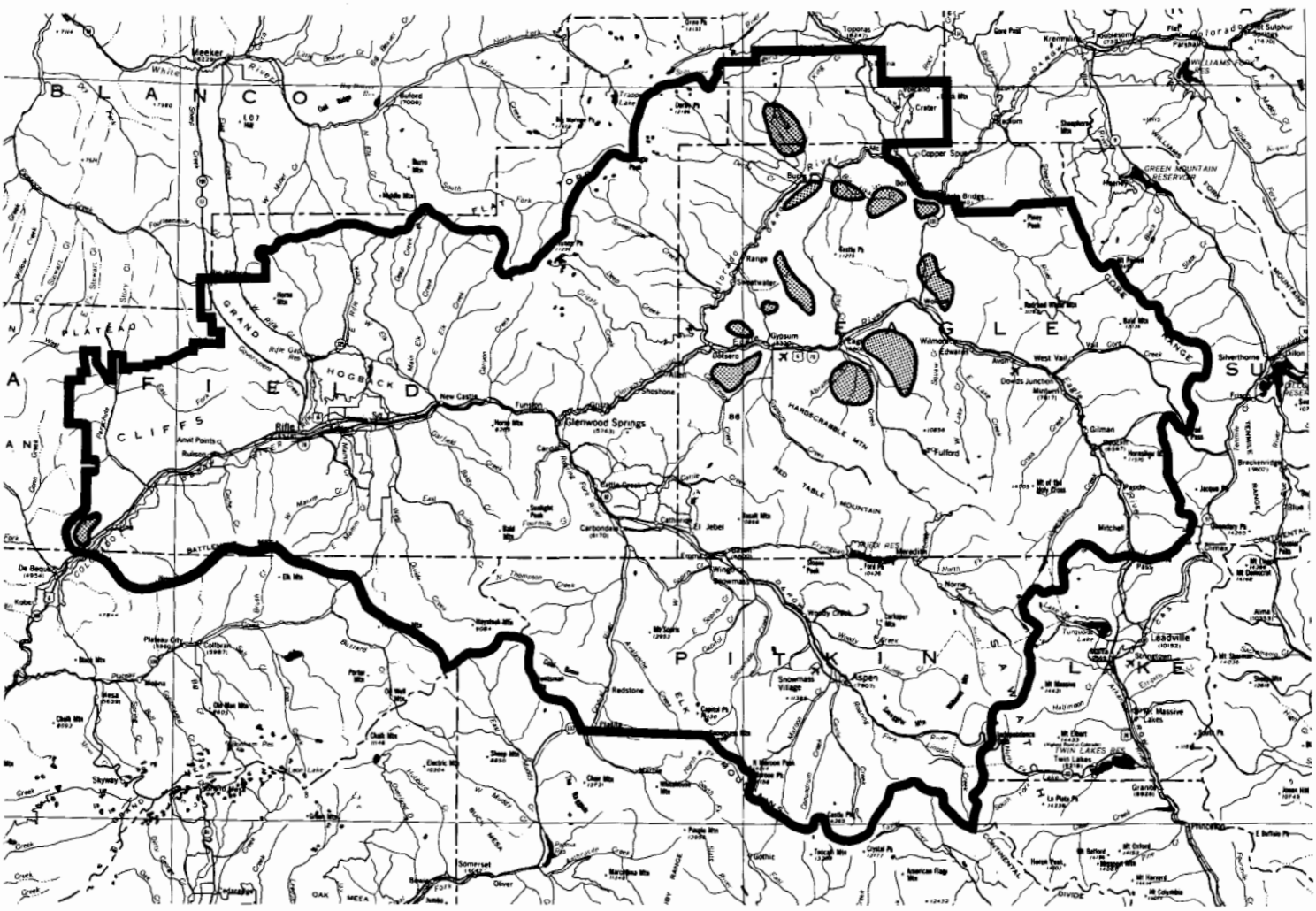
Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-6 Bighorn Sheep Overall Range



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Sage Grouse-Lek Habitat

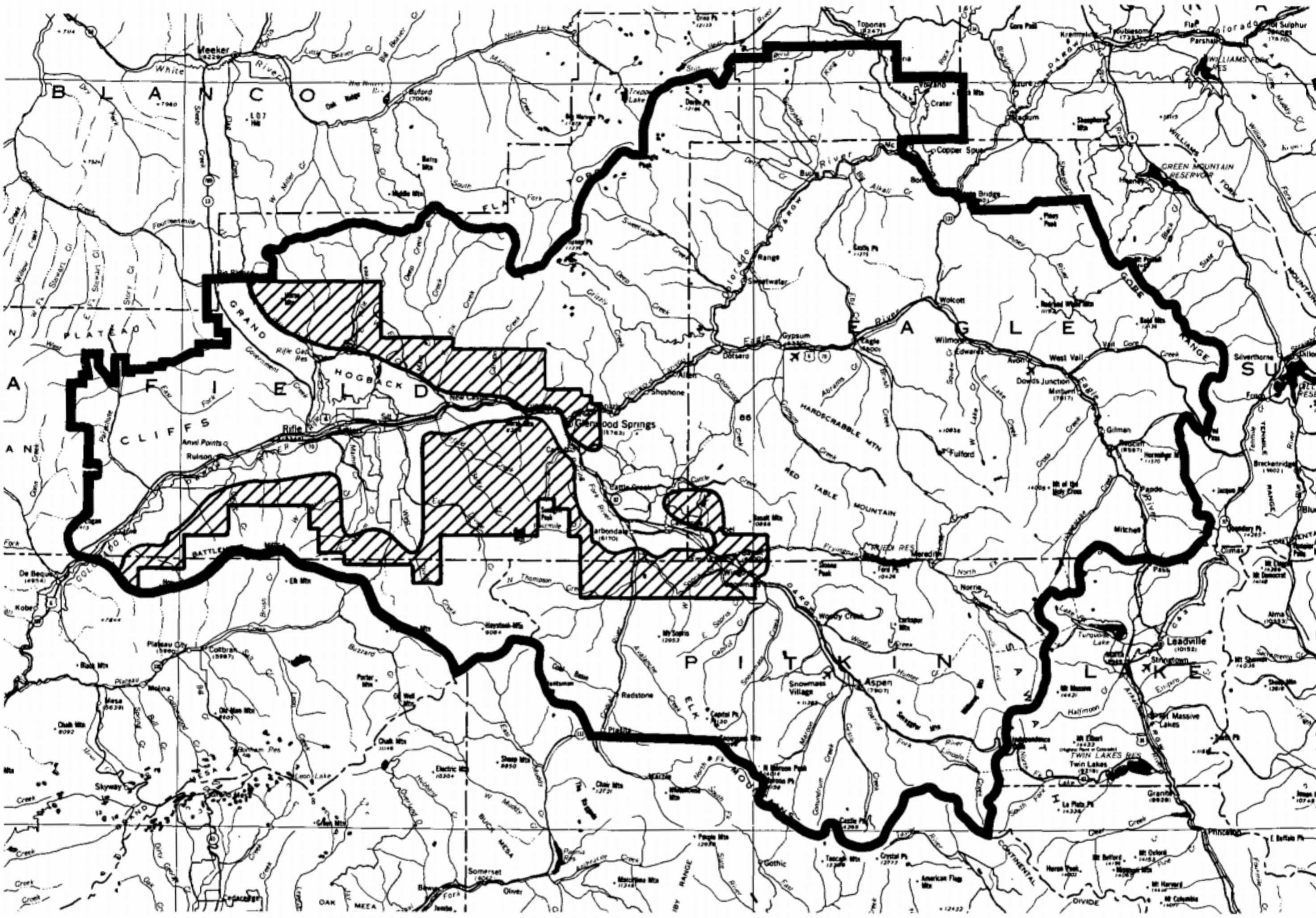
Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-7 Sage Grouse Winter/Lek Habitat



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Turkey Range

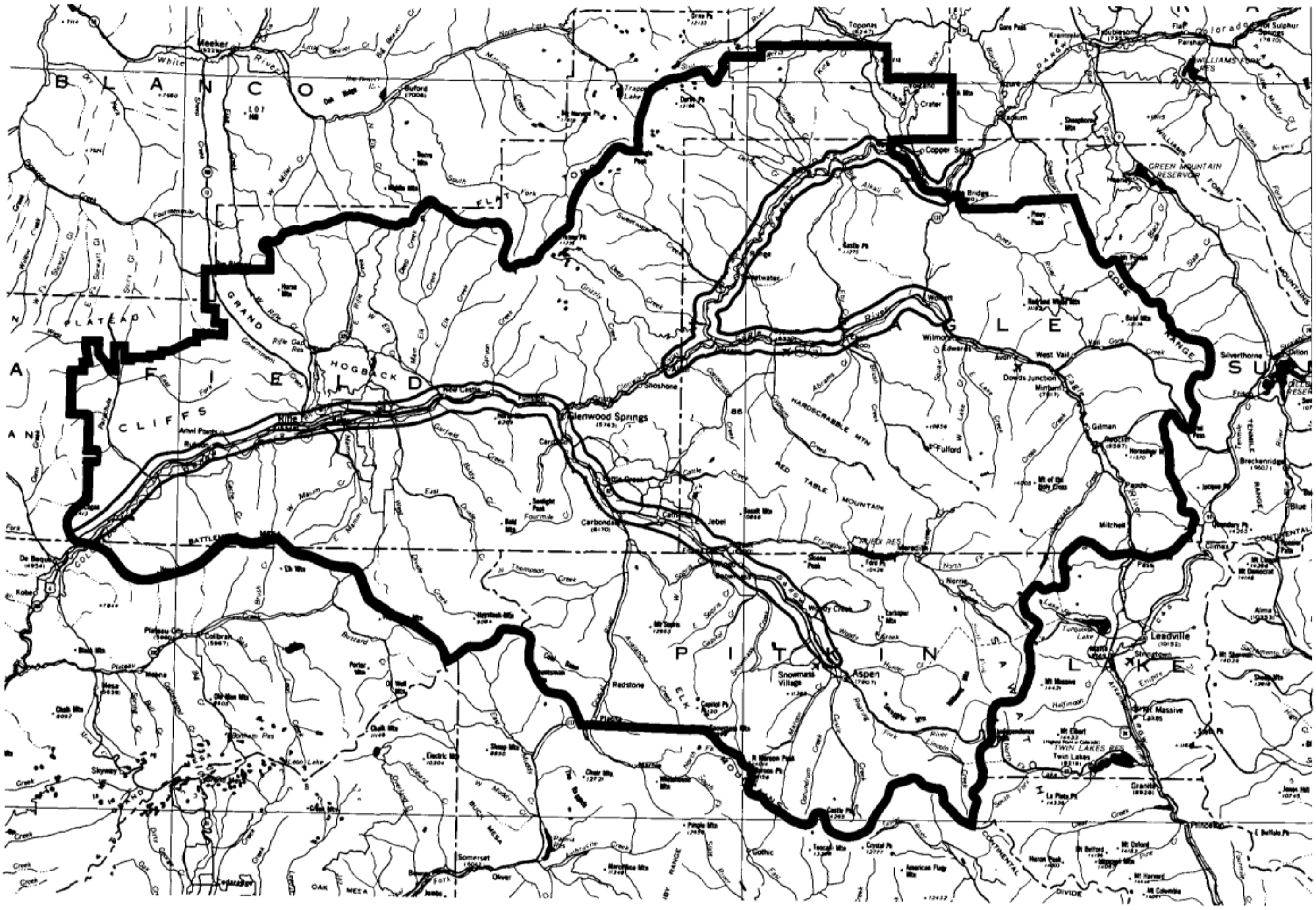
Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-8 Overall Turkey Range



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Waterfowl Usage Areas

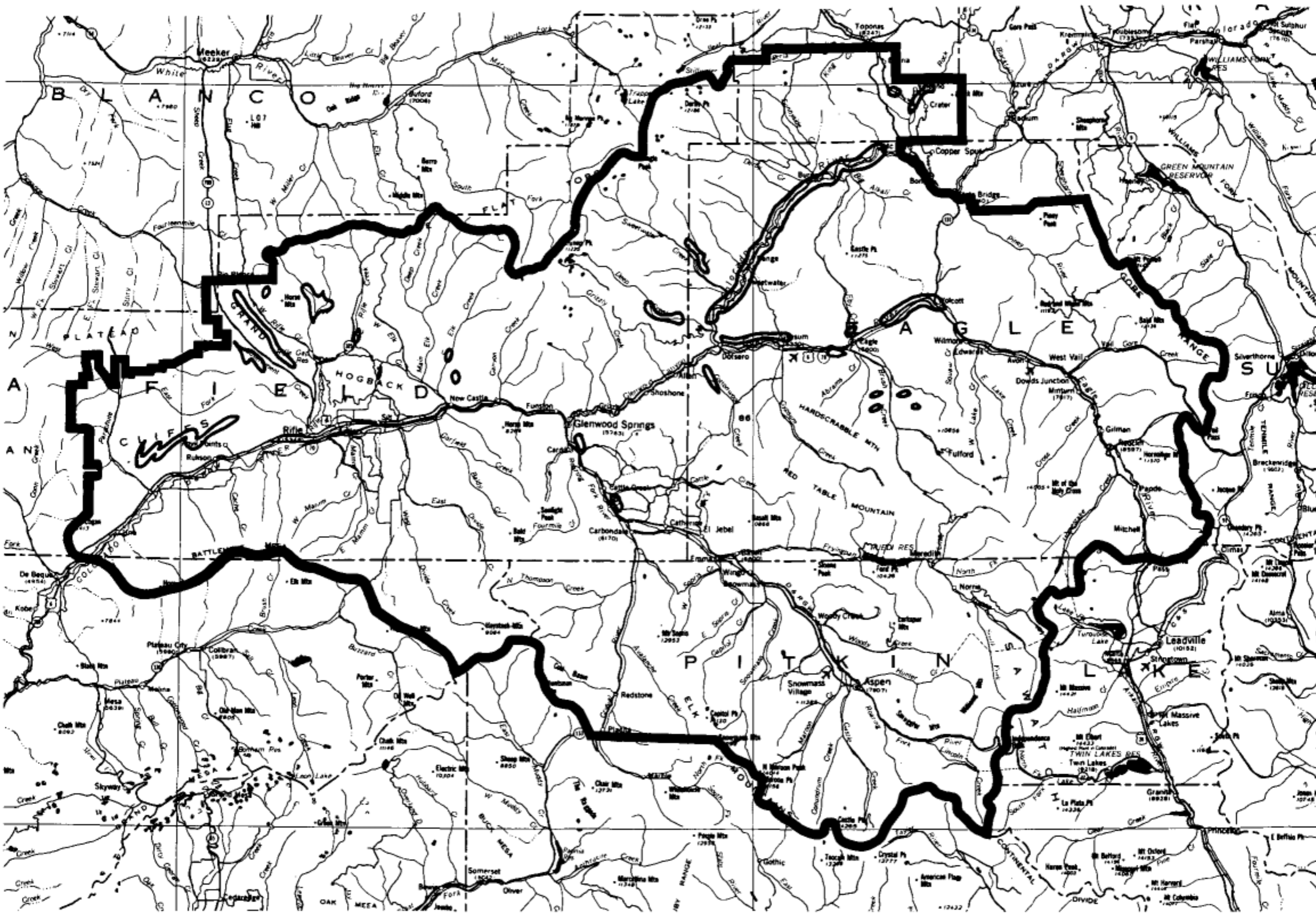
Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-9 Major Waterfowl Use Areas



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Raptor Areas

Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-10 Raptor Concentration Areas

The most productive fisheries occur in the Colorado, Roaring Fork, Eagle, Fryingpan, Piney, and Crystal Rivers, which make up about 32 percent of the total public land stream frontage providing an existing fishery. A relatively minor amount of the total miles of rivers and streams in the Resource Area occurs on public land.

Most streams tributary to the major rivers sustain a self-perpetuating fishery or are stocked regularly by the CDOW. However, most lakes and reservoirs that provide fisheries have been stocked at some time. Some of these streams provide spawning areas for fish that reside in the rivers. Approximately 14 streams and three lakes on public land are regularly stocked by the CDOW.

Threatened and Endangered Species

Tables K-1 and K-2 (Appendix K) list all threatened, endangered, and sensitive species either confirmed or having a potential to occur or historically occurring within the Resource Area. The bald eagle and peregrine falcon (presently on state and federal endangered species lists) and the great blue heron (a species of high federal interest) are known to use public land. The bald eagle and great blue heron areas are shown on Map 3-11.

During 1978-80, a minimum of 35 bald eagles were thought to winter in the Resource Area. Three historic bald eagle nests are located in the Resource Area, two of which occur on public land. In recent years several new nests have been constructed; however, to date they have been abandoned prior to egg laying. This nest building prior to the nesting season is not unusual and often occurs for several years before a serious nesting attempt.

Several isolated sightings of peregrine falcons have been reported in the past; however, no active nests are known at this time. A number of known historic nest sites exist in the Resource Area, and several potential nesting sites for peregrine falcon introduction have been identified on public land.

Approximately six (15 percent) of the known active heron nest sites in Colorado occur along the Colorado River within the Resource Area, with a majority of this use occurring from New Castle west to the Resource Area boundary.

Historically, the squawfish, humpback chub, and bony-tailed chub were thought to inhabit the Colorado River as far east as Rifle. Presently, none of these species are thought to occur in the Resource Area. All three species are listed as both federal and state endangered species.

The razorback sucker, although once inhabiting the Colorado River as far east as Rifle, is thought now to occur only as far east as Rulison. This species is classified federally as a candidate species and as endangered by the state.

The Colorado River cutthroat trout, once listed as threatened by the state is now classified federally as a candidate and as a State Species of Special Concern. Current information indicates that this species is located in nine streams and one lake on public land in the Resource Area.

Table K-2 in Appendix K lists the streams and stream mileage on public lands where the Colorado River cutthroat trout occurs, the year sampled, and the rating.

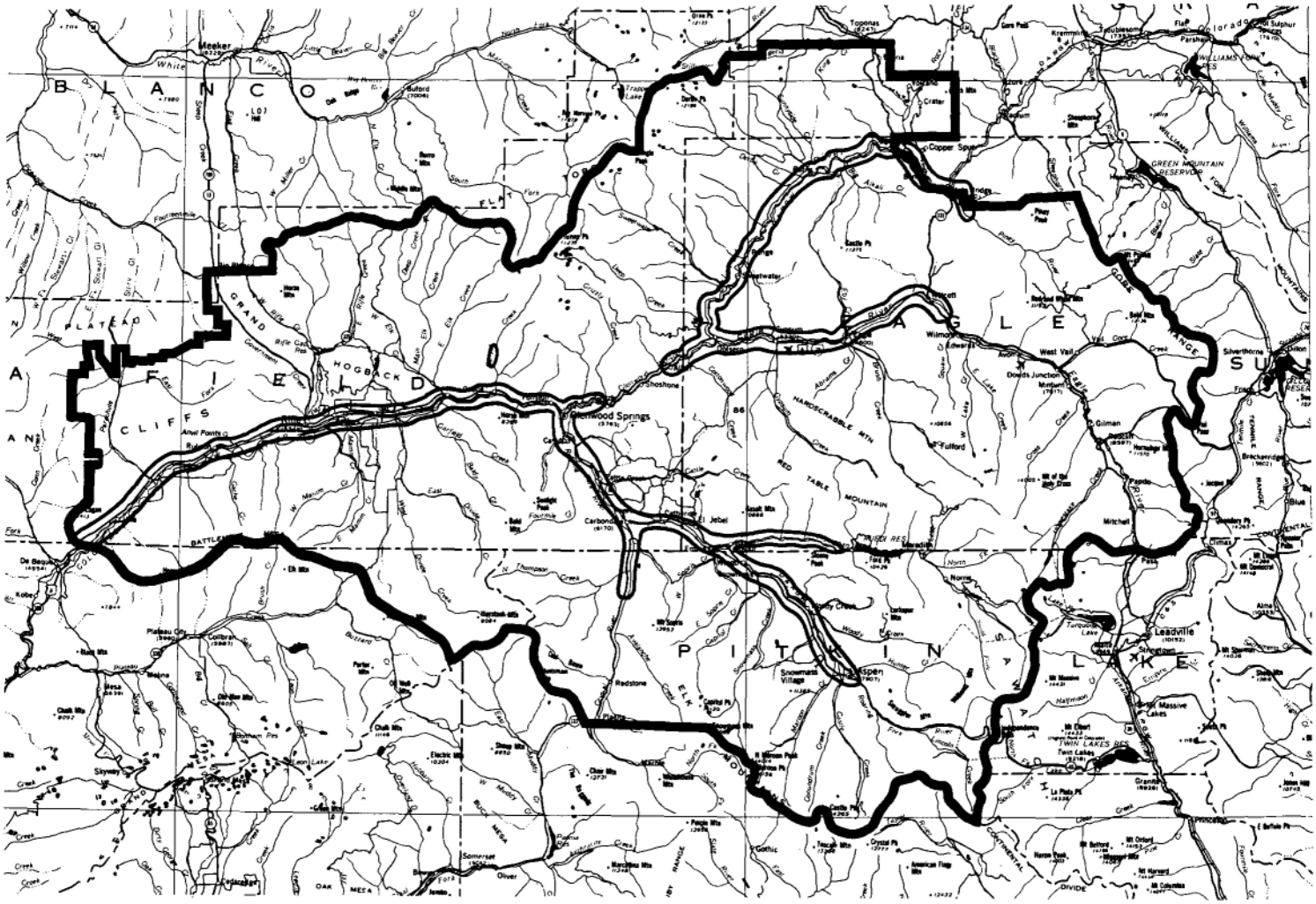
Kremmling Resource Area

This Resource Area provides habitat for approximately 310 species of animals, including 220 birds, 60 mammals, 20 fish, seven amphibians, one reptile, and three domestic herbivores. The 310 species of animals are widely distributed over approximately 1,222,000 acres of aquatic and terrestrial habitats.

Big Game

Mule deer, pronghorn antelope, and Rocky Mountain elk are the most common large mammals found in the area. Mule deer and elk occupy higher elevations, usually forested habitat, during summer and then migrate to lower elevation sagebrush dominant ridges and slopes to winter. BLM-administered public lands provide the vast majority of winter range available to deer and elk in the Resource Area.

Breeding populations of pronghorn were limited to North Park (including the Laramie



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Bald Eagle and
Blue Heron Areas

Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-11 Bald Eagle and Great Blue Heron Areas

River drainage). Antelope were historically residents of Middle Park but were eliminated by market hunters during the early 1900s. A few antelope, immigrants from North Park, began to appear in Middle Park in the mid-1970s, and have continued to expand their population numbers and habitat use.

Important Habitat Features

Severe winter ranges for elk, mule deer, and pronghorn antelope are essential to the survival of these species in the Resource Area. Severe winter ranges are located on sagebrush dominant ridges and south-facing slopes at lower elevations throughout the Resource Area. Habitats for species that depend on specific or historic sites for breeding and associated courtship activities are crucial. Sage grouse strutting grounds are a specific example of these important habitats. Strutting grounds are distributed throughout the sagebrush vegetative type, usually located on ridges with low-growing vegetation. Loss of nesting habitats that have been used historically and are limited in number and distribution for certain raptors, such as prairie falcons and golden eagles, may have serious negative impacts on these species. Detailed locations of these and other important habitat features are available in the Kremmling Resource Area Office.

Birds

Upland game birds common to the Resource Area include blue grouse and sage grouse. Blue grouse are widely distributed throughout the higher elevation woodlands and mountain meadows. Sage grouse occupy the lower elevation sagebrush-dominant rangelands throughout the Resource Area. Sage grouse depend almost entirely on the sagebrush ecosystem for successful breeding, nesting, and winter survival. The North Park sage grouse population has been extensively studied for the past ten years. The numerous streams, rivers, reservoirs, ponds, and associated riparian vegetation provide excellent habitat for a wide variety of waterfowl and shorebirds. Puddle ducks, including mallards, pintails, gadwalls, greenwinged teal, and American widgeon, are common throughout the aquatic habitats in the Resource Area. North Park is particularly important because its waterfowl production is the second highest of any area in Colorado. Only the San Luis Valley produces more ducks annually than does North Park. Waterfowl production occurs throughout the Resource Area, but no other area approaches North Park in magnitude.

Shorebirds are common in association with the numerous water bodies. Greater sandhill cranes, classified as a state endangered species, are known to nest in the southwest quadrat of North Park. Some public lands in this area have been identified by the CDOW as essential habitat for the greater sandhill cranes. Killdeers, American avocets, willets, and Wilson's phalaropes are among the more common shorebirds found in the Resource Area.

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Raptors (birds of prey) are abundant. Prairie falcons, red-tailed hawks, marsh hawks, and golden eagles are the more common raptors breeding and nesting in the area. Precipitous rock formations, large trees, and mountain meadows provide suitable nesting habitat for these species. The numerous songbirds and small mammal populations provide the prey base available to these raptors. Woodland nesting species such as goshawks, Coopers hawks, and sharp-shinned hawks are common in the forested areas.

Threatened and Endangered Species

Bald eagles and peregrine falcons, both classified as endangered species, are known to occur. Bald eagles are fairly common winter residents along the Colorado River and several major tributaries in Middle Park. Migrant bald eagles are observed annually in North Park and occasionally in the Laramie River drainage. Peregrine falcons are observed in migration in Middle Park and North Park; however, no established use has been recorded even though apparent suitable habitat exists. Essential or crucial habitats for bald eagles and peregrine falcons have not been designated in the Resource Area.

The black-footed ferret (Mustela nigripes), Colorado squawfish (Ptychocheilus lucius), humpback chub (Gila cypha), and bonytail

chub (Gila elegans) may occur in the Resource Area; however, these threatened and endangered species have not been recently recorded.

Federal candidate species which may occur in the Resource Area include Colorado cutthroat trout (Salmo clarki pleuriticus), Boreal western toad (Bufo boreas boreas), North American wolverine (Gulo gulo luscus), North American lynx (Felis lynx canadensis), swift fox (Vulpes velox), white-faced ibis (Plegadis chihi), and ferruginous hawk (Buteo regalis). Of these species, the Colorado cutthroat trout, Boreal western toad, white-faced ibis, and ferruginous hawk are known to exist in the Resource Area.

Little Snake Resource Area

Wildlife habitat within the LSRA consists of 1,280,500 acres of terrestrial uplands, 3,000 acres of riparian systems, about 400 acres of wetlands, and 150 miles of streams and rivers. Within these areas, the occurrence and interspersion of many habitat types provide for a large number of wildlife species. A minimum of 68 species of mammals, 189 species of birds, 22 species of amphibians and reptiles, and 22 species of fish occur regularly in the Resource Area.

Big Game

The primary big game species in the Resource Area are elk, mule deer, bighorn sheep, and pronghorn antelope.

Most elk populations within the area are migratory. Summer ranges occur at the higher elevations in the aspen and conifer habitat types of the Cold Spring and Douglas Mountain area and in the Routt and White River National Forests. These animals move to the lower elevation mountain shrub and sagebrush winter ranges in fall.

Small resident populations, that occupy certain areas yearlong, also occur on Cold Spring Mountain and in the Middle Mountain-Diamond Peak area. These areas are isolated and remain relatively undisturbed by human activity.

Severe winter ranges for elk are located south and west of Craig in Williams Fork Mountains and Williams Fork River drainage and extend westward along the Yampa River, including Iles and Duffy Mountains and Axial Basin. Northeast of Craig, elk severe winter range extends from the Battle Mountain-Slater area westward to Fourmile Creek and south to Fortification Creek and Cottonwood Gulch.

Mule deer are common in nearly all habitat types. Many migrate between aspen/conifer summer ranges and sagebrush/mountain shrub winter ranges. Some occupy shrub lands year-round. Although a vast majority of public lands in the Resource Area are classified as winter range, snow conditions in most winters limit the availability of forage. This results in crowding, over utilization of vegetation, and increased deer mortality rate when weather conditions are severe.

Severe deer winter ranges in the Resource Area are located along the lower Williams Fork drainage and the Yampa River drainage, from its confluence with Williams Fork to the Little Snake River, including Isles Mountain, Duffy Mountain, Little Yampa Canyon, Axial Basin, the foothills of Juniper Mountain, and Cross Mountain. The range continues up the east side of the Little Snake River and incorporates Godiva Rim and the northern Great Divide area and lower Scandinavian Gulch. Another severe winter range is located in the Big Gulch-Cottonwood Gulch and Fortification Creek area northeast of Craig. This area is mostly private land underlain by federal minerals.

Pronghorn are common year-round throughout the lower elevation habitats that consist primarily of sagebrush, saltbush, and greasewood. Some herds are migratory and move to winter concentration areas. Movement patterns may be influenced and altered by man-made barriers such as fences, roads, and canals. Such restrictions may lead to overuse of vegetation and declines in local herds in severe winters.

Severe winter range includes much of the Sand Wash area and along the entire length of the Little Snake River within about two to five miles on either side of the river channel. It also extends to the lower Fourmile Creek and West Timberlake Creek drainages.

Game Birds

Upland game bird species include sage grouse, sharp-tailed grouse, blue grouse, and chukar partridge.

Sage grouse occur throughout the sagebrush habitat and are dependent on sagebrush for food and cover. The LSRA, because of the large contiguous stands of sagebrush, contains the largest population of sage grouse in Colorado. As a result, Moffat County has the largest numbers of sage grouse hunters of any county in the state.

Sage grouse concentrate on strutting grounds (leks) which they use annually for mating displays. Strutting grounds, wintering areas, and nesting and brooding areas are essential to population survival. There are 126 total known strutting grounds in the Resource Area of which 38 are on BLM land. Most nesting activity takes place within two miles of strutting grounds, making such areas highly important to sage grouse reproduction.

Sharp-tailed grouse occur in the eastern one-third of the Resource Area and are frequently associated with agricultural land. Like sage grouse, sharp-tailed grouse breeding, nesting and brood rearing are associated with leks or dancing grounds. There are 31 dancing grounds within the Resource Area although none are on BLM land.

Raptors

The LSRA provides excellent habitat for a large number of raptors. Low density human habitation, coupled with considerable high quality habitat and a good prey base, contribute to the success of raptors in the area.

Raptor nesting information is not complete. Most of the information is associated with areas of potential coal mining in the southeastern portion of the Resource Area. The northwestern corner of the Resource Area north of the Yampa River and west of the Little Snake River contains considerable high quality habitat, however, less than ten percent of the area has been formally surveyed. Table 3-8 summarizes the most current raptor nesting information for the Resource Area.

TABLE 3-8. SUMMARY OF RAPTOR NESTING INFORMATION FOR THE LITTLE SNAKE RESOURCE AREA

Species	Number of Documented Nests
Golden eagle	579
Ferruginous hawk	139
Red-tailed hawk	71
Swainsons hawk	14
Prairie falcon	26
Goshawk	3
Great horned owl	2
Burrowing owl	2
Long-eared owl	1
Nests of Unknown Species	364
Total	1201

Raptor species, not listed in Table 3-8, exist in the Resource Area but without documentation of nests. These include sharp-shinned hawk, Cooper's hawk, northern harrier, American kestrel, and short-eared owl.

Aquatic/Wetlands/Riparian

There are about 150 miles of perennial, aquatic habitats on BLM land that are limited to relatively short stretches of rivers and streams, including the Yampa, Williams Fork, and Little Snake Rivers, and Beaver, Willow, Talamantes, and Vermillion Creeks. Game fish are limited primarily to the Yampa River, which supports catfish, pike, and brown trout; and Beaver Creek, which contains brown, brook, and cutthroat trout. The Yampa River ranges from poor to average in fisheries quality in the Resource Area according to the CDOW stream rating (Sealing 1981). Beaver Creek is considered above average and is one of the few natural trout fisheries in the Resource Area.

Riparian communities, although limited in quantity and quality, provide habitat for a large number of wildlife species and represent a highly important resource within the Resource Area. It is estimated that approximately 80 percent of all wildlife species known to inhabit the region are either totally dependent on riparian communities or utilize them more than other habitats.

Threatened and Endangered Animals

One mammal, three bird, and four fish species listed as threatened or endangered by

the USFWS or the state of Colorado may occur in the area.

There have been no confirmed sightings of the black-footed ferret in the Resource Area. However, the potential exists for locating the black-footed ferret in the western portion of the Resource Area. Prairie dog towns, which represent potential habitat, occur throughout this area. The USFWS is considering reintroducing the black-footed ferret on BLM lands in northwest Colorado. Before the reintroduction would take place, the impacts of the action and the availability of potential habitat would be evaluated and analyzed in a separate document. The ferrets would be protected by the Endangered Species Act and the Standard Terms and Conditions of the BLM's oil and gas leases. However, if additional protection is necessary, it would be added as Conditions of Approval on Applications for Permit for Drill, Sundry Notices, and rights-of-ways.

The bald eagle is a winter resident and occasionally breeds within the Resource Area. Currently, two bald eagle nests are known to be active. Winter roost sites are located along the Little Snake, Yampa, and Williams Fork Rivers in the riparian cottonwood trees. A total of 17 documented roost sites are located along the Yampa River from just below its confluence with the Williams Fork River downstream to about the town of Sunbeam. Only five sites are located on BLM land. In 1979-1980, BLM conducted an intensive bald eagle winter survey in Colorado.

The American peregrine falcon, federally listed as endangered, migrates through the area. It is known to nest within Dinosaur National Monument and hunts over adjacent public lands.

Crucial habitat for a state listed endangered bird, the greater sandhill crane, occurs in Routt and Moffat Counties. This bird nests along willow lined drainages in the riparian habitat. Specific areas that have been identified as important are Big Bottom, which is used for feeding and courtship dancing and Round Bottom, which is used for nesting. Both of these areas are on private land about ten miles southwest of Craig along the Yampa River. In addition, there are about 700 acres of BLM land along Willow Creek and Red Creek, south of Steamboat Lake in northeastern Routt County, which supply feeding, dancing, and nesting habitat for the sandhill crane.

The Yampa River is habitat for the federally endangered Colorado squawfish and humpback chub, as well as the state listed (threatened) razorback sucker. The Colorado squawfish, although rare, was reported in the Yampa River as far up as Round Bottom in 1982 (Miller et al. 1982). There are 82 miles of river from Round Bottom until the river leaves the Resource Area at Dinosaur National Monument, of which 25 miles are BLM. The humpback chub was last reported within the Resource Area on a six-mile section (private) on the Yampa River between the confluence of the Little Snake and Yampa Rivers to Deerlodge Park (Miller op. cit.). Only one specimen of the razorback sucker has been reported within the Resource Area, just above the confluence of the Yampa and Little Snake Rivers (EDAW 1980).

Northeast Planning Area

The variety of habitat occurring in the Planning Area results in many wildlife species occupying BLM-administered land. Management emphasis is placed on threatened and endangered species, game species, and species of high interest to state or federal agencies.

Big Game

Mule deer, white-tailed deer, pronghorn, elk, and bighorn sheep are the most common big game species found on BLM-administered land. Public land provides important winter range for mule deer along the Front Range, as well as winter range for elk.

Birds

The large irrigation reservoirs along the South Platte River are important for many nongame bird species including white pelicans, great blue herons, double crested cormorants, snowy egrets, cattle egrets, and black-crowned night herons. The South Platte drainage and associated reservoirs are important winter habitat for bald eagles. The midwinter count in January usually results in between 60 and 80 eagles sighted.

Other important raptor species in the Planning Area include golden eagles, Swainson's

hawks, red-tailed hawks, marsh hawks, and in the winter, rough-legged hawks. Current and potential peregrine falcon eyrie sites occur along the Front Range. Cathedral Spires, a currently unoccupied historical eyrie, occurs on BLM land along the North Fork of the South Platte.

Aquatic Species

Habitat for both warm and cold water fish occurs on BLM land. Several plains reservoirs are managed primarily for recreational fishing. The major species are bass, walleye, catfish, perch, and crappie. Several streams along the Front Range support cold water fisheries. The major species are brook, brown, and rainbow trout. The major waterways going through public land are Clear Creek, Bard Creek, Mill Creek, Fall River, Deer Creek, South Boulder Creek, and Left Hand Creek.

Threatened and Endangered Species

Two state threatened fish, the orangethroat darter and the Arkansas darter, occur in the Planning Area. The Arkansas darter is found in Big Sandy Creek, and the orangethroat darter in the Republican and Arikaree Rivers.

The greater prairie chicken, a state endangered species, inhabits areas in Yuma and Logan Counties that are subject to leasing of federal mineral estate. These birds are being actively managed by the CDOW in an area north of Eckley, Colorado, and at the CDOW's Tamarack Ranch in Logan County. Approximately 15 leks have been identified.

TABLE 3-9. THREATENED AND ENDANGERED SPECIES--NORTHEAST PLANNING AREA

FEDERALLY LISTED SPECIES
Bald Eagle (Haliaeetus leucocephalus)
Peregrine falcon (Falco peregrinus)
Black-footed ferret (Mustela nigripes)
Greenback cutthroat trout (Salmo clarki stomias)
Piping plover (Charadrius melodus)
Pawnee montane skipper (Hesperia leonardus montana)
FEDERAL CANDIDATE SPECIES
Preble's meadow jumping mouse (Zapus hudsonius preblei)
Southwestern otter (Lutra canadensis sonorae)
Swift fox (Vulpes velox)
Mountain plover (Charadrius montanus)
Long-billed curlew (Numenius americanus)
Ferruginous hawk (Buteo regalis)
White-faced ibis (Plegadis chihi)
Colorado burrowing mayfly (Ephemera compar)
Lost ethmiid moth (Ethmia monachella)
Regal fritillary butterfly (Speyeria idalia)
Stevens' tortricid moth (Decodes stevensi)

San Juan/San Miguel Planning Area

Big Game

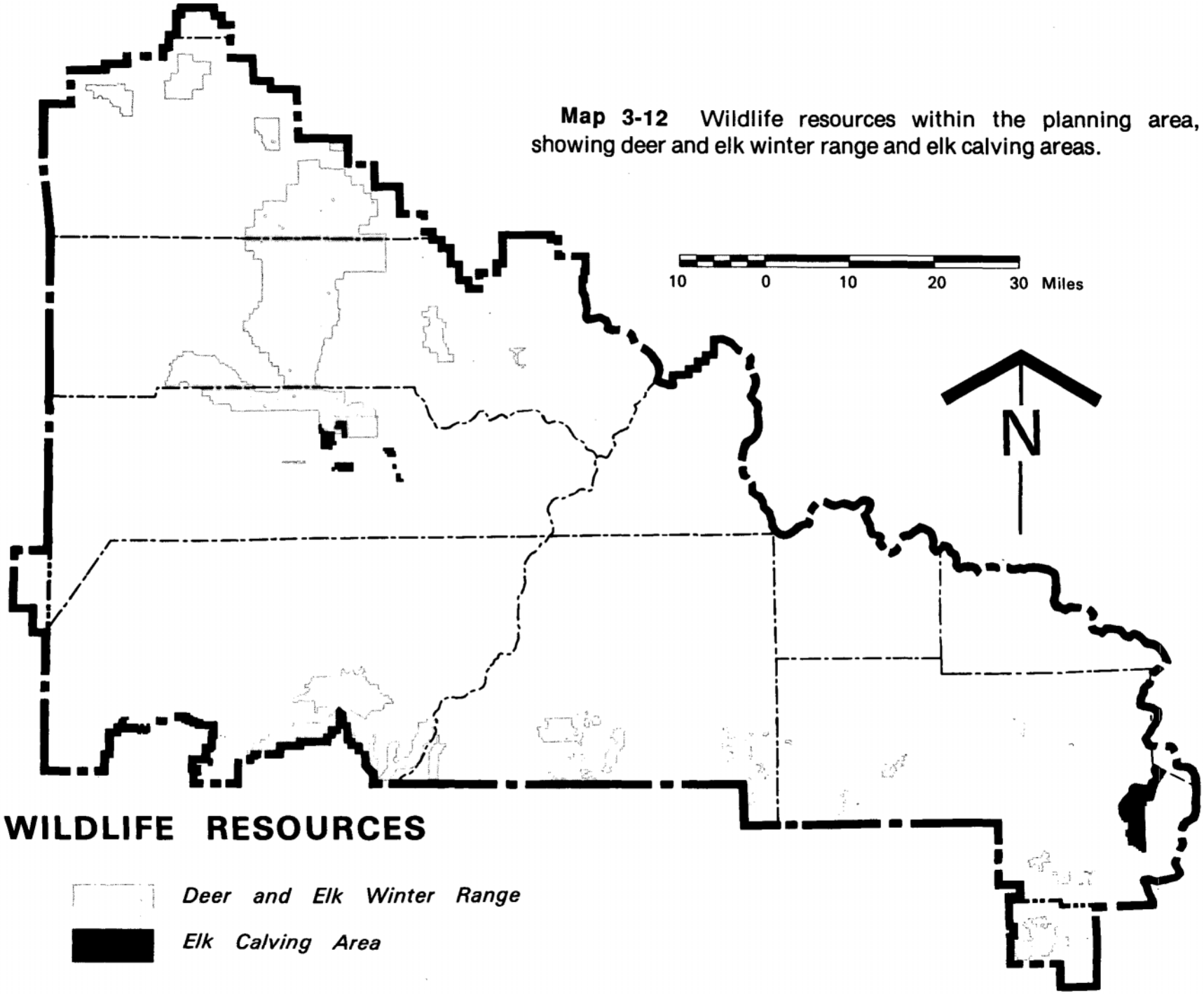
Mule deer and elk are common year-round residents in some portions of the Planning Area and seasonal occupants in other parts (see Map 3-12). Both species tend to migrate between forested lands at higher elevations in the spring and summer to woodlands at lower elevations in the fall and winter. Average herd densities are relatively low in summer (two-three deer/square mile) due to the large amount of available habitat. Winter herd densities may exceed 100 deer per square mile on some crucial winter ranges because snow depths limit habitat availability. Migration between winter and summer ranges may exceed 50 miles in this region. CDOW has documented deer migration of more than 70 miles (by marked animals).

Small Game and Waterfowl

Sage and blue grouse, chukar, quail, wild turkey, ptarmigan, and pheasant are present in small numbers in scattered localities throughout the Planning Area. Pheasants are mainly dependent on nearby agricultural land, while the others are associated with native rangeland, alpine, and forest habitats. Sage grouse strutting and nesting grounds have been identified in the vicinities of Dry Creek Basin and Miramonte Reservoir (see Map 3-13).

Aquatic Habitat

There are an estimated 400 miles of stream habitat in the Planning Area that run through lands administered by BLM, including approximately 120 miles that were intensively inventoried in 1980 and 1981. The remaining 280 miles of aquatic and riparian habitat are considered as potential habitat that warrants further investigation and is expected to provide additional quality habitat.



Map 3-12 Wildlife resources within the planning area, showing deer and elk winter range and elk calving areas.

Of the 280 miles that were not intensively inventoried for the plan (see Table M-1, Appendix M), the San Miguel River comprises approximately 25 miles on BLM lands. The Dolores River has an estimated 120 miles of aquatic and riparian habitat running through BLM land and the Animas River runs through nearly 16 miles of BLM land. The remaining 123 miles of stream habitat on BLM lands are principally those tributaries associated with these three major drainages. The breakdown (in terms of habitat quality) for all 144 miles of inventoried aquatic and riparian habitat is: one percent, excellent condition; five percent, good condition; 46 percent, fair condition; and 48 percent, poor condition (see Table M-2, Appendix M).

The major game species observed in the streams was rainbow trout. Some of the streams also contained brook, brown, and cutthroat trout. Other species included suckers, shiners, cottids, and some species that remain unidentified.

Threatened and Endangered Species

Bald eagles have historically nested in the region in forested areas along rivers. The impoundment of rivers and development of storage reservoirs has created additional nesting habitat. No nest sites have been identified on public lands, but potential habitat exists in several areas (near Vallecito and Lemon reservoirs northeast of Durango and near Summit Lake, north of Mancos). One identified bald eagle nest active in 1983 (Craig 1983) is within two miles of BLM land near Cortez. Three other confirmed nest sites occur within five to ten miles of BLM lands near Cortez and south of Durango. Most bald eagle activity on BLM lands occurs from November through April (see Map 3-13) when birds from northern states migrate into the area. Use areas were inventoried and mapped by BLM in 1979 and 1980. The largest concentration of eagles in the Planning Area is near the Disappointment Valley and Dry Creek Basin, where eagles exhibit opportunistic feeding behavior, taking carrion when available, and hunting rabbits and prairie dogs. Communal roosts are found in the San Miguel River canyon.

The black-footed ferret's historic range included nearly all BLM lands in the Planning Area except the higher elevation lands near Silverton. Their range and potential habitat coincide with prairie dog habitat below 10,000-foot elevation. No sightings or evidences of activity have been documented in the Planning Area since 1954 (in Montezuma County near Mancos).

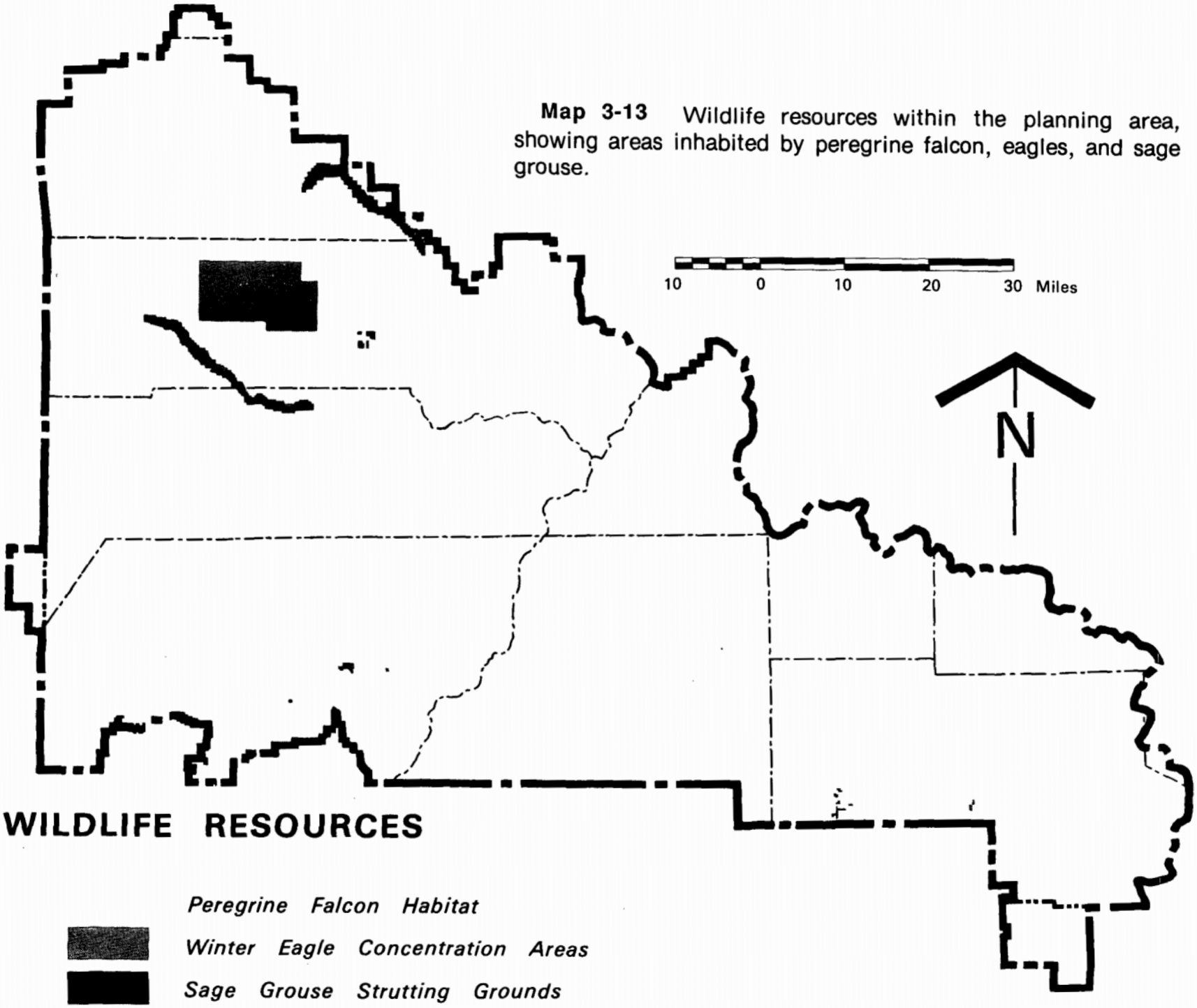
Peregrine falcons live in the region year-round. Suitable habitat for nesting has been intensively inventoried and mapped (CDOW 1978), including sites known to have been occupied in the past, presently occupied sites, and additional sites that are suitable for expanding known habitat. At least eight such potential or known sites occur on lands that could be directly or indirectly affected by managing BLM-administered lands or subsurface minerals (see Map 3-13). Two of these three have ongoing reintroduction programs and the third is under consideration for possible reintroduction efforts (Chimney Rock, Durango, and Mesa Verde sites) (Langlois 1983). Peregrine Falcon Recovery Team personnel (made up of various members of different federal agencies) have indicated that long-range plans may lead to reintroductions at all potential habitat sites.

The extreme eastern portion of the Planning Area and most of the Silverton area are included in the migration route of the Grays Lake whooping crane flock, based on migration records (CDOW 1978) for the greater sandhill cranes. The sandhill cranes are being used to foster whooping cranes in an experimental program to assist the recovery of the whooping crane species. No areas are currently designated as essential habitat in Colorado.

Greater sandhill cranes, a Colorado endangered species, once nested in the Silverton Planning Area in willow-lined drainages and meadows up to 9,500-foot elevation. Occupied nesting ranges have been reduced to the northwestern part of the state. No crucial habitat has been designated within the Planning Area, but the potential exists for recolonizing suitable habitat if the greater sandhill crane subspecies expands its population in Colorado.

Mexican spotted owls have been reported to occur at Mesa Verde in ponderosa pine and Douglas-fir habitat (G. Craig, CDOW, personal communication 1983). Similar habitat sites occur on Weber and Menefee mountains, in the Dolores River Canyon, and

Map 3-13 Wildlife resources within the planning area, showing areas inhabited by peregrine falcon, eagles, and sage grouse.



near Durango. No inventories have been conducted for this species. Since little is known about the preferred habitat of this species, no crucial habitat has been identified. Both the grey wolf and grizzly bear once occurred on the public lands in the Planning Area but are not presently known to exist.

Wolverines once occupied most of the densely forested mountain habitat in the state. Some animals may still occur in the Silverton area on BLM lands. No crucial habitat has been designated.

River otters were known to have occurred in the Dolores and San Miguel River drainages. They require year-round open water and a minimum flow of 10 cfs; and therefore, are limited to major waterways and lakes with an abundant fish supply. River otters have been introduced to the Piedra River by CDOW. The CDOW introduced seven river otters into the Dolores River in November of 1988. An agreement between CDOW and BLM will allow for introduction of 30 additional river otters at a future date.

At one time, lynx occupied nearly all alpine and subalpine forest habitat in Colorado. Parts of Eagle County and Clear Creek County are thought to be presently occupied range. The areas around Silverton are potential habitat for the species. See Table M-3 in Appendix M.

WILD HORSES

LSRA and SJ/SMPA are the only two areas that contain wild horses.

The LSRA currently manages a wild horse herd, amounting to several bands within the Sand Wash Basin. The herd level objective is to control and maintain approximately 160 horses. The herd management area is predominantly public lands. A total of 157,630 acres are included in the area, of which 154,940 acres are public lands (see Map 3-14). The herd consisted of 279 horses in March of 1988, which were in small bands of five to 20 horses, located throughout the basin. Historically the annual horse numbers have fluctuated to a large extent. The census data in Table L-2 (Appendix L) has been gathered since 1971.

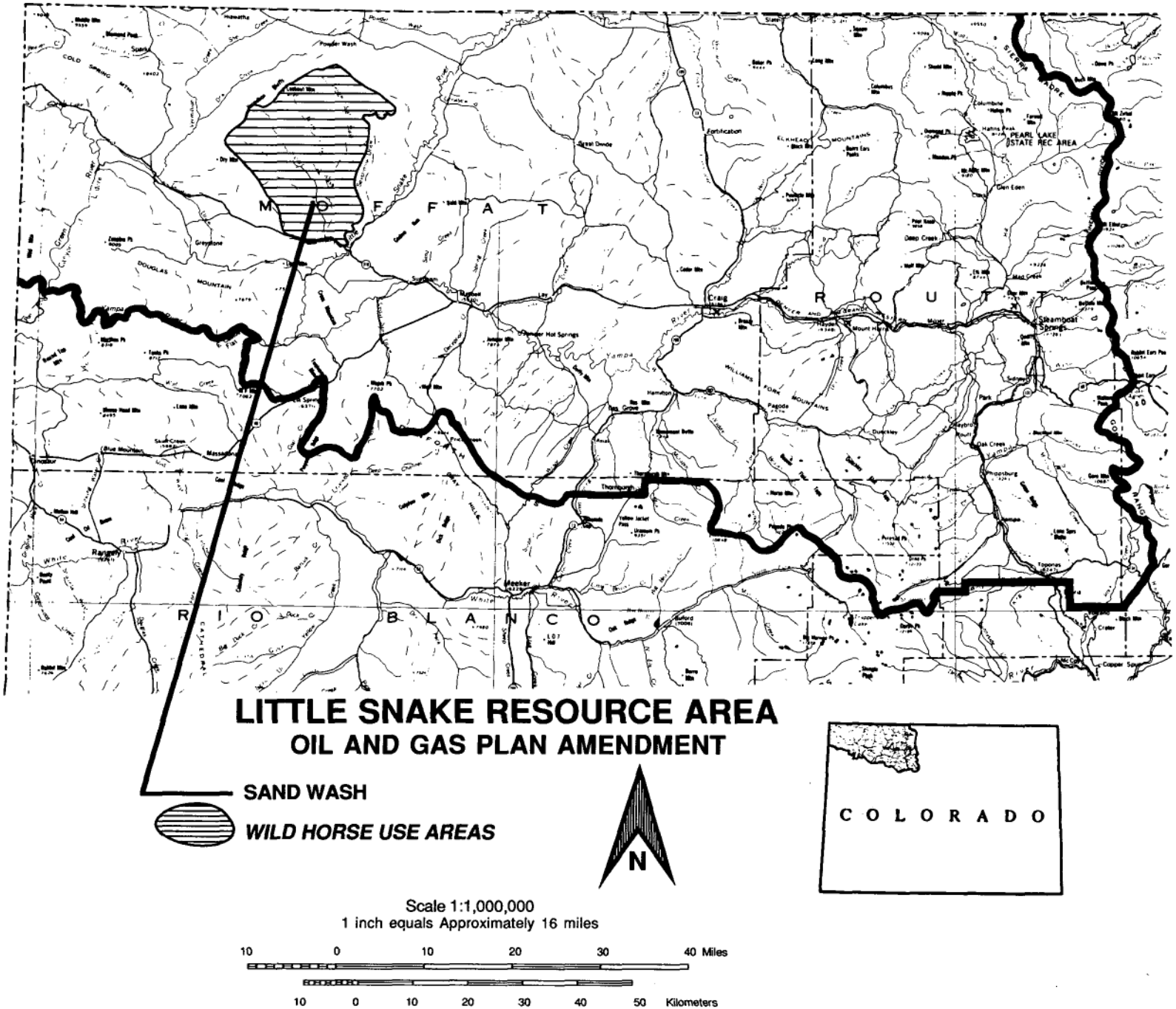
Wild horses are found in the SJ/SMPA at the southeast end of Disappointment Valley in Spring Creek Basin (see Map 3-15) which contains 35,000 acres, of which 27,000 acres (77 percent) are public lands. The herd has steadily increased from 24 head in 1971 to 65 head in 1989. One hundred-twenty head were gathered in the Spring Creek Basin area in 1985. The area was then restocked with 35 head. Currently there are approximately 80 head in the Spring Creek Basin area. Management goal for this area is an average herd size of 50 head.

SOILS

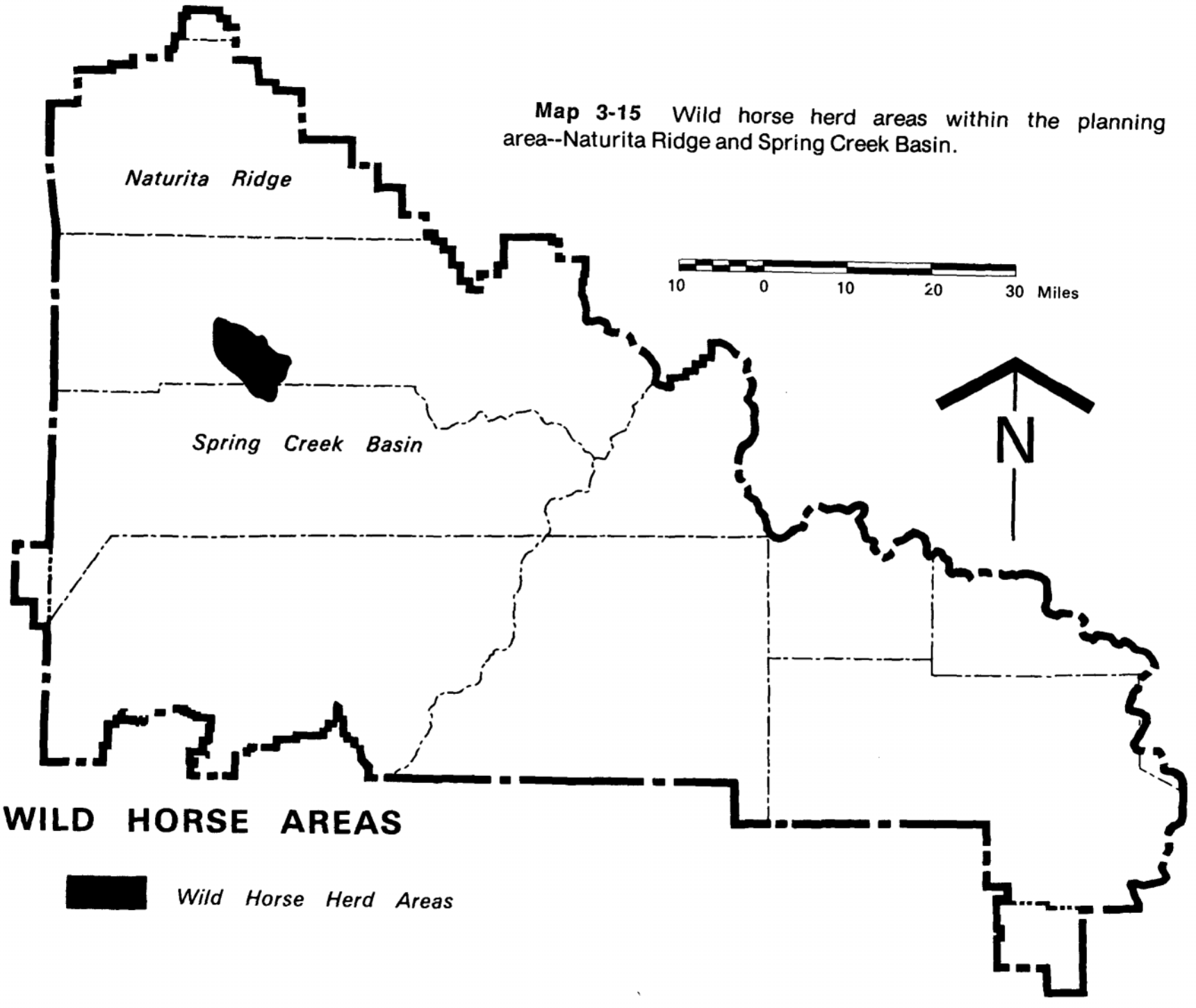
The soils in the Study Area are highly variable in texture, depth, fertility, and age. Young soils are found in drainage ways where deposition occurs and on unstable slopes where erosion is taking place. Older soils occur on stable uplands and in higher precipitation areas reflected by increased vegetative cover. Texture varies from fine clays, which are generally high in salts, to coarse sands, which may be wind deposited. Depth varies from shallow soils (a few inches), as on ridges and steep side slopes, to deep soils (greater than 60 inches), as found in alluvial drainages. Soil fertility may be reflected by the vegetative cover. Those with a sparse vegetative cover are not considered to be fertile soils, and the soil building processes are very slow. Those with a dense vegetative cover reflect higher fertility and faster soil building processes.

The spring thaw is when the soils are most susceptible to damage from vehicle travel or construction activities. Activities during this period could cause problems in the reclamation of a disturbed area. Increases in erosion and sedimentation are more likely during the spring thaw and periods of high runoff.

Steep, infertile and high salt content soils are classified as fragile soils. Major areas of fragile soils have been identified in the LSRA. These areas include the Danforth Hills, side slopes along drainage ways in the Vermillion Creek, Sand Wash, and the Little Snake River watersheds, and badlands throughout the Resource Area. Examples of what may happen when fragile soils are disturbed can be observed in the Danforth Hills area, where massive landsliding has occurred on side slopes associated with drill pads and access roads.



Map 3-14 Wild Horse Use Areas



Map 3-15 Wild horse herd areas within the planning area--Naturita Ridge and Spring Creek Basin.

Several potential prime farmland sites exist within the Study Area. These areas exhibit very high soil productivity potential and are eligible for special designation and protection. Special stipulations on surface-disturbing activities are used to prevent any unnecessary disturbance.

WATER

The Study Area encompasses portions of the following river basins: Colorado, North Platte, South Platte, and Green. Average annual precipitation over these basins range from 30 inches in some mountainous areas to less than 12 inches at lower elevations. Water yields range from 0.1 inch of runoff to a high of over 20 inches. The average from public lands is two inches or less. Peak flow on the main tributaries typically occurs in May and June due to spring snowmelt. Intense summer thunderstorms result in peak flows on small tributaries and cause locally severe flooding and debris flow.

Water quality is most often affected by the geologic formations that contribute significantly to the salinity of several basins. The most notable is the Colorado River Basin. Sedimentary rocks, such as the Mancos Shale, Eagle Valley Evaporite, and Green River, contain highly soluble minerals that are easily leached by water passing over or through them. Water quality measurements by the BLM indicate salinities (TDS) as high as 2,500 milligrams per liter (mg/l). This is five times the recommended drinking water standard of 500 mg/l. Values up to 1,000 mg/l have been found to be harmless. Salinity problems occur throughout the Study Area except for the KRA. In the KRA, many of the BLM lands are near the headwaters. The headwaters flow over insoluble geologic formations and have low salinity. There are limited areas where saline springs and soluble geologic formations contribute to salinity problems.

Sediment yield can vary from a low of less than 1/4 ton/acre/year to a high of 8.4 tons/acres/year. The overall average is probably one ton/acre/year. Erosion is more severe where ground cover is sparse.

Several critical watersheds are within the GSRA. These are the municipal watersheds for the cities of Rifle and New Castle. A flow hazard zone around Glenwood Springs is the other critical watershed. These areas require special stipulations on any surface-disturbing activity.

Most public land watersheds provide important groundwater recharge and discharge areas. These areas contribute significantly to baseflow to the local streams and river. The majority of the groundwater resources have not been developed. Some development has occurred by municipalities and agricultural interest.

Groundwater salinity is generally higher than surface water because it moves slower and is in contact with soluble minerals much longer. As an example, the Eagle River (GSRA) received 34 percent of its annual discharge from groundwater inflow and 58 percent of its salt load from that same groundwater inflow. Ranchers and farmers also use groundwater for both domestic and agricultural use.

FORESTRY

Each Resource/Planning Area supports small but active forestry programs. Both sawtimber and firewood sales are made in each area, except in the NPA where only commercial and family firewood are sold. The following describes the forest resources in each area.

Glenwood Springs Resource Area

The GSRA has approximately 45,640 acres of productive forest land that supports Engelmann spruce-subalpine fir (49 percent), lodgepole pine (38 percent), Douglas-fir (11 percent), aspen (11 percent), ponderosa pine (two percent), and subalpine (one percent). The forest, in general, is healthy with the majority of stands in a mature or over mature condition. The Resource Area also supports approximately 214,310 acres of pinyon pine (44 percent) and juniper (44 percent), considered to be woodlands. An estimated 75 acres of pinyon pine and juniper are harvested annually. Annual woodland harvest averages 1,000 cords of commercial fuel wood and 500 cords of fuel wood sold under public-use permits. The pinyon-juniper forest is typified by stands of all ages and conditions but is generally exemplified by slow-growing mature stands.

Kremmling Resource Area

In the KRA, the three major forest types are lodgepole pine, aspen, and pinyon-juniper. Lodgepole pine is found throughout most of the mountainous slopes between 8,000 and 10,000 feet. It is the most important and intensively-managed productive forest type. Four other coniferous forest types that occur in scattered pockets throughout the Resource Area are the spruce-fir, Douglas fir, ponderosa pine, and limber pine. Each of these types accounts for less than one percent of the total vegetative cover, and therefore, are not intensively managed. Stands of quaking aspen are found on mountain slopes at nearly all elevations and under a wide range of conditions. Aspen stands have largely been maintained and preserved for their scenic, recreational, wildlife, and grazing values. However, a waferboard factory, built in Kremmling in 1983, utilizes aspen trees that generally average larger than eight inches in diameter at breast height. The pinyon-juniper vegetative type is almost exclusively confined to the drier, warmer foothills in the southwest part of the Resource Area. Commercial pinyon-juniper trees are used for firewood and fence posts.

Little Snake Resource Area

In the LSRA, four major forest or woodland types occupy a total of 160,420 acres. These include pinyon-juniper woodlands, ponderosa pine, lodgepole pine, and aspen.

Pinyon-juniper woodland is the dominant forest type, occurring on approximately 127,730 acres in the western portion of the Resource Area. Current use of this type is for commercial and noncommercial harvest of fuel wood, fence posts, and poles.

Lodgepole pine occurs on approximately 6,800 acres. The largest concentrations of lodgepole are found adjacent to the Routt National Forest on the east side of the Resource Area and in the Diamond Peak-Middle Mountain area in the northwest corner of the Resource Area. Much of the commercial sized lodgepole is infected with mountain pine beetle and dwarf mistletoe, causing heavy mortality in sawtimber stands and dramatic growth reduction in post/pole size classes. Current use of this type is for commercial and noncommercial harvest of house logs, fuel wood, posts, and poles.

Isolated remnant stands of ponderosa pine occur on about 11,590 acres of Douglas Mountain in the southwest portion of the Resource Area. The average age of most of the sawtimber-size ponderosa is in excess of 250 years. This old age, coupled with mountain pine beetle infestation, is responsible for the present high rate of mortality of the species. Current uses include commercial harvest for sawlogs and fuel wood and noncommercial harvest of fuel wood. Aspen occurs in pure stands or mixed with lodgepole pine at elevations above 7,000 feet, and occupies approximately 14,300 acres. Current use of aspen is for noncommercial harvest of fuel wood.

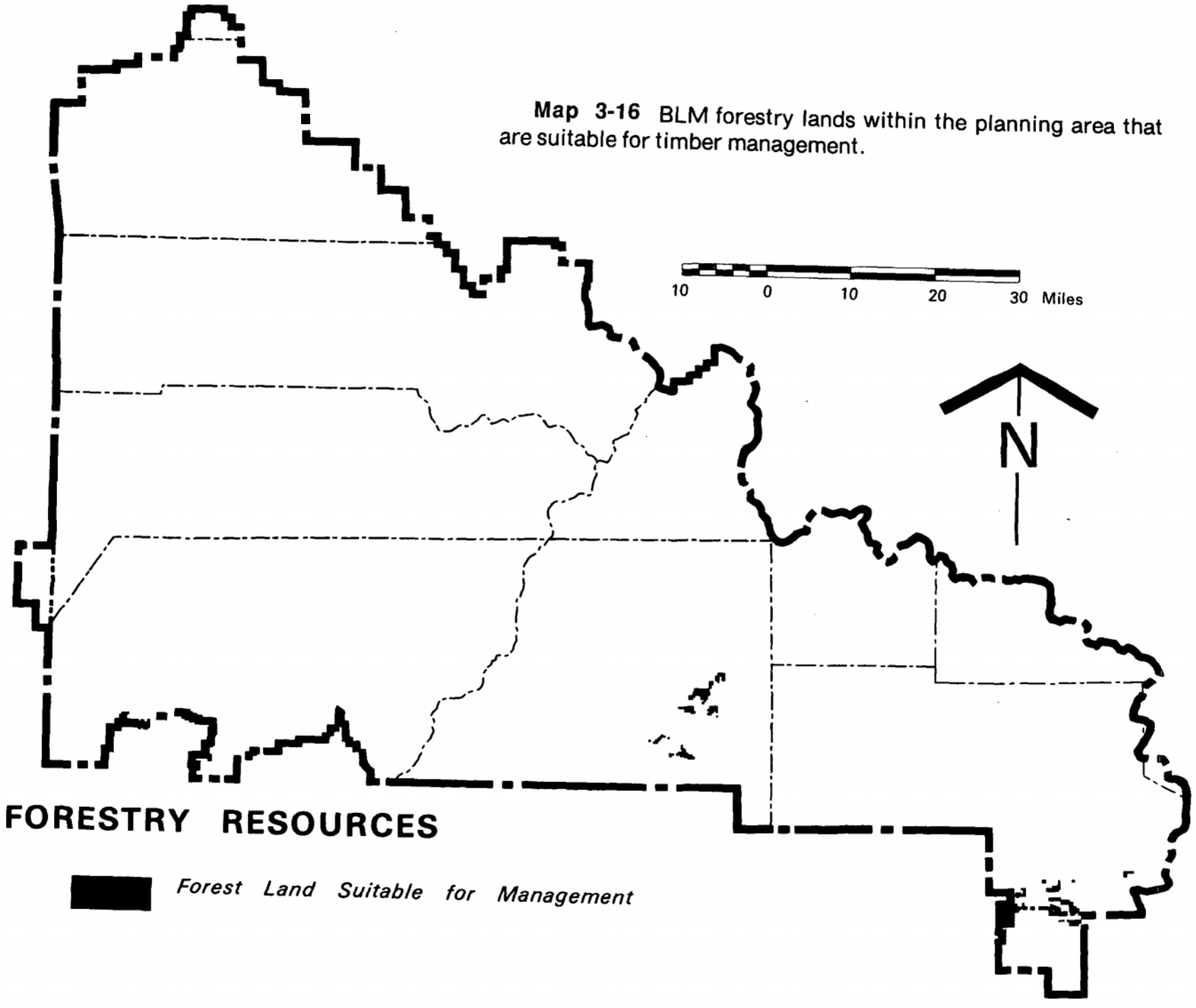
Northeast Planning Area

Forested lands in the NPA are found along the Front Range. The predominate tree species are ponderosa pine, Douglas fir, and lodgepole pine, with limber pine, sub-alpine fir, and Englemann spruce also occurring. Timber sales are small and well defined. Most of the wood is used for firewood, with about half being cut by individuals for personal use.

San Juan/San Miguel Planning Area

The SJ/SMPA contains 44,200 acres of commercial forest base with the predominant commercial species being ponderosa pine, Englemann spruce, and Douglas-fir (see Map 3-16). An estimated 9,540 acres or 22 percent of all the commercial forest base within the Planning Area are available for timber production. The remaining 34,660 acres are considered nonsuitable because of extreme topography, fragile soils, and recreational withdrawals.

Woodland species presently occupy approximately 600,000 acres of the SJ/SMPA. Approximately 67,000 acres of the woodland forests could be classified as productive, operable, and capable of being intensively managed. Under current management, no woodland acres are identified as being under intensive management. Most woodland activities have been implemented with an objective to improve range conditions. The demand for woodland products within the Planning Area has been estimated at 1,000 cords of fuel wood and 3,000 posts annually.



Map 3-16 BLM forestry lands within the planning area that are suitable for timber management.

RECREATION

Throughout the Study Area, outdoor recreation is an important component of local economies (see Social and Economic section). Public lands and lands overlying federal mineral ownership provide an important resource for a wide variety of recreational activities. Some of the more significant activities that may be impacted by oil and gas development are discussed. Throughout the Study Area, demand for recreational opportunities is expected to increase.

The BLM manages two types of recreational situations on public lands. Most of the public lands are managed to maintain a freedom of recreational choice with a minimum of regulatory constraints. There are few BLM recreational facilities or supervisory efforts on these lands. These areas are sometimes referred to as Extensive Recreation Management Areas (ERMAs). Where the nature of the resource attracts intensive recreational use, public lands may be managed as a Special Recreation Management Area (SRMA). These are areas where BLM makes major investments in recreational facilities and visitor assistance. Specific management direction in a SRMA is formulated by the BLM to provide for resource protection and public health, safety, and enjoyment. SRMAs within the Study Area are listed in Table 3-10.

Glenwood Springs Resource Area

The GSRA, in addition to the SRMAs shown on Map 3-17 and described in Table 3-10, provides a variety of outdoor recreational opportunities and settings. This area is becoming increasingly well known for its many caves. Also, within the area are several destination resorts including Vail, Aspen, Snowmass, and Glenwood Springs which add to the recreational character and to the demand on public lands as well. State and local parks sometimes occur on lands overlying federal mineral ownership. An example of this occurs at Rifle Mountain Park. This 400-acre park receives heavy use by local residents for community gatherings, camping, hiking, and fishing. The Colorado River, Deep Creek, and Crystal River are proposed for study under provisions of the Wild and Scenic Rivers Act.

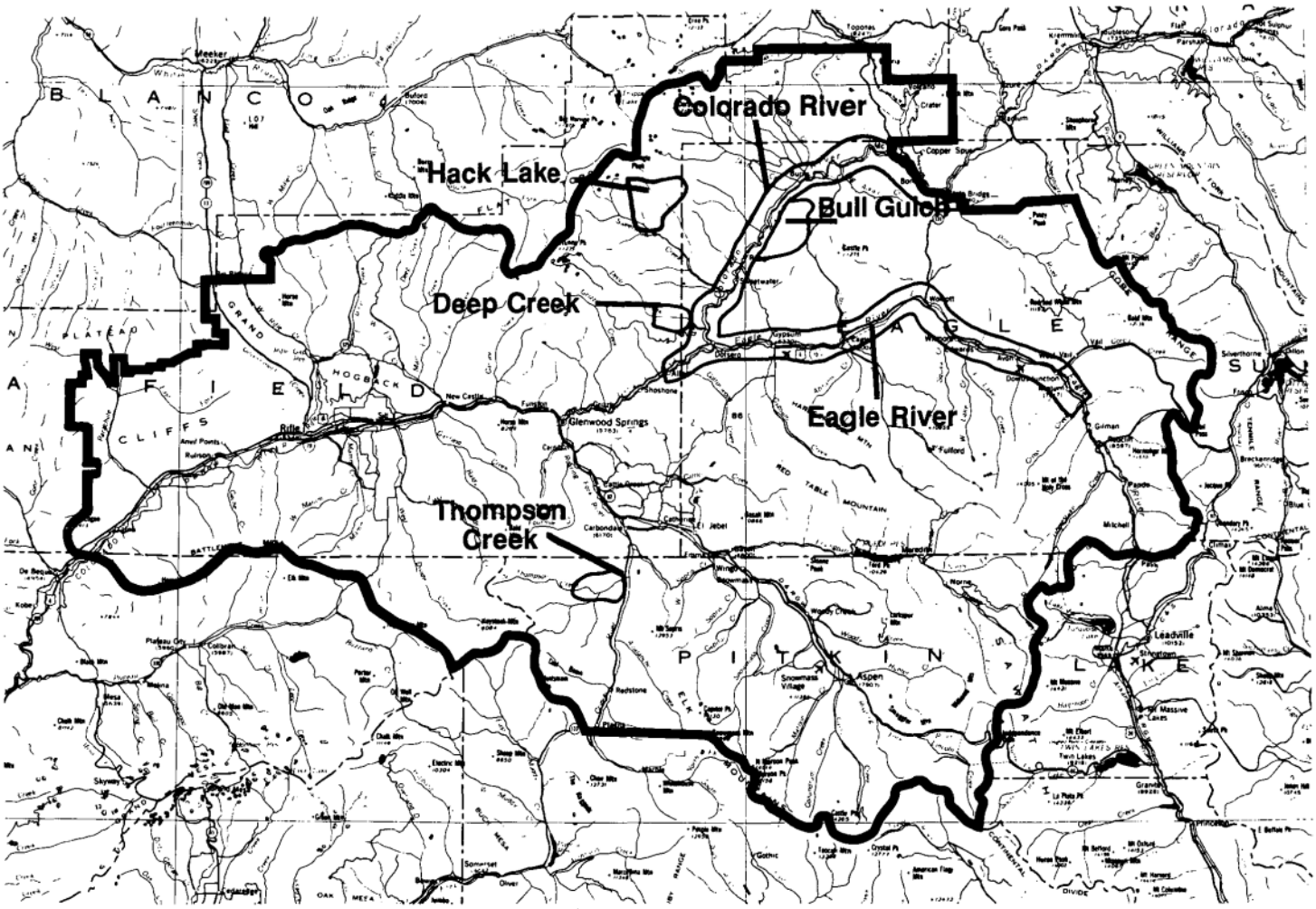
Kremmling Resource Area

The KRA contains an abundance of outdoor recreational opportunities. Major attractions include Rocky Mountain National Park, Arapaho National Recreation Area, several national forest wilderness areas, several

TABLE 3-10. SPECIAL RECREATION MANAGEMENT AREAS

Location	Name	Size (acres)	Annual Visitor Days	Major Activities/Features/Sites
Glenwood Springs	Upper Colorado River	13,144	8,540	Whitewater boating/ Spectacular canyons/Fishing
	Bull Gulch	9,900	710	Hiking/Wildlife viewing
	Hack Lake	3,100	1,390	Fishing/Hiking
	Deep Creek	2,400	1,870	Hiking/Caving/Fishing
	Eagle River	1,800	15,465	Fishing/Whitewater boating
	Thompson Creek	4,300	1,070	Hiking/Wildlife viewing
Kremmling	Upper Colorado River	4,870	36,375	Whitewater boating/ Spectacular canyons/ Developed campground/Fishing
	North Sand Hills	700	3,670	Off-highway vehicles/Sand dunes/Cultural resources
Little Snake	Upper Yampa River	19,800	7,150	Fishing/Flatwater boating/ Waterfowl viewing
San Juan/San Miguel	Anasazi	156,000	12,620	Viewing cultural ruins/Off-highway vehicles
	San Juan Triangle	54,000	118,825	Off-highway vehicles/Alpine scenery/ Historic ruins/ Camping/ Hiking
	Dolores River	22,464	11,720	Whitewater boating/ Fishing/ Camping/ Spectacular canyons

Source: Recreation Information Management System (RIMS).



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Special Recreation Management Areas

Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-17 Special Recreation Management Areas

major reservoirs, and the upper Colorado River. With the exception of the upper Colorado River and North Sand Hills, the major recreational features are located on lands managed by agencies other than BLM. The BLM-managed lands do play a significant supplemental role in the regional recreational setting.

In North Park, the BLM-administered lands comprise a majority of the basin and are mostly rolling, open sage country useful for dispersed recreation. In Middle Park, the BLM-administered lands are usually adjacent to national forest, except around Kremmling and along the Colorado River, and provide both access and "spill over" room for the more heavily-used areas. In addition, these public lands provide opportunities for activities such as rockhounding, off-highway vehicle (OHV) use, and wildlife viewing and hunting.

Little Snake Resource Area

The public lands within the LSRA boundaries provide significant recreational opportunities and supplement the other better known federal agency lands such as Dinosaur National Monument, the Routt National Forest, and Browns Park National Wildlife Refuge, which all provide for a variety of recreational activities in a variety of environmental settings. Parts of the Mount Zirkel and Flat Tops Wilderness Areas lie within the area and provide undeveloped, primitive types of recreational experiences. The Steamboat Springs ski area and Steamboat Lake State Park, on the other hand, provide developed recreational areas with intensive use, as do the various towns within the Resource Area.

The BLM-administered lands generally add another dimension to the recreational opportunities available by providing unrestricted settings for a variety of dispersed recreational activities. Activities now occurring on the public lands include hunting, camping, floatboating, rockhounding/collecting, picnicking, fishing, hiking, backpacking, horseback riding, nature study, viewing wildlife, viewing cultural/historical sights, sightseeing, photography, snowmobiling, cross-country skiing, and OHV use, among others. The Yampa River has been proposed for Wild and Scenic River study.

Hunting is currently the dominant recreational activity on the public lands throughout the Resource Area. It attracts people from around the nation, giving this area national significance. Big game hunting (deer, elk, antelope) and sage grouse hunting make up the majority of use on public lands. Small game hunting (rabbit, other upland game birds, varmints, etc.) accounts for only 20 to 30 percent of the total hunting use.

Northeast Planning Area

The NPA includes the most populated area of Colorado; however, the small quantity of public land and the scattered nature of the tracts have resulted in little dependence on BLM for recreation. Some scattered tracts of public lands are being transferred to local governments for recreational use. Because of its proximity to population centers along the Front Range, heavy recreational use is made of open space and park lands managed by state, county, and local governments. Many of these park lands contain federally-owned minerals or contain areas of federal land leased under provisions of the Recreation and Public Purpose (R&PP) Act. In either case, BLM may analyze their suitability for oil and gas leasing. Examples of such park lands include Golden Gate Canyon State Park, the city of Boulder, and Boulder County-managed open space, and Denver Mountain Parks.

San Juan/San Miguel Planning Area

Within the SJ/SMPA, the Dolores River, from McPhee Dam to Bedrock (104 miles) has become one of the more popular boating rivers in the Southwest. In 1976, most of this river segment was recommended as suitable for Wild and Scenic River designation (33 miles classified as wild, 20 miles scenic, and 41 miles recreational), however, Congress has not yet acted.

Also the Animas River (from Silverton to Ruby Creek) is on the Nationwide Rivers inventory of potential wild, scenic, and recreational rivers, and the Animas River Valley has been identified as a potential National Natural Landmark.

The San Juan Triangle SRMA is unique because it provides a full range of recreation setting opportunities (from primitive to urban), with an equally wide distribution and public availability for activities such as wilderness recreation, jeeping, mountain climbing, backpacking, cross country skiing, historic and geologic interpretation, fishing, hunting, and scenic viewing on an area unparalleled in all of BLM's public lands. SRMAs within the Planning Area are display on Map 3-18.

The remainder of the Planning Area provides dispersed, unstructured recreational use and opportunities. Significant public funds have been invested in the Dolores Overlook, Anasazi Heritage Center, and Lowry Ruin. These BLM facilities receive a large number of visitors.

VISUAL

To determine visual resource values, public lands are evaluated and placed into visual resource management (VRM) classes during the Resource Management Planning (or plan amendment) process. Each VRM management class is then managed for the following objectives:

Class I--Preserve the existing character of the landscape. The level of change should be very low and must not attract attention.

Class II--Retain the existing character of the landscape. The level of change should be low and management activities may be seen but should not attract attention.

Class III--Partially retain the existing character of the landscape. The level of change should be moderate and management activities may attract attention but should not dominate.

Class IV--Provide for activities which require major modification of the landscape. The level of change can be high.

Glenwood Springs Resource Area

The most unique scenic and sensitive areas of public land are identified for VRM Class I objectives to preserve the existing character of the landscape. In the GSRA, these include the Deep Creek, Bull Gulch and Thompson Creek areas, which are designated Areas of Critical Environmental Concern (ACEC) to protect scenic values. In addition, there are other areas, particularly along the I-70 corridor, that are managed for VRM Class II objectives to retain the existing landscape character (see Map 3-19). Within these areas, management activities, including oil and gas development, may be seen but should not attract the attention of the casual observer.

Kremmling Resource Area

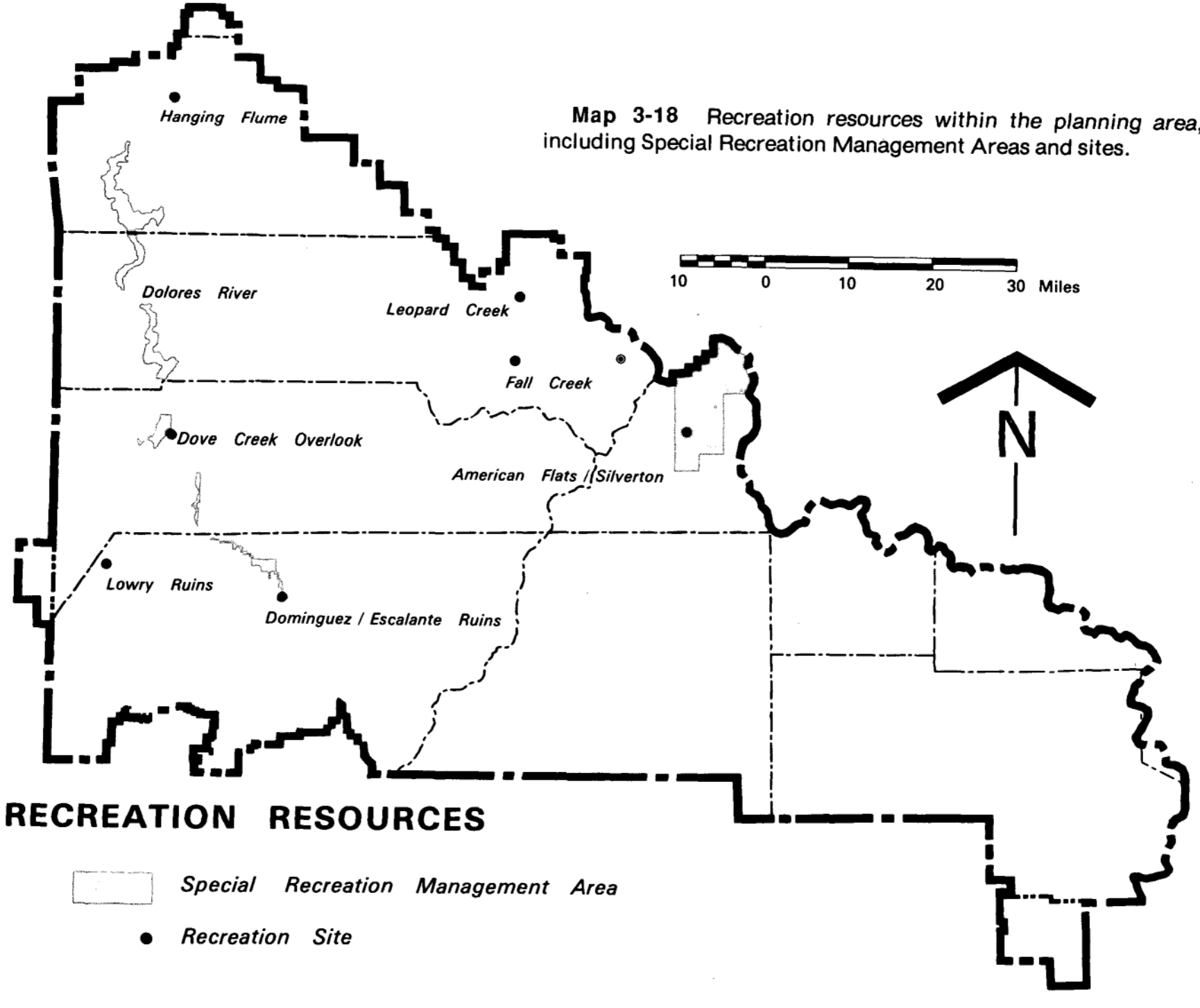
In the KRA the majority of public lands provide the foreground and middle ground landscapes to scenic mountain vistas when viewed from major travel routes such as US Highway 40. Public lands along these travel routes and along the Colorado River are managed for VRM Class II objectives. The remainder of the public lands within the Resource Area is managed for VRM Class III and Class IV objectives.

Little Snake Resource Area

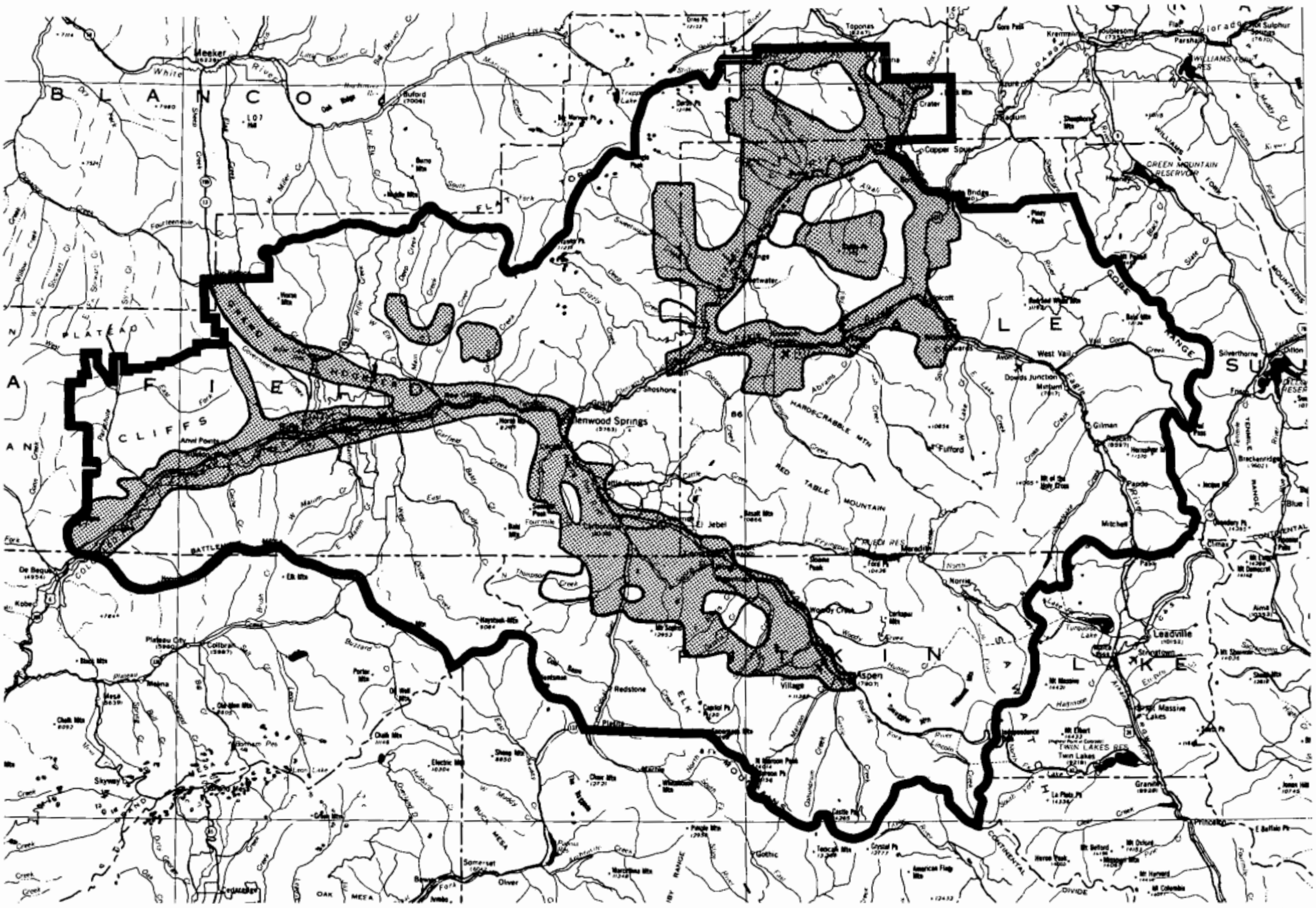
The outstanding scenic areas in LSRA, which are highly visible in the foreground along travel routes, populated areas, and in extensive recreation areas, were designated for VRM Class II objectives to retain the natural landscape character. These areas include slopes facing U.S. Highway 40, the Yampa River, along several state highways, and county and BLM roads.

Northeast Planning Area

Because of the amount of private land involved in the NPA, a visual resource inventory has not been done, and VRM classifications are made when activities are proposed. In general, the public lands in the eastern plains (where oil and gas development potential is considered medium and high) are managed for VRM Class III and Class IV objectives. Some public lands along travel routes such as the I-70 corridor and adjacent to state, county, or local parklands are managed for VRM Class II objectives. These lands generally are considered to have little oil and gas development potential.



Map 3-18 Recreation resources within the planning area, including Special Recreation Management Areas and sites.



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Class I

Class II

Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-19 Visual Resource Management

San Juan/San Miguel Planning Area

Within the SJ/SMPA, approximately 96,000 acres of public land are important landscape areas. The Dolores River Canyon WSA is managed consistent with VRM Class I objectives. Areas managed for VRM Class II objectives include: the Dolores River Canyon from Bradfield Bridge to Disappointment Creek; Weber and Menefee Mountains; public lands along the boundary of Mesa Verde National Park; public lands along the San Miguel River; key travel routes in the Silverton area; and Cross, Cahone, Squaw/Papoose, and Tabeguache Creek Canyons (see Map 3-20).

CULTURAL RESOURCES

In Colorado there are two types of cultural resources found on public lands: prehistoric and historic.

Prehistoric cultural resources, both known and unknown, can include, but are not limited to, the following list: lithic scatters, hunting sites, kill/butchering sites, hunting racks, quarry sites, temporary camps, pueblos, agricultural terraces, towers and rockshelters, extended camps, pit houses, wickiups, granaries, cists, process areas, burial sites, petroglyph-pictograph panels, trails, race tracks, vapor caves, villages, manufacturing sites, vision quest sites, and isolated artifacts. These resources were used during the past 10,000 to 15,000 years by peoples of the Paleo-Indian, Archaic, Anasazi, Fremont, and proto-historic native peoples.

Historic sites, both known and unknown, can contain a prehistoric element. Historic sites can include: trails, forts, toll and wagon roads, resorts, bridges, homesteads, ranches, railroads, towns, mines, mills, and schools. These sites are associated with farming, ranching, mining, commerce, and exploration activities that occurred during the late 18th, 19th, and 20th centuries.

Of particular concern are Native American sacred/religious places. A Native American sacred/religious place is a location that has traditionally been considered important to an Indian Tribe or member thereof, because of a religious event which happened there. The sacred/religious place may have played a part in life-cycle rituals of individuals, may contain specific natural products which are of cultural or religious importance, may figure in or is mentioned in myths and sacred songs, may be considered the dwelling place or embodiment of spiritual beings, may be conducive to communication with spiritual beings, or may have other specific and continuing significance in Indian religion or culture. Such places may be considered important to entire Indian tribes or groups of tribes, or may be considered important to smaller segments of Indian populations, such as chapters, clans, families, or individuals. (Sacred places may be protected under the provisions of 36 CFR 60.4 and the American Indian Religious Freedom Act (AIRFA)). No such sites have been identified within the Study Area, but such sites are likely to exist especially within the SJ/SMPA.

Based on present data, the following sites or areas are either listed or considered to be of National Register of Historic Places quality, and represent significant values that warrant protection from potentially destructive disturbance. There is significant potential that new cultural resource inventories conducted in advance of surface-disturbing activities will identify more cultural resources that will qualify for National Register listing. In addition, many known sites have not been evaluated.

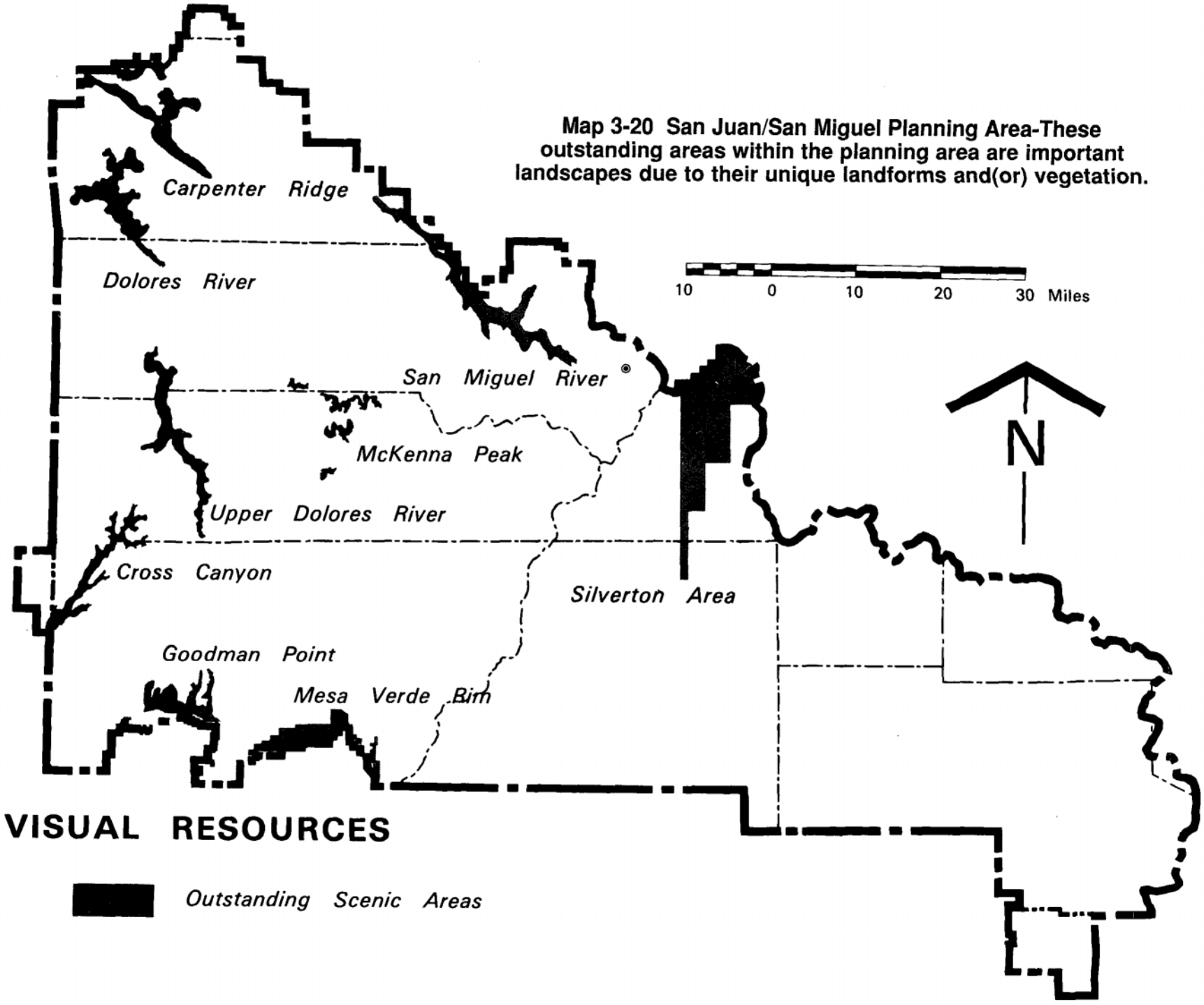
Glenwood Springs Resource Area
- Blue Hill Archaeological District (4,178 acres)

Kremmling Resource Area
- Windy Gap Cultural Resource Management Area (398 acres)

Little Snake Resource Area
- Irish Canyon Petroglyphs (80 acres)

Northeast Planning Area
- Georgetown - Silver Plume National Historic District
- Central City National Historic District
- Switzerland Trail (Railroad) Historic District

San Juan/San Miguel Planning Area (see Map 3-21)
- Lowry Ruin National Historic Landmark and Associations (880 acres, 280 acres split estate)
- Sand and East Rock Canyons (5,880 acres)
- Cannonball Ruin (80 acres)
- Dominguez-Escalante Ruins and Anasazi Heritage Center (55 acres)



Map 3-20 San Juan/San Miguel Planning Area-These outstanding areas within the planning area are important landscapes due to their unique landforms and(or) vegetation.

- Tabeguache Cave II and Tabeguache Canyon (3,200 acres)
- Dolores Cave (60 acres)
- Tabeguache Pueblo (200 acres)
- McLean Basin Towers and Associations (200 acres)
- Squaw/Papoose, Cross/Ruin, and Cahone Canyons and Cow Mesa (28,464 acres)
- Painted Hand Petroglyphs and Associations (240 acres)
- Painted Hand Ruin (160 acres, 40 acres split estate)
- Indian Henry's Cabin and Associations (280 acres)
- Lightning Tree Tower Group
- Hamilton Mesa (5,018 acres)
- Battle Rock (40 acres)
- Easter Ruin (160 acres, 80 acres split estate)
- Seven Towers Ruin Group (120 acres)
- Bull Canyon Rockshelter (5 acres)
- Hanging Flume (7 acres)
- Mockingbird Mesa 1/ (6,603 acres)
- Hovenweep Canyon 1/ (3,400 acres, 980 acres split estate)
- East Cortez (6,420 acres, 480 acres split estate)
- Goodman Canyon and Goodman Point Buffer Zone 1/ (1,560 acres, 295 acres split estate)
- Bass Ruin Complex 1/ (500 acres)
- Sandstone Canyon 1/ (2,840 acres,
- Brewer Well Complex 1/ (590 acres,
- Yellowjacket Canyon 1/ (5,120 acres, 1,640 acres split estate)
- Basin Wickiup Village (400 acres, 160 acres split estate)
- Woods Canyon 1/ (980 acres)
- Bridge Canyon 1/ (1,120 acres, 155 acres split estate)
- Ansel Hall Pueblo 1/ (120 acres, 80 acres split estate)
- Upper Ruin Canyon 1/ (640 acres, 60 acres split estate)
- Bowdish Canyon (1,000 acres)
- Silverton Historic District (34,000 acres)
- Dolores River Canyon (50,900 acres)

1/ All or parts of these designated areas are within the McElmo Dome Unitized area for carbon dioxide (CO_2). All leases within the unitized area are currently held by production and will not expire until approximately two years after the termination of the unit. If additional production is established during the two year period, those individual leases will continue to be held by production. Therefore, no new leasing will take place within this area until after the unit has terminated.

PALEONTOLOGY

Fossils occur in many geological formations throughout Colorado. These formations are classified into categories that indicate the likelihood of significant fossil occurrence. Those geological formations which are known to contain significant vertebrate, invertebrate, and plant fossils include, but are not limited to, the following.

Glenwood Springs Resource Area

- Wasatch - early horses, rhinoceroses, birds, rare primates, and crocodiles (see Map 3-22)

Kremmling Resource Area

- North Park - mammals
- Troublesome - mammals
- Morrison - dinosaurs
- Sandstone Members of the Pierre Shale -- ammonites

Little Snake Resource Area

- Morrison - dinosaurs
- Mesaverde
- Green River
- Wasatch
- Browns Park

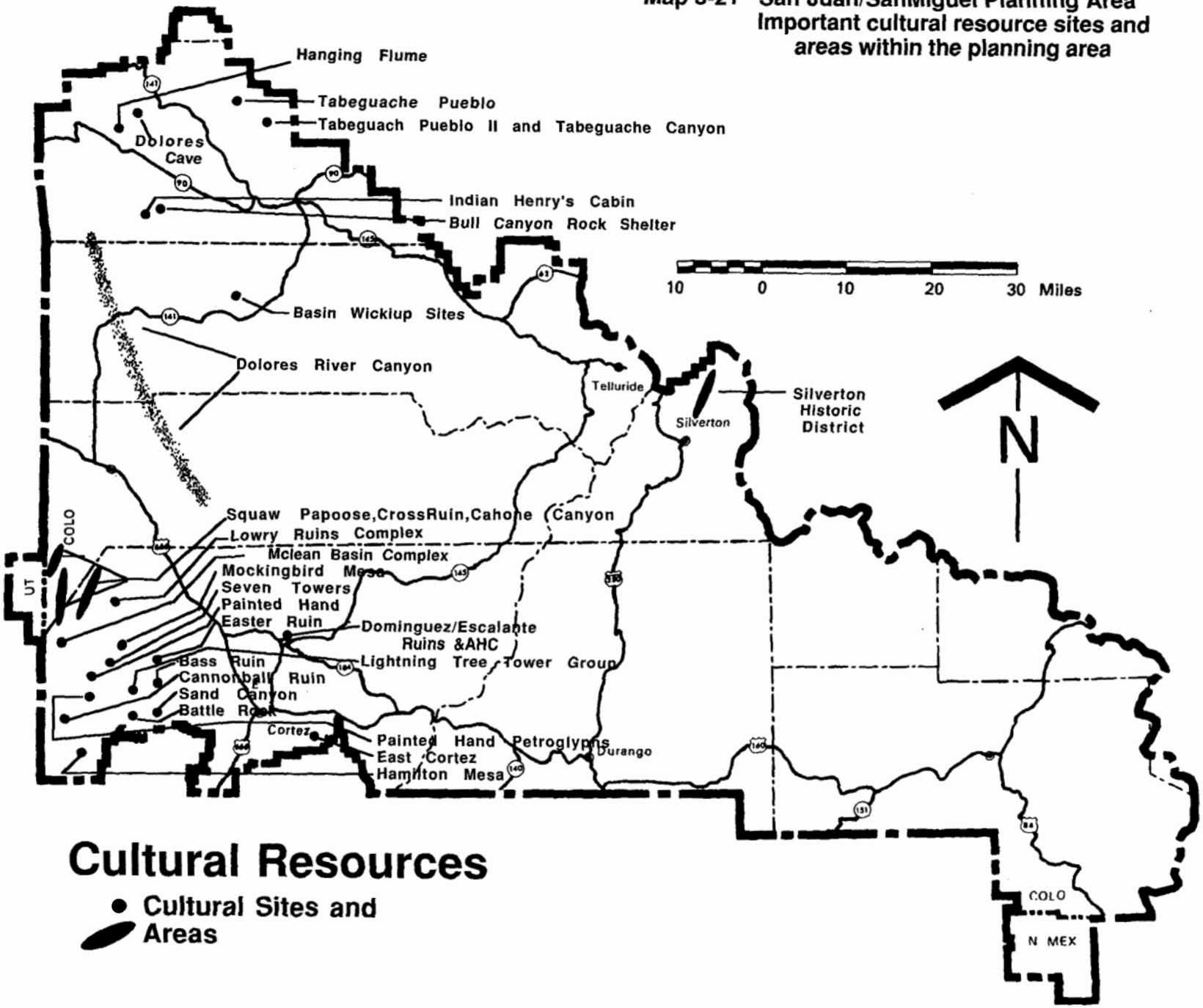
Northeast Planning Area

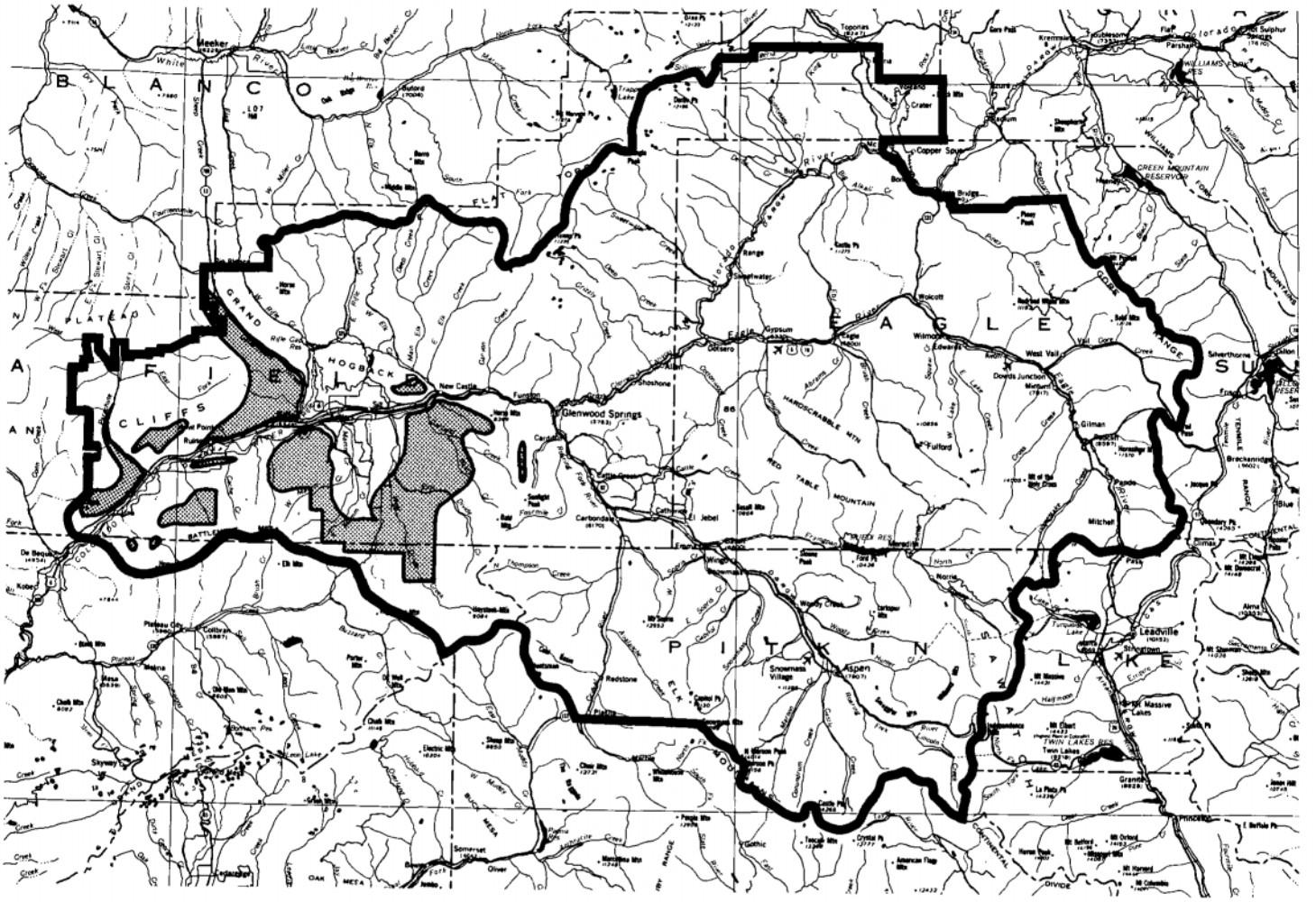
- Tertiary Sediments
- Morrison - dinosaurs
- Dakota - vertebrate tracks

San Juan/San Miguel Planning Area

- San Jose - vertebrate (dinosaurs)
- Mancos Shale - invertebrates
- Dolores - flowering plants
- Morrison - vertebrates and invertebrates
- Chinle - vertebrate (fish) and plants
- Mesaverde - invertebrates

Map 3-21 San Juan/SanMiguel Planning Area Important cultural resource sites and areas within the planning area





GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Paleontological Areas

Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers

N

Map 3-22 Sensitive Paleontological Areas

- Burro Canyon and Dakota Sandstone--plant and invertebrate
- Animas - plant
- Cutler - vertebrate

WILDERNESS

Wilderness resources on BLM-administered public lands were identified through inventories completed in 1980. Areas found to possess wilderness characteristics were identified as wilderness study areas (WSAs). These areas are managed under interim management guidelines that prohibit activities which might impair wilderness values pending a decision on wilderness designation by Congress. The Federal Land Policy and Management Act (FLPMA) provides that by 1991 the Secretary of the Interior will recommend to the President and Congress those areas that should be designated.

Interim management of WSAs is further constrained by provision of the Federal Onshore Oil and Gas Leasing Reform Act of 1987 which prohibits leasing WSAs. Exceptions to this prohibition may only be made to prevent drainage of the federal oil and gas resource and then only with a No Surface Occupancy stipulation to prevent impairment of wilderness values.

Table 3-11 displays by Resource/Planning Area, each WSA, its size, and wilderness suitability recommendation. For example, the GSRA contains four WSAs, totalling 26,644 acres. Three of these WSAs, totalling 10,118 acres, are recommended for Congressional wilderness designation. The Castle Peak WSA, and part of the Bull Gulch WSA are not recommended for wilderness because of conflict with other resource management actions. Whether recommended suitable or not, all WSAs are under interim wilderness management to protect their wilderness qualities (see Maps 3-23 to 3-26).

Cross Mountain (located in LSRA), while closed to leasing under BLM's interim management policy, is recommended to be opened to leasing with No Surface Occupancy allowed. This is because of the unique topography which is possibly conducive to directional drilling.

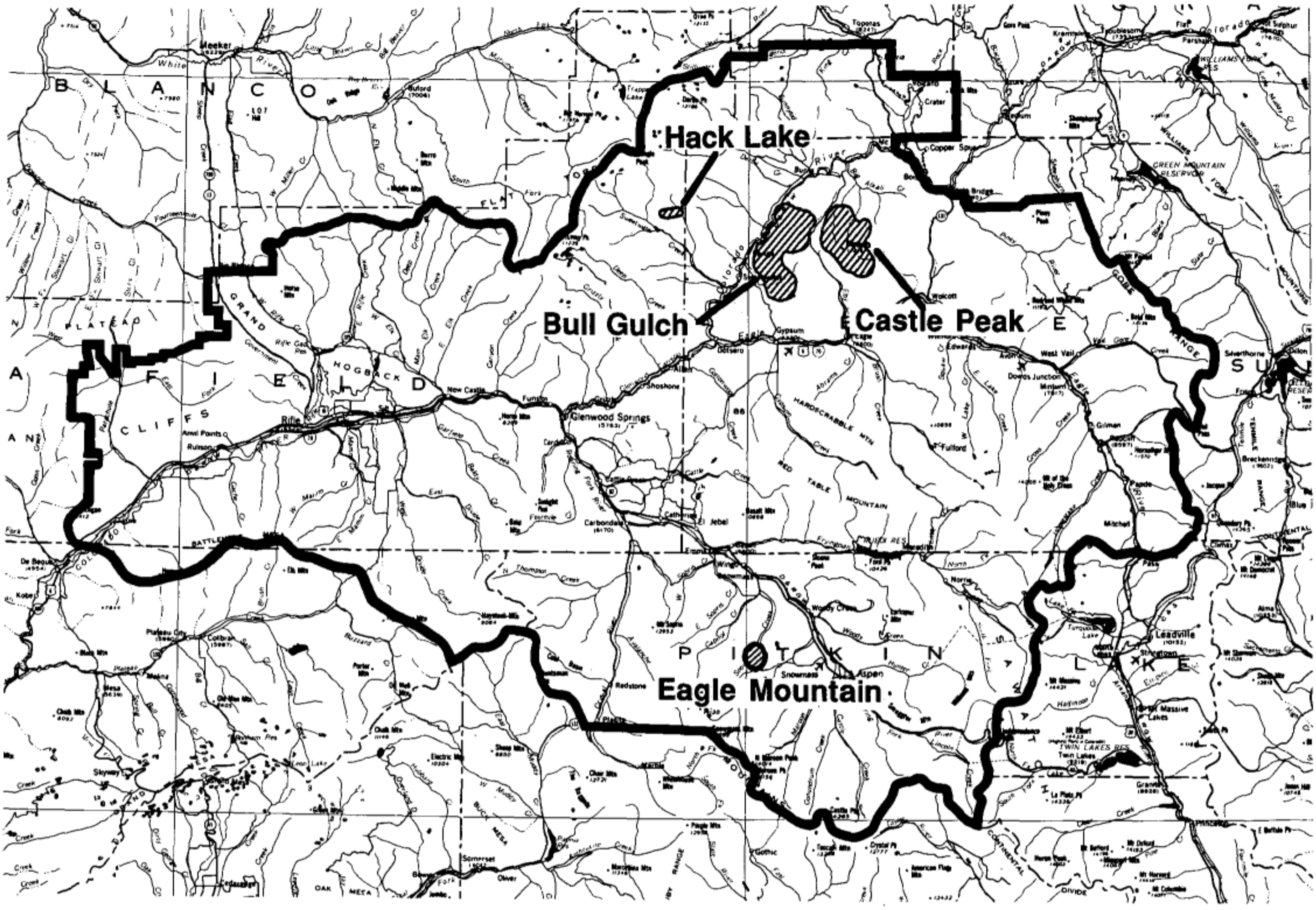
There are no designated wilderness areas or wilderness study areas managed by BLM in the NPA. However, there are split estate lands containing federal minerals managed by BLM adjacent to the Indian Peaks Wilderness Area which is managed by the Arapaho-Roosevelt National Forest. The potential of development (POD) for oil and gas near Indian Peaks is considered to be low.

TABLE 3-11. WILDERNESS STUDY AREAS

Location	WSA Name	Size (acres)	Recommendation
Glenwood Springs Resource Area	Eagle Mountain	330	Suitable
	Hack Lake	10	Suitable
	Bull Gulch	9,778	Suitable
		4,586	Non-Suitable
	Castle Peak	11,940	Non-Suitable
	Totals	10,118	Suitable
		16,526	Non-Suitable
		26,644	
Kremmling Resource Area	Troublesome	8,250	Non-Suitable
	Platte River Contiguous	30	Suitable
	Totals	30	Suitable
		8,250	Non-Suitable
		8,280	
Little Snake Resource Area	Cross Mountain	14,081	Suitable
	Diamond Breaks	31,480	Suitable
	West Cold Spring	17,682	Non-Suitable
	Ant Hills	4,354	Non-Suitable
	Chew Winter Camp	1,320	Non-Suitable
	Peterson Draw	5,160	Non-Suitable
	Vale of Tears	7,420	Non-Suitable
	Totals	45,561	Suitable
		35,936	Non-Suitable
		81,497	
Northeast Planning Area	None		
San Juan/San Miguel Planning Area	Cahone Canyon	8,960	Non-Suitable
	Cross Canyon	12,588	Non-Suitable
	Dolores River Canyon	29,415	Suitable
	McKenna Peak	19,562	Non-Suitable
	Menefee Mountain	7,129	Non-Suitable
	Squaw/Papoose Canyon	11,287	Non-Suitable
	Tabeguache Creek	7,908	Suitable
	Weber Mountain	6,303	Non-Suitable
	Totals	37,323	Suitable
		65,829	Non-Suitable
		103,152	
Study Area Totals	93,032	Suitable	
	126,541	Non-Suitable	
	219,573		

LANDS AND REALTY ACTIONS

The land ownership pattern varies from large blocks of public lands, to areas where federal ownership is limited to small (less than 40 acres) scattered parcels of land. Public lands and federal mineral estate comprise about one-third to one-half of the land area within each Resource/Planning Area, except in the NPA where it comprises less than three percent. The proportion of land potentially available for federal leasing is therefore locally significant in all but the NPA. However, even in the NPA, there are large blocks of split estate where the federal government owns the oil and gas resource underlying private or state-owned lands.



GLENWOOD SPRINGS RESOURCE AREA

Resource Area Boundary

Wilderness Study Areas

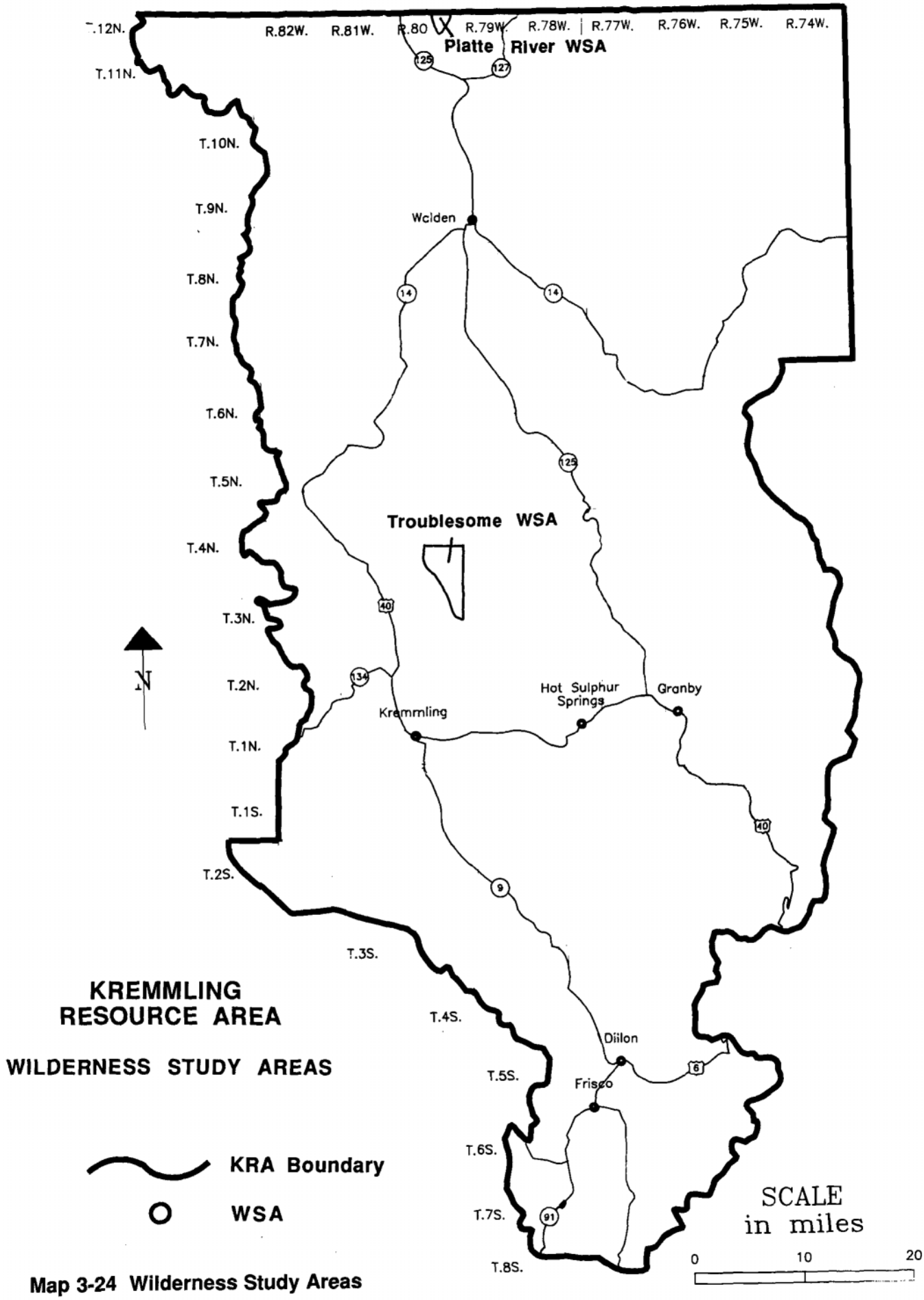
Scale 1:1,000,000
1 inch equals Approximately 16 miles

10 0 10 20 30 40 Miles

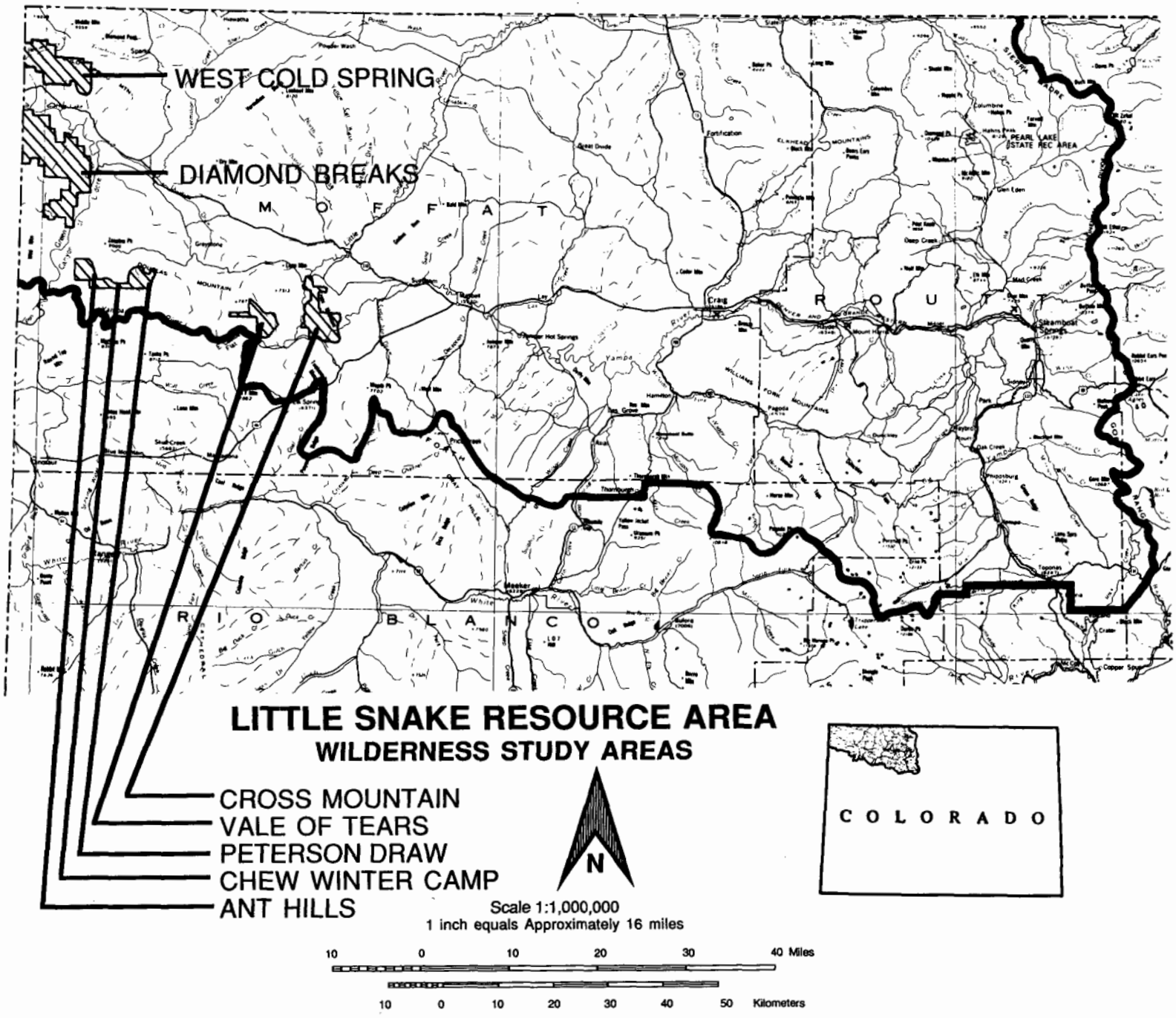
10 0 10 20 30 40 50 Kilometers

N

Map 3-23 Wilderness Study Areas

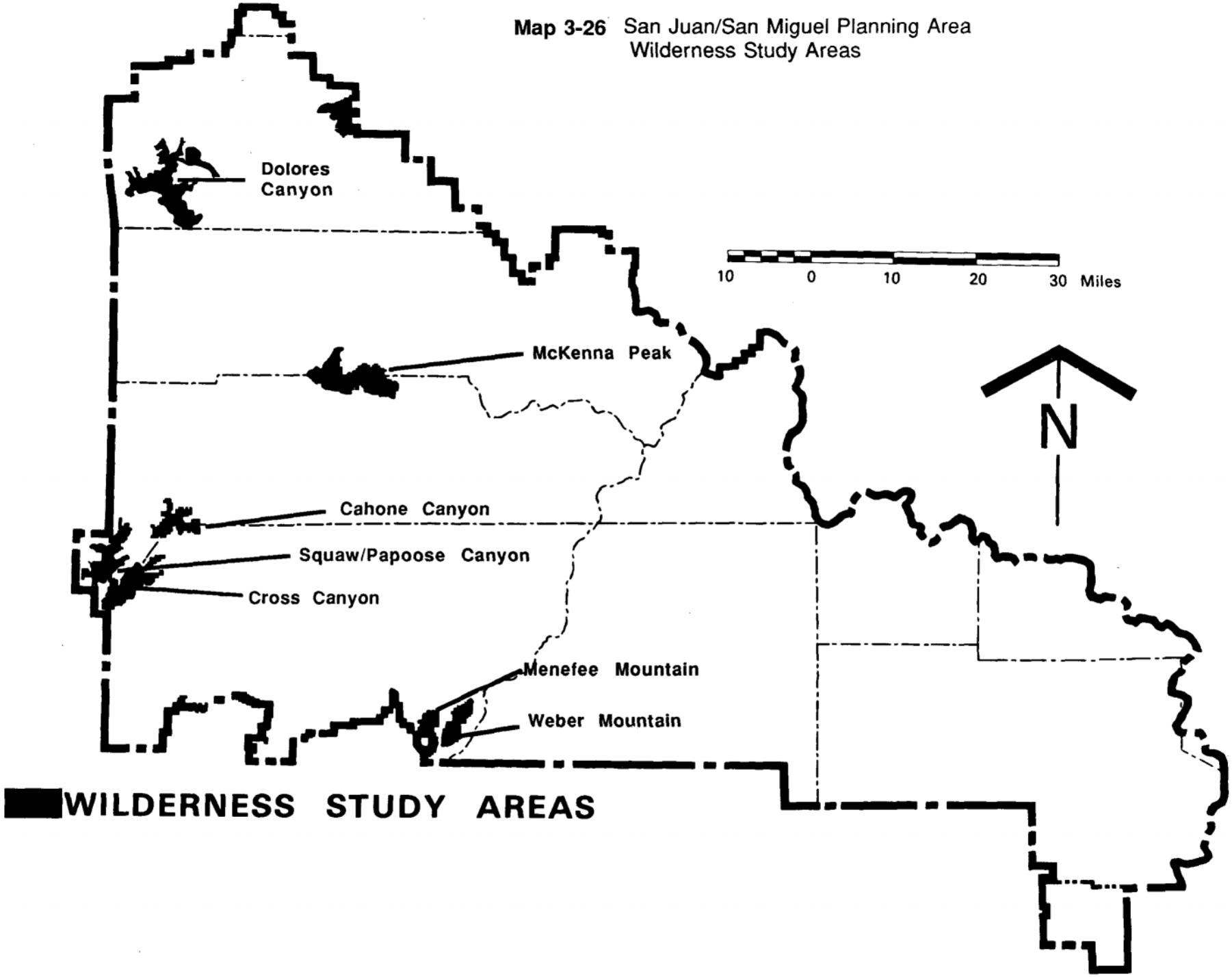


Map 3-24 Wilderness Study Areas



Map 3-25 Wilderness Study Areas

Map 3-26 San Juan/San Miguel Planning Area
Wilderness Study Areas



Various types of land-use authorizations are scattered throughout the public lands. These include linear rights-of-way, such as pipelines, power and telephone lines and roads; site-type rights-of-way, such as communication sites; leases under the Recreation and Public Purposes Act (R&PP); and leases/permits under Section 302 FLPMA. BLM's existing land use plans either identify corridors suitable for linear rights-of-way, or they use a "zoning" approach to identify area suitable or unsuitable or rights-of-way placement.

The greatest number of existing authorizations are related to linear rights-of-way, including some for major facilities such as power transmission lines oil and gas transportation pipelines, and state or federal highways. Gathering system pipeline rights-of-way are generally concentrated in specific areas associated with energy development.

Within the NPA in northeastern Weld and western Logan Counties, the U.S. Air Force maintains missile sites and an interconnecting cable network. Federal oil and gas lessees are advised of the possible existence of these structures and that they must coordinate any development activities with the U.S. Air Force to avoid possible damage to such structures.

TRANSPORTATION

Primary access within the Study Area is furnished by interstate highways, state highways, county roads, and public access roads. The majority of public lands are accessible to the general public via one of the above mentioned roads. Some areas do have significant amounts of BLM lands that are not accessible due to steep terrain, lack of maintained roads, or lack of legal access across private lands. Approximately 90 percent of the BLM roads in the areas are not maintained on a regular basis.

SOCIAL AND ECONOMIC

Glenwood Springs Resource Area

The area most likely to incur socioeconomic impacts from oil and gas development in the GSRA includes Mesa and Garfield Counties. While virtually all of the drilling and production would occur in central Garfield County, most of the locally supplied labor, equipment, and materials would come from Mesa County. The Grand Junction area has historically been a center for the oil and gas industry in western Colorado. Despite the turndown in activity in recent years, a number of oil and gas service and supply companies continue to work out of Grand Junction and the area can be expected to remain an industry hub through most foreseeable levels of development. However, unless levels of development in the next 20 years approach that of the early 1980s, the better part of the labor and equipment required will come from dispersed locations outside the area of impact, e.g., Casper, Farmington, Denver. This will considerably lessen the local socioeconomic impact of field development. The eastern and southern portions of the GSRA, Eagle and Pitkin Counties, can be expected to receive little or no impact and have been excluded from this analysis.

Table O-1 in Appendix O shows recent trends in population, employment, and income in Mesa and Garfield Counties. The changes that the GSRA incurred between 1977 and 1982 are a result of the boom brought on by the development of energy fuels, including oil and gas, in the area. The changes since then are the product of the downturn in prices of energy fuels. While employment and income related to the oil and gas industry cannot be calculated with any exactness at the county level, it is possible to estimate those figures. A 1980 survey (McKean, Weber, and Ericson 1981) indicated that about 5.5 percent of Mesa County's employment was directly or indirectly tied to the oil and gas industry. Assuming that ratio is still good, approximately 2,400 Mesa County jobs are today tied to the industry. Both the percentage and the total for Garfield County are much lower.

Production in the two-county area averaged just under 11 million mcf during 1980 to 1988 from an average of 310 producing wells. The low point was 1987's 6.6 million mcf, which was 41 percent less than the high of 1982, 15.4 million mcf.

Kremmling Resource Area

The KRA, for social and economic analysis, consists of Grand and Jackson Counties. Where BLM-controlled resources are located outside of those two counties--in adjacent portions of Eagle, Larimer, and Summit Counties--the resources are included in the analysis, but their use is treated as affecting only the two-county area.

Population

The Resource Area has experienced a rapid rate of population growth since 1970, in contrast to a relatively slow increase during the previous decade (Table O-2, Appendix O). The rate at which people have moved in to the Resource Area from 1970 to 1980 has been almost double that at which they have moved into the state. However, as might be expected, most of the growth has occurred in Grand County.

Economic developments readily explain the way population is distributed. Almost 90 percent of the growth since 1970 has occurred in two areas--the strip from Winter Park to Granby and western Grand County. In the latter case, the bulk of the growth has concentrated in or adjacent to the town of Kremmling. Northern and south-central Grand County have gained relatively few people. The period of 1980-87 reflects a slower rate of population growth for the Resource Area. In fact, Jackson County has experienced an 11 percent decrease in population for this period.

Recreation, including recreation homes, accounts for the largest part of the increase, which is in the eastern Grand County strip. The traditional elements of the economy--ranching and the timber industry--have had little effect, or a negative one, on population levels and distribution.

Employment and Income

In the last few years, a small amount of growth has occurred in the total labor force and in employment in the Resource Area (Table O-3, Appendix O). However, most of the growth has taken place in Grand County. From 1975 to 1987, the Resource Area's rate of increase has trailed that of the state as a whole. The unemployment rate remains below that of the state. Employment figures for the individual industry groups illustrate recent trends in the area's economy (Tables O-4 thru O-7, Appendix O). Personal income figures have shown nearly the same trends as employment (Tables O-8 thru O-11, Appendix O).

Local Government Finance

Rough measures of the adequacy of local funding sources are provided by assessed valuation per capita and retail sales per capita figures (see Table O-12, Appendix O). The figures show that both counties and the towns of Fraser/Winter Park and Grand Lake should have sufficient tax bases for their needs. Fraser, Winter Park, Granby, and Grand Lake also have large volumes of retail sales because of their role as resort centers. The other communities lack these advantages and must operate from more limited local resources.

Probably the most significant impact on local government finances from BLM actions would come from increased capital improvement needs caused by population growth. Conversely, reduced population would increase the burden of any existing debt on remaining residents. It should be noted that rapid population growth can quickly require capital spending in excess of the resources of most local governments. In which case, their only recourse is to seek financial assistance from state and federal programs.

Social Analysis

For social analysis, the KRA will consider Jackson and Grand Counties, omitting small portions of Larimer, Eagle, and Summit Counties.

The present social environments of the region cannot be understood without consideration of its history, geography, topography, climate, and location relative to the eastern slope population centers. There are three separate areas described below.

Jackson County, with the single incorporated town of Walden, is set in North Park, a high cold valley separated from the rest of Colorado by high mountain passes and opening to Wyoming on the north. Ranching, lumbering, and mining are its main economic bases. A mountainous

section of Larimer County lying across the Medicine Bow Range in this region orients to Wyoming and is virtually unpopulated.

Grand County consists of an east-west natural division of Middle Park, separated by Byers Canyon. Kremmling is the only population centering the western portion, a rugged ranching valley somewhat lower than North Park in elevation. It is separated from northwest Colorado by high passes, but open southward through Blue River Valley. Portions of Eagle and Summit Counties are found in this section.

Eastern Grand County has a T-formation of small towns: Hot Sulphur Springs on the west; Grand Lake on the north; and Tabernash, Fraser and Winter Park on the south, with Granby as the central hub. Eastern Grand County accesses eastern, southern, and northern Colorado only by high passes. Trail Ridge Road from Grand Lake is closed except for a few months in summer. (The two natural divisions of Middle Park correspond also to the Census Bureau Kremmling and Granby divisions.)

Little Snake Resource Area

Economics

The affected area of the economic analysis for LSRA is limited to Moffat and Routt Counties in Colorado. Since economic data is available only in county units, the economic analysis is defined in terms of these units. In each category, data is the most current available from the source listed.

Employment and Income

Figures for comparison of employment are shown in Tables O-13 and O-14 (Appendix O). The figures are by place of residence and do not factor commuting. For this reason, they will differ from most other employment and income figures.

The economies of the two affected counties of the area are based on mining, agriculture, and trade. However, Routt County has skiing and related seasonal resort activities as its principal economic activity. Coal is the leading economic mineral in both Moffat and Routt Counties, and there are coal-fired electric power plants in both Moffat and Routt Counties.

Agriculture, primarily livestock production, remains an important industry in both counties. However, it has become small numerically compared to the other major sectors.

The principal center of tourism is Steamboat Springs, which is a year-round resort. Hunting remains a viable seasonal industry in the area.

Minerals

Coal and coal-driven power production accounts for significant employment as well as contributing to greater personal income for the Resource Area. As Table O-15 (Appendix O) indicates, 15.3 percent of all employment and 20.2 percent of all personal income were derived from coal and other mineral production in 1985.

Agriculture

Livestock production is the principal agricultural commodity. Crop production is dominated by hay for livestock feed. Individual proprietor's average 1982 and 1984 livestock and crop earnings are shown in Table O-16 (Appendix O).

Recreation

Hunting, camping, fishing, and sightseeing continue to grow in terms of revenue generated. In 1980, these four categories accounted for $41.4 million; by 1985, revenue was $48.4 million. These four sectors accounted for 30 percent of all recreation revenue in 1980 and 26 percent in 1982. The percentage decline occurred because of marked growth in the ski sector from 1980 to 1987. Although the ski industry does not directly affect BLM lands, its income generation is so large that it must be mentioned. In 1982, skiing activities accounted for $73.8 million; by 1986, revenue was $111.9 million.

Population

Figures for 1986 reveal a concentration of population in two cities, Craig and Steamboat Springs, with growth occurring between the two cities and in the satellite towns of Oak Creek and Hayden. Both Craig and Steamboat Springs serve as local trade and

business centers. Regional trade, business, manufacturing, communication, and service centers are located in Grand Junction and Denver. See Table O-17 (Appendix O) for population figures.

Housing

Vacancy rates were approximately 23 percent in Moffat County and 14 percent in Routt County in 1986. Demand for new and existing homes in Moffat County, particularly Craig, has fallen considerably since 1980. Accordingly, prices for homes are starting to decline. Demand for new and existing homes in Routt County, especially Steamboat Springs, is moderate because the town is a growing ski resort. Vacancy levels listed in Table O-18 (Appendix O) should be read with caution, particularly data for Steamboat Springs, because vacancy levels do not indicate whether housing units are occupied year-round or are seasonal. Also, the rates for Moffat County do not indicate physical condition of the properties.

Local Government Finances

In Colorado, communities generally obtain most of their revenues locally. Previous studies in this area have shown that local sources account for 65 to 95 percent of total community revenues. This large dependence on local revenue sources means that the communities can be highly impacted by developments that affect their tax base. Local school districts, however, are becoming less dependent on locally generated revenues because of state equalization formulas.

Rough measures of local funding sources are provided by the per capita figures on assessed valuation and sales taxes in Tables O-19, O-20, O-21 (Appendix O). They indicate that, in general, the larger municipalities have more substantial property and sales tax bases, but that these and school districts' tax bases vary considerably. Those municipalities and school districts that have strong tax bases--generally because they are either business, mining, or tourist centers--are in a better position to handle additional financial impacts.

Presently, municipalities and special districts are restricted by state law in increasing revenue to fund programs. For example, statutes impose a seven percent limit on annual increases in property tax revenues and a four percent limit on combined municipal and county sales tax rates. However, Moffat County has only a two percent sales tax rate, and Routt County has no sales tax at all. Therefore, municipalities in these two counties have some leeway to increase revenues.

Table O-22 (Appendix O) presents 1985 monies generated in the two counties as a result of federal leasing of minerals, and the amount returned to state and local governments. The two counties generated just under 20 million dollars in 1985 from rentals and royalties of public lands. The counties' share of generated royalties and rentals is subject to 34-63 Colorado Revised Statute, which subjects the 50 percent federal return to distribution approval of the state legislature.

BLM also generates revenue from the Taylor Grazing Act, which produced a gross revenue of $150,140 in 1985 in Moffat County and $58,907 in Routt County. Under Section 10 of the Act, $22,521 was returned to Moffat County and $8,836 to Routt County.

Perceptions and Attitudes

Craig District BLM constantly acts in a highly politically-charged social environment because of the history of the region, the variety of resources and land management options, and the large proportion of subsurface and surface land under federal control in the district.

When the BLM was formed, absorbing the Grazing Service, new responsibilities for land management were added beyond the monitoring of grazing use. The new management responsibilities included both renewable resources (range, forests, wildlife, air, and water) and nonrenewable resources (soils, minerals). The BLM became concerned with managing the land for recreation, minerals extraction, forestry, wildlife habitat, agriculture, and a variety of other uses in addition to grazing. Perceptions of excessive governmental control became common among ranchers.

This expanded diversity of roles of BLM in land-use planning is of particular significance at the national level because of the

environment-versus-development controversy that exploded in the late 1960s and has continued ever since, becoming one of the primary present national political and social issues. The LSRA occupies a significant position in this controversy.

Community Settings and Conditions

Craig and Maybell in Moffat County, and Hayden, Milner, Steamboat Springs, Oak Creek, Phippsburg, and Yampa in Routt County, lie within the LSRA. Maybell, Milner, and Phippsburg are unincorporated but socially close-knit communities in which virtually all interaction, including the making of "official" community decisions, is informal.

Northeast Planning Area

Except for several small communities on the Front Range, BLM management does not significantly influence local revenue and infrastructure in the NPA. The most important aspect is the distribution of oil and gas royalties, and payment-in-lieu-of-tax payments. However, local and district revenues are obtained primarily from local sources (e.g., property tax). Other resource contributions include grazing leases, dispersed recreation, fuel wood, and consumptive and nonconsumptive uses of wildlife.

A majority of Colorado's population is in the northeast part of the state, 72 percent of the state's population lives along the Front Range from El Paso to Larimer County. In contrast, the eastern plains in the Planning Area constitute seven percent of the total population.

The counties east of the Front Range are primarily farming and ranching, and many communities serve as stops along major highways. Activities associated with oil and gas exploration and development such as construction and supplying laborers, are important to many of the small towns near the oil and gas fields. These small towns include New Raymen, Fort Morgan, and Wray. Much of the economies in the counties west of Denver are tourist based. The military and state colleges are important contributors to the economies of the Front Range and Weld County. The Denver area is the regional headquarters of many large business, as well as a large retail base. It also attracts a large number of tourists.

San Juan/San Miguel Planning Area

The affected area of the economic analysis is limited to seven counties in Colorado. The total 1986 population of these counties was approximately 84,325. Table O-23 (Appendix O) shows the 1980 and 1986 population, per capita income and number of persons employed by county and state. Population growth may be seen in all counties except Dolores and San Juan. All of the counties in the Planning Area have a notably lower per capita income than the Colorado average. Table O-24 (Appendix O) shows county employment by economic sector. The service sector, retail trade, government, and agriculture are the larger sources of employment in the area.

Recreation

The Planning Area derives significant economic benefit from expenditures made for recreation activities, many of which are not currently quantifiable--hiking, camping, and backpacking. However, numerical data do exist for fishing, hunting, whitewater boating, archaeological viewing and interpretation, and generalized tourist travel in the area.

Tourist Expenditures in General

Tourist travel is an important contributor to the Planning Area economy. Tourist expenditures in 1987 totaled $208 million creating employment for 5,634 people. Table O-25 (Appendix O) shows the 1987 impact of tourist expenditures to the counties in the Planning Area.

White Water Boating

The Dolores River is extensively used for whitewater boating. A 1987 estimate of 10,000 recreation visitor days was made for the Dolores. Expenditures for whitewater boating are estimated at $1.2 million annually within the Planning Area.

Fishing and Hunting

Fishing and hunting activity in the area contribute considerable primary and secondary expenditures to the economy of the region. Table O-26 (Appendix O) shows county primary expenditure data by category.

Many residents value the rural character of the area as an important part of their lifestyles. An appreciation for the wide-open spaces, natural values, solitude, and personal freedom is generally found. Outside control of land or any kind of outside interference is generally resented.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

Some areas of BLM-administered lands are managed to protect or enhance particular, special, or unique values. The areas are formally designated as Areas of Critical Environmental Concern (ACEC). More specific information concerning each ACEC is available in the respective Resource Area Office (see Maps 3-27 to 3-30).

TABLE 3-12. SPECIAL MANAGEMENT AREAS

RA/PA	ACEC Name	Critical Resource	Acres
GSRA	Thompson Creek	Recreation	4,286
GSRA	Bull Gulch	Recreation	10,214
GSRA	Deep Creek	Recreation	2,470
GSRA	Blue Hill	Cultural	4,178
GSRA	Debris Hazard	Hazard Area	7,126
GSRA	Lower Colorado River	Riparian	9,000
KRA	Ammonite Site	Paleontology	160
KRA	Phacelia Site	T&E Plants	300
LSRA	Irish Canyon	Scenic/Plants/Cultural	11,680
LSRA	Lookout Mountain	T&E Plants	6,500
LSRA	Cross Mountain	Scenic/T&E Plants	3,000
LSRA	Limestone Ridge	Scenic/T&E Plants	1,350
SJ/SMPA	Anasazi Culture	Cultural	156,000
SJ/SMPA	McElmo	Rare Flora & Fauna	443
SJ/SMPA	Tabeguache Creek	Scenic	440

MINERAL RESOURCES

Mining has been an integral part of Colorado since Man arrived in the region. Native Americans utilized clays for paint and pottery. They used flint and chert to make projectile points, and semi-precious stones and native metals for ornaments. With the arrival of Europeans, mining activity increased markedly. Presently, there is active or proposed extraction of a wide variety of minerals in the Study Area. Table 3-13 shows the mineral resources currently known to be in minable concentration in each of the five Resource/Planning Areas.

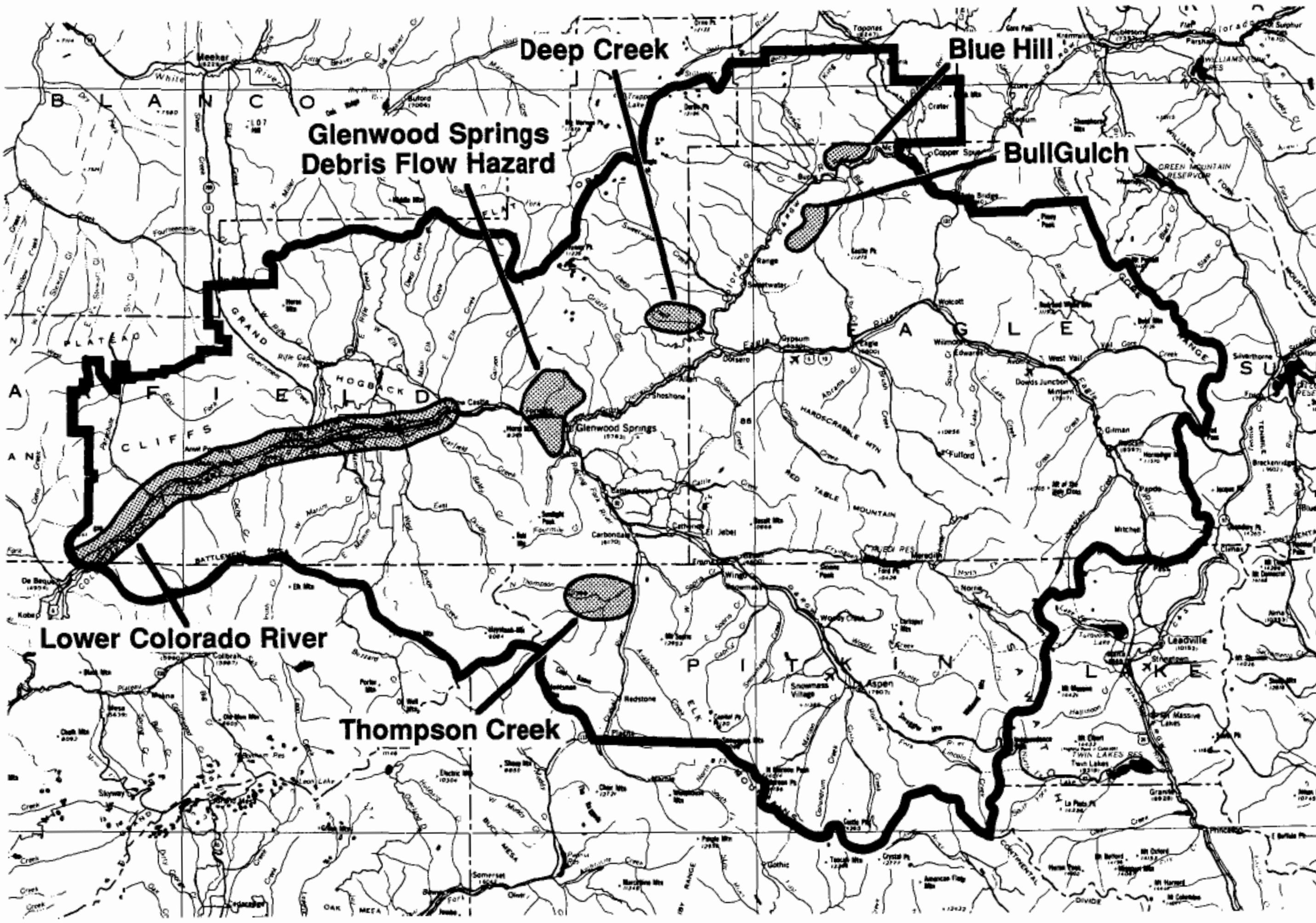
Geologic Setting

Rocks ranging throughout the geologic time sequence from Precambrian to Recent are represented in the Study Area (see Generalized Geologic Stratigraphic Charts, Figure 3-1). The complex tectonic and depositional activity responsible for the spectacular mountain ranges, valleys, basins, and the high plains of Colorado are the same processes that have left some of the richest mineral deposits in the world. The principle structural features in Colorado are shown on Map 3-31.

Oil and Gas

The first oil well was drilled in Colorado in 1862 near Florence in Fremont County. Oil and gas development spread rapidly across the state. First to the northeast, Denver-Julesburg Basin (NPA), then to the west slope. Many fields developed prior to 1920 are on lands patented under the General Mining Law of 1872. With the passage of the 1920 Mineral Leasing Act, fields have been developed on public lands with leases issued by the Department of the Interior.

Drilling and production in the Study Area are characterized as moderate compared with the western United States. New and refined exploration concepts and technology have resulted in geological interpretations that indicate a potential for the existence of new fields and the expansion of some existing ones. A detailed description of the oil and gas resources and the potential for

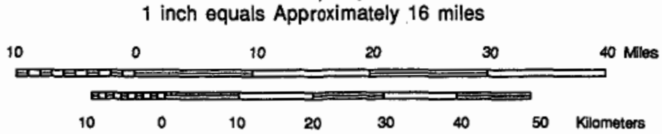


GLENWOOD SPRINGS RESOURCE AREA

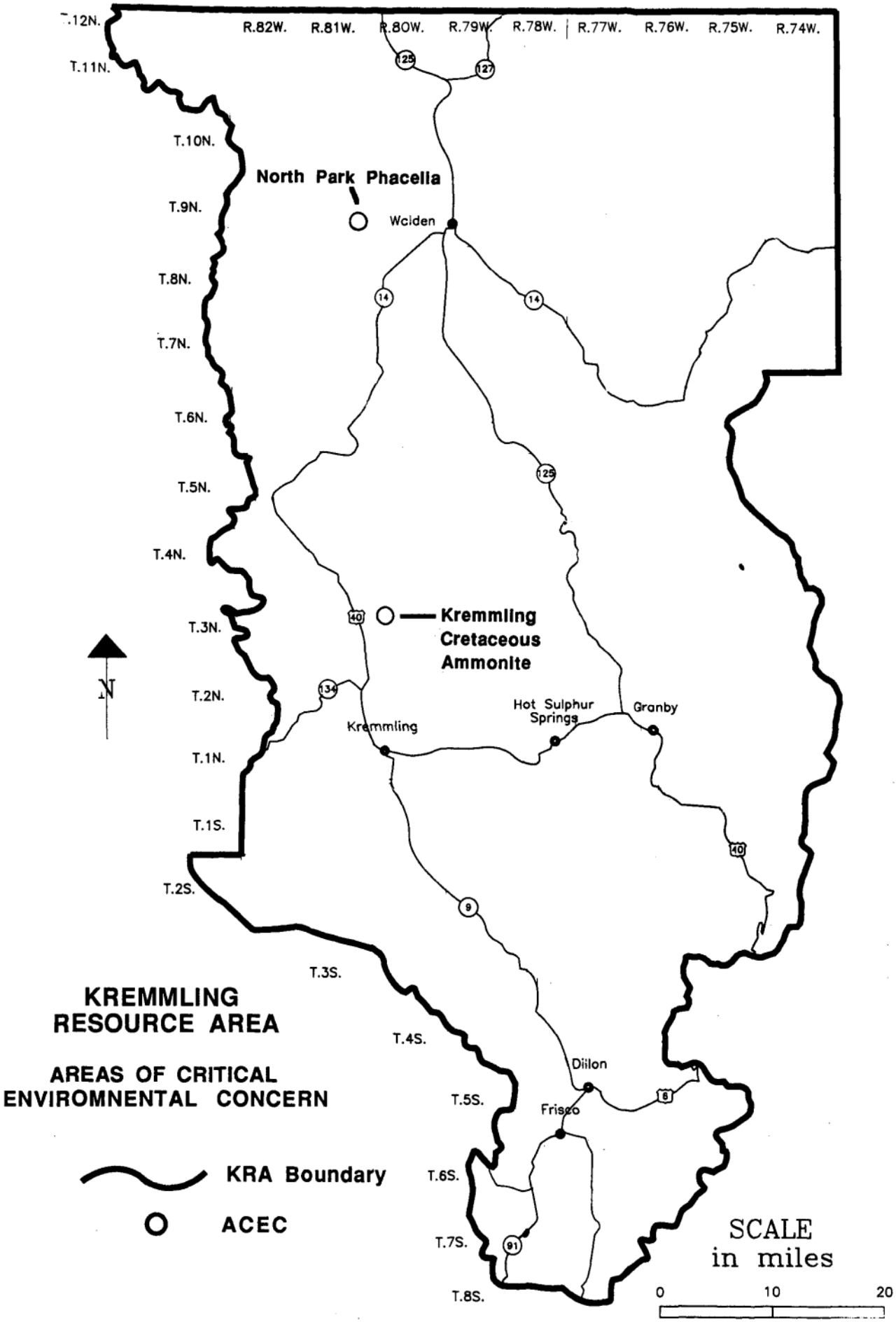
Resource Area Boundary

Areas of Critical Environmental Concern

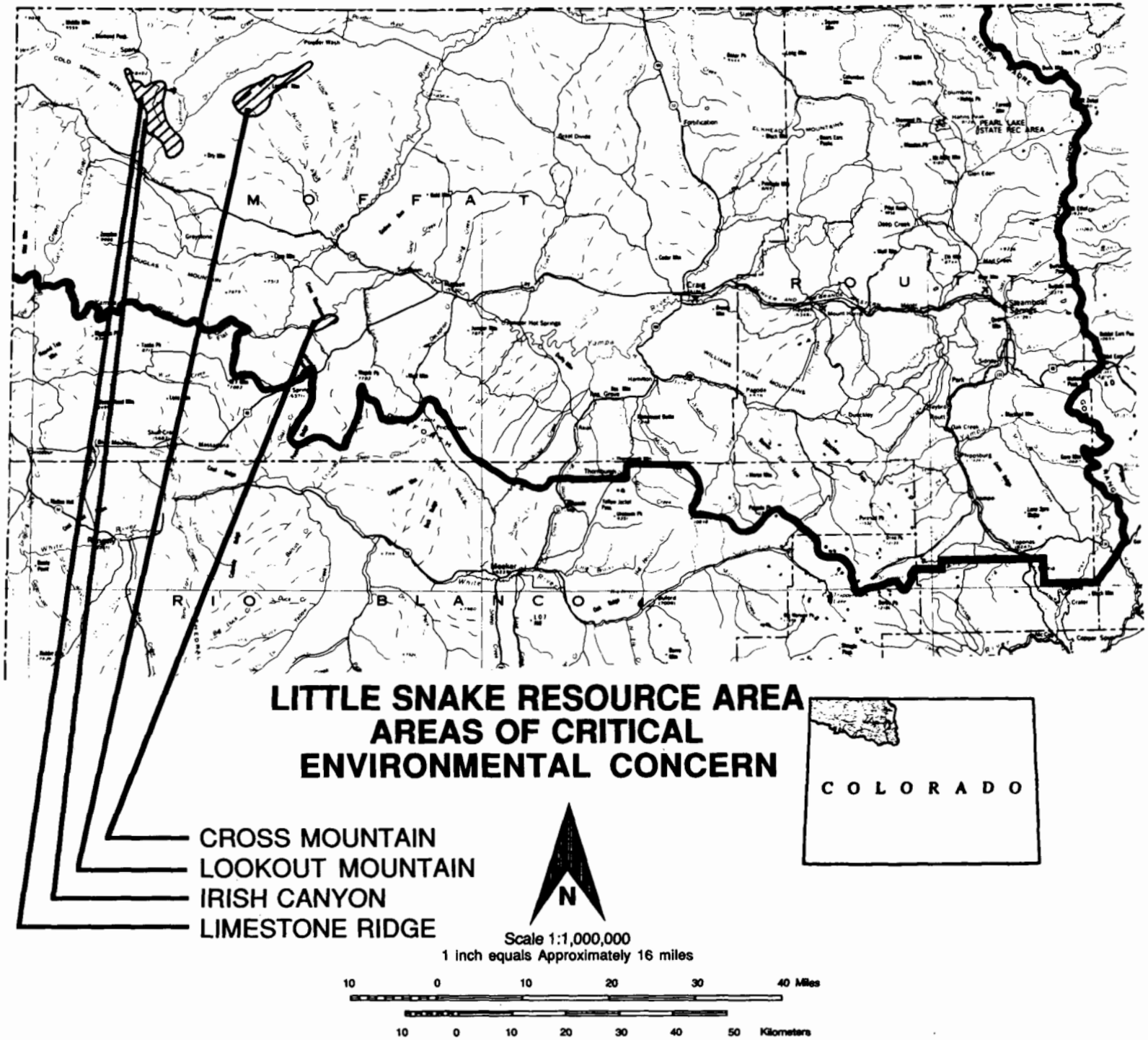
Scale 1:1,000,000
1 inch equals Approximately 16 miles



Map 3-27 Areas of Critical Environmental Concern



Map 3-28 Areas of Critical Enviromental Concern



Map 3-29 Areas of Critical Environmental Concern

Map 3-30 *Areas of Critical Environmental Concern*

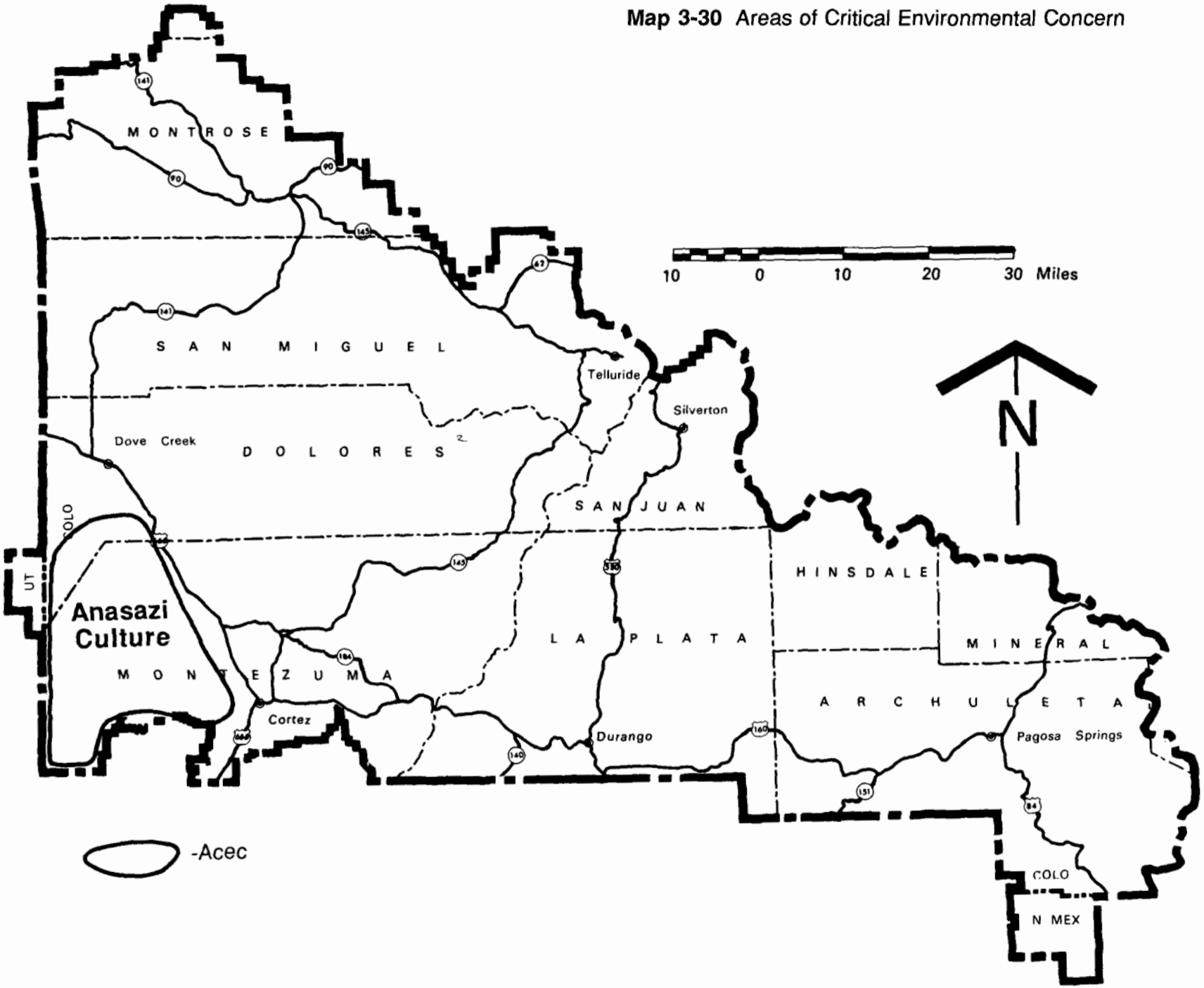
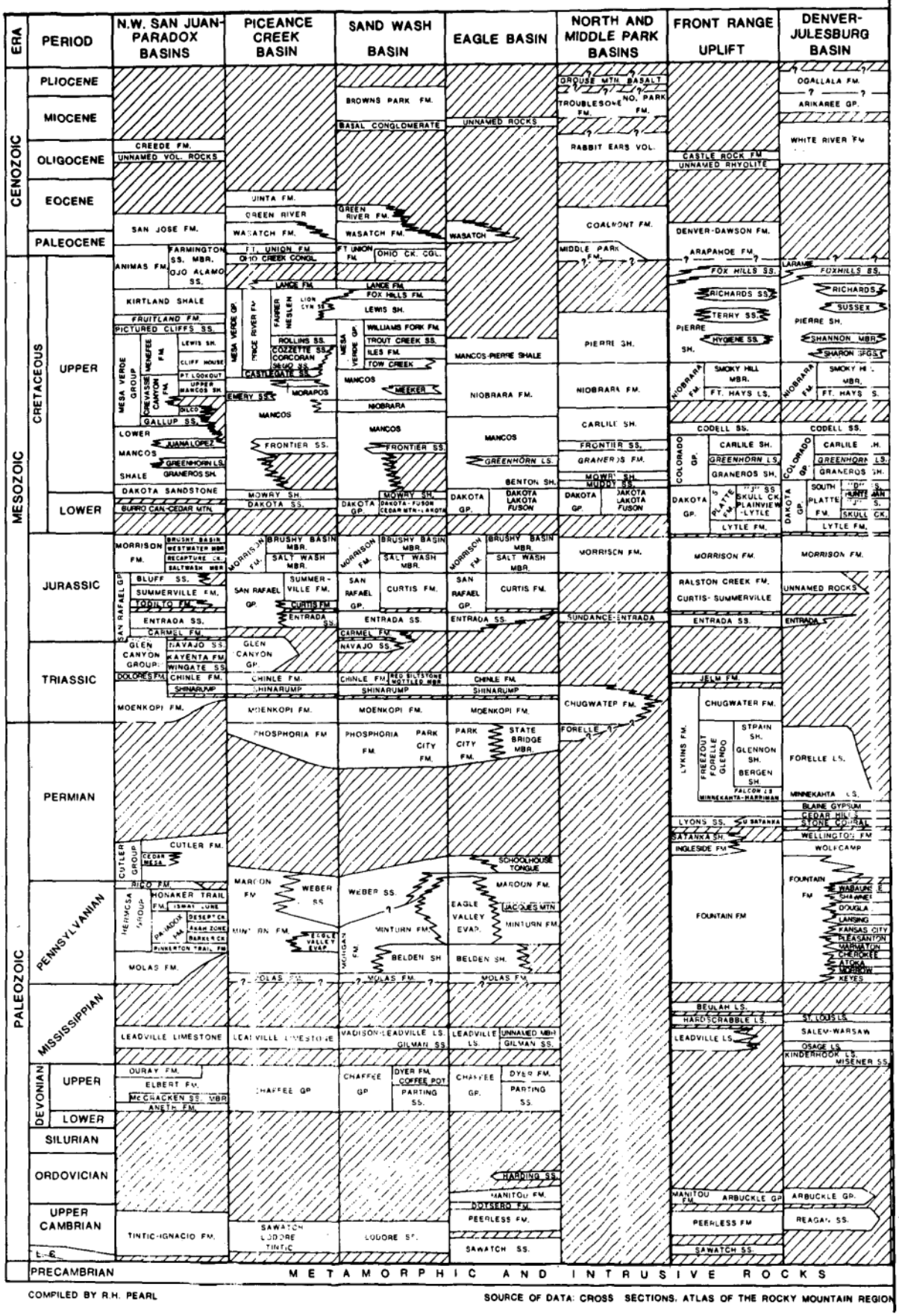
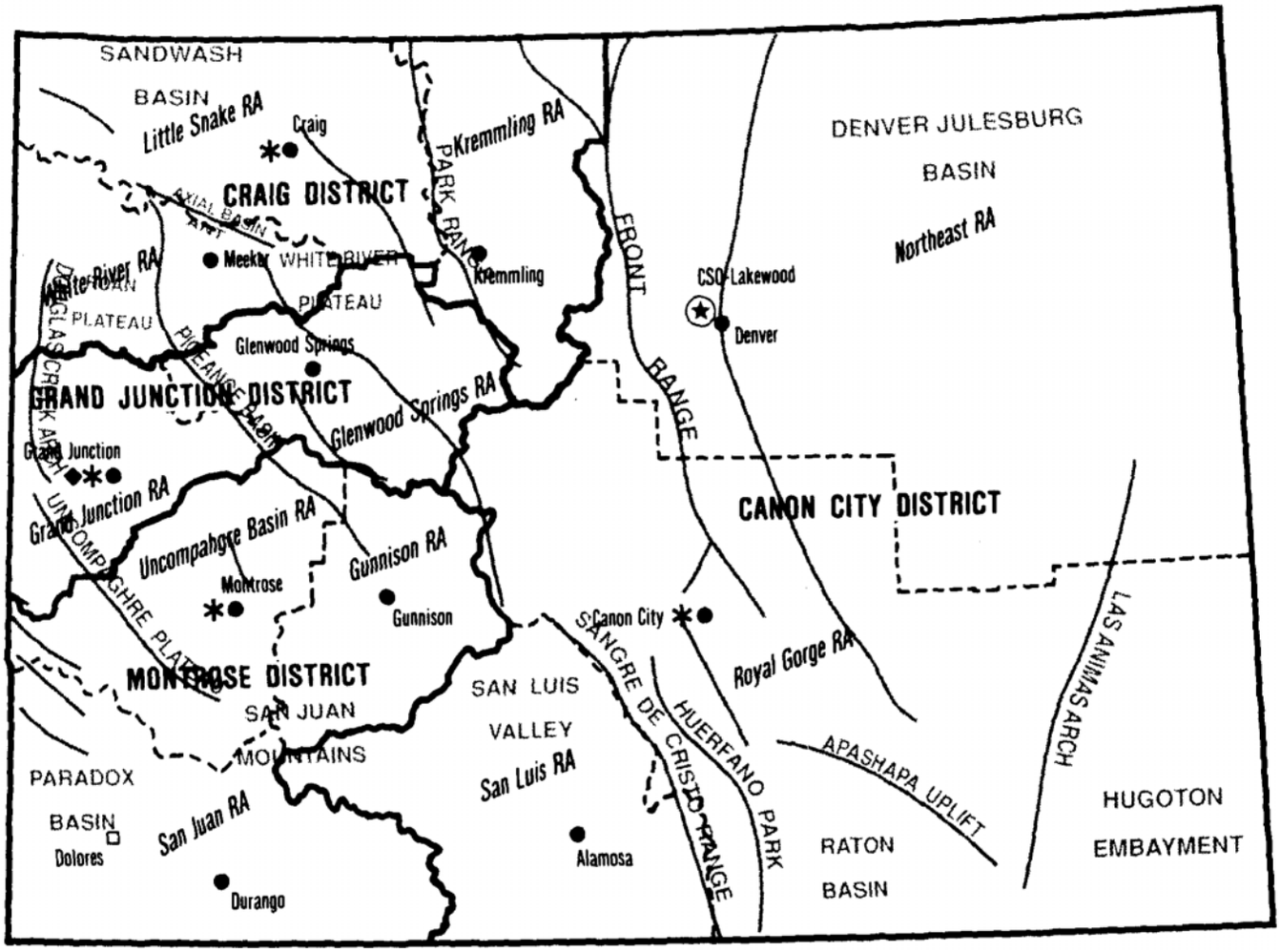


Fig. 3-1 COLORADO STRATIGRAPHIC NOMENCLATURE CHART





Map 3-31 Principal structural and tectonic features of Colorado

development for the entire Study Area is found in Appendix B.

Coal

Federal coal leasing has slowed to a level necessary for maintenance of existing mines. This down-turn in coal mining is due to several factors, chief among which has been the dramatic drop in coal prices since 1982.

Federal coal is leased under provisions of the 1920 Mineral Leasing Act, as amended. An environmental impact statement, in compliance with the National Environmental Policy Act of 1969, is prepared for each lease tract as applications are submitted. Coal resources within the five Resource/Planning Areas are described in the respective RMP/EIS.

Uranium and Vanadium

Uranium resources are found in abundance in all five Resource/Planning Areas. Uranium has been mined in quantity from the Browns Park Formation in LSRA, between Maybell and Lay. It has also been mined from the principal uranium and vanadium producing region in the state, the "Uravan Mineral Belt." The Belt extends from Gateway through Uravan to Slick Rock in the SJ/SMPA. Presently, SJ/SMPA is the only area with active uranium and vanadium mining. Renewed interest in vanadium seems to be the main reason.

Precious Metals

Historically, gold and silver have been mined in all five Planning/Resource Areas. Presently, gold is mined in the SJ/SMPA and NPA. Numerous claims are located in all five Planning/Resource Areas and interest has been expressed in reopening or beginning new operations in some of the areas.

Base Metals

Small, scattered deposits of base metals, including copper, lead, zinc, tungsten, molybdenum, iron, and manganese are found in all five Planning/Resource Areas. These deposits are found in igneous and Paleozoic age sedimentary rocks. Presently, there are no mining operations proposed for any of these deposits on BLM lands.

Limestone

Chemical grade limestone is found in GSRA and LSRA. High calcium limestone of this type is in demand for use in cleaning power plant flues and control of rock dust in coal mines. Mining of this resource is presently taking place on BLM-administered lands in the GSRA. Some marble deposits are known in GSRA; however, no mining operations are proposed.

Stone, Sand, and Clay

Sand, gravel, decorative stone, scoria, and clay occur throughout the Study Area. Sand, gravel, and scoria are primarily used in road construction, while decorative stone is used mainly for construction. Clay deposits within the Planning/Resource Areas have been used in the past as a source of commercial bentonite or for manufacture of brick and tile. Quarrying operations for these materials exists in all areas.

Geothermal

Geothermal resources occur in GSRA, KRA, LSRA, and SJ/SMPA. Presently there is one geothermal lease on BLM-administered lands in the GSRA.

Gypsum

Approximately 300,000 tons of gypsum are mined annually in GSRA. Minable concentrations of gypsum are available in all of the areas except LSRA and KRA. A plan to mine 500,000 tons annually is currently being processed.

Oil Shale

Oil shale deposits occur in western GSRA. While proposals have been made to produce oil from these deposits in the past, there are no current operations proposed, and none are anticipated during the life of this plan.

TABLE 3-13. MINERALS PRESENT IN POTENTIALLY MINABLE CONCENTRATIONS

Mineral	Glenwood Springs	Kremmling	Little Snake	Northeast	San Juan/San Miguel
Carbon Dioxide		X			X
Coal	X	X	X	X	X
Natural Gas	X	X	X	X	X
Geothermal	X	X	X		X
Oil	X	X	X	X	X
Oil Shale	X				
Gold	X	X	X	X	X
Silver		X	X	X	X
Lead			X	X	X
Copper	X	X	X	X	X
Iron			X		
Zinc			X	X	X
Tungsten				X	X
Molybdenum				X	
Uranium	X	X	X	X	X
Vanadium	X	X	X	X	X
Manganese	X				
Gypsum	X			X	X
Potassium	X				
Sodium	X				X
Limestone	X		X		
Marble	X				
Fluorite		X			
Sand (Construction)	X	X	X	X	X
Sand (Refactory)			X		
Clay (Bentonite)				X	
Clay (Common)			X	X	X
Clay (Shale)				X	
Clay (Refactory)				X	
Clay (Pottery)				X	
Scoria	X		X		
Decorative Stone	X		X	X	X
Gravel	X	X	X	X	X
Top Soil	X				
Fill Dirt	X				X

CHAPTER FOUR

ENVIRONMENTAL CONSEQUENCES

CHAPTER FOUR

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the impacts of the various alternatives on specific environmental components. The only environmental components described are those that may be affected by one or more of the alternatives.

The analysis was completed using the following assumptions:

- The oil and gas activity would occur as described in Chapter 2--Proposed Action Alternative and Appendices A and B.
- The laws and regulations will not change substantially over the next 20 years.
- All lease terms and conditions will be adhered to and that they are effective in mitigating impacts.
- Reclamation procedures will be completed and will be successful.
- There will not be any major shifts in the BLM's land management plans, policies, or emphasis.
- Development of coal-bed methane was considered in the production of the Potential of Development (PODs) for the GSRA, LSRA, and SJ/SMPA.

CLIMATE AND AIR QUALITY

Climate will not be impacted. Impacts to air quality will be very minor, short-term, and very localized.

VEGETATION

All Alternatives

Conducting preliminary exploration (seismic operations) would cause the loss of some vegetation. Vegetation would be crushed by vehicles on the line, and therefore, the loss would be minimal and short-term in nature. Overland travel off existing roads for seismic exploration during wet soil conditions would increase the degree of vegetation destruction.

Construction of access roads and drill pads for drilling wildcat wells would result in the loss of approximately ten acres of vegetation per well site. With proper reclamation following completion of drilling activities, this loss of vegetation would be short-term, assuming that reclamation success would take approximately three to five years. There is a likelihood that undesirable weeds would invade the disturbed ground at some point before reclamation is complete.

On the sites where wildcat wells become discovery wells, the loss of vegetation due to access roads and drill pads would become more long-term due to the relative permanence (in excess of 15 years) of these installations. Although as much as 1/2 of the two-acre drill pad may be reclaimed at the time of developing a permanent well site, additional road, pipeline, and other facility development would increase the actual loss of vegetation associated with each well. The maximum amount of vegetation that could be lost over the 20-year period amounts to 19,200 acres. This is 1/2 of one percent of the total BLM land in the Study Area and is not considered to be a significant cumulative impact.

Impacts to riparian and wetland habitats would not be significant. Development within these critical areas would be avoided by developing Conditions of Approval (COAs) during predrill inspections. Well site locations could be moved up to 200 meters to avoid construction in riparian and wetland areas.

To comply with requirements of the Endangered Species Act, all oil and gas activities would be cleared for species occurrence at the operational stage on a case-by-case basis rather than at the leasing stage. This ensures that each site with the potential

for threatened and endangered (T&E) species would be inventoried and site locations changed to avoid any discovered species. Locations with known T&E (or candidate) species are protected with No Surface Occupancy stipulations on the lease. Short of no leasing, the No Surface Occupancy stipulation is the only method of protecting the large (40 acres or more) areas of known populations and high concentrations.

It has been determined through analysis that the Proposed Action Alternative will not have an effect on any of the threatened or endangered species found in the Study Area.

On split estate lands, the vegetation impacts could be more significant. Reclamation requirements on private surface lands are negotiated with the landowner and the oil company. For this reason, there is no certainty that the land would be returned to its former condition. In the absence of successful reclamation, these damaged areas could become infested with noxious, poisonous, or other undesirable weeds. Erosion and sedimentation could also increase considerably. The BLM does have the option to require reclamation if off-site, or downstream, impacts on BLM land are predicted.

LIVESTOCK GRAZING

Proposed Action Alternative

Seismic activities utilizing explosive charges, thumpers, etc., could disrupt normal water aquifers, altering subsurface water flows if the activities are within close proximity of springs. This could result in reduced flows or even the loss of all water to existing springs and water wells. Conversely, the flows could also be increased which would be beneficial.

An Application for Permit to Drill (APD) condition requiring cattle guards to be installed in fences leading into pastures would prevent livestock from wandering out whenever gates are left open during extensive truck or equipment activity. Increased traffic deaths are more likely with sheep than with cattle.

Temporary forage loss would continue as long as the access roads and drill pads were in use. However, APD conditions for reclamation requiring recontouring and revegetation of these sites would restore forage production. The revegetation process would include eliminating livestock use for up to two growing seasons. This could cause a disruption in the normal grazing use of an area. The severity of the disruption depends upon each specific situation. Poisonous or noxious weeds introduced during the drilling operations could be eliminated through APD conditions requiring their control.

The potential development of livestock water encountered during the drilling operations could be ensured through APD conditions that require BLM notification of any aquifers which have the potential for development. An APD condition which states that any water well drilled by the oil and gas companies to provide water for drilling purposes may be turned back to the BLM for development as a livestock water well.

Other possible impacts to livestock due to field development include the possibility of livestock being killed on unfenced roadways by traffic associated with drilling activity, and loss of vegetation from the construction and continued use of roads, pipelines, and other ancillary facilities.

If full development occurred in the Study Area, as described in Chapter 2, 1,900 animal unit months (AUM) of livestock forage could be lost over the 20 years. This is only 1/2 of one percent of the total for the Study Area and is considered insignificant.

Continuation of Present Management Alternative

Implementation of this alternative would result in the same impacts as the Proposed Action Alternative.

Standard Terms and Conditions Alternative

Implementation of this alternative would result in the same impacts as the Proposed Action Alternative.

WILDLIFE

Proposed Action Alternative

Impacts to wildlife from oil and gas operations can be categorized as direct or indirect. Direct impacts consist of actions that result in immediate mortality, such as collision with vehicles and illegal shooting. Indirect impacts include actions that affect animal behavior or habitat quality consequently leading to a long-term reduction in wildlife populations.

The direct loss of habitat as a result of anticipated surface disturbance of 19,200 total acres over the next 20 years (960 total disturbed acres in any given year) would not, by itself, be a significant impact to wildlife in the Study Area. If oil and gas activity were concentrated in a small area over an extended period, detectable impacts may occur. The major concern would be the impacts of human activity associated with the surface disturbance. The severity of impacts would depend on factors such as time of year, duration of activity, and sensitivity of species involved.

Oil and gas activities may have an additional subtle but important effect on wildlife often overlooked during impact assessment (Bromley 1985). Deviations from normal activity patterns and habitat use may have profound effects on the energy budget and, therefore, the welfare and productivity of an animal (Burton and Hudson 1978 in Bromley 1985). Negative effects of environmental disruptions (flight, avoidance, interference with movement) raise the energy cost of living at the expense of energy needed for reproduction and growth (Geist 1970 in Bromley 1985). These effects would be most significant during critical seasons when the animals are already under substantial stress.

Appendix E contains specific wildlife mitigation in the form of lease stipulations. Appendices D and F contain the COAs that will be utilized when appropriate. The GSRA is proposing a stipulation that would require the oil and gas lessee to compensate for the loss of crucial habitat. The compensation could be required either on-site or off-site. Each specific case would have to be designed and evaluated on its own merits.

Examples of some mitigation methods on big game winter or transition range are: 1) prescribed fire, 2) sagebrush rotochopping, 3) fertilization of various browse species, and 4) dozing or chaining and seeding of closed canopy pinyon-juniper stands. If lost cover is the result, planting of appropriate species of grass, forbs, shrubs, or trees may be required. To replace lost riparian values, new riparian habitat may be created through appropriate water management and plantings or old destroyed habitat may be reclaimed. The exact method of reclamation, etc., will be determined on a site-specific basis.

Terrestrial

Big Game

The effects of temporary disturbance associated with oil and gas activity (for example, seismic) during noncritical periods seldom cause major impacts to big game because of minimal habitat disturbance and short duration of activity. The affected animals would be temporarily displaced but would return after the activity ceased with no mortality or other permanent adverse consequences.

Mortality from such activities would be slight, if any, and populations would recover quickly. Impacts from exploratory drilling would be somewhat more severe than seismic because the period of disturbance is longer. Animals could be displaced from traditional winter or birthing areas into marginal habitat for a longer time resulting in slightly greater mortality and a small, temporary reduction in population size.

Oil and gas development and production within crucial habitat would result in both loss of habitat and displacement of disturbed animals. Small losses of habitat, such as that resulting from a single well, would not have a significant effect on the availability of crucial habitat. Because drilling activity would be restricted to noncritical periods, disturbance to wildlife would not be a factor. Field development and production, on the other hand, could result in substantial loss of habitat and disturbance could occur during the critical winter period. Field development is intense and could result in a large percentage of a given crucial habitat being disturbed. Because crucial habitats are at or above carrying capacity, alternative habitats

would not be available and most of the displaced animals would die. Mortality would also result from the increased stress as animals attempted to avoid disturbance.

Competition among ungulates may occur as a result of reducing big game winter ranges. The magnitude of this impact would be site-specific and could be minimized through compensatory off-site habitat enhancement. However, the general effects could be significant. Available carrying capacity on deer and elk winter ranges in the Study Area is limited by the extent of such areas, fluctuating levels of forage productivity and availability, and utilization by domestic stock, deer, and elk. Even though disturbed areas are reclaimed within a few years, both deer and elk are very dependent on shrubs for winter survival. Success in replanting/seeding shrub species is very poor on most BLM lands because of the limited moisture, competition with grasses, and generally poorer soils. Therefore, grass and forbs are generally used to reclaim habitat and the shrubs must regenerate naturally. It usually takes from 15 to 30 years for a sagebrush stand to regenerate in this fashion. Consequently, even though an area may be reclaimed within a few years, it generally is not suitable for winter use because the forage produced is grass which generally isn't palatable and is unavailable due to snow depth.

Reductions in the quantity and quality of mountain lion and black bear habitat would also occur as a result of these actions. Both of these species characteristically utilize large home ranges and occur at relatively low densities. Therefore, potential impacts on mountain lion and black bear populations would most likely be restricted to the project areas and would be of low intensity.

New road construction into previously unroaded or isolated areas is another aspect of oil and gas operations that could impact big game. Such relatively undisturbed areas serve as sanctuaries in which animals can seek refuge from hunting pressure and reduce stress during critical times of the winter. As public access to these areas becomes easier and more widespread, both legal and illegal harvest could increase as well as disturbance from other activities associated with human presence. Significant reductions in populations could occur before measures could be taken to control hunting activity. The primary concern would be with seismic operations, wildcat wells, or new field development.

Road kills of deer and elk would increase above existing levels due to increased vehicle traffic along well-traveled roads, especially those associated with field development. Harassment of wildlife would be expected to increase with oil and gas exploration and development. There are more people in remote areas normally occupied by big game. There generally will be an increase in the number of guns and dogs in the area and consequently the potential for illegal harvest and harassment of wildlife will increase proportionately.

Seismic work associated with helicopters and blasting would have a significant negative impact if it occurs prior to or after the hunting season in heavily hunted areas. The animals tend to leave the area resulting in reduced harvest. In overstocked areas, this is a problem because more animals must survive the winter on limited forage. The usual result is increased winter mortality and reduced fertility and fawn survival.

Upland Game Birds

Oil and gas activity would probably not have a significant impact to blue grouse or chukar.

Sage grouse winter and breeding seasons are the periods when significant impacts would be expected to occur. Sage grouse are almost entirely dependent upon sagebrush for food and cover, especially in the winter. Only sagebrush of a certain density, height, and type appear to be suitable as winter habitat, therefore, they are concentrated during the winter and extremely susceptible to disturbance. Strutting grounds (leks) and the vegetation community within a two mile radius are also essential to maintaining healthy populations. Any activity that disrupts strutting or nesting success may result in significant losses to the population associated with the affected lek. Depending on the size of population loss, such an impact may be significant in terms of the total sage grouse population.

A major turkey reintroduction program is underway in the GSRA. Free roaming populations have increased significantly in

the past few years. As new information is gathered about their habitat preferences, these areas will be protected by implementing a seasonal restriction on newly defined crucial habitats, such as nesting areas or winter habitat.

Raptors

Impacts to raptors from oil and gas operations include direct destruction of nest sites and the possibility of nest abandonment from nearby disturbance. Direct destruction of nests on cliffs and rock outcrops would obviously be unlikely because of their location. Nests located on the ground or in trees would have a higher potential for disturbance, although the chances would still be fairly remote because of the dispersed nature of raptor nests. The highest potential for nest destruction would be in pinyon-juniper and aspen woodlands where a large number of trees could be removed for road or drill pad construction. Ferruginous hawk, red-tailed hawk, American kestrel, and Swainson's hawk may utilize pinyon-juniper for nesting while the goshawk, sharp-shinned hawk, Cooper's hawk, and red-tailed hawk nest in the aspen.

Disturbance of nesting raptors, leading to nest abandonment, would be the most likely impact from oil and gas operations, including seismic activity. The failure of parent birds to return to eggs or young is unpredictable (Fyfe and Olendorff 1976). The response of raptors to human interference varies for different species and individual birds of the same species. Nest abandonment is most likely to occur just prior to egg-laying. Later in the nesting cycle, in addition to abandonment, females flushing from a nest can crack eggs or injure young. Late in the nesting period, disturbance is unlikely to cause abandonment but the young birds may attempt to fly before they are ready, causing injury or death. Other problems associated with disturbance to nesting raptors include cooling or overheating of eggs, chilling of young birds, and missed feedings, as the mother remains away from the nest because of human presence. By implementing seasonal restrictions in the vicinity of known nests and a No Surface Occupancy stipulation around nest sites, these impacts can be minimized.

Nongame Wildlife

Small birds and mammals usually are not impacted significantly from oil and gas operations. Impacts to small or isolated populations could occur if an important riparian area or isolated mountain shrub or aspen stand were substantially altered. These isolated stands serve as habitat for feeding and nesting for a variety of bird species.

Aquatic and Wetland/Riparian Habitat

Impacts to localized aquatic habitats would result from increased sedimentation. Sediment would cover gravel beds on the stream bottom resulting in loss of habitat for macroinvertebrates which serve as a primary food source for most fish species. In addition, gravel beds serve as spawning areas and are necessary for successful reproduction by many fish species .

Any spill of hazardous material resulting from exploration or development that ended up in a drainage could potentially have disastrous effects on any fish or other water species.

These impacts would be minimized by limiting surface-disturbing activities within 500 feet of riparian zones. No significant impacts are predicted.

Threatened and Endangered Species and Species of High Federal Interest

All leases contain the protection for T&E species. Species of High Federal Interest are protected either with stipulations or COAs. No significant impacts to any threatened, endangered, or sensitive species are predicted under any of the alternatives.

No confirmed sightings of the black-footed ferret have occurred in the Study Area although prairie dogs, the primary prey species for the ferret, do occur within the area. Because of the limited prairie dog habitat and knowledge concerning the existence of ferrets in the Study Area, the potential for impacts from oil and gas operations must be considered a possibility, even though it is remote.

Impacts to wildlife under this alternative would not be significant after application of appropriate mitigation listed in Appendices D,

E, and F. Although impacts could not be significant, there would be some unavoidable loss of important habitat resulting in disturbance and small reductions in associated wildlife populations. Road closures would reduce but not eliminate disturbance to wildlife because of use of the roads by oil and gas personnel.

Continuation of Present Management Alternative

Under the Continuation of Present Management Alternative, seasonal restrictions reduce impacts to: (1) deer and elk during winter and elk during calving and fawning; (2) sage grouse during winter period and spring breeding; and (3) raptors during nesting. However, previously unidentified crucial habitat for these and other species are not adequately protected in this alternative.

Activity would not be permitted in threatened, endangered, and sensitive species' habitat that would jeopardize their continued existence.

Impacts that would remain unmitigated under this alternative include: (1) loss of escape cover and an increase in legal and illegal harvest of game animals as oil and gas road construction enhances public access into remote areas; (2) disturbance to aquatic and riparian areas, resulting in minor losses of both fish and wildlife habitat; (3) direct loss of crucial big game winter, calving, and fawning habitat; and (4) loss of solitude in big game crucial areas and around raptor, great blue heron, turkey, and waterfowl nesting areas; and (5) loss of habitat in previously unidentified crucial habitats.

Loss of escape cover and increased legal and illegal harvest of big game as a result of enhanced public access into remote areas would likely lead to significant long-term losses to big game populations. These animals are easily disturbed and often move onto private land which then creates game damage problems and increases stress on the animals because of proximity to human habitation. This also increases the pressure on other winter ranges and not only impacts the animals but also impacts the plants that support the animals, and in the long run, reduces the overall carrying capacity in future years.

Minor disturbance in or near the riparian, wetland, and aquatic zones should not have a detrimental effect on water quality or fisheries habitat.

Oil and gas development and production within crucial winter range would cause a direct loss of habitat as well as disturbance to the animals throughout the winter season. Because crucial winter range is often at or above carrying capacity and alternative habitat is not available, there is a potential for significant losses to big game populations.

Standard Terms and Conditions Alternative

Wildlife habitat would be protected from disturbance under the standard lease terms by specific conditions applied to oil and gas activities (APDs, rights-of-way, and seismic notices of intent) at the time of permit application. The types of mitigation measures would depend upon the specific habitat and project proposal involved. If operations cannot be modified to adequately protect the habitat, a COA would be attached to the permit or notice.

Avoidance Conditions of Approval (see Appendices D and F)

The locations of sensitive wildlife/plant habitat will be protected from human-induced surface-disturbing activities to the extent such protection does not unduly hinder or preclude the exercise of valid existing rights. The area of protection will include the actual location of the sensitive habitat and, if present, adjacent sites critical to the habitat or species in question. Sensitive habitat, upon which analysis determines protection to be necessary, shall be protected by requiring relocation or rerouting of proposed well sites, pipelines, roads, other surface facilities, etc. BLM will effectively regulate/mitigate potential impacts to important sensitive habitat to the degree that existing development rights are not unduly hindered or precluded. Individual actions with the potential for impacting sensitive habitat will be monitored during the construction phase to ensure compliance with protective mitigation.

Standard lease terms would not allow BLM to mitigate all of the most detrimental impacts to wildlife from oil and gas development. Therefore, possible impacts under this

alternative include: (1) disturbance to big game during calving and fawning, and critical winter seasons, (2) new road construction into unroaded or isolated areas, (3) disturbance to sage grouse and turkey nesting, breeding, brood rearing, and winter habitats, (4) disturbance to nesting raptors, waterfowl, and great blue heron, (5) protection of prairie dog colonies, and (6) impacts to aquatic and riparian/wetlands.

Serious impacts of oil and gas development could result from disturbance to big game during calving, fawning, and the critical winter seasons if the 60-day delay clause were not long enough to cover these periods. Significant losses to big game populations could occur from oil and gas development on crucial habitats during these seasons.

New road construction into unroaded or isolated areas would cause loss of escape cover and result in increased legal and illegal harvest of game animals. This could lead to significant long-term losses to all game species but most notably to big game.

Oil and gas development within crucial winter habitat could result in both loss of habitat and displacement of disturbed animals. Small losses of habitat, such as that resulting from a single exploratory well, would not have a significant effect on the availability of crucial habitat. However, the cumulative impact of this action in conjunction with other unrelated activities could have locally significant impacts. Field development, on the other hand, could result in substantial loss of habitat and disturbance would occur during the critical winter period. Because crucial habitats are at or above carrying capacity, alternative habitats would not be available and most of the displaced animals would die. Mortality could also result from the increased stress as animals attempt to avoid disturbance.

Oil and gas development within traditional big game calving or fawning areas would cause animals to move to adjacent and possible marginal habitat. Traditional areas are preferred because of the existence of optimal conditions for the highest rate of survival of newborn animals. Many of the displaced animals would probably proceed with calving or fawning in marginal habitat; however, increased mortality of newborn animals would be significant.

Disturbance to sage grouse winter, nesting, breeding, and brood rearing habitat could result in significant long-term losses to populations. Therefore, it is important to preserve the remaining habitat and population of sage grouse to the extent possible. Maintenance of this resource under this alternative could be seriously hampered.

Disturbance to turkey nesting areas could result in a significant loss to the population. Without good, undisturbed nesting and brood rearing, the population could eventually disappear. Disturbance to nesting raptors could result in significant long-term reductions in raptor populations.

Conclusions

Significant unavoidable adverse impacts could occur under the Standard Terms and Conditions Alternative. Substantial long-term cumulative population losses would be expected for big game, sage grouse, waterfowl, great blue heron, and raptors because of disturbance to crucial habitat during the winter and breeding seasons. Population losses to game species would affect hunting success/opportunities in the Study Area, which in turn, affects local and regional economics dependent upon hunting, recreation, and tourism.

Seasonal stipulations in the Continuation of Present Management and Proposed Action Alternatives would eliminate or reduce impacts of oil and gas activities to the aforementioned species or habitat. Impacts to game species resulting from disturbance to isolated or roadless areas would be mitigated to a degree under the Proposed Action Alternative but would remain under the Continuation of Present Management Alternative.

Under all alternatives, unavoidable adverse impacts could result from disturbance to important habitats. These impacts would not be significant under the Proposed Action Alternative because of proper mitigation. Because most of these species recover quickly from disturbance, impacts would be short-term and would not affect the long-term productivity of the species except in crucial habitats where cumulative impacts may already be limiting productivity.

Unavoidable adverse impacts could also occur in areas where data are not sufficient to define possible impacts from oil and gas activity. The most likely situation for such impacts would be disturbance to undiscovered raptor nests, important plant species, etc. The best mitigation would be field inspection, by a qualified individual, of every APD and seismic location. When this is not possible, some adverse impacts could be expected.

The proximity and density of surface disturbance and the continuous human activity in a field development make it impossible to mitigate all impacts. In this situation, some long-term loss and irreversible and irretrievable commitments of wildlife resources would occur, but no significant losses in wildlife populations or habitat would be expected.

WILD HORSES

General

Wild horses try to avoid motor vehicle movement and human activities within their range. It is logical to assume that they would continue this behavior and that the effect on their patterns of movement and areas of preferred habitat would relate directly to the magnitude of the disturbance and development activity.

During winter months, oil and gas development could have significant impacts on wild horses. Traffic and drilling activities could force the wild horses into less desirable grazing areas resulting in increased winter kills and lowered foaling percentages. The severity of the impacts would depend on the amount of drilling conducted in the winter.

An increase in oil and gas activity within the wild horse range would result in a reduction in the quantity and quality of their forage and habitat. Development of oil and gas facilities would reduce available forage as well as allow for less palatable forage for the wild horses. For every ten surface acres disturbed on the wild horse range, approximately one AUM of forage would be lost. This would not be significant with the expected level of development and reclamation.

Living space for the wild horses would be reduced by the actual number of surface acres disturbed and cleared. Development of areas around watering sites, south slopes, and windswept ridges, which are areas of high wild horse winter concentration, would impact the wild horses to a greater extent than development in other areas. As the available habitat is reduced, competition for the remaining habitat would increase between wild horses, livestock, and wildlife. Increased competition would result in: (1) a decrease in either the number of large herbivores, or (2) overgrazed range land, or (3) both. With reclamation practices, this should not be significant. Increased wild horse roundups may be necessary to keep the wild horse herds closer to the herd level objectives.

Proposed Action Alternative

Little Snake Resource Area

The Proposed Action Alternative would allow the wild horse herd continued use of its watering areas by restricting the location of oil and gas development activities, or providing water where it could be used by the horses. The application of these mitigations would protect the herd from seismic exploration and wildcat exploration wells. Should a field be discovered, some impacts may still occur to the herd from that level of human activity. Increased road access could result in impacts similar to those identified for big game.

San Juan/San Miguel Planning Area

All Alternatives

A wild horse herd, averaging 50 head, will be maintained in the Spring Creek Herd Management Area. The reproductive season is a crucial period in the life cycle of these animals. Disturbances during this period may create unnecessary stress and reduce herd productivity. In order to minimize effects on the horse herd during foaling periods, a seasonal stipulation will be attached to any newly issued leases. (See Appendix H.)

The following types of mitigation would be applied as conditions of APD approval:

- Avoidance conditions to avoid water sources used by wild horses.

• Surface disturbance would be kept to the minimum necessary for oil & gas exploration and development.

• All pits would be fenced to prevent entry by the horses.

• Avoidance conditions would locate exploration and development activities away from windswept ridges and pinyon-juniper areas. This will help to assure availability of winter forage and year-round shelter.

Operational conditions such as, but not limited to, those outlined above would be applied to seismic exploration activities as well, if necessary.

Continuation of Present Management and Standard Terms and Conditions Alternatives

Potential impacts to the wild horse herd would remain under these alternatives. Loss of winter forage and shelter would result when windswept ridges and pinon-juniper areas would not be avoided under the standard terms of the oil and gas lease. An increase in human activity would not be mitigated under this alternative because traffic and drilling operations throughout the year would force horses into less productive grazing areas.

Conclusions

Any impediment to free movement within the wild horse herd area is a significant adverse impact. Wild horse movement would be affected by oil and gas activities and facilities, also by the increase in vehicle and human activity associated with the oil and gas activities. Disturbance in areas preferred by wild horses would have the greatest impact within their established traditional range. Horses may abandon their traditional patterns of movement and areas of preferred habitat in order to avoid human activities. Since the wild horses occupy the most desirable areas for wild horse habitation, oil and gas exploration and development activities in these areas would force wild horse bands into less desirable areas.

Oil and gas development activities would result in short-term abandonment of wild horse habitat in and adjacent to the development site during exploration. Long-term abandonment would result if production is obtained and permanent facilities were installed. In general, impacts from individual or wildcat wells would be not impact long-term productivity.

SOILS

All Alternatives

Exploration and field development will have a direct impact on soils physically disturbed. This would be limited primarily to those areas where vegetation is removed or destroyed. The impacts would be of two types: (1) physical removal, mixing, or burying of surface soils, or (2) damage or destruction of soil properties in place.

The first impact would be caused by site preparation for well pads, related structures, roads, excessive erosion, and slope failures. This would destroy the soil texture, mix the soil horizons, and cause a short-term reduction in the potential productivity of the soils. Revegetating these disturbed areas would initiate the process of creating new soil structure and soil horizons. The revegetation rate will probably be slow due to low rain fall. The initial soil productivity would be influenced by organic matter incorporated in the mix, the length of storage before revegetation, and health of soil microflora. Initial soil productivity should not be significantly different from undisturbed areas.

The second impact would be soil compaction. This would be caused by vehicle or machinery travel with wide ranges in the amount of compaction. The compaction would decrease water and air infiltration into the soil profile, and thus, reduce soil productivity. Where compaction is severe, soil vegetative productivity would be virtually eliminated in the short term without mechanical treatment to reduce the compaction.

The small amount of total disturbed area anticipated at any given time--960 acres--would have no detectable effect on total vegetative productivity within a given soil or vegetative type. This acreage would be divided between the wells drilled over any three-year period further reducing the measurable effect.

Minor short-term losses to soils would occur because of erosion. These short-term losses are lessened in magnitude by reclamation measures. These short-term impacts, as well as specific soil problem areas, are protected through COAs utilized on specific exploration and development authorizations. Specific reclamation measures (such as waterbarring, contouring, seeding, etc.) would be developed and applied on a site-specific basis. These COAs would mitigate impacts to soil resources to insignificant levels. Most of the adverse impacts to soil resources would be mitigated by applying the present COAs. Therefore, the cumulative impacts are insignificant.

Proposed Action and Continuation of Present Management Alternatives

In LSRA, large areas of fragile soils occur in existing oil and gas fields. With no BLM-imposed surface restrictions, future oil and gas development is expected on the fragile areas. Based on the reasonably foreseeable level of development (RFD) assumptions, approximately 15 percent of new development could occur in major fragile soil areas, including the Danforth Hills, Temple Canyon, Maudlin Gulch, Wilson Creek, and areas within the Vermillion Creek watershed. Fifteen percent would equate to approximately 70 new development wells and 81 exploration wells, or a total of 2,380 acres of new disturbance over a 20-year period. The actual disturbance could be more or less depending on the existence and discovery of oil or gas resources.

Disturbance of 2,380 acres on fragile soils would be a significant adverse impact in terms of soil productivity loss and in soil loss itself. A typical undisturbed side slope in the Vermillion Creek area has a soil loss rate of approximately 1.6 tons/acre/year. After disturbance, assuming all the vegetation has been removed, the rate of soil loss would increase to about 4.7 tons/acre/year, or by 300 percent. Likewise, a typical side slope in the Danforth Hills area would undergo an 800 percent increase in soil erosion rates, from 0.6 tons/acre/year to 5.0 tons/acre/year, due to surface disturbance. These soil erosion rates are most likely underestimated for potential erosion increase because they do not take into account the massive types of erosion activity, such as landsliding, gullying, and soil piping, which normally take place on fragile soils.

This impact is mitigated under the Continuation of Present Management and Proposed Action Alternatives through the use of performance objectives attached to the lease.

The performance objectives are as follows:

I. Maintain the soil productivity of the site.

II. Reduce impact to off-site areas by preventing accelerated erosion (such as landsliding, gullying, etc.).

III. Protect water quality and quantity of adjacent surface groundwater sources.

IV. Select the best possible site for development in order to reduce the impact to the soil and water resources.

Although surface disturbances associated with oil and gas activities will cause unavoidable adverse impacts in the form of increased erosion rates, many of the impacts would be mitigated by erosion control COAs. With careful application of the COAs, soil erosion can be effectively controlled on nonfragile sites under all the alternatives.

Standard Terms and Conditions Alternative

Under this alternative, fragile soils, particularly those occurring adjacent to existing development fields, would not be protected, resulting in irreversible and irretrievable soil losses. In addition, long-term productivity of the soil would be lost on these sites. The loss of soil and site productivity in fragile areas would be a highly significant impact.

WATER

All Alternatives

Activities associated with oil and gas exploration and development could have adverse impacts on surface waters. The most adverse impacts would probably occur in perennial streams within or adjacent to fragile soil areas. High rates of soil erosion from disturbance of fragile sites would result in increased sediment and salinity loads within

the affected streams. Increases in sediment loads would also lead to increases in stream bank erosion and instability. Although the increases in sediment and salinity yields from surface disturbances cannot be calculated, it is believed that they would be adverse and long-term, based on magnitude of soil erosion that could occur from these activities. Current Colorado Department of Health water quality standards for chlorides and sulphates could be exceeded if high increases in salinity occurred.

Outside of the fragile soil areas, short- and long-term adverse impacts to surface waters would occur from surface disturbances associated with oil and gas wells. Again, impacts would consist mainly of increases in sediment and salinity loads from the erosion of barren surfaces. Because exploration well sites would be reclaimed within a three-year period, sediment and salinity increases generally would be short term and not significant. Long-term sediment and salinity increases would result in field development situations from barren areas (mainly roads and pads). Disruption of normal flows from wells and springs could occur from seismic activity in close proximity to the well or spring. This flow disruption could either be an increase or decrease.

Waste fluids associated with oil and gas operations would present another potentially adverse impact to surface waters. Reserve pit and/or produced water fluids could percolate from unlined pits into nearby surface waters, possibly degrading water quality. Occasionally reserve pit fluids may contain small amounts of toxic elements used in drilling muds, such as chromium (hexavalent) and other heavy metals. Drilling fluids may also have high salt concentrations. Produced waters may contain high concentrations of salts (particularly sodium and chloride), heavy metals, and aromatic hydrocarbons such as benzene and toluene.

The Potential of Development (Appendix B) estimates that 1,753 oil and gas wells will be drilled over the next 20 years. This could disturb 19,200 acres over the same period. Depending on the proximity of these disturbed areas to the surface waters in the Study Area, sedimentation and possibly salinity impacts could occur degrading water quality. Further water quality impacts could occur from reserve pit and/or produced water leakage and percolation. However, specific impacts to water resources are determined by individual analysis of the drill sites and other operations. With the application of COAs to individual field operations, these impacts are minimized or eliminated.

Oil and gas operators are regulated to protect freshwater zones with a total dissolved solids (TDS) concentration of 10,000 mg/l or less. This is generally accomplished by correct placement of casing, cement, packers, and /or other downhole devices.

Recent increased coal-bed methane development in GSRA, LSRA, and SJ/SMPA has given rise to two environmental issues related to groundwater: (1) the effects of withdrawing water from the coal seams, and (2) the need to dispose of that water.

Water disposal into deep wells will not cause adverse impacts to shallow useable aquifers. Evaporation ponds are an alternative disposal method which, if properly constructed, provides an environmentally safe method of water disposal.

If shallow aquifers above the coal beds are in communication with the coal beds, depletion of those overlying aquifers may occur. However, if the removal of the water allows the formation to subside and reduce the permeability and porosity of the coals, water from zones outside the coals would not be able to enter. The presence of thick intervening shales combined with the depth differential between the coals and the overlying useable aquifers may also preclude the loss of useable groundwater. Thick shales, which are generally impermeable, lie between the coals and the shallow aquifers. In the absence of large regional fractures and/or faults, it seems unlikely that communication between shallow aquifers and coals at depth can occur. The exception to this may be near the basin margin where the various formations bend upward and are exposed at the surface.

Proposed Action and Continuation of Present Management Alternatives

Glenwood Springs Resource Area

The Continuation of Present Management and Proposed Action Alternatives call for No Surface Occupancy leasing stipulations on 21,218 acres of public lands on the Colorado, Fryingpan, Eagle, Piney, Crystal, and Roaring Fork River corridors. Additionally, the municipal watersheds for Rifle (Beaver Creek) and New Castle (East Elk Creek) have No Surface Occupancy stipulations, as does the 7,126 acre flow hazard zone around Glenwood Springs. The watershed for two fish hatcheries also have protective stipulations. These limitations will afford adequate protection of the water resources in these areas.

Kremmling Resource Area

The Colorado River corridor is unavailable for leasing.

Little Snake Resource Area

The Continuation of Present Management and Proposed Action Alternatives call for a "controlled surface use" lease stipulation to protect fragile soil areas. This stipulation, with its performance standards, would protect surface waters from sediment and salinity impacts associated with surface disturbance on these specific soils (see Soils section).

Northeast Planning Area

No Surface Occupancy stipulations would protect reservoir rights-of-ways and riparian zones under both the Continuation of Present Management and Proposed Action Alternatives.

FORESTRY

All Alternatives

Road and well pad development could have both beneficial and adverse impacts on forest resources. Beneficial impacts could include construction of access roads to forested stands which were previously inaccessible and the replacement of old, decadent trees by young, vigorous seedlings, possibly of a more desirable species. Adverse impacts would result from the long-term removal of forested tracts from timber and woodland production. Increased demand could be placed on the forested areas for products like fuel wood, posts and poles, and Christmas trees. Increased trespass for harvesting of these same products would also be anticipated.

Construction or improvement of access roads in the well field to areas which are proposed or which have the potential, for future forest product harvest would reduce the costs of commercial logging operations on these tracts. Due to the relatively high cost of road construction and the small size of some sales, well field road construction would result in a significant cost savings to the lumber and fuel wood industry for commercial harvesting in these areas.

Road, well pad, and gathering line construction in the well field would remove forest resources. Assuming that all forest products removed would be recovered and utilized, these changes in forest resources would not result in significant adverse impacts to forest economics. If local loggers are given the clearing work, the local forest industry would receive a beneficial economic impact.

Long-term productivity, however, would be slightly reduced by the semi-permanent nature of well field operations in forested areas. Reclamation of well pads and right-of-way corridors from construction to operational widths would help mitigate this long-term effect, but on some forest and woodland sites regeneration would be unlikely. On favorable sites, it would take between 75 and 100 years in commercial forest lands and up to 200 years in pinyon-juniper woodlands for trees to attain harvestable size in the reclaimed areas. This is not considered to be significant.

It is estimated that no more than one percent of the forest land or woodlands in the Study Area will be impacted by oil and gas development activities during the 20-year planning period.

RECREATION

Proposed Action Alternative

Exploration and most drilling activities would have relatively insignificant and short-term impacts on recreationists. The exception would be in fields where intensive oil and gas development occurs. In developed oil and gas fields, permanent support facilities would tend to cause a shift from resource-dependent recreation (primitive) to facility-dependent recreation (modern urban). The primitive and semi-primitive recreation settings would never return to their original settings, even with rehabilitation. The cumulative effect would be a decline in the area available to users who prefer undeveloped settings and an increase in area to users who prefer more developed types of settings in which to engage in various activities. Providing physical access to areas currently isolated from public use would help offset some of the loss of area and would generally be considered a benefit except in areas being managed to provide primitive and semi-primitive nonmotorized recreation. Some undeveloped campsites may be affected by placement of oil and gas facilities. These impacts would be important to those users who prefer primitive and semi-primitive settings to engage in such activities as hunting, hiking, viewing, floatboating, and backpacking, but would only occur in and near those areas where field development occurs.

Field development is anticipated to occupy less than five percent of the land within each Resource and Planning Area.

Glenwood Springs Resource Area

The semi-primitive nonmotorized area around Sunlight Peak may be affected by road construction if fields develop nearby. The high increase in vehicle traffic, and human presence will reduce the semi-primitive qualities such as isolation, low amounts of noise, and low density of human activity.

Kremmling Resource Area

No disturbance is projected and impacts to recreation are unlikely in POD area 1. In POD areas 2 and 3, a disturbance of 73 acres at any given time would not interfere with dispersed recreation. In POD area 4, a projected disturbance of 1,090 acres at any one time would normally present an impact to recreational use, however, existing recreational use in this area is presently minimal and dispersed. Activities that would be displaced are driving off-highway vehicles (OHVs), and antelope and small game hunting. The COAs presently in use would be adequate to mitigate anticipated impacts on public lands within the Upper Colorado River (3,464 acres) and North Sand Hills (1,313 acres). SRMAs would be protected with No Surface Occupancy stipulations and only adjacent lands would be subject to development.

Little Snake Resource Area

Adverse impacts to recreational settings could be mitigated to an acceptable level with the use of appropriate COAs designed to minimize impacts to recreational values. These include ensuring that key access routes previously available to the user public are not unnecessarily blocked, and in certain situations, arranging for the retention of access roads in the abandonment phase where such retention would provide public access to previously inaccessible areas. No Surface Occupancy stipulations would protect the Little Yampa/Juniper Canyon Special Recreation Management Area (SRMA), the Cedar Mountain unit, Steamboat Lake State Park, and Pearl Lake State Recreation Area.

Northeast Planning Area

Special stipulations requiring No Surface Occupancy within major reservoir rights-of-ways and a seasonal closure at Sterling Reservoir will protect the major intensive recreation areas in the medium to high potential areas. Since most drilling is expected to occur on split estate lands, hunting and viewing wildlife are the only recreational activities that may be impacted. Field development could cause big game species to discontinue using the area, and local hunting success and viewing opportunities would decrease.

San Juan/San Miguel Planning Area

Adverse impacts from oil and gas activities are not anticipated. Intensively used recreation areas such as the public lands along the Dolores River and the Dolores River Canyon Wilderness Study Area (WSA)

are protected with a No Surface Occupancy stipulation. Similarly, the Weber and Menefee Mountains primitive recreation areas are protected by their WSA status, which if they are not designated wilderness, would revert to No Surface Occupancy. The Tabeguache Canyon Outstanding Natural Area (ONA) and the Tabeguache Pueblo are protected from adverse impact by No Surface Occupancy stipulations.

Continuation of Present Management Alternative

Impacts from this alternative would be the same as those described under the Proposed Action Alternative.

Standard Terms and Conditions Alternative

Glenwood Springs Resource Area

Impacts would be similar to those described for the Proposed Action Alternative, except that Thompson Creek headwaters would not be protected with a No Surface Occupancy stipulation. Exploration and development activities in Field #8 in the headwaters of Thompson Creek could increase erosion which could increase sedimentation downstream in the Thompson Creek Area of Critical Environmental Concern (ACEC), possibly affecting the aquatic habitat and degrading the recreational fishing opportunities in the stream. Field development is not expected to occur in the other SRMAs within the Resource Area, so adverse impacts to recreationists are unlikely.

Kremmling Resource Area

Impacts to recreationists would be the same as described for the Proposed Action Alternative with the following additions.

North Sand Hills

The North Sand Hills SRMA is within POD area 2 where 22 wells are projected with a disturbance of 232 acres over the next 20 years. Should the projected 57 acres of disturbance at any one time be located within the SRMA, impacts to the recreation setting and experience would be significant. In the long term, vehicle access may be increased with the construction of roads associated with oil and gas development, but areas now intensively used for camping, hunting, and operating off-highway vehicles (OHVs) would be unavailable to oil and gas development and activity. Impacts to scenic values, causing a shift from semi-primitive motorized to a modern urban setting would cause a decline in use from 6,000 OHV visits and 1,000 camping visits to less than 500 OHV and 50 camping visits. This would not only cause a loss of unique recreational opportunities available in the North Sand Hills, but would increase pressure and lead to significant impacts on the East Sand Hills Natural Area which is managed by the Colorado State Department of Parks and Outdoor Recreation. Enforcement and compliance with an existing OHV closure in the East Sand Hills would be difficult due to the loss of motorized recreational opportunities in BLM's North Sand Hills. Conflicts between nonmotorized recreationists who presently use the East Sand Hills and motorized recreationists who presently use North Sand Hills would increase as both user groups are concentrated into the East Sand Hills Natural Area. Problems associated with access to East Sand Hills would occur since the most reasonable vehicle route involves access through a privately owned ranch.

Upon completion and termination of oil and gas development in the North Sand Hills, reclamation would not be totally successful in returning the area to its natural semi-primitive setting. Some visual impacts and modifications to the landscape would be permanent, causing a loss of recreational opportunities. Visitor use could return to predevelopment levels, but the experience would change from the undeveloped (semi-primitive) to the developed (rural or urban). COAs would not mitigate anticipated impacts.

Upper Colorado River

The Upper Colorado River SRMA is within POD area 1 where no wells or disturbance are projected over the next 20 years. However, public lands would remain open to leasing and there is potential for surface disturbance.

Depending upon the location and type of development, impacts to recreation resources could be significant. Public lands adjacent to the Upper Colorado River receive intensive use, primarily during the spring and summer floatboating and fishing season. Intensive oil

and gas development could cause a shift from semi-primitive and roaded-open-county settings and experiences to those of rural and modern urban.

Little Snake Resource Area

Impacts would be similar to those described for the Proposed Action Alternative. Adverse impacts to changes in recreational settings could be mitigated to an acceptable level except in Little Yampa/Juniper Canyon SRMA, the Cedar Mountain area, Steamboat Lake State Park, and Pearl Lake State Recreation Area. Impacts caused by oil and gas development could degrade the values which qualified these areas for special recreation management emphasis.

Those areas impacted by oil and gas development could be lost to public recreational use for the life of the field (30-40 years). The loss of semi-primitive recreational settings and opportunities in the Little Yampa Canyon/Juniper Canyon SRMA, and the loss of settings and locally unique opportunities for environmental education, hiking, and viewing in the Cedar Mountain area, would be significant adverse impacts.

Northeast Planning Area

Impacts would be similar to those described for the Proposed Action Alternative. In addition, impacts associated with drilling could occur adjacent to the shoreline, swimming areas, campgrounds, and boat launching facilities.

San Juan/San Miguel Planning Area

Impacts would be the same as those described for the Proposed Action Alternative, except public lands protected by No Surface Occupancy stipulations could be adversely impacted should field development occur on or adjacent to them. This includes the non-WSA portion of the Dolores River, the Tabeguache Canyon ONA, and the Tabeguache Pueblo.

VISUAL

All Alternatives

Oil and gas exploration and development could have an adverse effect on the visual resources. Even though the facilities are painted and hidden from view as much as possible, there will be viewsheds that may be degraded no matter how well they are hidden. The majority of these impacts on the visual resources will be insignificant and short-term. Some facilities with full field development would be considered long-term and significant.

CULTURAL

All Alternatives

Regardless of possible development levels, there are both positive and negative cumulative impacts upon cultural resources. Development of federal oil and gas resources in previously undeveloped areas would mean that more areas that have not undergone Class III survey inventory would be surveyed. This would provide more information related to past human activities in the Study Area. Oil and gas development has been a positive factor in data collection.

The use of, and adherence to, prescribed conditions will mitigate direct impacts to cultural resources. Negative aspects of development deal mainly with secondary impacts. As more development takes place, more access to otherwise inaccessible areas is created. This will increase the potential of impacts to identified and unidentified cultural resources resulting in the likelihood of vandalism (Nickens, et al. 1981).

If the appropriate sequence of cultural resource management practices are followed during oil and gas development phases and for any ground-disturbing activity associated with oil and gas operations, major impacts to the cultural resources is unlikely.

Proposed Action Alternative

The use of a No Surface Occupancy stipulation in critical cultural resource areas in KRA and SJ/SMPA would limit potential impacts. Some cultural resources are subsurface and not easily recognized on the surface. Even with a Class III survey, it is likely that the cultural resources would not be discovered until construction activities begin.

Continuation of Present Management Alternative

The impacts to the cultural resources would be essentially the same as those described in the Proposed Action Alternative.

Standard Terms and Conditions Alternative

Under this alternative, cultural resources would be managed under the applicable laws which require that cultural resources be identified and an assessment of impacts be made prior to surface disturbance. As National Register eligible sites are discovered, impacts to them would be mitigated by avoidance or excavation and recordation.

The known sites listed in Chapter 3 CULTURAL RESOURCES would not be leased under this alternative since they may not be adequately protected under the standard provisions of section 6 of the oil and gas lease.

PALEONTOLOGY

All Alternatives

Oil and gas development could disturb surface exposure of geologic formations bearing fossils. This disturbance would be in the form of a direct impact, such as a drill pad excavation or from the increased accessibility of a fossil locality by the construction of an access road. In some rare cases, the surface exposure of a formation is the last remnant of that formation. In these cases, it may be desirable to protect significant fossils within this remnant formation from disturbance. In other cases, the fossils may be distributed throughout a massive formation, but the significance of the fossils requires protection of the entire formation. In most cases, preservation of individual outcrops is unimportant, either because of the lack of significance, the wide distribution, or the absence of fossils.

Existing law will protect significant fossils from adverse impacts by oil and gas development when the fossils are identified.

Under all alternatives, prior to approval of an APD, identified sites must either be proven to have no significant fossils or appropriate mitigative measures must be taken. For areas of 40 acres or less, mitigation would usually mean avoidance of the site. If a site could not be avoided and if the disturbed area is significant, it would have to be excavated or the resource otherwise protected. This protection is provided in the Standard Terms and Conditions of all oil and gas leases. Leases in areas designed for protection would also carry a No Surface Occupancy stipulation. This stipulation is used on all formally designated areas over 40 acres.

The small percent of unavoidable loss would be an irreversible and irretrievable commitment of the resource. The unavoidable loss is insignificant in relationship to the widespread distribution of the resource.

WILDERNESS

Proposed Action and Continuation of Present Management Alternatives

Impacts to wilderness could occur on WSAs that had leases issued prior to prohibitions against leasing in WSAs. It is considered unlikely that any development activity will occur on these leases.

Impacts to wilderness could also occur to WSAs and established wilderness areas if development activities were to take place on adjacent lands. Should development activities be proposed, the COAs would be utilized to minimize or prevent impairment of wilderness values.

Congressional designation of areas as wilderness will remove these areas from leasing as required by the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA). Areas that are not designated as wilderness will be leased on conformance with the decision made in the applicable Resource Management Plan.

Standard Lease Terms Alternative

The impacts of this alternative will be the same as described above until Congress designates wilderness areas in Colorado. Following designation, those areas not designated will all be open to leasing and development. Assuming that Congress designates those areas recommended by the

Secretary of the Interior, adverse impacts to wilderness values could occur to some of the areas not recommended. These values are the opportunity for solitude, naturalness, and primitive recreation.

In order to protect the United States from loss of revenues resulting from the drainage of oil and gas under lands closed to leasing (including wilderness), the Secretary of the Interior has authority to issue protective leases within the areas. These leases are only issued under the special circumstances of having an adjacent lease which drains the oil and/or gas from beneath the closed area. Protective leases would only be issued in designated wilderness and wilderness study areas with special leasing stipulations which preclude any surface or subsurface occupancy of the protective leases.

LANDS AND REALTY ACTIONS

All Alternatives

Lease development and production requires construction of roads to allow increased access to wells, treatment and storage facilities, and for the construction and maintenance of pipelines, electric power lines, and communication facilities. Electric power lines may be constructed to service wells (pumping equipment), tank batteries, communication, and production facilities. Numerous pipelines would be constructed to transport oil and gas from the wells to gathering stations and treatment facilities. Additional facilities may include storage yards, camp facilities, and airstrips.

Existing facilities may or may not be affected by lease development and production, depending on the location and placement of new oil and gas facilities. Linear-type facilities such as roads, pipelines, and power lines have the greatest potential to be impacted, primarily during construction, maintenance, and reclamation activities of new oil and gas facilities. Some examples of potential impacts are: (1) placement of a well pad may necessitate realignment of short segments of roads or power lines as a result of topography (narrow valleys, ridges); (2) pipeline construction across a road could cause damage to the road surface, possibly disrupting use of the road; (3) construction of a buried pipeline across an existing pipe could expose and possibly rupture the pipe causing a spill; and (4) road maintenance activities could expose and possibly rupture a buried pipeline. These impacts are rare and usually short term because compliance with construction and safety standards generally prevents such impacts, and damage is promptly repaired.

Placement of oil and gas related surface facilities, particularly the linear facilities such as roads, power lines and pipelines, could cumulatively tend to dominate the land use, especially in areas where these facilities are concentrated. This could tend to dictate location of future facilities as well as limit other authorized uses or users.

TRANSPORTATION

All Alternatives

New oil and gas drilling activity will result in construction of new access roads to the specific locations. When new oil or gas fields are discovered and developed, or existing fields are expanded, roads are usually constructed to each new site as needed.

On occasion, road development for oil and gas development results in improved vehicular access into an area whose resources are fragile and could be critically harmed by improved access by the general public. In these instances, BLM may require the lessee to install a locked gate to restrict access to administrative access (BLM and its licensees and permittees only). This may result in some negative reaction from the public, mainly recreationists, who previously were allowed primitive access into the area.

If a location proves to be a dry hole, the roadway would be closed and rehabilitated unless public benefit would be realized by leaving the road open for either public or administrative use. If roads are retained rather than rehabilitated, increased costs of road maintenance must be borne by the BLM. Even if maintained, these roads may fall to a lower standard. If the roads are not maintained, they may become unusable or contribute to soil displacement, loss of surface vegetation, and increased sediment due to runoff.

If a producing well is found, the road would be upgraded by providing proper drainage and/or resurfacing the road for all-weather use in order to provide year round well access. This road upgrading would provide drainage through waterbars or culverts, road ditching, and some spot gravel surfacing in soft areas.

BLM's road constructions standards are utilized in the designing of access roads to well locations. These standards have proven to be effective in the mitigation of erosion problems that could arise from improperly constructed roads.

SOCIAL AND ECONOMIC

All Alternatives

Glenwood Springs Resource Area

Projected oil and gas development in the GSRA indicates that, under all alternatives, 90 gas wells would be drilled in the next 20 years. Seventy-two would be drilled in the high potential area of central Garfield County and 18 in the rest of the Resource Area. An assumed success rate of 70 percent would eventually yield total annual production of 2.1 million mcf, equivalent to about 20 percent of the annual average during the 1980s.

The U.S. Forest Service (FS) economic input-output model (IMPLAN) of Colorado was used to estimate the indirect and induced economic impacts of oil and gas development in the Economic Study Area (ESA). The model uses a 1977 data base. Economic sectors were updated using 1982 employment/output and sales/output ratios. The data used by the economic model are not directly comparable with Bureau of Economic Analysis (BEA) statistics. For consistency, BEA statistics are used. Only employment multipliers are used from the state model.

Whether development occurred at an even rate of about five wells per year or all at once during a short period of time, economic impacts would be negligible. The activity required to drill five wells a year would sustain total employment of only five work years and total income of $153,000. Both figures are less than 1/10 of one percent of the 1987 numbers for Garfield County alone. Even if all 90 wells were drilled in one year, the resultant 94 work years and $2.7 million in annual income would amount to less than one percent of the 1987 Garfield County totals.

Most of the local impact would be felt in Mesa County and the greater part of total employment and income effects would be dispersed throughout the Rocky Mountain region, further diminishing the strength of the impacts. Certain businesses--motels, restaurants, local contractors, and service companies--would undoubtedly feel the benefits of increased local expenditures by drilling companies. However, the effect would not be sustained nor would it be consistent.

The total government revenue generated could eventually be sizeable but still not significant. Sixty-three producing wells (70 percent of the 90 drilled) would yield annually over $500,000 in federal royalties, about $175,000 in Colorado severance taxes and another $175,000 in local property taxes. The county's share of federal royalties, $135,000, combined with the property taxes of $175,000, would amount to 2.6 percent of Garfield County's total 1987 revenue.

Kremmling Resource Area

FS economic input-output model of Colorado was used to estimate the indirect and induced economic impacts of oil and gas development in the ESA. The model uses a 1977 data base. Economic sectors were updated using 1982 employment/output and sales/output ratios. The data used by the economic model are not directly comparable with BEA statistics. For consistency, BEA statistics are used. Only employment multipliers are used from the state model.

The economic analysis is based upon the assumption presented under the RFD section of this document. For the purpose of this analysis, we assumed that price would be "sufficient" to support development and exploration of 108 new wells over the next 20 years. In other words, the analysis assumes two scenarios: (1) 64 new wells will be operating by the year 2010 and an average of five wells are drilled per year, (2) the second scenario assumes 64 new wells by year 2010 and 108 wells are explored that year.

Since a Colorado State model was used and is not specific to the ESA, only an estimate can be made as to how much of the impact will occur in the ESA area. In most cases, the impact will be less than the total projected.

Oil and gas developments, as projected in the "Reasonable Foreseeable Development Assumptions," would not cause significant economic impacts to the region. Significant impacts are defined as changes in population, employment, and income greater than 10 percent.

Employment

Scenario (1). The labor force would expand by less than one percent in the ESA. This increase would not be a significant as defined above.

Scenario (2). The labor force would expand by not more than 2.4 percent in the ESA.

Income

No significant impact in either personal or labor income would occur.

Population

Table O-27 (Appendix O) presents population impacts.

Little Snake Resource Area

For the economic analysis, base projections were calculated for Routt and Moffat Counties, using the preceding activities selected from the Basic Activity System of the State of Colorado's Planning and Assessment System (PAS).

Use of the PAS affords a common base of methodology, data, and assumptions and still allows flexibility for local judgment. This system is, therefore, the basis of our methodology. Oil and gas development in northwest Colorado, as projected in the RFD, would not cause significant economic impacts to the region. Significant impacts are defined as changes in population, housing, income, infrastructure, etc., greater than 10 percent.

Development of oil and gas in the LSRA is and will continue to be a function of price. World crude oil price is the driving force behind supply and demand. For the purpose of this analysis, we will assume that price will be "sufficient" to support the development of 1,000 new wells over the next 20 years. The economic analysis is based upon the assumptions presented under the "Reasonably Foreseeable Development Assumptions" section of this document.

Employment

Expansion of the labor force by less than one percent would occur in both Routt and Moffat counties. The Routt County labor force would increase by 41 persons and Moffat by 143 through the year to 2000. This would not be a significant impact as defined above.

Income

No significant impacts in either personal or labor income would occur. Routt County would have both personal and labor income increases of less than one percent, while Moffat County would see a two percent increase in both personal and labor income.

Housing

Vacancy rates between 9 and 27 percent exist in communities in the region, indicating a housing surplus. Communities could absorb growth from 9 to 27 percent without significant impacts.

Population

An increased population of 76 persons in Routt County and 293 in Moffat County is expected as a result of development. Table O-28 (Appendix O) presents population impacts.

Northeast Planning Area

Impacts

Oil and gas production benefits local economies in several different ways:

a) Increased direct local employment with the company.

b) Increased local income and employment from:

1) Additional purchases from local businesses and contractors by the oil company.

2) Additional purchases from local businesses by company employees.

c) Increased tax base from:

1) Fifty percent of all royalties and public land rentals are redistributed to the county involved, Colorado Water Conservation Board, and Public School Fund.

2) Increased property tax revenues.

The extent of these benefits vary. Initial exploration leads to a temporary income benefit to the community. If a discovery is made, these effects are more lasting. Possible negative impacts on a local community are primarily increased demand on local infrastructures brought about by new employees and business activities. None of the alternatives would have a significant income effect on the area if 238 wells were drilled over 20 years.

None of the alternatives will lead to significant population changes in the NPA. It is estimated that the urban Front Range would have greater than four additional jobs created for every $1,000,000 of oil and gas produced. This includes the oil and gas employees, company operations, and other employment from expenditures in the area. In contrast, oil and gas activity on the rural Eastern Plains would probably generate less than four jobs per $1,000,000 locally (although it would be greater if spin-off jobs in urban areas were included). In either case, anticipated effects are expected to be minimal.

There will be no significant differences between the three alternatives in royalty revenue to the federal, state, and local governments, or in the personal income generated. (Approximately 121 producing wells will be drilled on federal minerals in 20 years.)

San Juan/San Miguel Planning Area

FS economic input-output model of Colorado was used to estimate the indirect and induced economic impacts of oil and gas development in the ESA. The model uses a 1977 data base. Economic sectors were updated using 1982 employment/output and sales/output ratios. The data used by the economic model are not directly comparable with BEA statistics. For consistency, BEA statistics are used. Only employment multipliers are used from the state model.

The economic analysis is based upon the assumptions presented under the RFD section of this document. For the purpose of this analysis, we assumed that price would be "sufficient" to support development and exploration of 353 new wells over the next 20 years. In other words, the analysis assumes two scenarios for each alternative. (1) At most 150 new wells will be operating by the year 2010 and an average of 18 wells are drilled per year. (2) The second scenario assumes 150 new wells by year 2010 and 353 wells are explored in one year. (However, this magnitude of exploration is unlikely to occur in one year.)

Since a Colorado State model was used and is not specific to the ESA, only an estimate can be made as to how much of the impact will occur in the ESA area. In most cases the impact will be less than the total projected.

Oil and gas developments, as projected in the Reasonable Foreseeable Development Assumptions would not cause significant economic impacts to the region. Significant impacts are defined as changes in population, employment, and income greater than 10 percent.

Employment

Scenario (1) The labor force would expand by less than one percent in the ESA. This increase would not be a significant impact as defined above.

Scenario (2) The labor force would expand by not more than 2.4 percent in the ESA.

Income

No significant impacts in either personal or labor income would occur.

Population

Tables O-29 to O-31 present population impacts for all the alternatives.

TABLE 4-1. SPECIAL MANAGEMENT AREAS--LEASE RESTRICTIONS

NAME	DESIGNATION	LEASE RESTRICTIONS
GSRA		
Thompson Creek	ACEC	NSO
Bull Gulch	ACEC	NSO
Deep Creek	ACEC	NSO
Blue Hill	ACEC	NSO
Debris Hazard	ACEC	NSO
Lower Colorado River	ACEC	NSO
KRA		
Ammonite Site	ACEC	NSO
Phacelia Site	ACEC	NSO
LSRA		
Irish Canyon	ACEC	Avoidance Stipulation
Lookout Mountain	ACEC	Avoidance Stipulation
Cross Mountain Canyon	ACEC	NSO
Limestone Ridge	ACEC/RNA	NSO
SJ/SMPA		
Anasazi Cultural Multiple Use Area	ACEC	Avoidance Stipulation
Bull Canyon Rockshelter		NSO
Tabeguache Pueblo		NSO
Cahone Canyon		NSO
Cross Canyon		NSO
Squaw/Papoose Canyon		NSO
Painted Hand Ruin		NSO
Easter Ruin		NSO
Seven Towers Ruin Group		NSO
Lighting Tree Tower Group		NSO
McLean Basin Towers		NSO
Lowery Ruins & Associations		NSO
Dominguez-Escalante Ruins		NSO
Dolores Cave		NSO
Indian Henry's Cabin		NSO
Battle Rock		NSO
Resource Protection Zone for Hovenweep National Monument		NSO
Painted Hand Petroglyphs		NSO
Hovenweep Canyon		NSO
East Cortez		NSO
Goodman Canyon and Goodman Point Buffer Zones		NSO
Bass Ruin Complex		NSO
Sandstone Canyon		NSO
Brewer Well Complex		NSO
Yellow Jacket Canyon		NSO
Basin Wickiup Village		NSO
Woods Canyon		NSO
Bridge Canyon		NSO
Ansell Hall Pueblo		NSO
Upper Ruin Canyon		NSO
Bowdish Canyon		NSO
Sand and East Rock CanyonACEC		NSO
Cannonball Ruin	ACEC	NSO
McElmo	RNA	NSO
Tabeguache Creek	ONA	NSO

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

Recreation, cultural, riparian, paleontological, sensitive plant, and scenic values, and hazardous areas would be protected on the 13 Areas of Critical Environmental Concern (ACECs) discussed in Chapter 3 and listed on Table 4-1.

Proposed Action Alternative

This alternative would protect areas of special concern from injurious effects of oil and gas development through the use of No Surface Occupancy (NSO) and/or surface restriction stipulations.

The lease restrictions shown in Table 4-1 are the most restrictive of the mitigative measures prescribed under the Proposed Action Alternative. These restrictions are described in more detail in the RMP/EIS for each special area. The RMP/EIS also describes alternative mitigative measures under changed conditions, such as stipulation waivers or exemptions, or legislative changes (some ACECs may be managed as wilderness upon Congressional designation).

Continuation of Present Management Alternative

This alternative would protect Areas of Critical Environmental Concern through the use of No Surface Occupancy stipulations on oil and gas leasing.

Standard Terms and Conditions Alternative

This alternative would protect the Areas of Special Environmental Concern through the use of No Leasing.

MINERALS

All Alternatives

Oil and Gas

The RFD projects that as many as 1,753 new wells could be drilled throughout the Study Area. The most favorable conditions for exploration and development of oil and gas would be with as few restrictions as possible.

Oil and gas lessees face numerous environmental obligations in order to comply with applicable laws and regulations. These are incorporated into the lease form (Section 6) and require that oil and gas development must occur in a manner which provides reasonable protection for other energy and mineral resources (coal, fluid minerals, locatable minerals, mineral materials, and non-energy leasable minerals); environmental resources (air, soil, water, vegetation, and visual resources); renewable resources (fish and wildlife habitat, forests and woodlands, livestock grazing, and wild horses); and land-use resources (cultural resources, natural areas, recreation, rights-of-way, and wilderness). Discretionary lease stipulations for mitigation of disturbance to environmental resources, energy and mineral resources (other than oil and gas), renewable resources, land-use resources, and support services brings about even greater impacts to oil and gas development. These restrictions can be seasonal restrictions, avoidance stipulations, performance standards, No Surface Occupancy stipulations, or no new leasing.

Application of standard lease terms would not result in any significant irretrievable, or unavoidable impacts to oil and gas. No discretionary lease stipulations have been identified for the protection of other minerals.

The designation of WSAs as wilderness would result in impacts to oil and gas ranging from the loss of some rental income to the irreversible and irretrievable losses of oil and gas resources and the associated royalty income. The magnitude of the loss would depend on the resources available in the particular WSA.

When combining the numerous forms of leasing restrictions or discretionary mitigation with the myriad of resources, it is evident that the Proposed Action and Continuation of Present Management Alternatives would have an adverse impact on oil and gas development. Drilling costs would increase as a result of directional drilling requirements in avoidance or NSO areas. Seasonal restrictions could result in access times being too short for effective exploration and development programs. Performance standards could also increase the cost of exploration and drilling. The cumulative impact of lease restrictions could hinder or prevent oil and gas development in certain locations. In light of this, oil and gas development would be least impacted by allowing lessees to operate under the standard lease terms along with any nondiscretionary mitigation that is currently in effect. This would allow for a more simplified and comprehensive development of oil and gas resources while still promoting the protection of other resources. It should be noted that

any discretionary mitigation decided upon in this document would apply only to new leases and not to existing leases.

Any energy and mineral resources or freshwater zones encountered in the wellbore require additional plugs, cement, and casing for adequate protection. With respect to some minerals, such as oil shale, special protective measures are required in known mineral areas. (See description of drilling operations in Appendix A.)

The leasing and production of oil, natural gas, coal-bed methane, and carbon dioxide reserves would result in irreversible and irretrievable losses of the resources that are extracted and the resources that would remain in the ground as unrecoverable. The extent of these impacts would vary greatly depending on particular reservoirs and development methods.

Other Minerals

Required mitigation embodied in Section 6 of the standard lease terms and further defined in the Code of Federal Regulations will protect other minerals penetrated by oil and gas wellbores (see description of drilling operations in the Exploratory Drilling section, Appendix A). This mitigation is enforced through review and COAs which monitor and adjust locations, cementing, and plugging programs in order to protect these resources. These actions are taken on APDs, Sundry Notices, and Rights-of-Way approvals.

The location of oil and gas wells is determined at APD approval. Conflicts between other minerals and oil and gas development and rights-of-way would be alleviated through standard lease terms or through negotiation between operators. The recovery of coal may be reduced in oil and gas areas. Coal mines are required to leave a protective pillar of coal around any wells that are drilled in the mining area. The amount of unrecoverable coal, therefore, depends on the number of wells drilled within the mining zone. As development continues, specific conflicts will become evident. The BLM manager will have to decide whether to forgo coal leases or to defer oil and gas leasing until the coal is mined. No significant short-term or long-term cumulative impacts are expected to occur under any of the three alternatives.

Potential coal/oil and gas conflict areas include the Sand Wash Basin margin and along the Axial Basin Anticline in the LSRA, the northern San Juan Basin margin in the San Juan Resource Area, the Piceance Basin side of the Grand Hogback in the GSRA, and North Park in the KRA.

CUMULATIVE IMPACTS

This section describes the overall, or cumulative, direct or indirect impacts to the various environmental components. In some instances, there are no differences in impacts between the various alternatives. When this occurs, the cumulative impacts of the Proposed Action Alternative will be presented.

Climate and Air Quality

No impacts will occur.

Vegetation

The impacts to vegetation are considered insignificant. The loss over a 20-year period are projected to be 19,200 acres, which is 1/2 of one percent of all the BLM lands in the Study Area.

Livestock

The impacts would be disturbance by human activity which would result in a slightly lower calf crop and slight weight loss. A minor loss (less than 1/2 of one percent) of forage would also result from surface disturbance.

Wildlife

Proposed Action and Continuation of Present Management Alternatives

The impacts on big game consist of temporary loss of forage (1/2 of one percent) and minor amounts of disturbance due to human presence. None of these impacts are considered significant over the 20-year study period. No significant impacts are projected for the upland game bird populations. Raptors subjected to temporary disturbance during nesting periods could be subjected to minor losses to the general population. Nongame wildlife would not be subjected to any significant impacts. Riparian and wetland areas are protected by stipulations and COAs, and therefore, will not be

subjected to any significant impacts. All threatened and endangered species are covered by laws and regulations that protect them from any significant impacts.

Standard Terms and Conditions Alternative

Big game will be subjected to disturbance by human activity during portions of their calving, fawning, and critical winter seasons. New roads into previously isolated areas will cause loss of habitat and cause more disturbance during critical seasons. Disturbance to upland game birds and raptors during the critical seasons will result in significant impacts. Prairie dog colonies (larger than 40 acres) will not be well protected and could have significant impacts on black-footed ferret habitat. Significant impacts are more probable with this alternative than the others.

WILD HORSES

Human disturbance would have short-term significant impact to the horses. Loss of winter forage is possible but it is not considered significant.

SOILS

The annual amount of soils disturbed (960 acres) would not result in any significant impacts. Minor amounts of soil erosion will occur. Strict adherence to COAs and performance standards are necessary to prevent highly significant amounts of fragile soil erosion. These protections would not be provided under the Standard Terms and Conditions Alternative and the high erosion rates would occur.

WATER

Short-term increases in sediment and salinity would be insignificant. The long term sediment and salinity increases would be minor and directly associated with active well sites and roads.

FORESTRY

No significant impacts.

RECREATION

The impacts on recreation are considered short term and insignificant. They consist mainly of intrusion into the area by human activity and a small increase in vehicular traffic.

VISUAL

The majority of the impacts would be insignificant and short-term. Full field development could result in significant long-term impacts.

CULTURAL

The increased possibility of vandalism resulting from increased access is significant. Beneficial impacts from increased oil and gas activity includes cultural resources such as increased surveys, data collection, and analysis.

PALEONTOLOGY

No significant impacts.

WILDERNESS

No significant impacts.

LANDS AND REALTY ACTIONS

No significant impacts.

TRANSPORTATION

No significant impacts.

SOCIAL AND ECONOMIC

No significant impacts.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

ACECs that consist of large cultural sites could sustain significant impacts over the long term due to increased access and general recreation uses.

MINERALS

Oil and Gas

Exploration and development costs will be higher under the Proposed Action and Continuation of Present Management Alternatives than with the Standard Terms and Conditions. These extra costs are not considered to be significant and will not reduce the total effort by the industry.

Other Minerals

Minor amounts of coal would be lost when oil or gas wells are drilled through coal seams. The amount of coal lost due to protective pillars around the wells and required mining configurations to accommodate the wells is not quantifiable.

Cumulative Impacts

The Standard Terms and Conditions Alternative will cause more impacts than either the Proposed Action or the Continuation of Present Management Alternatives.

Implementation of the Standard Terms and Conditions Alternative will result in significant impacts to all forms of wildlife during critical seasons. The oil and gas industry will be subject to less constraints and the operating costs will be less. This could result in shorter time frames in their development programs. Significantly higher erosion rates are possible in fragile soil due to less constraints. None of the impacts defined above would occur under the Proposed Action or Continuation of Present Management Alternatives.

CHAPTER FIVE

CONSULTATION AND COORDINATION

CHAPTER FIVE

CONSULTATION AND COORDINATION

INTRODUCTION

The various Resource Area Offices coordinated with neighboring agencies, concerned groups, and industry representatives. The U.S. Forest Service and Colorado Division of Wildlife were the two primary agencies that had direct input into the consultation and coordination process. Appendix N contains the letters that were sent to the U.S. Forest Service as a part of the process.

The EIS scoping process section of Chapter 1 of this EIS contains a summary of the public scoping process used by the BLM on this effort.

CHAPTER SIX

LIST OF PREPARERS

CHAPTER SIX

LIST OF PREPARERS

The following list displays the various individuals who have contributed to this EIS, their home office, and field of expertise.

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CHAPTER SEVEN

ACRONYMS/ GLOSSARY

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ACRONYMS/GLOSSARY

ACRONYMS

ACEC	Area of Critical Environmental Concern
ACMP	Areas of Critical Mineral Potential
AIRFA	American Indian Religious Freedom Act
APD	Application for Permit to Drill
AQRV	Air Quality Related Values
AUM	Animal Unit Month
BCF	Billion Cubic Feet
BLM	Bureau of Land Management
BO	Barrels of oil
Btu	Heat Output
CDOW	Colorado Division of Wildlife
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CNAP	Colorado Natural Areas Program
COA	Condition of Approval
CSU	Controlled Surface Use
DAP	Dolores Archaeological Project
DAU	Data Analysis Unit
DEIS	Draft Environmental Impact Statement
DOE	Department of Energy
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERMA	Extensive Recreation Management Area
ESA	Economic Study Area
FLPMA	Federal Land Policy and Management Act
FOOGLRA	Federal Onshore Oil and Gas Leasing Act of 1987
GSRA	Glenwood Springs Resource Area
IHICS	Integrated Habitat Inventory and Classification System
KRA	Kremmling Resource Area
KRCRA	Known Recoverable Coal Resource Area
LSRA	Little Snake Resource Area
LSRMP	Little Snake Resource Management Plan
MCF	1,000 cubic feet
NEPA	National Environmental Policy Act
NERA	Northeast Resource Area
NOI	Notice of Intent
NPA	Northeast Planning Area
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NTL	Notice to Lessees
NWCCOG	Northwest Colorado Council of Governments
NWPS	National Wilderness Preservation System
OHV	Off-Highway Vehicles
ONA	Outstanding Natural Area
PA	Plan Amendment
PAS	Planning and Assessment System
POD	Potential of Development
PSD	Prevention of Significant Deterioration
PV	Prospectively valuable
R&PP	Recreation and Public Purposes Act
RFD	Reasonably Foreseeable Development
RMP	Resource Management Plan
RNA	Research Natural Area
ROW	Right-of-Way
SCS	Soil Conservation Service
SJRA	San Juan Resource Area
SJ/SMPA	San Juan/San Miguel Planning Area
SRMA	Special Recreation Management Area
SSF	Soil Surface Factor
T&E	Threatened and Endangered
TDS	Total Dissolved Soils
TSP	Total Suspended Particulates
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USLE	Universal Soil Loss Equation
VRM	Visual Resource Management
WRIS	Wildlife Resource Information System
WSA	Wilderness Study Area

CHAPTER SEVEN

GLOSSARY

ABANDONMENT. Abandonment is plugging a well, removal of installations, and termination of operations for production from a well. Conclusively, abandoned unpatented oil placer mining claims are subject to conversion into a noncompetitive oil and gas lease pursuant to the Federal Oil and Gas Royalty Management Act of 1982 (30 U.S.C. 188(f)).

AIR QUALITY CLASSES. Classifications established under the Prevention of Significant Deterioration portion of the Clean Air Act which limits the amount of air pollution considered significant within an area. Class I applies to areas where almost any change in air quality would be significant; Class II applies to areas where the deterioration normally accompanying moderate well-controlled growth would be permitted; and Class III applies to areas where industrial deterioration would generally be allowed.

ALLUVIAL SOIL. A soil developing from recently deposited alluvium and exhibiting essentially no horizon development or modification of the recently deposited materials.

ALLUVIUM. Clay, silt, sand, gravel, or other rock materials transported by flowing water. Deposited in comparatively recent geologic time as sorted or semi-sorted sediment in riverbeds, estuaries, floodplains, lakes and shores, and in fans at the base of mountain slopes.

ANIMAL UNIT MONTH (AUM). The amount of forage necessary to sustain one cow and one calf or its equivalent for one month.

ANTICLINE. A fold, generally convex upward, whose core contains the stratigraphically older rocks.

APPLICATION. A written request, petition, or offer to lease lands for the purpose of oil and gas exploration and/or the right of extraction.

AQUATIC. Living or growing in or on the water.

AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC). An area established through the planning process as provided in FLPMA where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values; or to fish and wildlife resources or other natural systems or processes; or to protect life and afford safety from natural hazards.

BASIN. (a) A depressed area with no surface outlet. (b) A low are in the Earth's crust, of tectonic origin, in which the sediments have accumulated.

BIG GAME. Larger species of wildlife that are hunted, such as elk, deer, bighorn sheep, and pronghorn antelope.

CANDIDATE SPECIES. Any species not yet officially listed but which are undergoing a status review or are proposed for listing according to *Federal Register* notices published by the Secretary of the Interior or the Secretary of Commerce.

CONDITION OF APPROVAL (COA). Conditions or provisions (requirements) under which an Application for a Permit to Drill or a Sundry Notice is approved.

CONTROLLED SURFACE USE (CSU). Use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational constrains that may modify the lease rights. CSU is used for operating guidance, not as a substitute for the NSO or Timing stipulations.

CRUCIAL HABITAT. A biological feature, that if lost, would adversely affect the species.

CULTURAL RESOURCES. Those fragile and non-renewable remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were of importance in human events.

CULTURAL RESOURCES INVENTORY CLASSES.

CLASS I. An existing data survey. This is an inventory of a study area to (1) provide a narrative overview of cultural resources by using existing information, and (2) compile existing cultural resources site record data on which to base the development of the BLM's site record system.

CLASS II. A sampling field inventory designed to locate, from surface and exposed profile indications, all cultural resource sites within a portion of an area so that an estimate can be made of the cultural resources for the entire area.

CLASS III. An intensive field inventory designed to locate, from surface and exposed profile indications, all cultural resource sites in an area. Upon its completion, no further cultural resources inventory work is normally needed.

CUMULATIVE IMPACTS. The collective and aggregate impacts of all actions affecting a particular resource.

DIASTROPHISM. A general term for all movement of the crust produced by tectonic processes, including the formation of ocean basins, continents, plateaus, and mountain ranges.

DIRECTIONAL DRILLING. Drilling borehole wherein course of hole is planned before drilling. Such holes are usually drilled with rotary equipment at an angle to the vertical and are useful in avoiding obstacles or in reaching side areas or mineral estate beneath restricted surface.

DIVERSITY. The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area.

EASEMENT. Right afforded a person or agency to make limited use of another's real property for access or other purposes.

ENDANGERED SPECIES. Any species which is in danger of extinction throughout all or a significant portion of its range.

ENVIRONMENTAL ASSESSMENT (EA). A concise public document prepared to provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact. It includes a brief discussion of the need for the proposal, alternatives considered, environmental impact of the proposed action and alternatives, and a list of agencies and individuals consulted.

ENVIRONMENTAL IMPACT STATEMENT (EIS). A formal public document prepared to analyze the impacts on the environment of a proposed project or action and released for comment and review. An EIS must meet the requirements of NEPA, CEQ guidelines, and directives of the agency responsible for the proposed project or action.

EXCEPTION. Case-by-case exemption from a lease stipulation. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria applies.

FACIES. The aspect, appearance, and characteristics of a rock unit, usually reflecting the conditions of its origin; esp. as differentiating the unit from adjacent or associated units.

FAULT. A fracture or zone of fractures along which there has been displacement of the sides relative to one another parallel to the fracture.

FEDERAL LAND POLICY AND MANAGEMENT ACT OF 1976 (FLPMA). Public Law 94-579 signed by the President on October 21, 1976. Establishes public land policy for management of lands administered by the Bureau of Land Management. FLPMA specifies several key directions for the Bureau, notably (1) management be on the basis of multiple-use and sustained yield, (2) land use plans be prepared to guide management actions, (3) public lands be managed for the protection, development, and enhancement of resources, (4) public lands be retained in federal ownership, and (5) public participation be utilized in reaching management decisions.

FOLD. A curve or bend of a planar structure such as rock strata, bedding planes, foliation, or cleavage. A fold is usually a product of deformation, although its definition is descriptive and not of genetic and may include primary structures.

FORAGE. All browse and herbaceous foods that are available to grazing animals.

FOREST MANAGEMENT. The application of business methods and technical forestry principles to the operation of a forest property.

FORMATION. A body of rock identifies by lithic characteristics and stratigraphic position; it is prevailingly but not necessarily tabular, and is mappable at the Earth's surface or traceable in the subsurface (NACSN, 1983, Art. 24).

FOSSIL. The remains or traces of an organisms or assemblage of organisms which have been preserved by natural processes in the earth's crust exclusive of organisms which have been buried since the beginning of historic time. Minerals, such a soil and gas, coal, oil shale, bitumen, lignite, asphaltum, and tar sands, phosphate, limestone, diatomaceous earth, uranium and vanadium, while they may be of biologic origin, are not here considered "fossils." Fossils of scientific value may occur within or in association with such materials.

FRAGILE SOIL. A soil that is especially vulnerable to erosion or deterioration due to its physical characteristics and/or location. Disturbance to the surface or the vegetative cover can initiate a rapid cycle of loss and destruction of the soil material, structure, and ability to sustain a biotic community.

GEOPHYSICS. Study of the Earth by quantitative physical methods.

GRANITE WASH TRAP. Granite wash is a sandstone formed by weathered granite basement rock. Granite is composed of coarse, sand-size crystals that weather to from a sandstone covering the flanks of buried granite mountains and hills. Source rocks occur deeper, along the flanks.

GRAZING SYSTEM. Scheduled grazing use and non-use of an allotment to reach identified goals or objectives by improving the quality and quantity of vegetation.

GROUNDCOVER. The area of ground surface occupied by the stem(s) of a range plant, as contrasted with the full spread of its herbage or foliage, generally measured at one inch above soil level.

GROWING SEASON. Generally, the period of the year during which the temperature of vegetation remains sufficiently high to allow plant growth.

HABITAT. A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

HYDROCARBON. Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

IGNEOUS. Said of a rock or mineral that solidified from molten or partly molten material.

IMPACT. The effect, influence, alteration, or imprint caused by an action.

INTERMONTAINE. Situated between or surrounded by mountains, mountain ranges, or mountainous regions.

INVERTEBRATE. An animal lacking a backbone or spinal column.

KNOWN GEOLOGIC STRUCTURES (KGS). A trap in which an accumulation of oil and gas has been discovered by drilling and which is determined to be productive. Its limits include all acreage that is presumptively productive (43 CFR 3100.0-5(a)).

LAND TREATMENT. All methods of artificial range improvement and soil stabilization such as reseeding, brush control (chemical and mechanical), pitting, furrowing, water spreading, etc.

LEASABLE MINERAL. Oil, gas, sodium, potassium, phosphate, coal, oil shale, tar sands, and asphaltic materials.

LEASE. A contract in legal form that provides for the right to develop and produce oil and gas resources for a specific period of time under certain agreed-upon terms and conditions.

LEASE NOTICE. Provides more detailed information concerning limitations that already exist in law, lease terms, regulations, or operational orders. A Lease Notice also addresses special items the lessee would consider when planning operations, but does not impose new or additional restrictions.

LEASE STIPULATIONS. Additional specific terms and conditions that change the manner in which operation may be conducted on a lease, or modify the lease rights granted.

LEASEABLE MINERALS. Those minerals or materials designated as leaseable under the Mineral Leasing Act of 1920. They include coal, phosphate, asphalt, sulphur, potassium and sodium minerals, and oil and gas. Geothermal resources are also leaseable under the Geothermal Steam Act of 1970.

LOCATABLE MINERALS. Minerals or materials subject to claim and development under the Mining Law of 1872, as amended. Generally includes metallic minerals such as gold and silver, and other materials not subject to lease or sale (some bentonites, limestone, talc, some zeolites, etc.).

LOCATION. Perfecting the right to a mining claim by discovery of a valuable mineral, monumenting the corners, completing discovery work, posting a notice of location, and recording the claim.

LONG-TERM. Long-term impacts would occur over a 20-year period.

MINERAL ENTRY. Claiming public lands (administered by the BLM) under the Mining Law of 1872 for the purpose of exploiting minerals. May also refer to mineral exploration and development under the mineral leasing laws and the Material Sale Act of 1947.

MINERAL ESTATE (MINERAL RIGHTS). The ownership of minerals, including rights necessary for access, exploration, development, mining, ore dressing, and transportation operations.

MINERAL MATERIALS. Common varieties of sand, building stone, gravel, clay, moss rock, etc., obtainable under the Minerals Act of 1947, as amended.

MINING LAW OF 1872. Provides for claiming and gaining title to locatable minerals on public lands. Also referred to as the "General Mining Laws" or "Mining Laws."

MITIGATION. Alleviation or lessening of possible adverse effects on a resource by applying appropriate protective measures or adequate scientific study.

MODIFICATION. Fundamental change to the provisions of a lease stipulation, either temporarily or for the term of the lease. A modification may, therefore, include an exemption from or alteration to a stipulated requirement. Depending on the specific modification, the stipulation may or may not apply to all other sites within the leasehold to which the restrictive criteria applied.

MONOCLINE. A geologic structure in which the strata are all inclined in the same direction at a uniform angle of dip.

MULTIPLE-USE. Management of the various surface and subsurface resources so that they are jointly utilized in the manner that will best meet the present and future needs of the public, without permanent impairment of the productivity of the land or the quality of the environment.

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA). Public Law 91-190. Establishes environmental policy for the nation. Among other items, NEPA requires federal agencies to consider environmental values in decision-making processes.

NATIONAL REGISTER OF HISTORIC PLACES (NATIONAL REGISTER, NRHP). A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance, established by the Historic Preservation Act of 1966 and maintained by the National Park Service.

NO SURFACE DISTURBANCE. Defined on a case-by-case basis when the activity plan for an area is developed. In general, an activity would be allowed so long as it does not interfere with the management objectives of the area.

NO SURFACE OCCUPANCY (NSO). A fluid mineral leasing stipulation that prohibits occupancy or disturbance on all or part of the lease surface in order to protect special values or uses. Lessees may exploit the oil and gas or geothermal resources under leases restricted by this stipulation through use of directional drilling from sites outside the no surface occupancy area.

NOTICE TO LESSEES (NTL). A written notice issued by the Authorized Officer. These notices implement regulation and operating orders, and serve as instructions on specific item(s) of importance within a State, District, or Area.

OFF-HIGHWAY VEHICLE (OHV). Any motorized vehicle capable of or designed for travel on or immediately over land, water, or other natural terrain.

OFF-ROAD VEHICLE DESIGNATIONS.

CLOSED. Designated areas and trails where the use of off-road vehicles is permanently or temporarily prohibited. Emergency use of vehicles is allowed.

LIMITED. Designated areas and trails where the use of off-road vehicles is subject to restrictions such as limiting the number or types of vehicles allowed, dates and times of use (seasonal restrictions), limiting use to existing roads and trails, or limiting use to designated roads and trails. Under the designated roads and trails designation, use would be allowed only on roads and trails that are signed for use. Combinations of restrictions, such as limiting use to certain types of vehicles during certain times of the year, are possible.

OPEN. Designated areas and trails where off-road vehicles may be operated (subject to operating regulations and vehicle standards set forth in BLM Manuals 8341 and 8343).

ONLAP. An overlap characterized by the regular and progressive pinching out, toward the margins or shores of a depositional basin, of the sedimentary units within a conformable sequence of rocks, in which the boundary of each unit is transgressed by the next overlying unit and each unit in turn terminates farther from the point of reference.

ONLAP SANDS TRAP. Onlap sands are beach sands that were deposited on an unconformity surface as sea level rose. Numerous buttress sand can occur along a single unconformity and each can from a pool.

OVERSTORY. That portion of a plant community consisting of the taller plants on the site; the forest or woodland canopy.

PALEONTOLOGICAL RESOURCE. A site containing non-human life of past geological periods, usually in the form of fossil remains.

PATENT. A grant made to an individual or group conveying fee simple title to selected public lands.

PATENTED CLAIM. A claim on which title has passed from the federal government to the mining claimant under the Mining Law of 1872.

PLANNING AREA. The geographical area for which land use and resource management plans are developed and maintained.

PRIMITIVE. Areas that are almost completely free of management controls lying more than three miles from the nearest point of motor vehicle access, unmodified landscapes and little evidence of other people.

PUBLIC LAND. Any land and interest in land (outside of Alaska) owned by the United States and administered by the Secretary of the Interior through the Bureau of Land Management (BLM).

RAPTOR. Bird of prey with sharp talons and strongly curved beaks, e.g. hawks, owls, vultures, eagles.

RECLAMATION. Returning disturbed lands to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

RECREATION AND PUBLIC PURPOSES ACT (R&PP). This Act authorizes the Secretary of the Interior to lease or convey public lands for recreational and public purposes under specified conditions to states or their political subdivisions, and to nonprofit corporations and associations.

RESOURCE AREA. A geographic portion of a BLM District that is the smallest administrative subdivision in the BLM.

RESOURCE MANAGEMENT PLAN (RMP). A land use plan that establishes land use allocations, multiple-use guidelines, and management objectives for a given planning area. The RMP planning system has been used by the BLM since about 1980.

RIPARIAN. Situated on or pertaining to the bank of a river, stream, or other body of water. Normally describes plants of all types that grow rooted in the water table or subirrigation zone of streams, ponds, and springs.

RIPARIAN/AQUATIC SYSTEM. Interacting system between aquatic and terrestrial situations. Identified by a stream channel and distinctive vegetation that requires or tolerates free or unbound water.

RIPARIAN ZONE. An area encompassing riparian and adjacent vegetation.

ROADLESS. Refers to the absence of roads that have been constructed and maintained by mechanical means to ensure regular and continuous use.

ROADS. Vehicle routes which have been improved and maintained by mechanical means to ensure relatively regular and continuous use. (A way maintained strictly by the passage of vehicles does not constitute a road.)

SALINITY. Refers to the solids such as sodium chloride (table salt) and alkali metals that are dissolved in water. Often in non-saltwater areas, total dissolved solids is used as an equivalent.

SCOPING PROCESS. An early and open public participation process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.

SEDIMENT YIELD. The amount of sediment produced in a watershed, expressed as tons, acre-feet, or cubic yards of sediment per unit of drainage area per year.

SEMIPRIMITIVE. Areas that have very few management controls lying between 1/2 mile and three miles from the nearest point of motor vehicle access, excepting four-wheel drive roads and trails, with mostly natural landscapes and some evidences of other people.

SENSITIVE SPECIES. A species included on the sensitive species list developed by the Colorado State Office pursuant to section CL of Instruction Memorandum No. 80-722 and approved by the State Director.

SEVERE WINTER RANGE. An area where 90 percent of the animals are located when the annual snowpack is at its maximum in the two worst winters out of ten.

SHEET EROSION. The removal of a fairly uniform layer of soil from the land surface by runoff water.

SHORT-TIME. In this document, refers to the 10- to 12-year life of the plan. Short-term impacts would occur within that time period.

SHUT-IN. An oil or gas well that is capable of production but is temporarily not producing.

SPECIAL RECREATION MANAGEMENT AREA (SRMA). An area that possesses outstanding recreation resources or where recreation use causes significant user conflicts, visitor safety problems, or resource damage.

SPLIT ESTATE. Lands where the owner of the mineral rights and the surface owner are not the same party in interest. The most common split estate is Federal ownership of mineral rights and other interest ownership of the surface. Where such a condition occurs, the Federal Government can lease the oil and gas rights without surface owner consent.

STIPULATION. A provision that modifies standard lease rights and is attached to and made a part of the lease.

STREAMBANK (and CHANNEL) EROSION. The removal, transport, deposition, recutting, and bed load movement of material in streams by concentrated water flows.

STUDY AREA. Refers to all the Resource Areas and Planning Areas covered in this EIS collectively.

SUITABILITY. As used in the Wilderness Act and in the Federal Land Policy and Management Act refers to a recommendation by the Secretary of Interior or the Secretary of Agriculture that certain federal lands satisfy the definition of wilderness in the Wilderness Act and have been found appropriate for designation as wilderness on the basis of an analysis of the existing and potential uses of the land.

SUNDRY NOTICE. Standard form to notify or approve well operations subsequent to Application for Permit to Drill, in accordance with BLM regulations.

SUPPLEMENTAL VALUES. Resources associated with wilderness which contribute to the quality of wilderness areas.

SURFACE MANAGEMENT AGENCY. Any agency outside of the Department of the Interior with jurisdiction over the surface overlying federally owned minerals.

SUSTAINED YIELD. The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple-use.

SYNCLINE. A fold of which the core contains the stratigraphically younger rocks; it is generally concave upward.

TECTONICS. A branch of geology dealing with the broad architecture of the outer part of the Earth, that is the regional assembling of structural or deformational features, a study of their mutual relations, origin, and historical evolution.

TERRESTRIAL. Living or growing in or on the land.

THREATENED SPECIES. Any species or significant population of that species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Usually includes only those species that have been recognized and listed as threatened by federal and state governments, but may include species categorized as rare, very rare, or depleted.

THRUST FAULT. A fault with a dip of 45 degrees or less over much of its extent, on which the hanging wall (overlying side) appears to have moved upward relative to the footwall (underlying side).

TIMBER. Standing trees, downed trees, or logs which are capable of being measured in board feet.

TIMING LIMITATION (SEASONAL RESTRICTION). Prohibits surface use during specified time periods to protect identified resource values. The stipulation does not apply to the operation and maintenance of production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.

TOTAL DISSOLVED SOLIDS (TDS). Salt, or an aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts.

TRAP-Any barrier to the upward movement of oil or gas, allowing either or both to accumulate. A trap includes a reservoir rock and an overlying or updip impermeable roof rock; the contact between these is concave as viewed from below. See also: definitions of types of stratigraphic traps below.

TRESPASS. Any unauthorized use of public land.

UNCONFORMITY. A substantial break or gap in the geologic record where a rock unit is overlain by another that is not next in stratigraphic succession, such as an interruption in the continuity of a depositional sequence of sedimentary rocks or a break between eroded igneous rocks and younger sedimentary strata.

UNDERSTORY. That portion of a plant community growing underneath the taller plants on the site.

UNIVERSAL SOIL LOSS EQUATION (USLE). A formula for predicting soil loss resulting from sheet and rill erosion caused by rainfall.

UPDIP PINCH OUT OF SANDSTONE TRAP. An updip pinch of wedge out of a sandstone in shale forms a trap. These are common in coastal plains where updip is landward. They tend to be small traps. If uplift caused dip, the trap type is combination.

UTILIZATION. The proportion of current year's forage production that was consumed or destroyed by grazing animals; usually expressed as a percentage.

VALID EXISTING RIGHTS. Legal interests that attach to a land or mineral estate that cannot be divested from the estate until that interest expires or is relinquished.

VANDALISM. Willful or malicious destruction or defacement of public property; e.g., cultural or paleontological resources.

VEGETATION MANIPULATION. Planned alteration of vegetation communities through use of prescribed fire, plowing, herbicide spraying, or other means to gain desired changes in forage availability, wildlife cover, etc.

VEGETATION TYPE. A plant community with immediately distinguishable characteristics based upon and named after the apparent dominant plant species.

VERTEBRATE. An animal having a backbone or spinal column.

VISUAL RESOURCES. The visible physical features on a landscape, (topography, water, vegetation, animals, structures, and other features) that comprise the scenery of the area.

VISUAL RESOURCE MANAGEMENT (VRM). The inventory and planning actions taken to identify visual resource values and to establish objectives for managing those values, and the management actions taken to achieve the visual resource management objectives.

VISUAL RESOURCE MANAGEMENT CLASSES. VRM classes identify the degree of acceptable visual change within a particular landscape. A classification is assigned to public lands based on the guidelines established for scenic quality, visual sensitivity, and visibility.

VRM CLASS I. This classification preserves the existing characteristic landscape and allows for natural ecological changes only. Includes Congressionally authorized areas (wilderness) and areas approved through the RMP where landscape modification activities should be restricted.

VRM CLASS II. This classification retains the existing characteristic landscape. The level of change in any of the basic landscape elements due (form, line, color, texture) to management activities should be low and not evident.

VRM CLASS III. This classification partially retains the existing characteristic landscape. The level of change in any of the basic landscape elements due to management activities may be moderate and evident.

VRM CLASS IV. This classification provides for major modifications of the characteristic landscape. The level of change in the basic landscape elements due to management activities can be high. Such activities may dominate the landscape and be the major focus of viewer attention.

VRM CLASS V. This classification applies to areas where the characteristic landscape has been so disturbed that rehabilitation is needed. Generally considered an interim short-term classification until rehabilitation or enhancement is completed.

VISUAL SENSITIVITY. Visual sensitivity levels are a measure of public concern for scenic quality and existing or proposed visual change.

WAIVER. Permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

WILDERNESS. An area formally designated by Congress as a part of the National Wilderness Preservation System.

WILDERNESS CHARACTERISTICS. Identified by Congress in the Wilderness Act of 1964; namely, size, naturalness, outstanding opportunities for solitude or a primitive and unconfined type of recreation, and supplemental values such as geological, archaeological, historical, ecological, scenic, or other features.

WILDERNESS INVENTORY. An evaluation of the public land in the form of a written description and a map showing those lands that meet the wilderness criteria as established under Section 603(a) of FLPMA and Section 2(c) of the Wilderness Act. The lands meeting the criteria will be referred to as WSAs.

WILDERNESS MANAGEMENT POLICY. Policy document prescribing the general objectives, policies, and specific activity guidance applicable to all designated BLM wilderness areas. Specific management objectives, requirements, and decisions implementing administrative practices and visitor activities in individual wilderness areas are developed and described in the wilderness management plan for each unit.

WILDERNESS STUDY AREA (WSA). An area determined to have wilderness characteristics. Wilderness study areas will be subject to interdisciplinary analysis through BLM land use planning system and public comment to determine wilderness suitability. Suitable areas will be recommended to the President and Congress for designation as wilderness.

WITHDRAWAL. An action which restricts the use of public land and segregates the land from the operation of some or all of the public land and mineral laws. Withdrawals are also used to transfer jurisdiction of management of public lands to other federal agencies.

CHAPTER EIGHT

REFERENCES

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REFERENCES

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APPENDIX A

PROPOSED ACTION

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Oil and Gas Exploration and Development

Oil and gas exploration and development activities progress through five phases that are, in part, sequential and may overlap in time: preliminary exploration, exploratory drilling, development, production, and abandonment. Leases are obtained before the second phase (exploratory drilling).

Preliminary Exploration

Petroleum exploration occurs in unexplored portions of areas where petroleum is known or thought to occur in commercial quantities. An area where petroleum is thought to occur in commercial quantities is known as a frontier or rank wildcat area. With declining known oil and gas supplies, it has become profitable to explore for oil and gas in less promising geological provinces and in areas where the climate, terrain, depth of deposits, and other obstacles have discouraged previous efforts. Increasingly sophisticated exploration techniques, improved oil and gas drilling, and transportation technologies have also enhanced prospects for locating, extracting, and marketing petroleum resources.

Geological Exploration

Where the bedrock geology of an area is well exposed, it is often possible to predict where oil might gather. The potential traps (anticlines, faults, or formations with varying porosity) can sometimes be located with the aid of published geologic maps, aerial photos, and landsat imagery. Occasionally, additional data will be gathered by aircraft. Low altitude reconnaissance flights, frequently at elevations of 100 to 500 feet, help identify rock outcrops that can be studied later on the ground. Next, one or more geologists may examine and sample the rock outcrops in the area and map the surface geology. Geological exploration can be performed with little surface damage; four-wheel drive pickups, motorcycles, or all terrain vehicles can be used to cover the area.

Geophysical Exploration

Subsurface geology is not always accurately indicated by surface outcroppings. In such cases, geophysical prospecting is used. Three subsurface characteristics are measured by geophysical methods including gravitational field, magnetic field, and seismic characteristics.

Gravitational and magnetic surveys involve small portable units which are easily transported via light ground vehicles such as four-wheel drive pickups and jeeps or aircraft. Off-road vehicle traffic is common in these two types of surveys. Sometimes, small holes (approximately one inch by two inches by two inches) are hand dug for instrument placement along the survey lines.

Seismic surveys are the most popular of the geophysical methods and seem to give the most reliable results. A seismic survey is a method of gathering subsurface geological information by recording impulses from an artificially-generated shock wave. The common procedure used in seismic surveys on land consists of creating shock waves and recording, as a function of time, the resultant seismic energy as it arrives at groups of vibration detectors (one-half to five pound seismometers, or "jugs" arrayed on the ground at spaced intervals). These arrays of seismometers are connected to a recorder truck that receives and records the reflected seismic energy.

The seismic sensors and energy source are located along lines on a one to two mile grid. Surveys may be laid out in excess of 40 miles in a series of grid patterns or in a single line.

Where possible, existing roads are used to conduct seismic operations. Some lines may require clearing of vegetation and loose rock to improve access for trucks. Each mile of line, cleared to a width of eight to fourteen

feet, represents disturbance of about one acre. Completely clearing a seismic line is unusual. Most lines which run where no roads exist are not bladed except at wash crossings. Vehicles travel over land with a bulldozer towing them through rough spots or in sandy areas.

In remote areas where there is little known subsurface data, a series of short seismic lines may be required to determine the characteristics of the subsurface formations. After this, seismic lines would be aligned to make seismic interpretations more accurate. Although alignment may be fairly critical, spacing of the lines can often be changed up to a quarter of a mile on a one-mile grid before the results will affect the investigation program. This allows some adjustment for existing or alternate access of lines.

Seismic methods are usually referred to by the various methods of generating the shock wave. The following are some of the more common methods.

The thumper method involves dropping a steel slab weighing about three tons to the ground several times in succession along a predetermined line. The weight is attached by cables to a crane on a special truck.

The vibrator method is widely used and is replacing the explosive method in accessible areas. A typical operation would use three or four large trucks or tractors, each equipped with a vibrator mounted between the front and back wheels, four or five support vehicles, and a crew of ten to fifteen people.

The vibrator pads (about four feet square) are lowered to the ground and vibrators on all trucks are triggered electronically from a recording truck. After the information is recorded, the trucks move forward a short distance and the process is repeated.

The spark ignition method can be used with a variety of vehicles. It consists of a bell-shaped chamber mounted underneath a vehicle. The seismic energy is imparted to the ground through the spark ignition of a propane and oxygen mixture confined in the chamber. This method causes little surface damage.

The above referenced methods have similar surface-disturbing factors in common. Generally, the methods involve travel either on existing roads or off-road with four to five energy source trucks (usually weighing two and one-half to ten tons) plus the recording truck and cable trucks or pickups. Bulldozer assistance may be required, depending on soil conditions. The vehicles may travel off-road along a single two lane trail made by the trucks as the survey progresses. The vehicles may make several parallel trails in an attempt to distribute travel loads over a broader area. Travel along the line (trails) is usually a matter of one to two passes by the vehicle since the energy source is mobile and recording is done as the vehicles move down the line.

Historically, explosives have been the most widely used way to generate seismic shock waves. Subsurface and surface explosives are used.

In the subsurface explosive method, five to fifty pounds of explosive charge are detonated at the bottom of a twenty-five to two-hundred foot drill hole. The hole is usually two to six inches in diameter and drilled with a truck-mounted drill. Access suitable to the travel of drill and recording trucks across the surface is desirable. Detonation of the charge in some areas causes no surface disturbance, while in other areas, a small crater up to six feet in diameter is created. Cuttings from the well are normally hauled to a suitable disposal site, scattered by hand near the "shot hole," or put back in the shot hole afterwards. Bentonite mud is often used to plug the shot hole. The same hole may be reloaded and shot several times to find the depth and charge returning the best signal.

Drilling and shooting is similar to vibrators and thumpers since the drill is transported by truck. However, the trucks used in drilling are usually heavier (15 to 20 tons). As with other truck transported operations, existing roads may be used or trails may be blazed by the drill vehicles and/or a bulldozer. A truck-mounted drill and shot operation generally takes longer to complete and requires more trips by vehicles along a line (drill service equipment) than do vibrator and thumper operations.

Where access limitations, topography, or other restraints prevent use of truck-mounted drill rigs or recording trucks, light weight

portable drill equipment can be used. Various kinds of portable drills can be backpacked or delivered by helicopter to the area. These portable operations use a pattern of holes drilled to a depth of about 25 feet. The holes are loaded with explosives and detonated simultaneously.

The surface explosive charge method involves the placing of explosives directly on ground, on snow, or on a variety of stakes and platforms. Paper cones, survey stakes, lathes, or 2 x 4s up to eight feet in length have been used with varying success in different areas. Use of tall stakes or explosives placed on the surface of deep snow results in good seismic data in some areas, while creating little visible surface disturbance.

Surface explosive methods are very mobile. Generally, 4x4 vehicles are used for transportation, although the method is adaptable to airborne and pack teams.

A given area may be explored several times by the same or different companies over a long period of time. Multiple exploration is undertaken because first attempts were unsuccessful, another company wants its own information, or new, or different techniques and/or equipment are used.

Exploratory Drilling

Drilling does not begin until a lease has been acquired by the operator. When preliminary investigations are favorable and warrant further exploration, exploratory drilling may be justified. Stratigraphic tests and wildcat tests are the two types of exploratory drill holes.

"Strat" tests involve drilling relatively shallow holes to supplement seismic data. These tests aid in revealing the nature of near-surface structural features. The holes are usually from 100 to several thousand feet deep, and are drilled primarily by rotary drill rigs. As the rock is drilled, the resulting rock chips are brought to the surface by a high-pressure airflow or circulating drilling mud. Samples of these chips are collected, bagged, and identified as to depth of origin. They are then studied by a geologist to determine such data as rock type, age, and formation.

Truck-mounted drilling equipment for strat tests is fairly mobile; therefore, roads and trails to test sites on level solid ground are temporary and involve minimal construction. In hilly or mountainous areas, more road building is necessary.

Generally, access roads are bladed 12 to 14 feet wide and are not crowned or ditched. Some roads may simply be surface scraped; i.e., vegetation is clipped off next to the soil surface. Other roads may require cuts in excess of 20 feet and fills exceeding ten feet. Strat tests requiring a large amount of construction (i.e., several acres of cut and fill described previously) are unusual since construction costs may outweigh the information gained.

A space of about one-half acre or less is leveled and cleared of vegetation for the average drill site. If high pressure air is used to remove rock chips or rock cuttings, rock dust may be emitted to the air when samples are not being collected. If mud is used as a drilling fluid, mud pits may be dug; more commonly, portable mud tanks are used. Usually one to three days are required to drill the test holes, depending on depth to and hardness of the bedrock. In areas with shallow, high-pressure, water bearing zones, casing may be required to keep water out of the hole.

After the surface and subsurface geological studies, the subsurface geological studies, the seismic, and other geophysical surveys, comes the evaluation of the prospect. Only by drilling a wildcat well (a well drilled in unproved territory) will the oil company know if the rocks in the prospect they have identified contain oil or gas.

Nationally, about one in 16 wildcat wells produces significant amounts of oil or gas. Locally success ratios may be as high as one in ten.

The deeper wells may require several months or more to complete; shallower wells up to a few thousand feet deep may be completed in a little as a few weeks. As a general rule, the deeper the test, the larger the drilling rig and facilities required.

Prior to approval for drilling, on-site inspections are conducted with the proposed drill pad and access road staked out, to assess

potential impacts and attach appropriate mitigative conditions to the permit to drill. A drill "pad" (well site) from one to four acres in size is then cleared of all vegetation, and leveled for the drill rig, mud pumps, mud (or reserve) pit, generators, pipe rack, and tool house. Topsoil and native vegetation is usually removed and stockpiled for use in the reclamation process. The mud pit may be lined with plastic or bentonite to prevent fluid loss or prevent contamination of water resources. Other facilities such as storage tanks for water and fuel are located on the pad or are positioned nearby on a separate cleared area. If the well site is not large enough for the equipment required to rig-up (prepare the drilling rig for operation), a separate staging area may be constructed. Staging areas are usually no larger than 200 feet by 200 feet and may simply be a wide flat spot along the access road on which vehicles and equipment are parked.

Five thousand to 15,000 gallons of water a day may be needed for mixing drilling mud, cleaning equipment, cooling engines, etc. A surface pipeline may be laid to a stream or a water well, or the water may be trucked to the site from ponds or streams in the area.

The rigs are very large and may be moved in pieces. In some instances, rigs can be moved short distances on level terrain with little or no dismantling of equipment which will shorten the tearing-down and rigging-up time. Moving a dismantled rig involves use of heavy trucking equipment for transportation, and crews to erect the rig. Gross weight of vehicles may run in excess of 80,000 lbs.

In order to move a drill rig and well service equipment from one site to another, and to allow access to each site, temporary roads may be built. These roads are generally 16 feet to 18 feet wide (driving surface) and may be as short as 200 feet or as long as ten miles or more. Bulldozers, graders, and other types of heavy equipment are used to construct and maintain temporary wildcat roads.

The start of a well is called "spudding in." A short piece of tubing called conductor pipe is forced into the ground (sometimes with a piledriver), and cemented in place. This keeps surface sand and dirt from sloughing into the well hole. Next the regular drill bit and drill string (the column of drill pipe) take over. These pass vertically through a heavy steel turntable (the rotary table) on the derrick floor and the conductor pipe. The rotary table is geared to one or more engines, and rotates the drill string and bit. As the bit bores deeper into the earth, the drill string is lengthened by adding more pipe to the upper end.

Once the hole reaches a depth of several hundred feet, another string of pipe (the surface casing), is set inside the conductor pipe and cemented in place by pumping cement between the casing and hole wall. Surface casing acts as a safety device to protect freshwater zones (aquifers) from drilling fluid contamination. To prevent the well from "blowing out" in the event the drill bit hits a high pressure zone, "blowout preventors" (large metal rams) are installed around the surface casing just below the derrick floor. These rams will close around, crushing the drill string and sealing the well in the event of a blowout.

After setting the surface casing, drilling resumes using a smaller diameter bit. Depending on well conditions, additional strings of casings (intermediate casing) may be run (installed) before the well reaches the objective depth (total depth or "T.D.").

During drilling, a mixture of water, clay, and chemical additives known as "mud" are continuously pumped down the drill pipe. It exits through holes in the bit and returns to the surface outside the drill pipe. As the mud circulates, it cleans and cools the bit and carries the rock chips (cuttings) to the surface. It also helps to seal off the sides of the hole (thus preventing cave-ins), and to control the pressure of any water, gas, or oil encountered by the drill bit.

The mud is the first line of defense against at possible blow-out since it is used to control pressure. It is for this reason that a pit full of "reserve" mud (the reserve pit) is maintained on location. The reserve mud is used in emergencies to restore the proper drilling environment when radical or unexpected changes in down-hole pressure is encountered.

The cuttings are separated from the mud and sampled so that geologists can note and analyze (log) the various strata through which

the bit is passing. The rest of the cuttings pass into the reserve pit as waste. Some holes are drilled at least partially with compressed air which serves the same purpose as drilling mud of cooling and cleaning the bit and evacuating the cuttings from the hole.

During or at completion of drilling activity, the well is logged. Logging means measuring with geophysical instruments the physical characteristics of the rock formations and associated fluids through which the borehole passed. These instruments are lowered to the bottom of the well, and slowly raised to the surface while recording data. Other measuring procedures include the drill stem test, in which pressures are recorded and fluid samples taken from zones of interest. After studying the data from those logs and tests, the geologist and/or petroleum engineer decide if the well will produce petroleum.

If the well did not encounter oil and gas, it is plugged with cement and abandoned. The well pad and access road are recontoured and revegetated.

If the well will produce, casing is run to the producing zone and cemented in place. A proper cementing of the production casing string is required to provide coverage and prevent interzonal communication between oil and gas horizons and usable water zones. The drill rig is usually replaced by a smaller rig that is used for the final phase of completing the well.

Development

If a wildcat well becomes a discovery well (a well that yields commercial quantities of oil or gas), development wells will be drilled to confirm the discovery, to establish the extent of the field, and to efficiently drain the reservoir. The procedures for drilling development wells are about the same as for wildcats, except there is usually less subsurface sampling, testing, and evaluation. If formation pressure can raise oil to the surface, the well will be completed as a flowing well. Several downhole acid or fracture treatments to enhance the formation permeability may be necessary to make the well flow. A free-flowing well is simply closed off with an assembly of valves, pipes, and fittings (called a Christmas tree) to control the flow of oil and gas to other production facilities. A gas well may be flared for a short period to measure the amount of gas per day the well can produce, then shut in or connected to a gas pipeline.

If the well is not free-flowing, it will be necessary to use artificial lift (pump) methods. These are explained, along with well production equipment and procedures, in the following section on production. After a pump is installed, the well may be tested for days or months to see if it is economically justifiable to produce the well and to drill additional development wells. During this phase, more detailed seismic work may be run to assist in precisely locating the petroleum reservoir and to improve previous seismic work.

As with wildcat wells, field development well locations will be surveyed. A well spacing pattern must be established by the state, with concurrence of the BLM.

Oil well spacing for production from federal leases is usually a minimum of 40 acres. Most gas well spacing for production from federal leases uses units of 160, 320, and 640 acres per well. Spacing for both oil and gas wells is based on the characteristics of the producing formation. If a field is producing from more than one formation, the surface location of the wells may be much closer than one per 40 acres. Once well spacing has been approved, development of the lease proceeds.

During the development stage, the road system of the area is greatly expanded. Once it is known which wells produce and their potential productive life, a permanent road system can be designed and built. Because it often takes several years to develop a field and determine field boundaries, the permanent road system is usually built in segments. Since the roads in an expanding and developing field are built in segments, many temporary roads (built initially for wildcats or development) end up as long term (in excess of 15 years) main access or haul roads. The planning of temporary roads for wildcats and development wells is done with road conversion to long term in mind.

Since development wells have longer life spans than wildcat wells, access roads for development wells are better planned,

designed, and constructed. Access roads are normally limited to one main route to serve the lease areas, with a maintained side road to each well. Upgrading of temporary roads may include ditching, draining, installing culverts, graveling, crowning, or capping the roadbed. The amount of surface area needed for roads would be similar to that for temporary roads mentioned earlier, and would also be dependent on topography and loads to be transported over it. Generally, main access roads are 20 feet to 24 feet wide and side roads are 14 feet to 18 feet wide. These dimensions are for the driving surface of the road and not the maximum surface disturbance associated with ditches, back cuts, or fills. The difference in disturbance is simply a matter of topography. Surface disturbance in excess of 130 feet is not unusual in steep terrain (slopes exceeding 30 percent).

When an oil field is developed on the current minimum spacing pattern of 40 acres per well, the wells are 1,320 feet apart in both north-south and east-west directions. If a section (one square mile) is developed with 16 wells, at least four miles of access roads are built. In mountainous terrain,the length of access roads may be increased since steep slopes, deep canyons, and unstable soil areas must often be circumvented in order to construct stable access to the wells.

Surface use in a gas field may be similar to an oil field (though usually less) even though the spacing of wells is usually 160 acres. Though a 160 acre spacing requires only four wells per section, the associated pipeline system often has similar initial surface requirements (acreage of surface disturbance).

In addition to roads, other surface uses for development drilling may include flowlines; storage tank batteries; facilities to separate oil, gas and water (separators and treaters); and injection wells for salt water disposal. Some of the facilities may be installed at each producing well site, and others at places situated to serve several wells. These facilities are discussed more in the following production section.

Surface use in an oil and gas field may be affected by unitization of the leaseholds. In many areas with federal lands, an exploratory unit is formed before a wildcat is drilled. The boundary of the unit is based on geologic data. The developers unitize the field by entering into an agreement to develop and generate it as a unit, without regard to separate ownerships. Costs and benefits are allocated according to agreed terms.

Unitization reduces the surface-use requirements because all wells are operated as though on a single lease. Duplication of field processing facilities is minimized because development operations are planned and conducted by a single unit operator, often resulting in fewer wells.

The rate of development well drilling depends on whether the field is operated on an individual lease basis or unitized, the probability of profitable production, the availability of drilling equipment, protective drilling requirements (drilling requirements to protect federal land from subsurface petroleum drainage by off-setting nonfederal wells), and the degree to which limits of the field are known. The most important development rate factor may be the quantity of production. If the discovery well has a high rate of production and substantial reserves, development drilling usually proceeds at a fairly rapid pace. If there is some question whether reserves are sufficient to warrant additional wells, development drilling may occur at a much slower pace. An evaluation period to observe production performance may follow between the drilling of successive wells.

Development on an individual lease basis usually proceeds more rapidly than under unitization, since each lessee must drill his own well to obtain production from the field. On a unitized basis, however, all owners within the participating area share in a well's production regardless of whose lease the well is on. Spacing requirements are not applicable to unit wells. The unit is developed on whatever the operator considers to be the optimal spacing pattern to maximize recovery.

As mentioned earlier, drilling in an undeveloped part of a lease to prevent drainage of petroleum to an offset well on an adjoining lease (protective drilling) is frequently required in fields of intermingled federal and privately owned land. The terms of federal leases require such drilling if the

offset well is on nonfederal lands, or on federal lands leased at a lower royalty rate.

Many fields go through several development phases. A field may be considered fully developed and produce for several years, then a well may be drilled to a deeper pay zone. Discovery of a new pay zone in an existing field is a "pool" discovery, as distinguished from a new field discovery. A pool discovery may lead to the drilling of additional wells--often from the same drilling pad as existing wells--with the boreholes separated only by feet or inches. Existing wells may also be drilled deeper.

Usually four to six inch diameter pipelines transport the petroleum between the well, the treating and separating facilities, and central collection points. These lines can be on the surface, buried, or elevated. Most pipelines in the Planning Areas are buried.

Trucking and pipelining are the two methods used separately or in conjunction to transport oil out of a lease or unitized area. Trucking is used to transport crude oil from small fields where installation of pipelines is not economical and the natural gas in the field is not economically marketable. It is not practical to truck natural gas.

Pipelines are the most common way to transport oil and gas. If a field has substantial amounts of natural gas, separate pipelines will be necessary for oil and gas. Pipelines move the oil from gathering stations to refineries. As existing fields increase production or new fields begin production, new pipelines may be needed. These new lines usually vary in size from four to 16 inches in diameter, and range in length from a few miles to tie into an existing pipeline, to hundreds of miles to supply a refinery. Construction of a pipeline requires excavating and hauling equipment, a temporary and/or permanent road, possibly pumping stations, clearing the right-of-way of vegetation, and possibly blasting.

Natural gas pipelines transport gas from the wells (gathering or flow lines) to a trunk line then to the main transmission line from the area. Flow lines are usually two inches to four inches in diameter and may or may not be buried. Trunk lines are generally six inches to eight inches in diameter and are buried, as are transmission lines which vary in diameter from ten inches to 36 inches. The area required to construct a pipeline varies from about 15 inches wide (for a two inch to four inch surface line) to greater than 75 feet for the larger diameter transmission lines (24 inches to 36 inches). Surface disturbance is primarily dependent on size of the line and topography of the area on which the line is being constructed.

Compressor stations may be necessary to increase production pressure to the same level as pipeline pressure. The stations vary in size from approximately one acre to as much as twenty acres for a very large compressor system.

Construction techniques for natural gas lines are similar to those used for oil pipelines.

Production

Production in an oil field begins just after the discovery well is completed and is usually concurrent with development operations. Temporary facilities may be used at first, but as development proceeds and reservoir limits are determined, permanent facilities are installed. The extent of such facilities is dictated by the number of producing wells, expected production, volume of gas and water produced with the oil, the number of leases, and whether the field is to be developed on a unitized basis.

The primary means of removing oil from a well in the Planning Areas is by pumping jacks (familiar horsehead devices). The pumps are powered by electric motors (power lines required) or if there is sufficient casinghead gas (natural gas produced with the pumped oil), or another gas source is available, it may be used to fuel internal combustion engines.

Some wells drilled in the area produce sufficient water that must be disposed of during the operation of the well. Although most produced waters are brackish to highly saline, some are fresh enough for beneficial use. If water is to be discharged, it must meet certain water quality standards. Because water may not come from the treating and separating facilities completely free of oil, oil skimmer pits may be established between separating facilities and surface discharge.

When salt water is disposed of underground, it is always introduced into a formation containing water of equal or poorer quality. It may be injected into the producing zone from which it came or into other producing zones. In some cases, it could reduce the field's productivity and may be prohibited by state regulation or mutual agreement of operators. In some fields, dry holes or depleted producing wells are used for salt water disposal, but occasionally new wells are drilled for disposal purposes. Cement is squeezed between the casing and sides of the well to prevent the salt water from migrating up or down from the injection zone into other formations.

Underground oil is under pressure in practically all reservoirs. This pressure is usually transmitted to the oil through gas or water in the reservoir with the oil. When oil is pumped out of the well, pressure is reduced in the reservoir around the drill hole. This allows the gas or water in the reservoir to push more oil into the space next to the well. A reservoir that has mostly gas pushing the oil is called "gas drive," and one that has mostly water pushing the oil is called "water drive." Oil that is recovered under these natural pressures is considered primary production. Primary production accounts for about 25 percent of the oil in a reservoir.

Methods of increasing recovery from reservoirs generally involve pumping additional water or gas into the reservoir to maintain or increase the reservoir pressure. This process is called secondary recovery. Recently, the trend has been to institute secondary recovery processes very early in the development of a field. Surface disturbance from a water flooding recovery system is similar to drilling and development of an oil and gas well itself, i.e., a drill pad and access road are constructed and water pipelines may be built. Surface use is increased substantially since as many as four injection wells may be used for each oil well in the field (there are many different patterns as well as many other methods of secondary recovery).

Tertiary recovery methods increase recovery rates by lowering the viscosity of the oil either by heating it or by injecting chemicals into the reservoir so that the oil flows more easily. Heating of reservoir oil can be accomplished by injecting steam into the reservoir. Tertiary recovery methods are not yet widely used in this area. By the year 2000, ultimate recovery (including secondary and tertiary recovery) from any given oil reservoir is expected to average 40 percent nationally.

Crude oil is usually transferred from the wells to tank storage facilities (a tank battery) before it is transported from the lease. If it contains gas and water, they are separated before the oil is stored in the tank battery. The treating and separating facilities are usually located at a storage tank battery on or near the well site.

After the oil, gas, and water are separated, the oil is piped to storage tanks located on or near the lease. There are normally at least two tanks; so that one tank can be filling as the contents of the other are measured, sold, and transported. The number and size of tanks vary with the rate of production on the lease, and with the extent of automation in gauging the volume and sampling the quality of the tank's contents.

Abandonment

The life span of fields varies because of the unique characteristics of any given field. Reserves, reservoir characteristics, the nature of the petroleum, subsurface geology, and political, economic, and environmental constraints all affect a field's life span from discovery to abandonment. The life of a typical field is 15 to 25 years. Abandonment of individual wells may start early in a field's life and reach a maximum when the field is depleted.

Well plugging and abandonment requirements vary with the rock formations, subsurface water, well site, and the well. In all cases, all formations bearing useable-quality water, oil, gas, or geothermal resources, and/or prospectively valuable deposits of minerals will be protected. Generally, in a dry (never produced) well, the hole below the casing is filled with heavy drilling mud, a cement plug is installed at bottom of the casing, the casing is filled with heavy mud, and a cement cap is installed on top. A pipe monument giving the location, lease number, operator, and name of the well is required unless waived by the Authorized Officer. If waived, the casing may be cut off and capped below ground level. Protection

of aquifers and known oil and gas producing formations may require placement of additional cement plugs.

In some cases, wells that formerly produced are plugged as soon as they are depleted. In others cases, depleted wells are not plugged immediately but are allowed to stand idle for possible later use in a secondary recovery program. Truck-mounted equipment is used to plug former producing wells. In addition to the measures required for a dry hole, plugging of a depleted producing well requires a cement plug in the perforated section in the producing zone. If the casing is salvaged, a cement plug is put across the casing stub. The cement pumpjack foundations are removed or buried below ground level. Surface flow and injection lines are removed, but buried pipelines are usually left in place and plugged at intervals as a safety measure.

After plugging, the drilling rig is removed and the surface, including the reserve mud pit, is restored to the requirements of the surface management agency. This may involve the use of dozers and graders to recontour those disturbed areas associated with the drill pad plus the access road to the particular pad. The reserve pit (the part of the mud pit in which a reserve supply of drilling fluid and/or water is stored) must be evaporated or pumped dry, and filled with soil material stockpiled where the site was prepared. There will be little leakage if the pit was lined with plastic or bentonite. The area will be reshaped to a useful layout that will allow revegetation to take place, restore the landform as near as possible to its original contour, and minimize erosion. After grading the subsoil and spreading the stockpiled topsoil, the site is seeded with a grass mixture that will establish a good growth. A fence may be erected to protect the site until revegetation is complete, particularly in livestock concentration areas.

APPENDIX B

POTENTIAL OF DEVELOPMENT

APPENDIX B

POTENTIAL OF DEVELOPMENT

Assumptions for the Potential of Development (POD) consist of average disturbances, projected number of wells, and total acres disturbed. The tables below display these assumptions for the five Planning Areas.

Miscellaneous acres include off-site facilities such as tank batteries, camp facilities, gathering stations, air strips, and helicopter pads.

The acreages shown in Table B-1 are derived from the following average dimensions for roads and transmission lines.

The total number of acres that will be disturbed over the life of the plan is derived by using the number of new wells forecasted and the average number of acres disturbed per well. Table B-3 displays the total acreage disturbed during an average year and Table B-4 displays the total acreage disturbed over the life of the plan (20 years).

TABLE B-1. AVERAGE DISTURBANCES (ACRES)

	Drill Pad	Roads	Transmission Lines	Misc.
Glenwood Springs	1.5	4	5.5	100
Kremmling	2	8	8	100
Little Snake	2	8	12	250
Northeast	2	1	0.5	100
San Juan/San Miguel	1.6	1.5	0.9	10

TABLE B-2. AVERAGE DIMENSIONS FOR ROADS AND TRANSMISSION LINES

	ROADS		TRANSMISSION LINES	
	length(mi)	width(ft)	length(mi)	width(ft)
Glenwood Springs	1	30	1	45
Kremmling	2	30	2	30
Little Snake	2	30	2	50
Northeast	0.25	30	0.25	20
San Juan/San Miguel	0.5	25	0.5	15

TABLE B-3. MAXIMUM ACREAGE DISTURBED AT ANY GIVEN YEAR

	Glenwood Springs	Kremmling	Little Snake	Northeast	San Juan/ San Miguel
Area 1	0	0	50	0	0
Area 2	5.5	57	100	2	16
Area 3	13.8	16	260	3	120
Area 4	59.5	1,090	8,388	40	272
Misc.	0	5	12.5	5	0.9
Total	78.8	1,168	8,760.5	50	408.9
Reclaimed	25	429			1,004

TABLE B-4. TOTAL ACREAGE DISTURBED (20 YEARS)

	Glenwood Springs	Kremmling	Little Snake	Northeast	San Juan/ San Miguel
Area 1	0	0	50	6	0
Area 2	55	232	100	9	52
Area 3	110	64	462	120	400
Area 4	671	1,296	15,254	40	960
Misc.	0	100	250	15	18
Total	836	1,692	16,116	145	1,430

OIL AND GAS POTENTIAL AND REASONABLE FORESEEABLE DEVELOPMENT OF THE GLENWOOD SPRINGS RESOURCE AREA

INTRODUCTION

The Glenwood Springs Resource Area (GSRA) is situated within both the Piceance and Eagle structural basins (Figure 1). The Eagle basin is a structurally complex Pennsylvanian-age depositional basin that is located east of the southern Piceance basin (Peterson and Hite 1969). The Piceance basin is an asymmetrical kidney shaped basin that is bounded on the east by the Grand Hogback and separated from the Eagle basin by the White River uplift. The basin is deepest on the east where it is estimated to contain over 20,000 feet of Phanerozoic sediments.

PROSPECTIVELY VALUABLE FOR OIL AND GAS

Land classified as prospectively valuable (PV) for oil and gas is based on criteria described in Appendix a. PV lands for oil and gas in the GSRA are shown in Figure 2 and generally include lands that have a minimum of 1,000 feet of sedimentary rock, favorable structural setting, and minimum evidence of potential for the occurrence of oil and gas. Areas not designated as PV are rated as having no potential.

OIL AND GAS POTENTIAL

Oil and gas potential rating criteria is described in Appendix b and is the basis for the ratings described below. In general, areas defined by the USGS as a play have a high potential for oil and gas.

Eagle Basin

The Eagle Basin is stratigraphically similar to the Paradox basin of the four-corners region to the southwest. However, the oil and gas potential is quite different when the tectonic and thermal histories are compared (Spencer and Wilson 1988). The oil potential is considered to be low based on the paleogeothermal and oil generation studies conducted by Nuccio and Schenk (1986). They found that most of the Paleozoic rocks within the basin have a very high thermal maturity and concluded that oil generated would have been either escaped or be found in late Paleozoic or Jurassic reservoirs. That information, coupled with the basin stratigraphy and structure, lack of large areas of younger source rocks, and drilling history are the basis for the medium potential rating.

Piceance Basin

Two conventional and two unconventional gas plays are present within the Piceance basin portion of the GSRA. The conventional plays are the Uinta-Piceance Upper Cretaceous and Uinta-Piceance Tertiary gas plays, while the unconventional gas plays are Piceance basin tight gas sands and Cretaceous coal bed methane (Figures 3-6).

Figure 3 is an oil and gas potential map for the conventional Upper Cretaceous gas play. As can be seen, the entire Piceance basin portion, from the Grand Hogback west, has a high potential; while the remainder of the Resource Area has no potential.

The conventional Tertiary gas play is illustrated in Figure 4. High potential occurs within the play boundary. A medium potential is assigned to those lands within the Piceance basin defined by the contact between the Wasatch Formation and underlying Mesaverde Group. The remainder of the Resource Area has no potential owing to the absence of Tertiary Wasatch sediments.

The area designed by the Federal Energy Regulatory Commission eligible for tight gas production price incentives is shown in Figure 5. This designation is for gas produced from the lower Mesaverde Group marginal-marine sandstone. This area has a high potential, while the remainder of the Piceance basin within the Resource Area has a medium potential.

Coal bed methane resources of the southern Piceance basin has been studied extensively (Choate, Jurich, and Saulnier 1984; Johnson and Nuccio 1986; Rightmire and Choate 1986). Areas rated as having low through high potentials for coal bed methane production are shown in Figure 6. The remainder of the Resource Area is rated as having no potential (Figure 7). The low through high potential area is based on

criteria developed by Choate, Jurich, and Saulnier (1986), and is described in their article.

OIL AND GAS ACTIVITY

Historical Background:

Several dry holes were drilled in the Resource Area prior to the 1950s, however, gas exploration and development accelerated through the 1950s, peaked during 1959 through 1961, 1980 through 1982, and again in 1985 to the present (Table 1; Figure 8). The present activity is due to Barrett Resources Company's exploration and development of the Parachute and Grand Valley fields in Garfield County.

All production has been from nine fields (Figure 9), in the Piceance basin from reservoirs in the Upper Cretaceous Mesaverde Group and the Tertiary Wasatch Formation. Production has been continuous since 1956 with the discovery of gas in both the Divide Creek and Rulison fields. Table 2 illustrates development wells and wildcat wells completed on BLM, Forest Service, and Fed/State lands. This table shows that approximately 18% of wells have been drilled on BLM lands, 18% of wells on the National Forests, and 64% on nonfederal lands.

Cumulative production of all the fields, through 1987, has been 16,074 barrels of oil (BO) and 80,497,787 thousand cubic feet (MCF) of gas (Table 3). During the same period, cumulative production from federal wells has been 1,285 BO and 3,921,341 MCF of gas (Table 4). Production from federal lands represents about 4.9% of the total production from the Resource Area.

Exploratory drilling in the Eagle Basin has resulted in 13 dry holes since 1947 with the last well abandoned in 1980.

PRESENT ACTIVITY

Historically less than 5% of the total oil and gas production has been from federal leases. However, during 1987, 20% of the oil and 18% of the gas was produced from federal leases (Table 4).

The major player in the Resource Area is Barrett Resources Company. They plan to drill 15 to 30 wells on 8,800 acres of leases acquired from Mobil Oil, North of the Parachute and Grand Valley fields, during 1989 (Lyle 1988). They have also indicated an interest to drill 100 to 200 wells during the next few years. These wells will likely target Wasatch and Mesaverde (Tertiary and Upper Cretaceous conventional gas reservoirs) reservoirs and lower Mesaverde coal seams within the Grand Valley, Parachute, and possibly new fields not yet discovered.

Reasonably Foreseeable Development Activity:

Historical trends, U.S. Geological Survey estimates, present activity, and professional judgment were the key ingredients in formulating the reasonably foreseeable development scenario for oil and gas activity in the GSRA.

Spacing units for gas wells are set by the Colorado Oil and Gas Conservation Commission. While the BLM is not bound by their spacing unit sizes, they are usually recognized. Within the Resource Area, Tertiary Wasatch gas wells are usually spaced on 160 acres and the Mesaverde gas wells are spaced on 320 to 640 acre units.

The U.S. Geological Survey (Spencer and Wilson 1988) estimated the number of gas fields not yet discovered in the Uinta-Piceance Tertiary and Uinta-Piceance Upper Cretaceous conventional gas plays at 5% and 95% probability confidence limits (Table 5). These estimates are for the discovery of fields having a recoverable reserve of 6 billion cubic feet of gas (BCF). Since that portion of the Resource Area within the Uinta-Piceance gas play area is less than 10%, an estimate of the number of fields that may be discovered is a best guess estimate.

A 6 BCF gas field in the Wasatch, which is spaced in 160-acre units and has an average recoverable reserve of .75 BCFG would require 8 wells and 1,280 acres. A Mesaverde well, on the other hand, is generally spaced on 320- to 640-acre units and has recoverable reserves of 1 to 2 BCFG. A 6 BCFG field producing from the Mesaverde would vary in size from 960 acres to 3,840 acres with 3 to 12 wells respectively.

Based on the USGS estimates, the above data translates to one to three Wasatch and three to six Upper Cretaceous Mesaverde fields yet to be discovered. At a minimum it would be expected, at a success rate of 75% that 11 to 33 wells would be drilled to discover and develop one to three Wasatch fields and 12 to 96 wells to develop three to six Mesaverde fields.

The distribution of BLM lands, present field development, and with 18% of the wells drilled on BLM lands results with approximately five to 24 wells projected to be drilled on BLM lands to develop the four to nine fields of minimum size. This probably represents a conservative estimate, considering Barrett's plans for development of Wasatch and Mesaverde gas. If Barrett were to follow through with its plans to drill 200 wells in the continued development of the Grand Valley and Parachute fields, as well as exploring the Mobil leases would result in approximately 36 wells drilled on BLM lands.

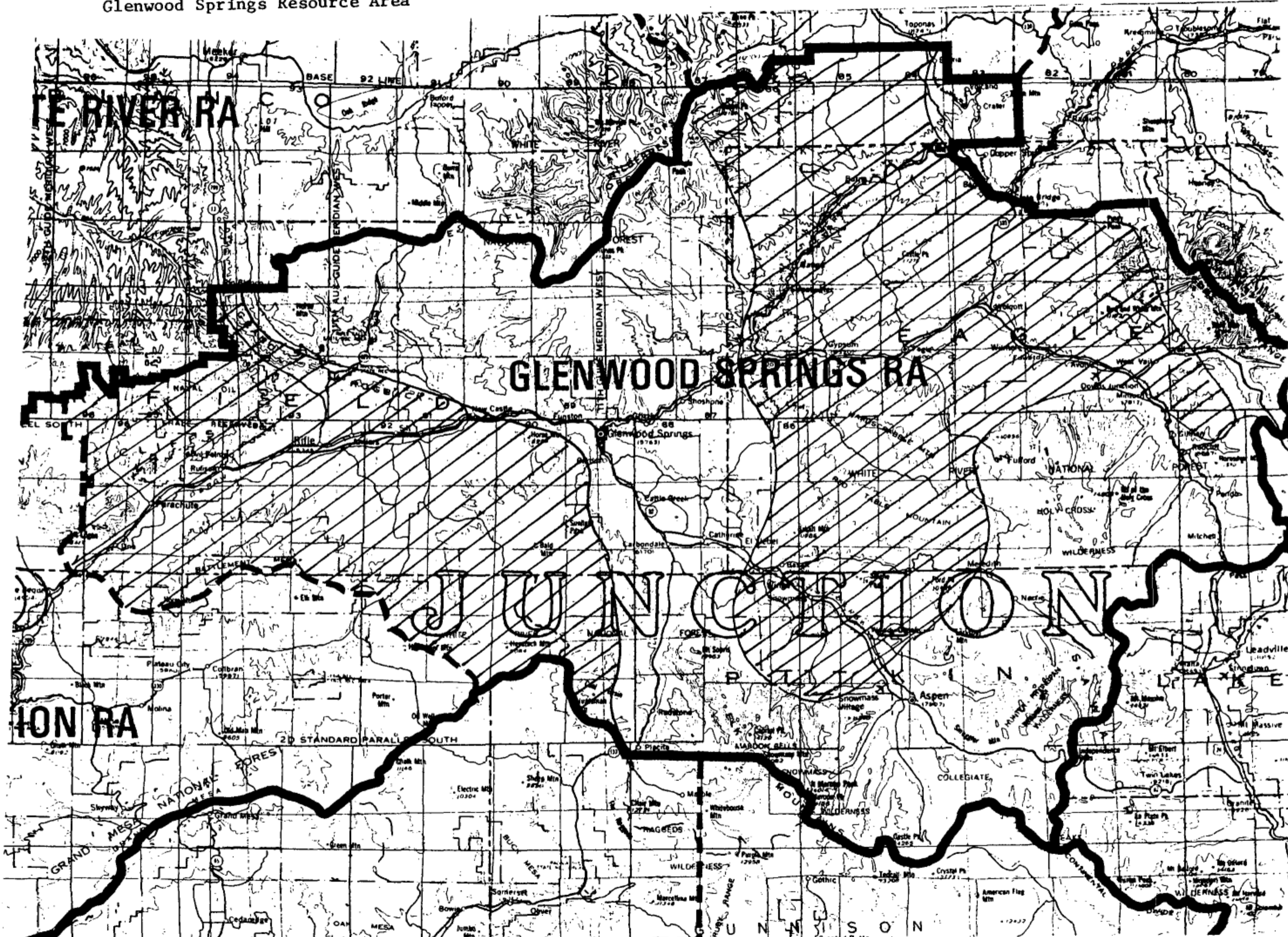
Forecasting Activity Based on Historical Trends

Since 1950, a total of 253 wells have been completed within the Piceance Basin of the Resource Area. Future oil and gas activity is difficult to predict, however, a sudden increase in the demand for gas or an increase in price could trigger a large exploration and development program throughout the Piceance Basin very rapidly. Evaluation of past activity and professional judgment indicates that it is reasonable to expect at least one cycle of increased drilling activity during the next 20 years.

Trend analysis and statistical forecasting based on historical activity indicate approximately 300 wells will be completed during the period 1989 through 2010. This includes both wildcat and development wells in the Piceance Basin. Of those 54 or 18% are expected to be drilled on BLM lands.

It seems reasonable to expect up to 36 wells to be drilled within the Tertiary conventional gas and Upper Cretaceous conventional gas plays, with an additional 18 wells drilled outside of the play areas on BLM lands.

Figure 1. Major structural elements of
Glenwood Springs Resource Area



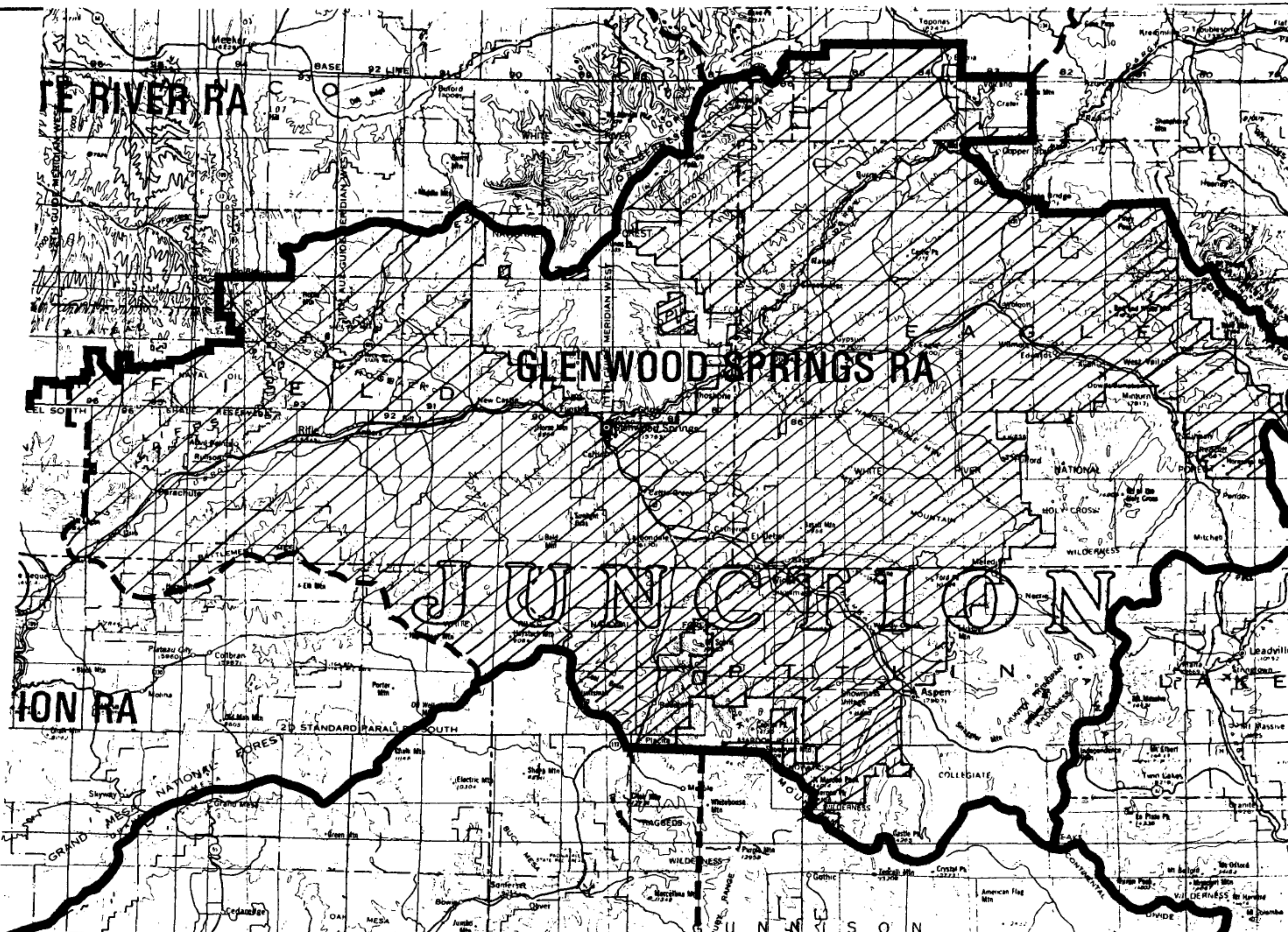


Figure 2. Prospectively valuable lands for oil and gas.

Figure 3. Uinta-Piceance basin upper Cretaceous conventional gas play.

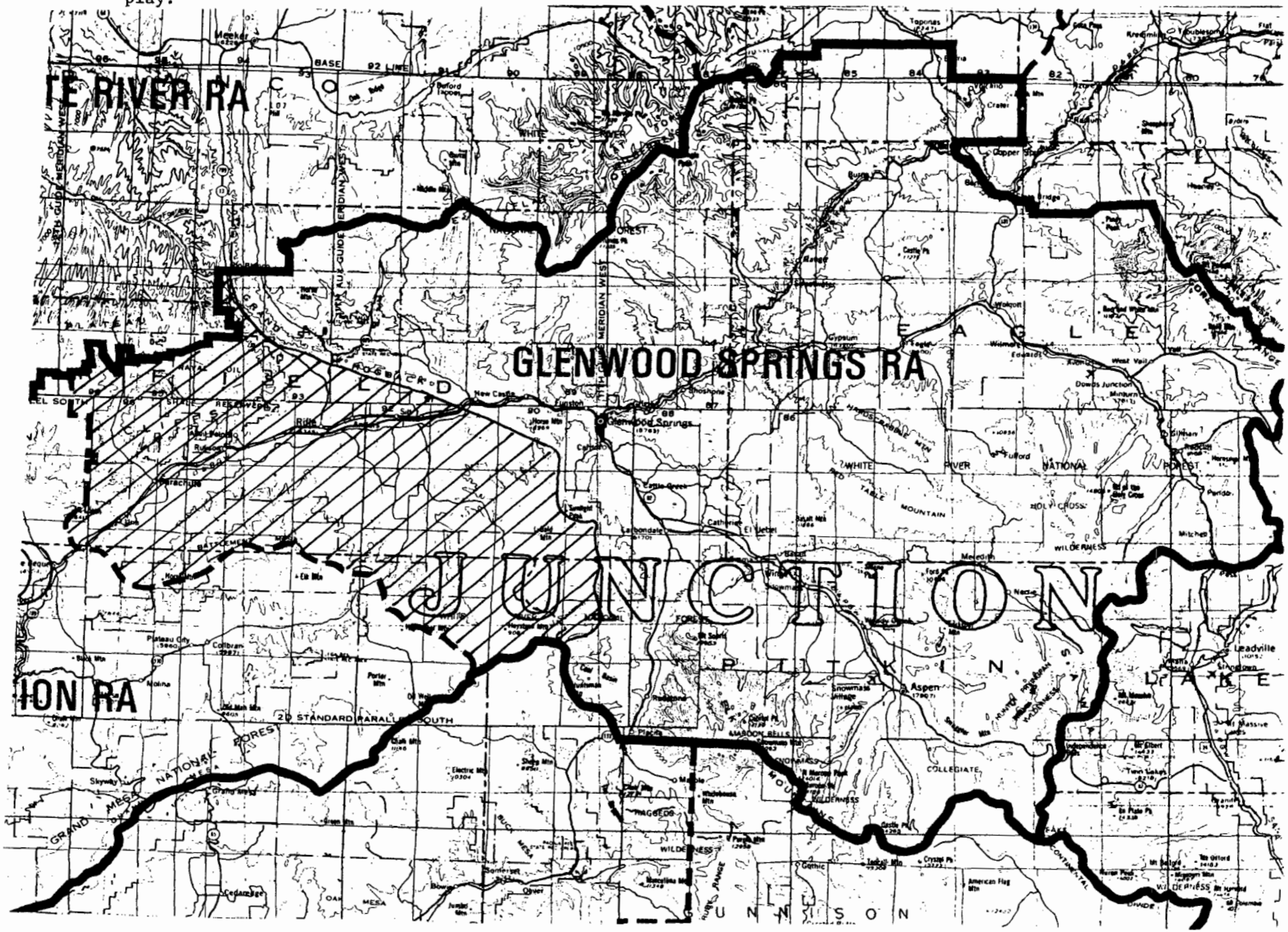
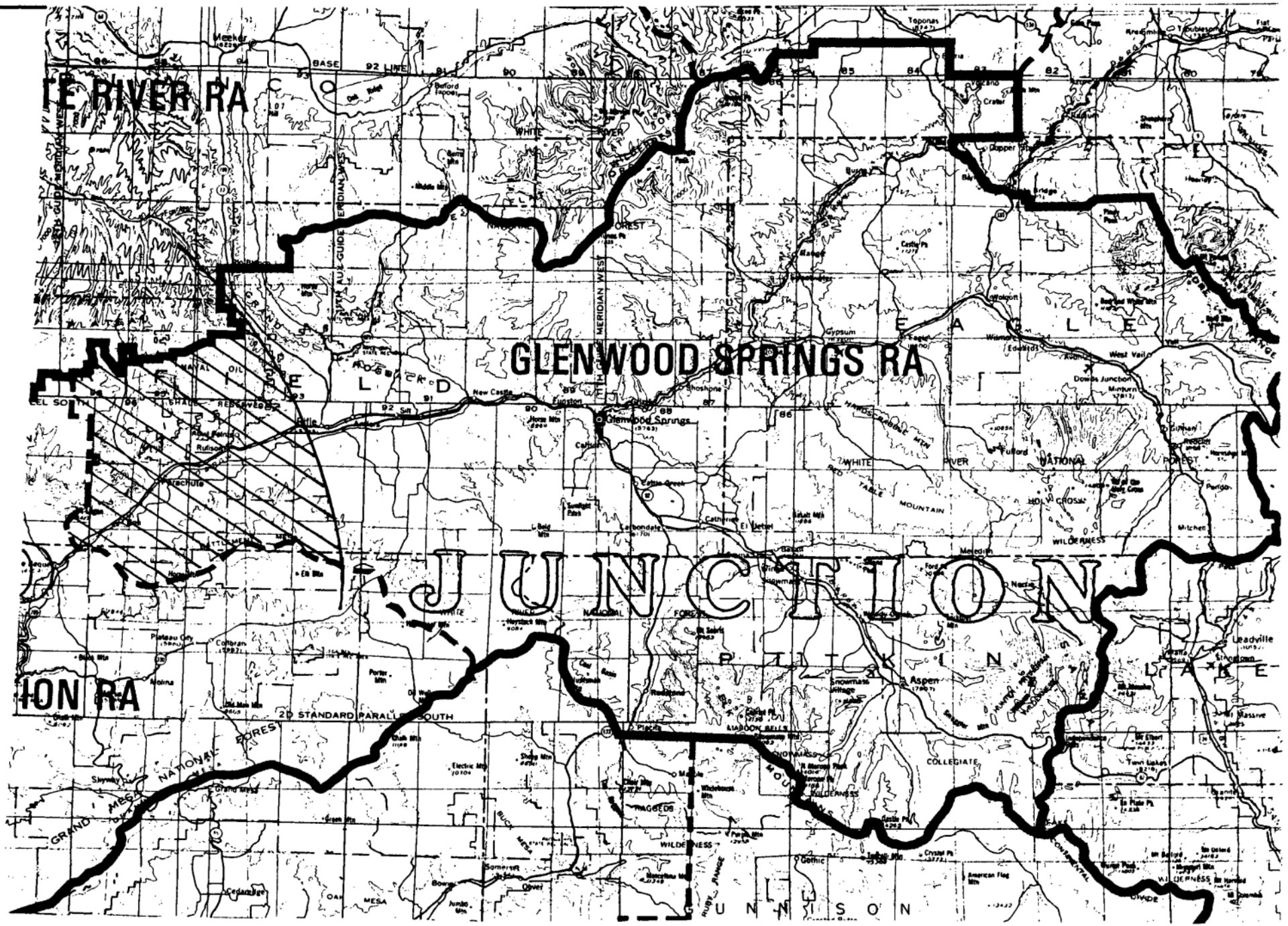


Figure 4. Uinta-Piceance basin Tertiary conventional gas play.



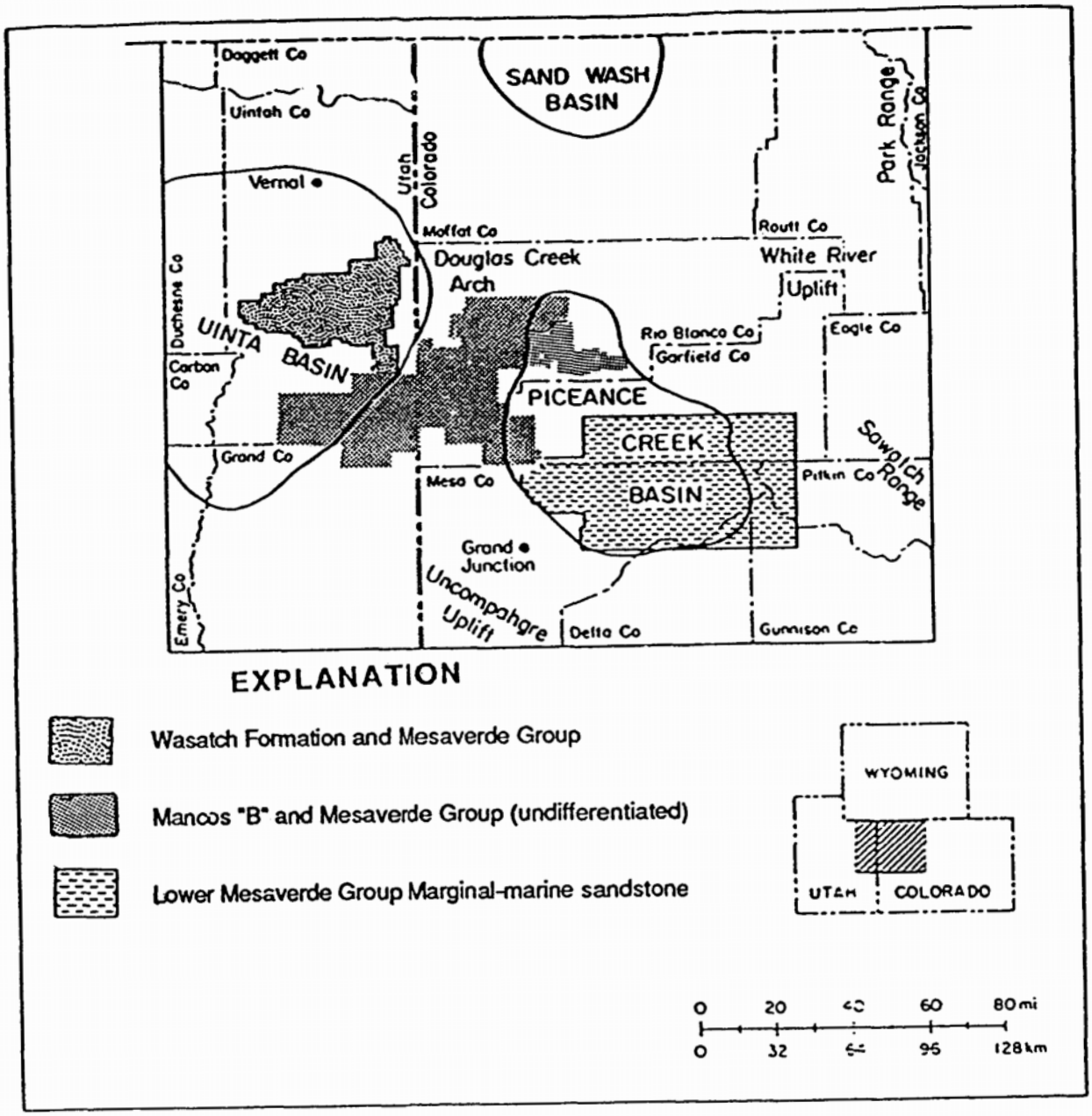


Figure 5 .--Areas in the Uinta and Piceance basins designated as eligible for receiving tight gas production incentive prices by the Federal Energy Regulatory Commission (Modified from Finley, 1984, his fig. 74).

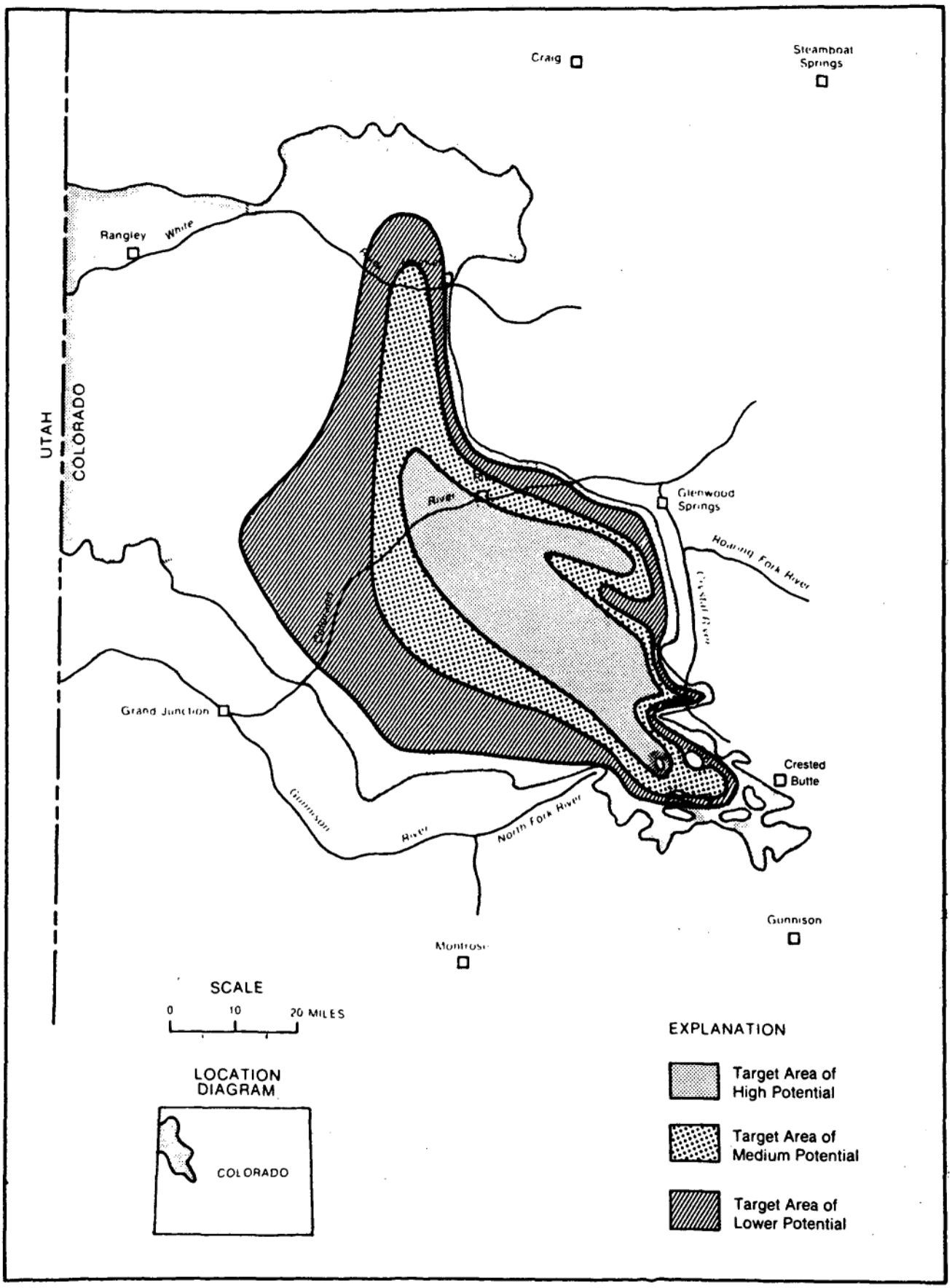


Figure 6 –Piceance Basin coalbed methane target area.

Figure 7. Oil and gas potential map (None-blank, Low-vertical hature, Medium-slant hature, High-cross-hature).

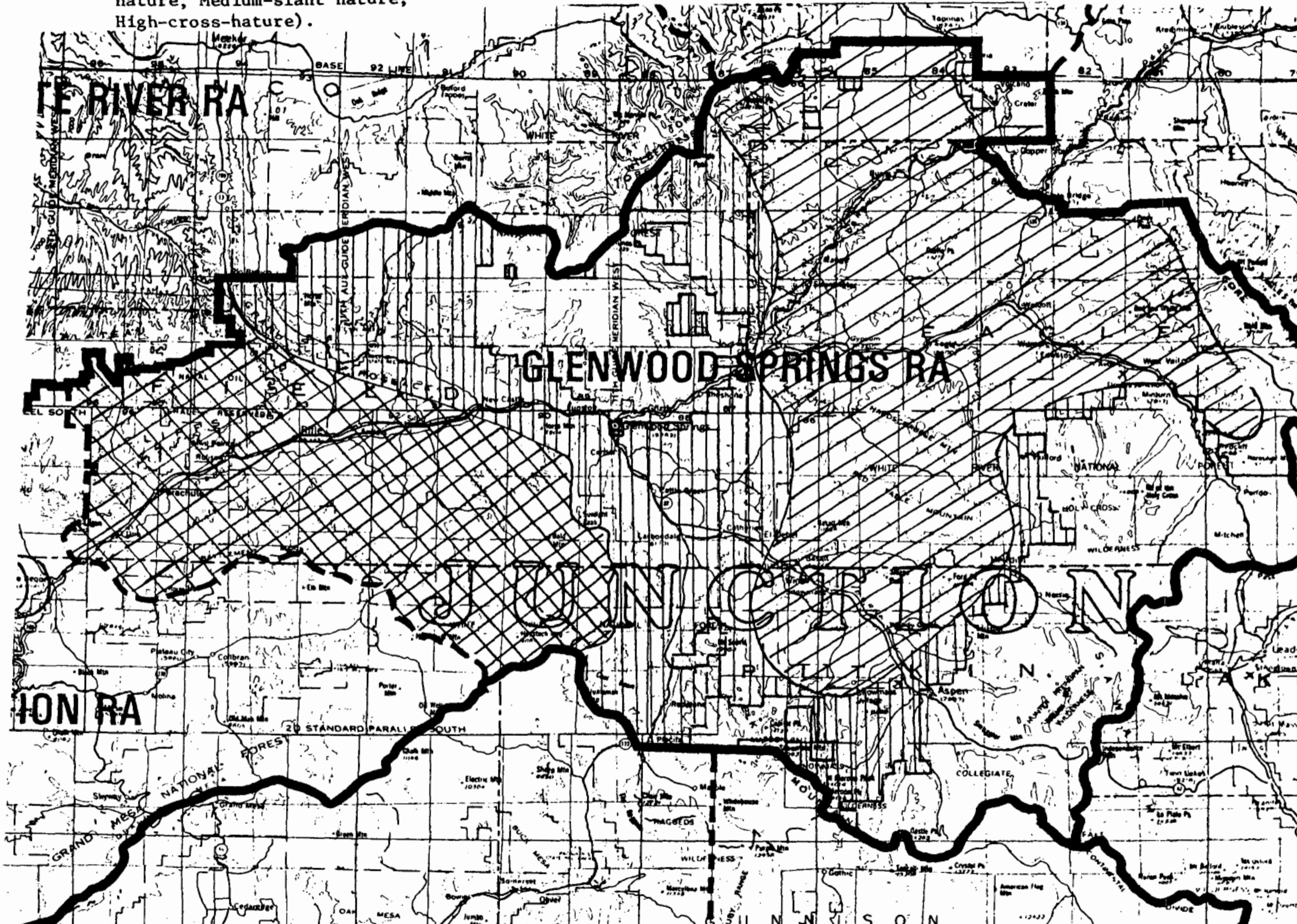


Figure 8. Graph of oil and gas activity by mineral ownership.

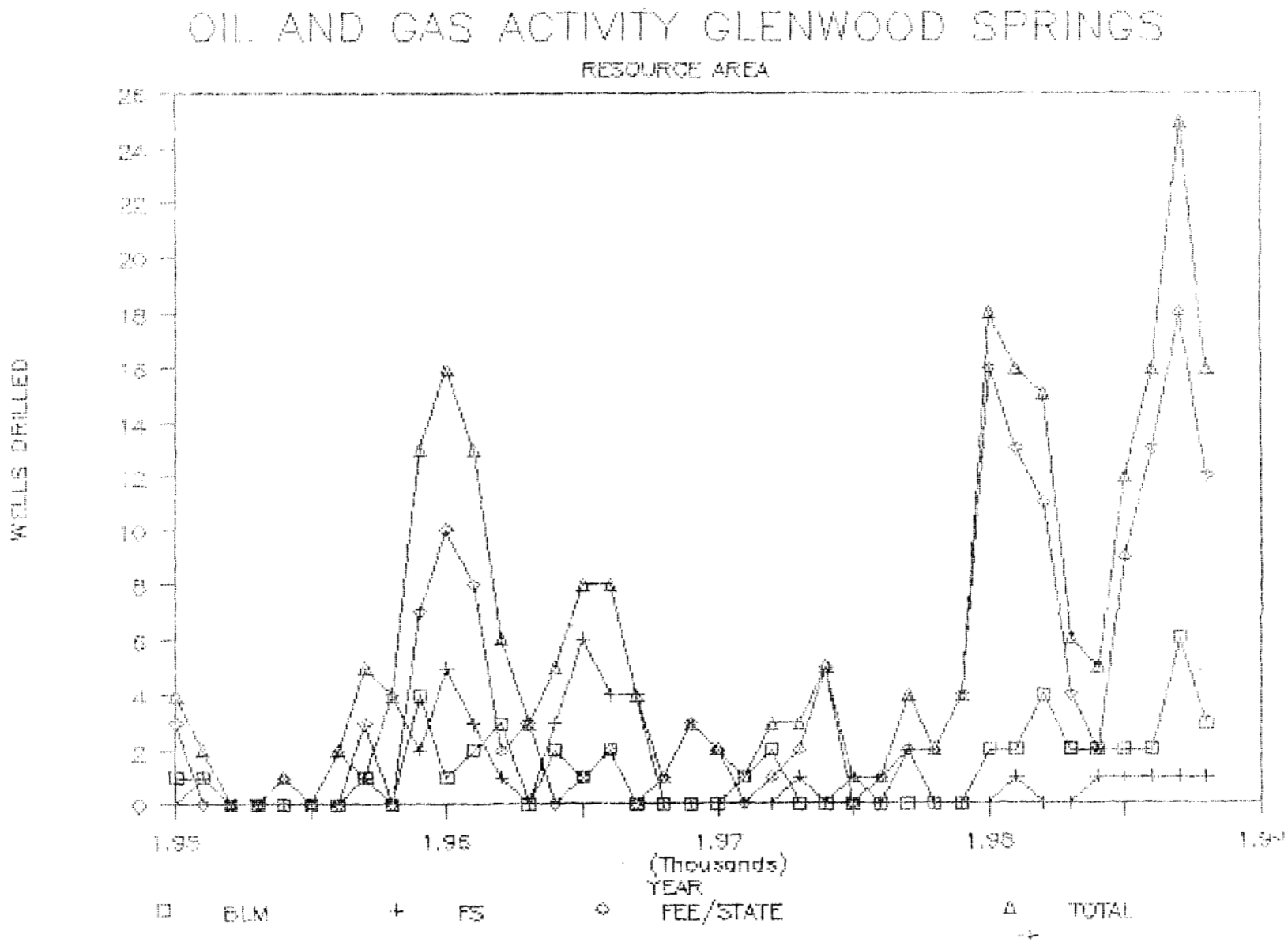


Figure 9. Oil and gas fieldsmap
(1) Grand Valley, (2) Parachute
(3) Rulison, (4) Mam Creek,
(5) Horsethief Creek,
(6) Divide Creek, (7) Baldy
Creek, and (8) Wolf Creek

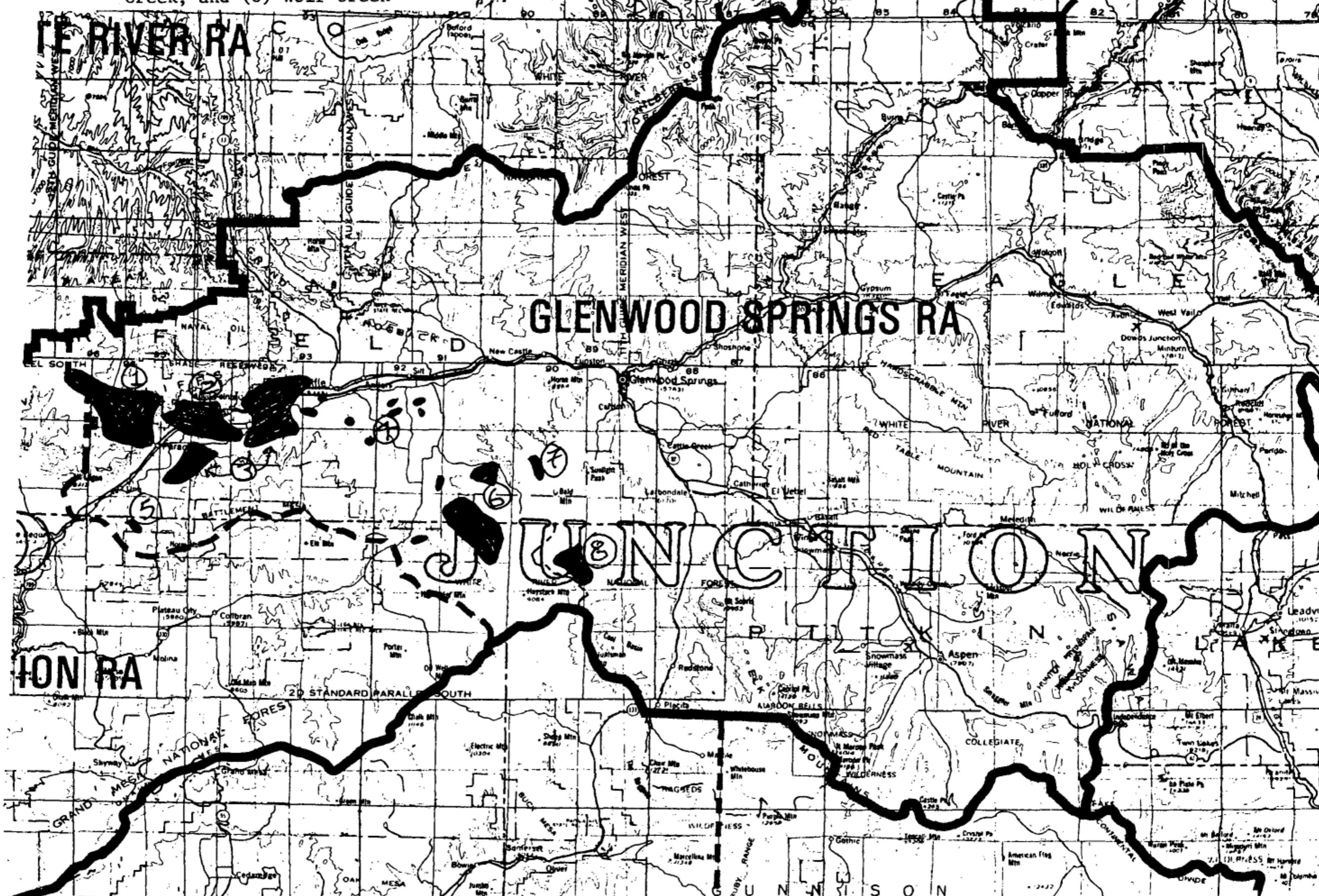


TABLE 1. GLENWOOD SPRINGS OIL AND GAS DRILLING HISTORY
(1950 - 1988)

	BLM		BLM T	FS		FS T	FED		FED T	FEE		FEE T	TOTAL		G T
YEAR	D&A	PWR		D&A	PWR		D&A	PWR		D&A	PWR		D&A	PWR	
1950	1	0	1	0	0	0	1	0	1	3	0	3	4	0	4
1951	1	0	1	1	0	1	2	0	2	0	0	0	2	0	2
1952	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1
1955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	2	2	0	2	2	0	0	0	0	2	2
1957	0	1	1	0	1	1	0	2	2	1	2	3	1	4	5
1958	0	0	0	0	4	4	0	4	4	0	0	0	0	4	4
1959	0	4	4	0	2	2	0	6	6	1	6	7	1	12	13
1960	0	1	1	0	5	5	0	6	6	4	6	10	4	12	16
1961	0	2	2	3	0	3	3	2	5	5	3	8	8	5	13
1962	1	2	3	0	1	1	1	3	4	2	0	2	3	3	6
1963	0	0	0	0	0	0	0	0	0	2	1	3	2	1	3
1964	2	0	2	1	2	3	3	2	5	0	0	0	3	2	5
1965	1	0	1	1	5	6	2	5	7	0	1	1	2	6	8
1966	0	2	2	2	2	4	2	4	6	1	1	2	3	5	8
1967	0	0	0	1	3	4	1	3	4	0	0	0	1	3	4
1968	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1
1969	0	0	0	0	0	0	0	0	0	3	0	3	3	0	3
1970	0	0	0	0	0	0	0	0	0	2	0	2	2	0	2
1971	1	0	1	0	0	0	1	0	1	0	0	0	1	0	1
1972	1	1	2	0	0	0	1	1	2	0	1	1	1	2	3
1973	0	0	0	1	0	1	1	0	1	1	1	2	2	1	3
1974	0	0	0	0	0	0	0	0	0	1	4	5	1	4	5
1975	0	0	0	0	1	1	0	1	1	0	0	0	0	1	1
1976	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1
1977	0	0	0	2	0	2	2	0	2	1	1	2	3	1	4
1978	0	0	0	0	0	0	0	0	0	1	1	2	1	1	2
1979	0	0	0	0	0	0	0	0	0	1	3	4	1	3	4
1980	0	2	2	0	0	0	0	2	2	0	16	16	0	18	18
1981	0	2	2	1	0	1	1	2	3	0	13	13	1	15	16
1982	1	3	4	0	0	0	1	3	4	1	10	11	2	13	15
1983	0	2	2	0	0	0	0	2	2	2	2	4	2	4	6
1984	0	2	2	0	1	1	0	3	3	2	0	2	2	3	5
1985	0	2	2	0	1	1	0	3	3	2	7	9	2	10	12
1986	0	2	2	0	1	1	0	3	3	1	12	13	1	15	16
1987	0	6	6	0	1	1	0	7	7	0	18	18	0	25	25
1988	0	3	3	1	0	1	1	3	4	1	11	12	2	14	16
Totals==>	9	37	46	14	32	46	23	69	92	39	122	161	62	191	253

TABLE 2. FIELD WELL SUMMARY FOR GLENWOOD SPRINGS RESOURCE AREA
(includes Grand Valley Field wells in GWRA)

FIELD	FS		BLM		FEE/STATE		TOTAL			
	D&A	PWR/SI	D&A	PWR/SI	D&A	PWR/SI	D&A	PWR/SI	TOTAL	SUCCESS %
Baldy Creek	0	0	0	1	0	1	0	2	2	100.00%
Divide Creek	2	23	0	1	3	3	5	27	32	84.38%
Hells Gulch	0	0	0	1	0	0	0	1	1	100.00%
Horsethief Creek	0	0	1	0	1	1	2	1	3	33.33%
Grand Valley	0	0	0	7	0	9	0	16	16	100.00%
Mam Creek	0	0	0	0	1	3	1	3	4	75.00%
Parachute	0	0	0	2	0	27	0	29	29	100.00%
Rulison	0	0	0	18	7	57	7	75	82	91.46%
Wolf Creek	5	9	0	0	0	0	5	9	14	64.29%
Wildcat	4	4	7	10	29	23	40	37	77	48.05%
TOTALS========>	11	36	8	40	41	124	60	200	260	76.92%

TABLE 3. CUMULATITIVE PRODUCTION
(TO 1-1-88)
FOR OIL AND GAS FIELDS
GLENWOOD SPRINGS RESOURCE AREA

FIELD	FORMATION	SIW	PRW	1987 CUM OIL (Bbls)	1987 CUM GAS (Mcf)	TOTAL CUM OIL (Bbls)	TOTAL CUM GAS (Mcf)
Baldy Creek	Mesaverde	0	3	0	47,037	0	432,789
Divide Creek	Mesaverde	8	3	0	138,336	0	49,842,793
Grand Valley	Mesaverde	1	11	263	382,009	487	526,190
Hells Gulch	Mesaverde	0	0	0	0	0	150,397
Horsethief Creek	Mesaverde	0	0	0	0	0	141,282
Mam Creek	Mesaverde	1	0	102	15,746	545	886,331
Parachute	Wasatch	0	30	112	740,228	112	1,327,499
Rulison	Wasatch	6	28	0	584,776	32	6,740,252
	Mesaverde	10	14	1,268	365,305	14,898	7,820,432
Wolf Creek	Mesaverde	0	0	0	0	0	12,629,822
TOTALS========>		26	89	1,745	2,273,437	16,074	80,497,787

TABLE 4. CUMULATITIVE PRODUCTION
(TO 1-1-88)
FOR FEDERAL WELLS
GLENWOOD SPRINGS RESOURCE AREA

FIELD	FORMATION	SIW	FE PRW	1987 CUM OIL (Bbls)	1987 CUM GAS (Mcf)	TOTAL CUM OIL (Bbls)	TOTAL CUM GAS (Mcf)	% FED.
Baldy Creek	Mesaverde	0	1	0	17,341	0	17341	4.01%
Divide Creek	Mesaverde	0	1	0	20,970	0	176130	0.35%
Grand Valley	Mesaverde	1	5	263	244,193	480	379610	72.14%
Hells Gulch	Mesaverde	0	0	0	4,763	0	150,397	100.00%
Horsethief Creek	Mesaverde	0	0	0	0	0	0	0.00%
Mam Creek	Mesaverde	0	0	0	0	0	0	0.00%
Parachute	Wasatch	0	2	0	4,763	0	4763	0.36%
Rulison	Wasatch	1	4	0	47,133	0	616741	9.15%
	Mesaverde	3	1	88	67,190	805	2576359	32.94%
Wolf Creek	Mesaverde	0	0	0	0	0	0	0.00%
TOTALS========>		5	14	351	406,353	1,285	3,921,341	
	PERCENT FEDERAL==>			20.11%	17.87%	7.99%	4.87%	

TABLE 5. U. S. GEOLOGICAL SURVEY GAS FIELD DISCOVERY PROBABILITY TABLE (FIELDS > 6 BCFG)

PLAY	0.95	0.05
Uinta-Piceeance Tertiary Gas	9	35
Uinta-Piceeance upper Creatceous	25	55

POTENTIAL FOR OCCURRENCE AND DEVELOPMENT OF OIL AND GAS IN THE KREMMLING RESOURCE AREA

INTRODUCTION

The Kremmling Resource Area (KRA) is located within the Colorado Park Basin Province in North-Central Colorado and encompasses both the North Park and Middle Park Structure Basins (Figure 1). Both basins are essentially a single structural basin that is separated by Tertiary volcaniclastic and flow rocks of the east-west-trending Rabbit Ears Range. A detailed description of the geology of the basins can be found in Maughan's (1988) Open-File Report on the geology and petroleum potential of the province.

Hydrocarbon Occurrence

Oil and gas were first discovered in 1926 by Continental Oil Company in northeastern Jackson County. This discovery opened the North McCallum Field and consisted of gas, composed of 96% CO_2 and 4 % hydrocarbons from the Cretaceous Dakota Sandstone.

It was not until 1952 that oil was discovered in the Coalmont area from fractures in Dakota shales. Since that time, 13 fields have been discovered and developed, all in North Park (Figure 1). During 1987, a total of 101 wells produced 233,351 BO and 292,098 MCFG, while 27 wells produced 1,128,761 MCF of CO_2.

No commercial hydrocarbons have been produced from the Middle Park Basin. However, the Granby Anticline (T.2-3 N., R. 76-77 W.), just north of the town of Granby, tested significant gas shows in the Niobrara and Muddy-Dakota interval in 1953 by British American.

Three subsequent wells had shows of gas, but also revealed the highly complex structure of the anticline (Wellborn 1977).

PROSPECTIVELY AVAILABLE FOR OIL AND GAS

The majority of the lands within the Resource Area are classified as prospectively valuable (PV) for oil and gas (Figure 2). Appendix a details the criteria for PV classifications. Recent structural interpretations of the North Park Basin suggest that the PV classification needs to be revised. This is particularly evident at the northern terminus of the basin where Independence Mountain has been overthrust the Paleozoic and Mesozoic Section (Park 1977; Wellborn 1977).

OIL AND GAS POTENTIAL

Oil and gas potential rating criteria are described in Appendix b and is the basis for the ratings described below for both the North Park and Middle Park Basins. In general, areas defined by the USGS as a play have a high potential for oil and gas, while lands not classified as PV have no potential.

Maughan (1988) describes two major plays that occur within the Resource Area. The first, upper Jurassic and lower Cretaceous structural play includes all of North Park and Middle Park Basins containing reservoirs and potential reservoirs within rocks of those ages. Reservoirs within that play are typically developed in combination traps. The fields occur within structural closure or entrapment against or adjacent to northwest-southeast trending faults and folds (Figure 3).

The second play is a hydrocarbon subthrust play that includes lands not classified as PV, due to the presence of Precambrian crystalline rocks on the surface. Several areas of outcropping Precambrian rocks actually are overthrusts and are represented by the Sheep Mountain, Independence Mountain Vasquez, Never Summer, and Williams Range thrust faults. Maughan concluded that the sedimentary rocks and structure of North Park extend northward underneath (12 miles) the Independence Mountain overthrust, and therefore, have the same oil and gas potential. The other overthrusts mentioned above occur along the eastern margin of the basins, and are probably limited in their overthrusting when compared to the Independence Mountain thrust, but are geologically similar (Figure 4).

Oil land gas potential for the Resource Area is shown in Figures 5 and 6. As can be seen the majority of the area is high potential based on the subthrust play and Jurassic and Lower Cretaceous structural plays defined by the

USGS. Areas outside of these two plays have no potential.

OIL AND GAS ACTIVITY

Historical Background

Approximately 50% of the wells drilled in the Resource Area were completed as dry holes (Table 1). Figure 6 illustrates the drilling history for 1926 through 1988. Drilling activity has peaked during four periods with the greatest activity starting in the early 1970s and continuing into the early 1980s.

All production has been from 13 fields (Figure 1), in North Park from porous sandstone reservoirs of the Entrada Sandstone, Morrison Formation, Dakota Sandstones (Lakota, Dakota, and Muddy Sandstones), Codell Sandstone, and Pierre Shale. Production also occurs from fractured shale reservoirs in the Niobrara Formation.

Table 2 illustrates development and wildcat wells completed on BLM, FS, and Fee/State lands. This table shows that approximately 58% of the development and 32% of the wildcat wells were completed on BLM lands, while no development wells and 7% of the wildcat wells were completed within National Forest lands.

Cumulative production of all the fields, through 1987, has been 14,962,306 BO and 9,690,708 MCFG, as well as 666,846,756 MCF of CO_2 produced from the McCallum Fields (Table 3). During the same period, cumulative production from federal wells has been 9,122,682 BO and 662,701 MCFG, and 659,721,551 MCF of CO_2 (Table 4). Federal production accounts for approximately 61% of oil produced, 7% of gas, and 99% of the CO_2.

Exploratory drilling in the Middle Park Basin has not resulted in any commercial production.

PRESENT ACTIVITY

Exploration and development activity has declined from a total of 48 wells drilled during the last peak of activity in 1984 to two in 1988. Development drilling in the McCallum and Canadian River Fields accounted for 90% of the activity. The decrease in activity is due to market conditions resulting from the collapse of oil prices.

REASONABLY FORESEEABLE DEVELOPMENT ACTIVITY

Historical trends, USGS estimates, present activity, and professional judgment were the key ingredients in formulating the reasonably foreseeable development scenario for oil and gas activity in KRA.

While the USGS (Maughan 1988) has not estimated the number of fields yet to be discovered, there is an estimate of undiscovered recoverable oil and gas within the basin. At a 95% confidence level (probability), only negligible oil and 10 million MCFG are estimated as undiscovered recoverable. The volume increases to 30 million BO and 50 million MCFG at 5% probability, with a mean of 10 million BO and 20 million MCFG. The mean probability estimate translates to doubling the number of development wells completed to date.

Field size, based on 40-acre spacing units, varies from 40 to 3,000 acres. The largest fields are McCallum, McCallum-North, and Canadian River. Doubling of recoverable reserves would probably double the productive acreage, or an increase of approximately 8,400 acres.

Forecasting Activity Based on Historical Trends

Since 1926, a total of 466 wells have been completed within the Resource Area. Future oil and gas activity is difficult to predict; however, a sudden increase in the demand for oil and gas or price increases could trigger a larger exploration and development program. Evaluation of past activity and professional judgment indicates that it is reasonable to expect at least one cycle of increased drilling activity during the next 20 years.

Trend analysis and statistical forecasting based on historical activity indicate that 225 wells are forecast to be drilled within the Resource Area. This forecast is based on the following assumptions and is the worst case scenario:

- Best fit, statistically with lowest mean squared error.

- 62% of wells forecast are development and 38% wildcat.
- 57% of development and 32% of wildcat wells are drilled on BLM.
- 78% success rate for development and 7% success rate of wildcat wells drilled on BLM.

Of the 225 wells forecast, 80 development and 28 wildcat wells will be drilled on BLM lands. Sixty-two of the development wells are expected to be completed for production in the upper Jurassic and lower Cretaceous structural play of North Park Basin. Only 28% of the wildcat wells have been drilled in Middle Park, with 18% drilled on BLM lands. Based on these statistics, two wells are expected to be drilled in Middle Park upper Jurassic and lower Cretaceous structural play. The remaining 20 wildcat wells will be drilled in North Park., Four wells will be drilled on BLM lands on the subthrust play (Independence Mountain overthrust) and the remaining 16 within the upper Jurassic and lower Cretaceous structural play.

The development and exploratory drilling is expected to be concentrated in the McCallum, Sheep Mountain-Delaney Butte, and Coalmont areas. Exploration in Middle Park will be in the Granby area, with one or two wells drilled in the Blue River Valley area (Figure 7).

As previously discussed, based on the USGS estimates of undiscovered reserves, the above estimate would be doubled.

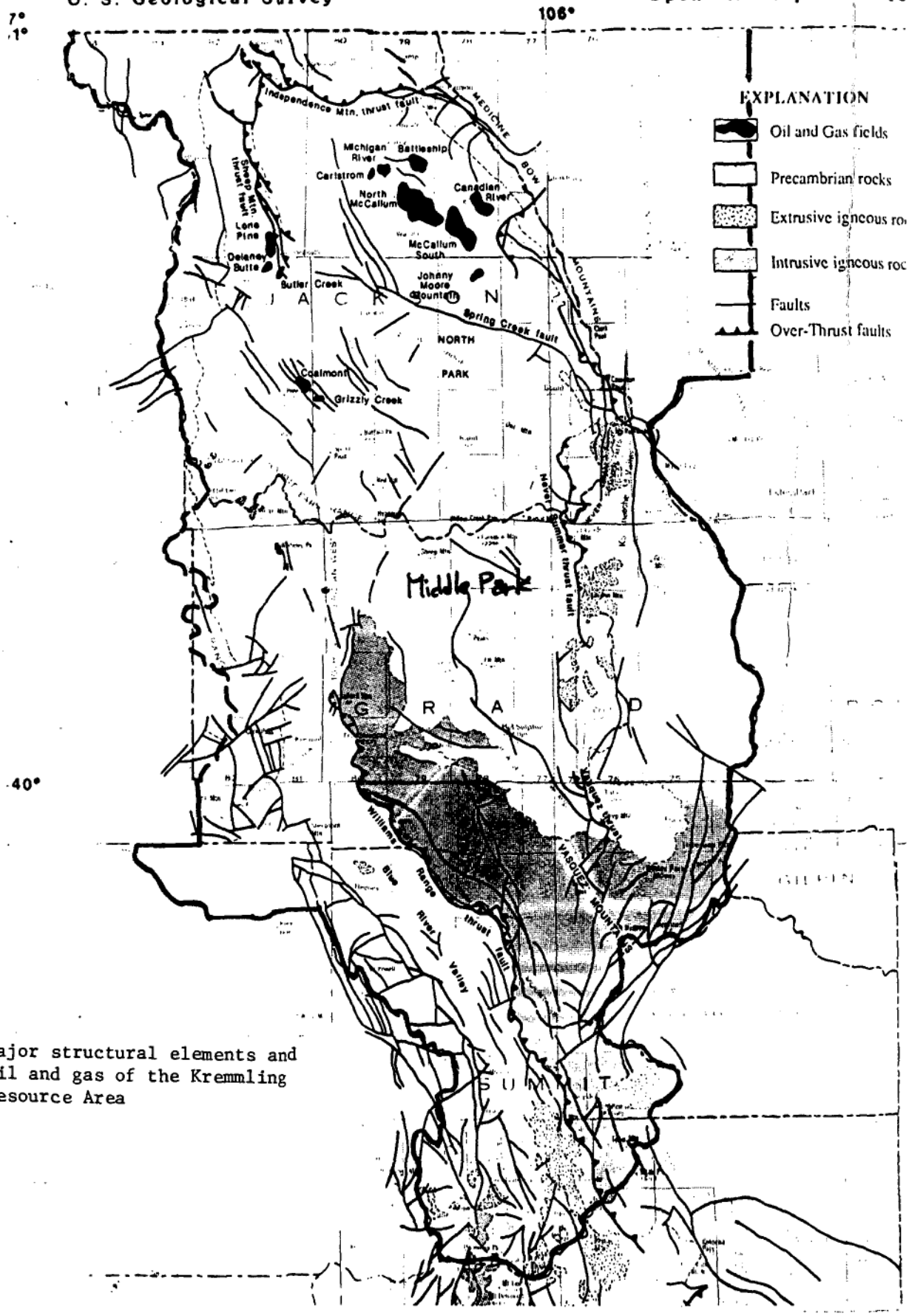


Figure 1. Major structural elements and oil and gas of the Kremmling Resource Area

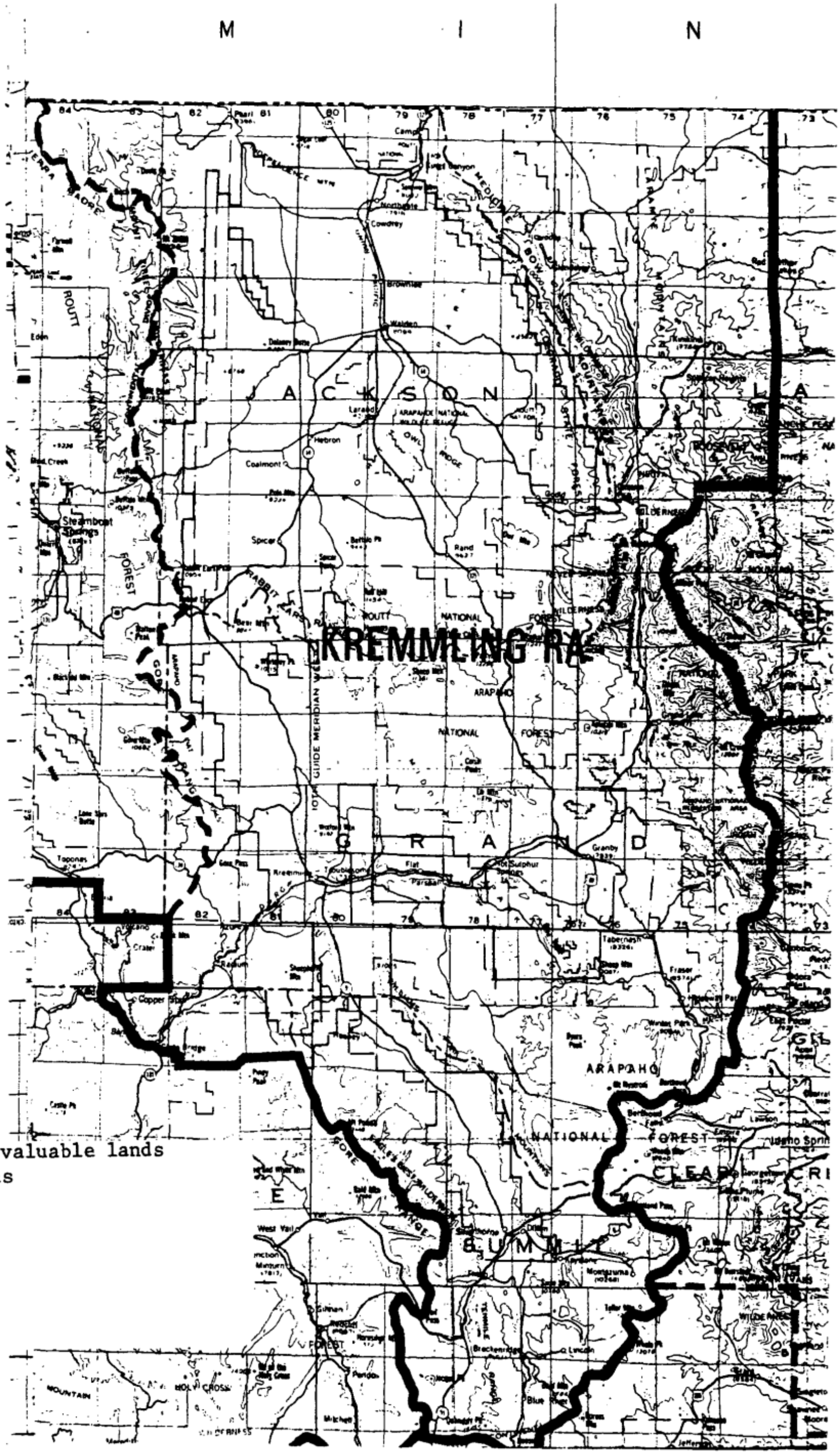


Figure 2. Prospectively valuable lands for oil and gas

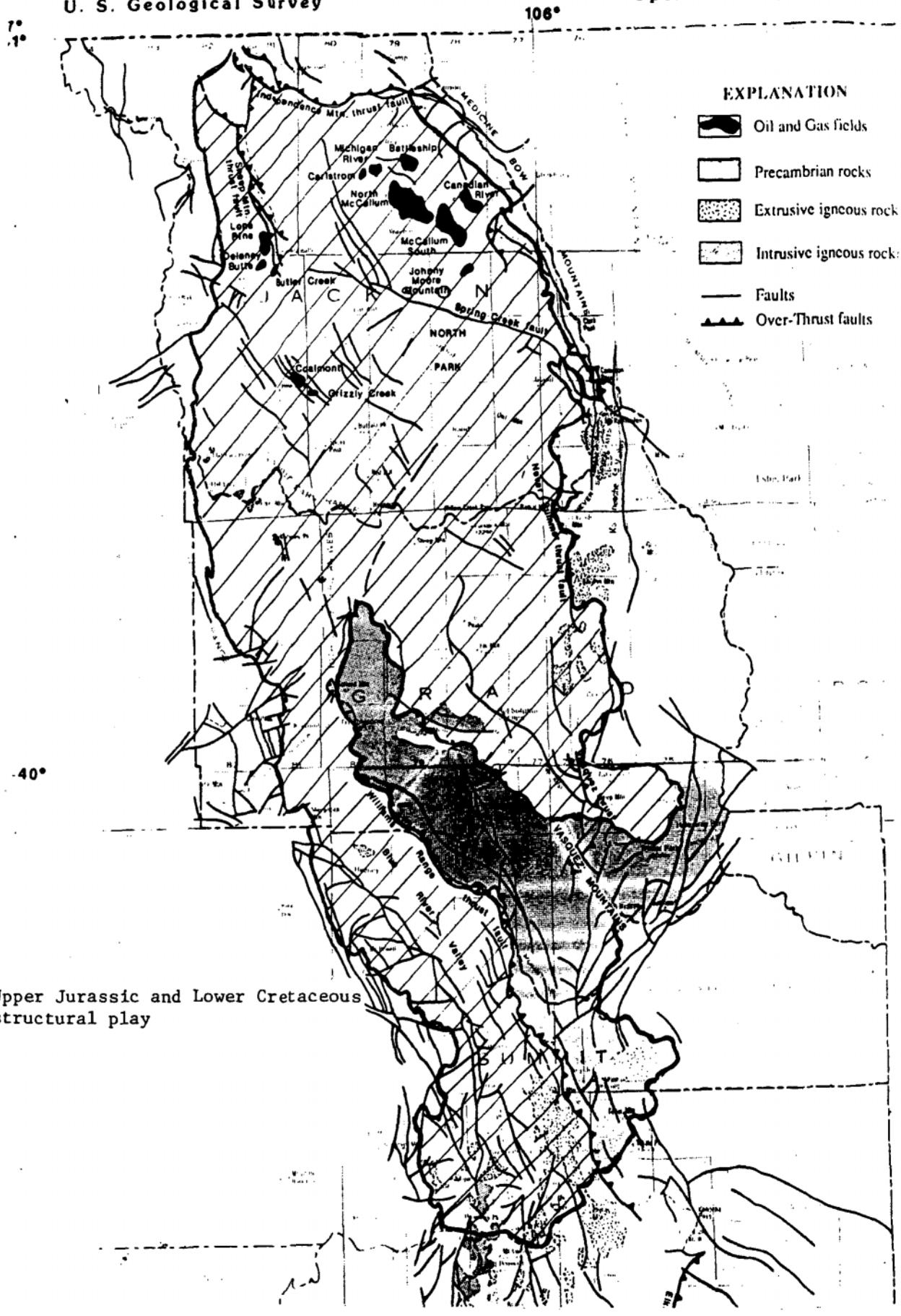


Figure 3. Upper Jurassic and Lower Cretaceous structural play

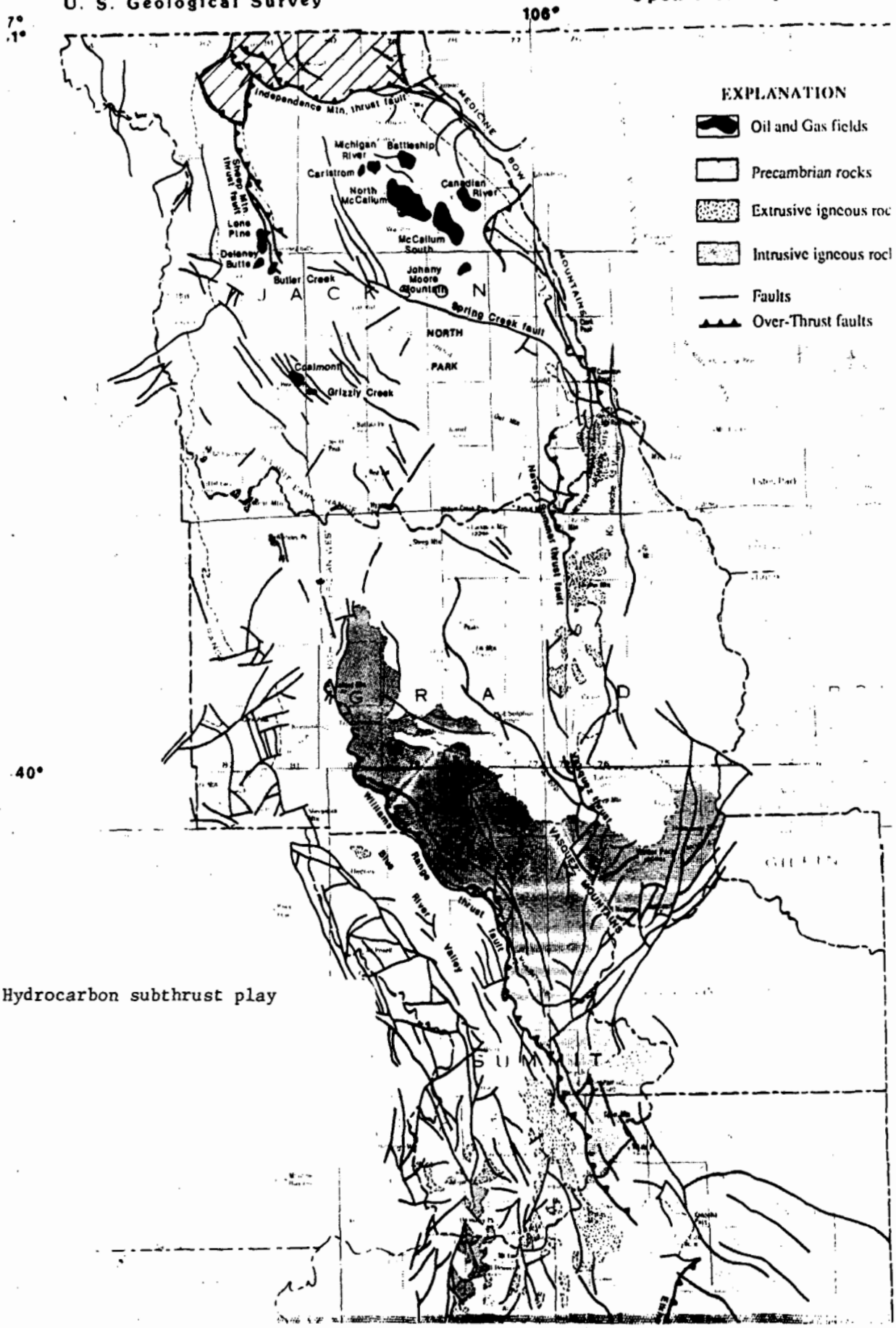


Figure 4. Hydrocarbon subthrust play

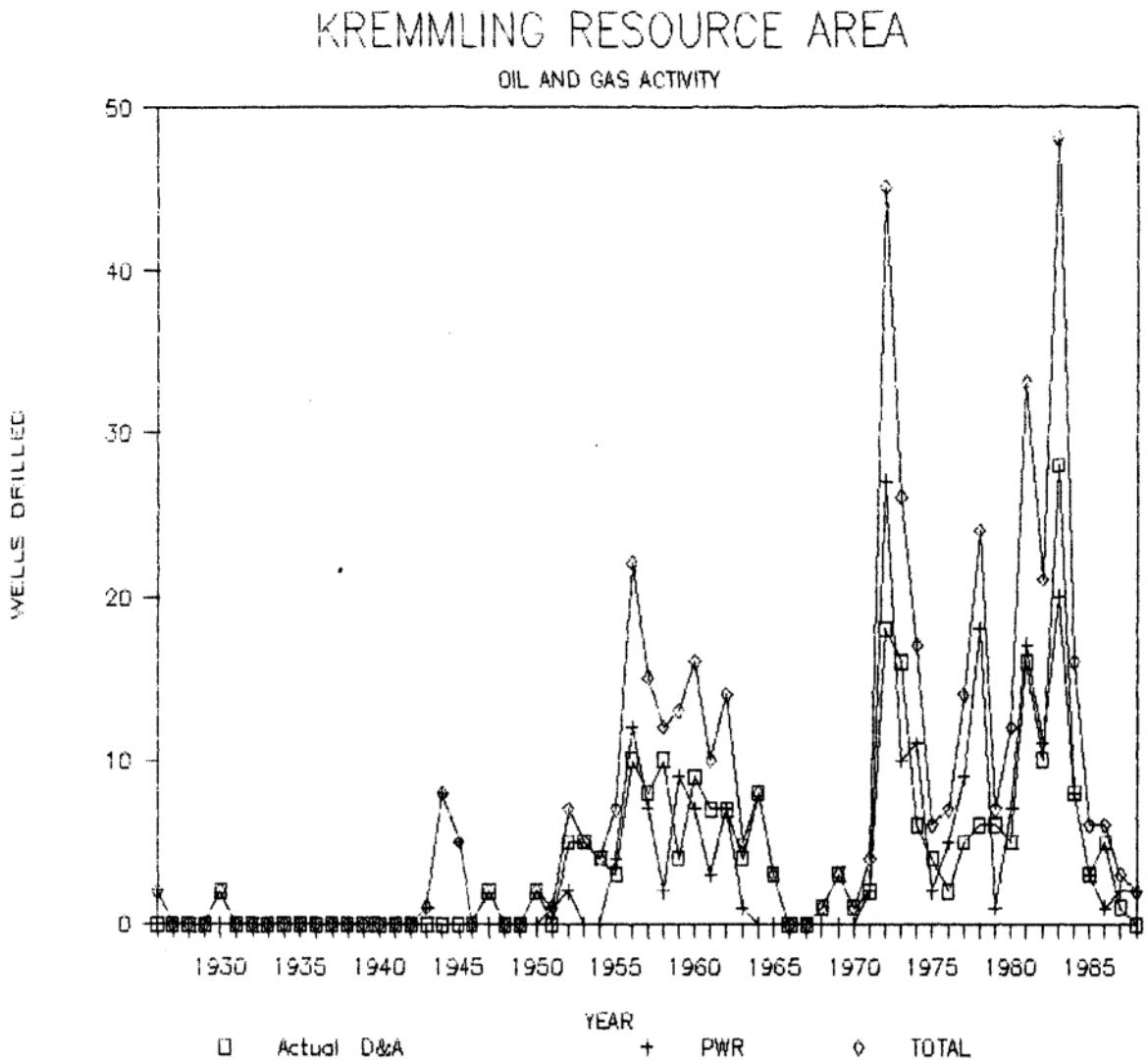


Figure 5. Oil and gas drilling activity graph for the Kremmling Resource Area.

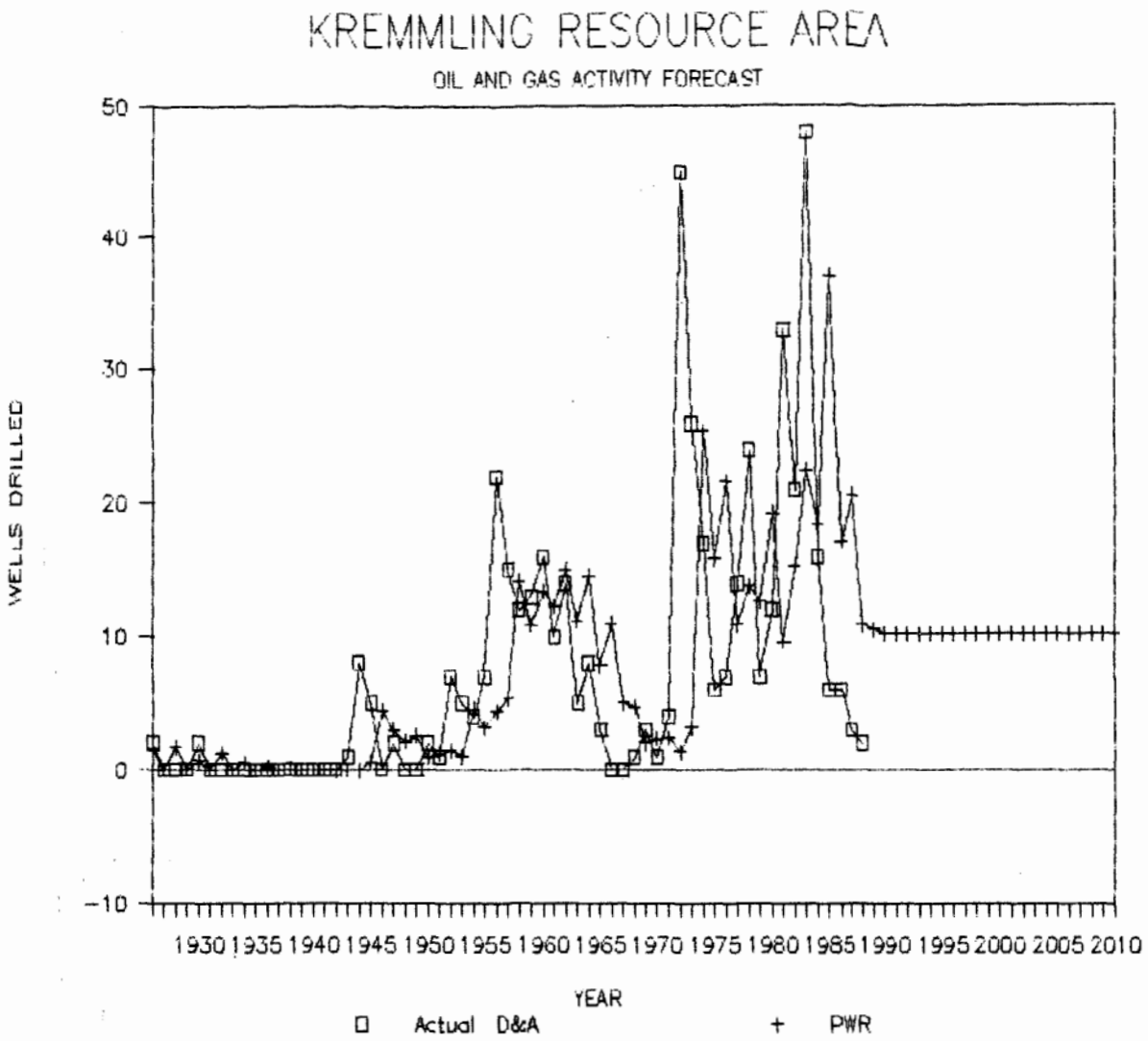


Figure 6. Trend forecast graph for the Kremmling Resource Area.

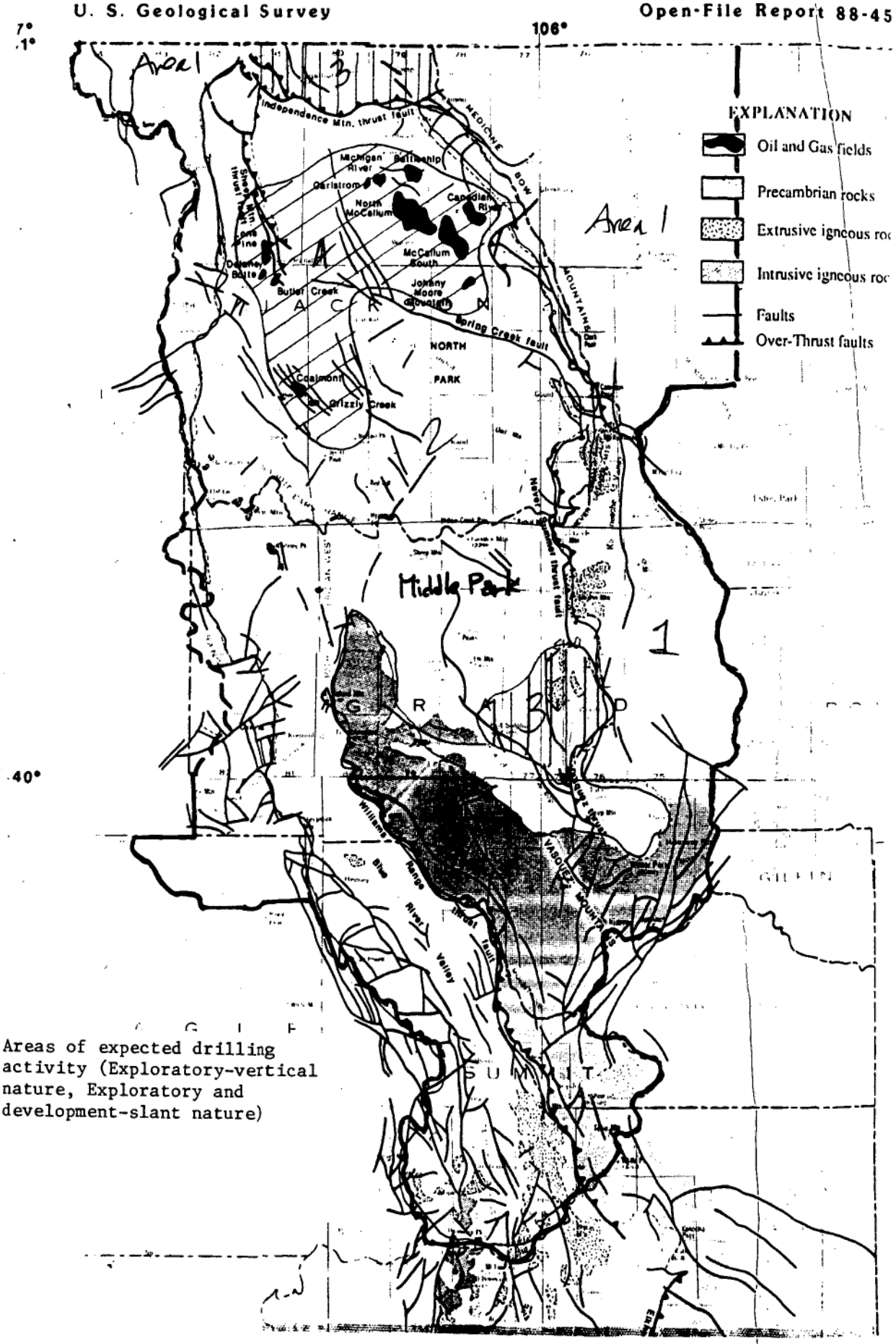


Figure 7. Areas of expected drilling activity (Exploratory-vertical nature, Exploratory and development-slant nature)

TABLE 1. OIL AND GAS ACTIVITY IN THE KREMMLING RESOURCE AREA

	BLM			FS			FEE/ST					
YEAR	D&A	PWR/SI	TOTAL	D&A	PWR/SI	TOTAL	D&A	PWR/SI	TOTAL	D&A	PWR/SI	TOTAL
1926		1	1			0		1	1	0	2	2
1927			0			0			0	0	0	0
1928			0			0			0	0	0	0
1929			0			0			0	0	0	0
1930			0			0	2		2	2	0	2
1931			0			0			0	0	0	0
1932			0			0			0	0	0	0
1933			0			0			0	0	0	0
1934			0			0			0	0	0	0
1935			0			0			0	0	0	0
1936			0			0			0	0	0	0
1937			0			0			0	0	0	0
1938			0			0			0	0	0	0
1939			0			0			0	0	0	0
1940			0			0			0	0	0	0
1941			0			0			0	0	0	0
1942			0			0			0	0	0	0
1943	0	1	1			0			0	0	1	1
1944	0	5	5			0	0	3	3	0	8	8
1945	0	5	5			0			0	0	5	5
1946			0			0			0	0	0	0
1947	1	0	1			0	1		1	2	0	2
1948			0			0			0	0	0	0
1949			0			0			0	0	0	0
1950			0			0	2	0	2	2	0	2
1951	0	1	1			0	0	0	0	0	1	1
1952	2	1	3			0	3	1	4	5	2	7
1953	1	0	1			0	4	0	4	5	0	5
1954	1	0	1			0	3	0	3	4	0	4
1955	1	0	1			0	2	4	6	3	4	7
1956	2	2	4			0	8	10	18	10	12	22
1957	1	3	4	1	0	1	6	4	10	8	7	15
1958	5	2	7			0	5	0	5	10	2	12
1959	3	6	9	1	0	1	0	3	3	4	9	13
1960	3	6	9			0	6	1	7	9	7	16
1961	3	2	5			0	4	1	5	7	3	10
1962	4	7	11	1	0	1	2	0	2	7	7	14
1963	3	1	4			0	1	0	1	4	1	5
1964	3	0	3			0	5	0	5	8	0	8
1965			0			0	3	0	3	3	0	3
1966			0			0			0	0	0	0
1967			0			0			0	0	0	0
1968			0	1	0	1			0	1	0	1
1969			0			0	3	0	3	3	0	3
1970			0			0	1	0	1	1	0	1
1971	2	1	3			0	0	1	1	2	2	4
1972	13	20	33			0	5	7	12	18	27	45
1973	8	2	10	1	0	1	7	8	15	16	10	26
1974	4	9	13	1	0	1	1	2	3	6	11	17
1975	3	0	3			0	1	2	3	4	2	6
1976	1	0	1	1	0	1	0	5	5	2	5	7
1977	1	6	7			0	4	3	7	5	9	14
1978	3	16	19	1	0	1	2	2	4	6	18	24
1979	1	1	2	1	0	1	4	0	4	6	1	7
1980	0	1	1			0	5	6	11	5	7	12
1981	2	8	10	2	0	2	12	9	21	16	17	33
1982	0	5	5	1	0	1	9	6	15	10	11	21
1983	8	10	18			0	20	10	30	28	20	48
1984	6	7	13	1	0	1	1	1	2	8	8	16
1985	2	2	4			0	1	1	2	3	3	6
1986	2	1	3			0	3	0	3	5	1	6
1987	0	1	1			0	1	1	2	1	2	3
1988	0	1	1			0	0	1	1	0	2	2
TOTALS==>	89	134	223	13	0	13	137	93	230	239	227	466

TABLE 2. DRILLING ACTIVITY IN OIL AND GAS FIELDS IN KREMMLING RESOURCE AREA

	BLM			FS			FEE/ST					
FIELD	D&A	PWR/SI	TOTAL	D&A	PWR/SI	TOTAL	D&A	PWR/SI	TOTAL	D&A	PWR/SI	TOTAL
Alkali Lake	0	2	2	0	0	0	0	0	0	0	2	2
Battleship	0	0	0	0	0	0	4	9	13	4	9	13
Butler Ck	0	0	0	0	0	0	0	1	1	0	1	1
Canadian River	0	1	1	0	0	0	34	42	76	34	43	77
Carlstrom	0	0	0	0	0	0	0	1	1	0	1	1
Coalmont	1	0	1	0	0	0	0	2	2	1	2	3
Delany Butte	0	0	0	0	0	0	2	1	3	2	1	3
Grizzly Ck	0	0	0	0	0	0	0	1	1	0	1	1
Johnny Moore Mtn	0	1	1	0	0	0	0	0	0	0	1	1
Lone Pine	0	0	0	0	0	0	3	16	19	3	16	19
McCallum	24	94	118	0	0	0	1	3	4	25	97	122
McCallum, S	12	31	43	0	0	0	0	1	1	12	32	44
Michigan River	0	1	1	0	0	0	2	2	4	2	3	5
TOTALS==>	37	130	167	0	0	0	46	79	125	83	209	292
Wildcat	52	4	56	13	0	13	91	14	105	156	18	174
TOTALS==>	89	134	223	13	0	13	137	93	230	239	227	466

TABLE 3. TOTAL CUMULATIVE OIL AND GAS PRODUCTION IN THE KREMMLING RESOURCE AREA

			TOTAL WELLS 1987		CUMULATIVE	
FIELD	SWI	PWR	OIL	GAS	OIL	GAS
Alkali Lake	0	1	233	0	4,211	0
Battleship	2	3	19,220	0	2,877,152	1,390
Butler Ck	1	0	0	0	20,900	14,871
Canadian River	7	23	3,225	146,434	487,123	7,923,890
Carlstrom	0	0	0	0	7,741	4,194
Coalmont	1	1	3,467	0	126,909	76,235
Delany Butte	1	1	790	0	7,827	1,373
Grizzly Ck	0	0	0	0	1,342	0
Johnny Moore Mtn.	1	0	309	550	36,189	64,693
Lone Pine	4	14	81,531	15,282	2,159,617	611,996
McCallum	4	35	122,602	129,832	8,328,617	716,322
McCallum, S	0	0	0	0	771,010	119,958
Michigan River	1	1	1,974	0	133,668	155,786
TOTALS==>	22	79	233,351	292,098	14,962,306	9,690,708
McCallum (CO_2)	18	9	0	1,128,761	0	512,050,758
McCallum, S (CO_2)	0	0	0	0	0	154,795,998
TOTALS==>	18	9	0	1,128,761	0	666,846,756

TABLE 4. CUMULATIVE PRODUCTION FROM FEDERAL LANDS IN THE KREMMLING RESOURCE AREA

			FEDERAL WELLS					
			1987		CUMULATIVE		% FEDERAL	
FIELD	SWI	PWR	OIL	GAS	OIL	GAS	OIL	GAS
Alkali Lake	0	1	233	0	4,211	0	100.00%	
Battleship	0	0	0	0	0	0	0.00%	0.00%
Butler Ck	0	0	0	0	0	0	0.00%	0.00%
Canadian River	0	0	0	0	27,609	91,583	5.67%	1.16%
Carlstrom	0	0	0	0	0	0	0.00%	0.00%
Coalmont	0	0	0	0	13,448	16,560	10.60%	21.72%
Delany Butte	0	0	0	0	0	0	0.00%	0.00%
Grizzly Ck	0	0	0	0	0	0	0.00%	
Johnny Moore Mtn.	1	0	309	550	36,189	64,693	100.00%	100.00%
Lone Pine	0	0	0	0	0	0	0.00%	0.00%
McCallum	3	35	119,804	46,222	8,292,753	362,621	99.57%	50.62%
McCallum, S	0	0	0	0	739,308	119,958	95.89%	100.00%
Michigan River	0	0	0	0	9,164	7,286	6.86%	4.68%
TOTALS==>	4	36	120,346	46,772	9,122,682	662,701	60.97%	6.84%
McCallum (CO2)	18	9	0	1,128,761	0	512,050,758		100.00%
McCallum, S (CO2)	0	0	0	0	0	147,670,793		95.40%
TOTALS==>	18	9	0	1,128,761	0	659,721,551		98.93%

OIL AND GAS POTENTIAL AND REASONABLE FORESEEABLE LITTLE SNAKE RESOURCE AREA

INTRODUCTION

The Little Snake Resource area (LSRA) sets on the southern edge of the Southwest Wyoming Basins Province. The LSRA portion of the Province contains the Sand Wash Basin, the Axial Basin Uplift, and portions of the Uinta, and the Park Range Uplifts (Figure 1) (Law 1988). Tectonic elements of the region are illustrated in Figure 2. The production of oil is primarily from fields located in and adjacent to the Laramie Basin, which in LSRA is the Axial Basin Uplift. The remainder of the hydrocarbon production in the planning area is nonassociated gas. Producing reservoirs range from Cambrian through Tertiary rocks and are composed dominantly of sandstone with minor carbonate reservoirs.

PROSPECTIVELY VALUABLE FOR OIL AND GAS

Land described as prospectively valuable (PV) for oil and gas is based on criteria described in Appendix a. PV lands for the LSRA are shown in Figure 3 and generally include lands that have 1,000 feet of sedimentary rock, favorable structural setting, and minimum evidence of potential for the occurrence of oil and gas. Areas not designated as PV are rated as having no potential. The PV lands in LSRA are rated 2, Intermediate Low; 3, Intermediate High; or 4, High potential for oil and gas occurrence and prospective development. Areas not rated as PV (Area 1) are rated as having no potential for occurrence or development, though there may be potential for exploratory drilling.

OIL AND GAS POTENTIAL

Oil and gas potential rating criteria are described in appendix b and is the basis for the ratings described below. Areas defined by the USGS as a play have a high potential for oil and gas occurrence.

Sand Wash Basin

The Sand Wash Basin is the southern most basin of the Basin Center Play. This play includes the areas not considered in the other plays. It includes reservoirs that are strigraphically equivalent to other assessed Cretaceous and Tertiary tight gas reservoirs as well as reservoirs stratigraphically above and below the tight gas reservoirs.

The tight gas play includes the Cretaceous and lower Tertiary reservoirs. The play is subdivided into five stratigraphic intervals: 1) the lower Cretaceous Dakota Sandstone and Upper Cretaceous Frontier Formation, 2) the Upper Cretaceous Mesaverde Group, 3) the Upper Cretaceous Lewis Shale, 4) the Upper Cretaceous Lance Formation, and 5) the lower Tertiary Fort Union Formation. Because of the difficulty in accurately locating the areas of conventional reservoirs within the tight reservoir area, some conventional reservoirs were probably included in the tight gas reservoir play.

Coal bed methane is assessed as part of the tight gas play.

Axial Basin Uplift

The Axial play area is located between the Piceance and Sand Wash Basins figure 4. It appears to be a southeast extension of the eastern end of the Uinta Mountains Uplift. During much of Paleozoic time, the Axial arch was a structurally depressed area referred to as the Colorado trough. The principal reservoirs in the play include the Pennsylvanian Minturn Formation and Weber Sandstone; Triassic Shinarump Sandstone, and Moenkopi Formation; Jurassic Entrada Sandstone and Morrison Formation; Lower Cretaceous Dakota Sandstone; and Upper Cretaceous Frontier Formation, Niobrara Formation, and Morapos Sandstone Member of the Mancos Shale. Porosity ranges from 12 to 20% and permeability ranges from 0.1 to 300 millidarcys. Reservoir thickness ranges from 8 to 65 feet. The depth of reservoirs ranges from 2,000 to 12,000 feet.

The area is maturely explored. However, because the area is structurally complex and has experienced a long history of structural deformation, structural traps were likely formed as early as Pennsylvanian time. Thus, the temporal relationship between hydrocarbon generation and migration, and structural trap development were favorable.

Uinta Uplift

The subthrust play is highly speculative. The play area is located along the overridden thrust margins of basins. Possible reservoirs include any of the reservoirs previously discussed in the province. The depth of occurrence is unknown but is related to depths of sedimentary rocks beneath the hanging wall of the thrust margin.

The Southwestern Wyoming province probably contains more wells drilled for this objective than anywhere else in the U. S., and most certainly, in the Rocky Mountain region. However, the play is immature to moderately maturely explored. There are large areas that appear to be unevaluated. There are no fields in the play area but the attributes of the play and the relatively unexplored nature of the play are intriguing.

Park Range Uplift

The Park Range is the western most expression of the Transcontinental Arch. It is composed primarily of Precambrian granitic rock.

This area is considered to have no potential for oil and gas occurrence (since there are no source rocks) and therefore none for development, even though it is recognized that exploration could take place.

OIL AND GAS ACTIVITY

Historical Background

Relatively small discoveries in the 1920s opened oil fields in Moffat and Routt counties. Tow Creek and Moffat oil fields were found in 1924. The major gas fields of Hiawatha and Powder Wash, in Sand Wash Basin, were discovered in 1925 and 1931 respectively (Rountree 1984).

Since 1924, fields have been discovered at the average rate of one field annually with peak discoveries in the late 1950s. Oil and gas development peaked in the late 1950s or early 1960s. Since that time, activity has remained at a relatively stable development level. Even in the late 1970s and early 1980s, while drilling records were being broken elsewhere in the Rocky Mountains, drilling activity did not surpass the record set in 1959 for LSRA.

PRESENT ACTIVITY

Exploration and development activity has generally declined from the high of 1980-1981 for conventional reservoirs. However, tax incentives for the development of coal-bed methane has resulted in maintaining a fairly high level of overall activity.

REASONABLY FORESEEABLE DEVELOPMENT ACTIVITY

Historical trends, present activity, and professional judgement were used to formulate the reasonably foreseeable development (RFD) scenario for oil and gas activity in the LSRA.

Based on analysis of historical trends, it is projected that 550 wells will be drilled within the planning unit in the next 20 years. This projection is drawn from a gradually diminishing curve derived from the graph of past drilling activity. However, because the cumulative impact analysis remains valid only for as long as drilling activity is at or below the levels assumed for analysis purposes, the projected number of wells derived by the analysis has been increased by a factor of 1.82. This increase will allow for the analysis to err on the side of protection of sensitive resources. The factor was derived by counting the number of Applications for Permit to Drill (APDs) approved by the Craig District from 1983 through 1985 and dividing that number of wells spudded in those same years. As a result, the assumed RFD level for purposes of the impact analysis in this plan is 1,000 wells drilled within the boundaries of the Little Snake Resource Area over the next 20 years.

The analysis of past drilling activity shows that 47 percent of the wells drilled in the LSRA were within known fields. (Note: The discovery well in each of the presently known fields is counted with the field total even though at the time of drilling the field itself would have been known). The remaining 53 percent of the wells drilled in the Resource Area are abandoned, unproductive wildcat wells. Assuming this ratio remains stable over the life of the plan, and applying it to the 1,000 projected wells, it means 470 more field development wells and 530 more wildcat wells will be drilled.

he average well densities of all known fields and projected drilling rates were applied to the potential ratings. Existing wells were counted in each of the potential areas and compared to the total wells within the LSRA.

Potential Rating	Wells
4	96.8%
3	3.0%
2	0.2%
1	< 0.1%

The varying density of existing development between potential areas was applied to the overall assumption of 1,000 wells over the life of the plan to determine an assumed level of development for each of the zones by applying the current ratio of wildcat wells to development wells.

This report is taken largely from Law, B.E. 1988.

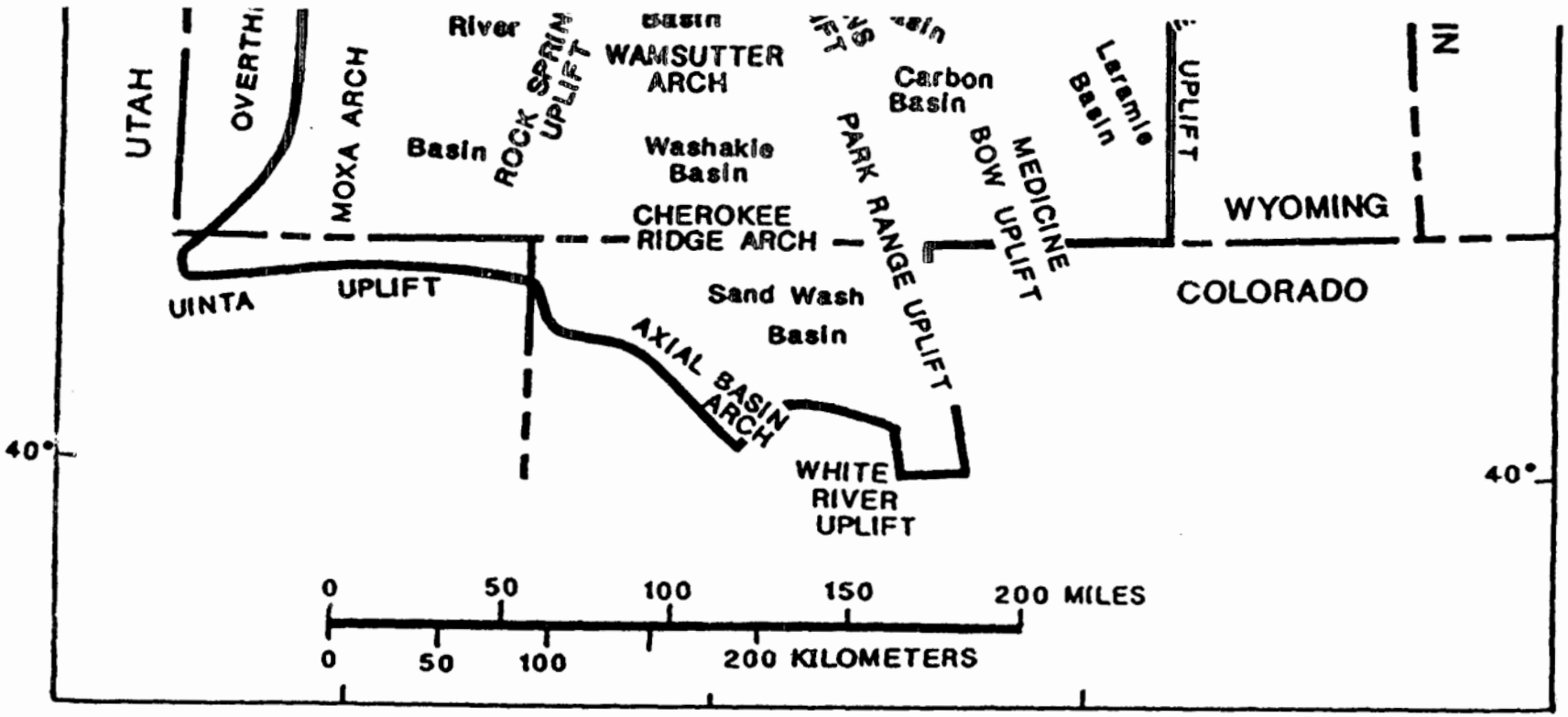


Figure 1.--Index map showing location of the Southwestern Wyoming Basins province and major structural features.

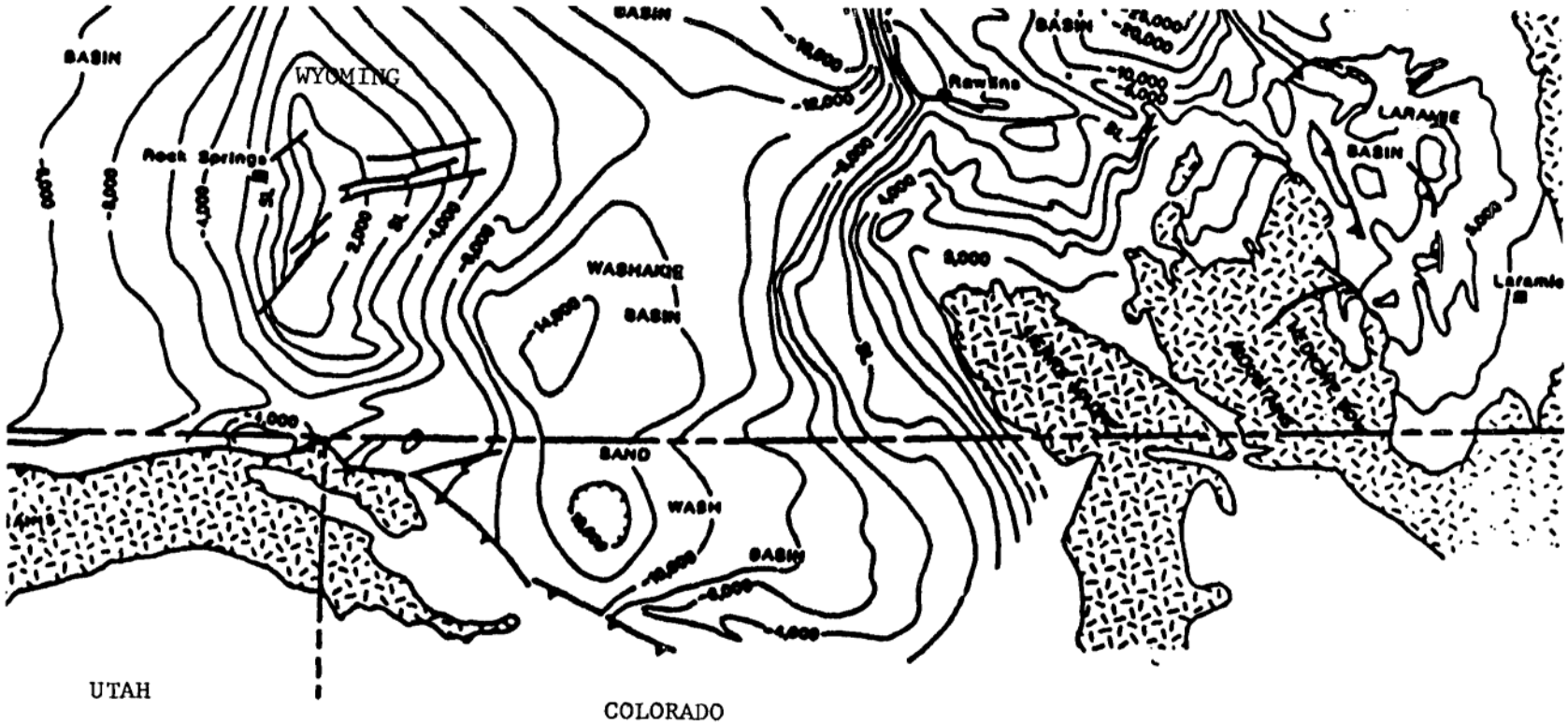
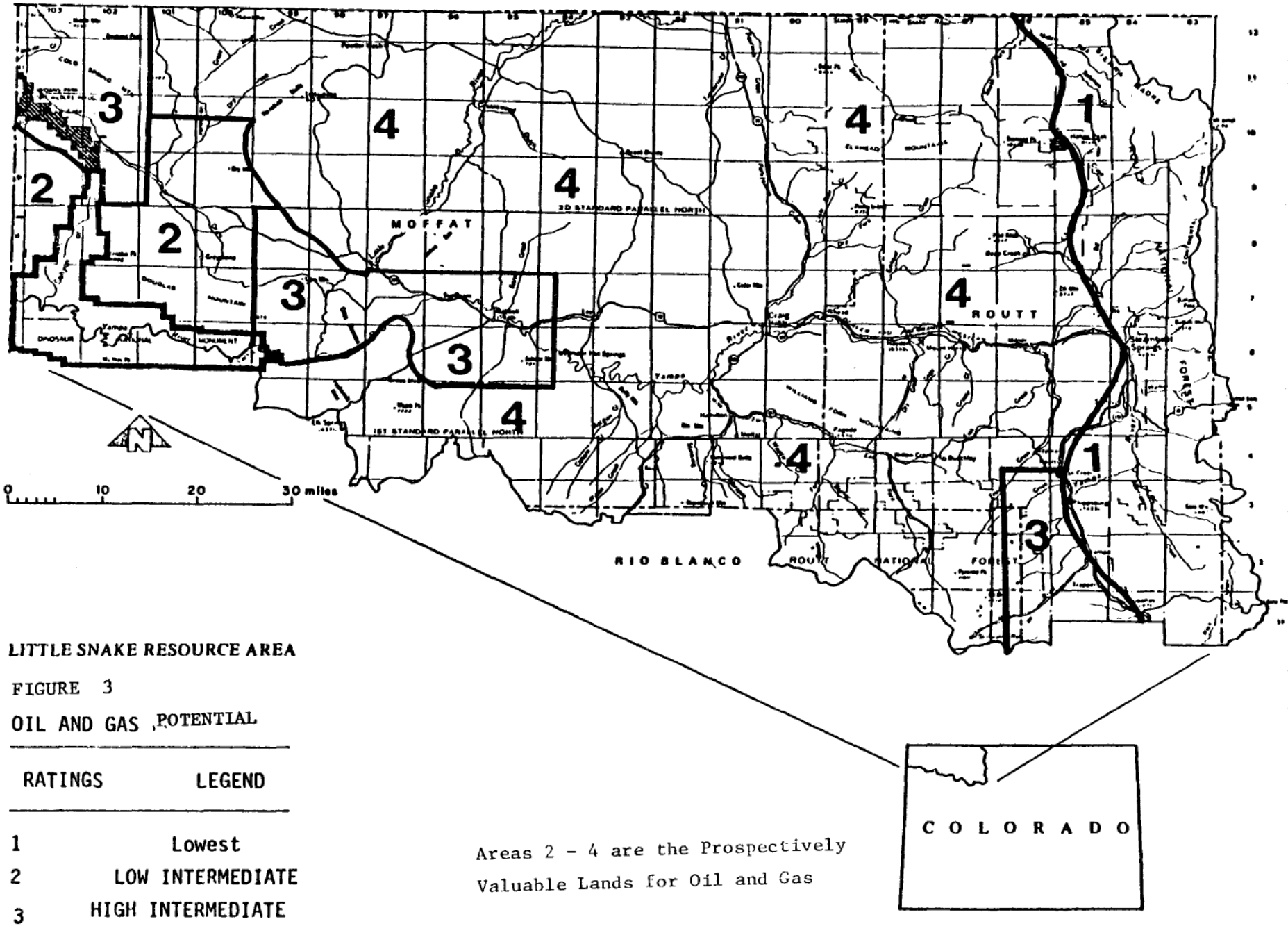


Figure 2.--Structure contour map of part of the Southwestern Wyoming Basins province. Structural datum is the top of the Lower Cretaceous Dakota Sandstone. Contour interval 2,000 and 5,000 ft. Modified from Skeesters and Hale (1972).



LITTLE SNAKE RESOURCE AREA

FIGURE 3

OIL AND GAS POTENTIAL

RATINGS	LEGEND
1	Lowest
2	LOW INTERMEDIATE
3	HIGH INTERMEDIATE
4	HIGHEST

Areas 2 - 4 are the Prospectively Valuable Lands for Oil and Gas

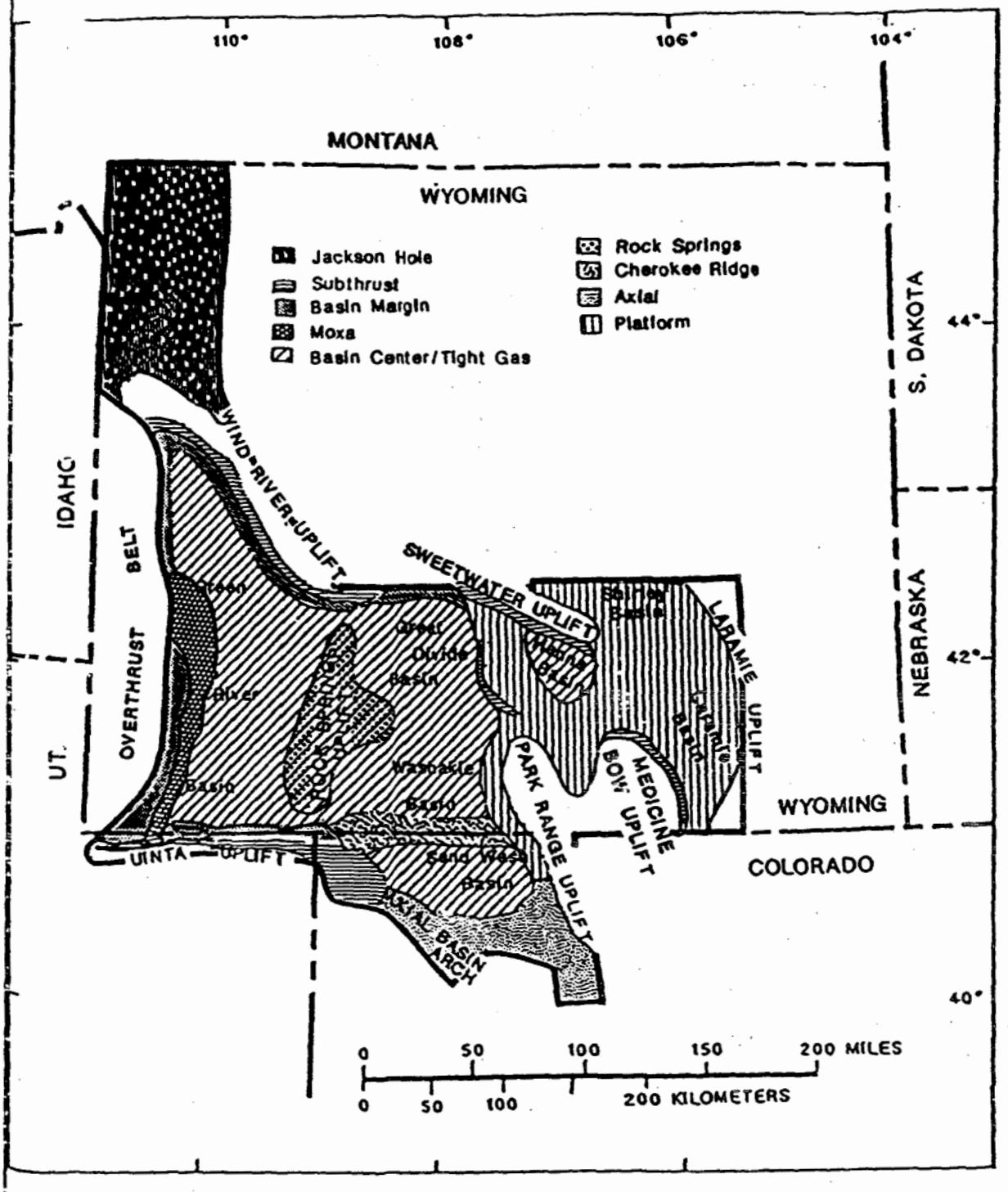


Figure 4.--Map showing approximate locations of plays in the Southwestern Wyoming Basins province.

POTENTIAL FOR OCCURRENCE AND DEVELOPMENT OF OIL AND GAS IN THE NORTHEAST PLANNING AREA

INTRODUCTION

The Northeast Planning Area (NPA) is situated within the Denver Basin and Las Animas Arch petroleum provinces (Figure 1). Hydrocarbons occur in lower Cretaceous sandstones of the Dakota Group (D and J sandstones), marine sandstones of the Pierre Shale, and the Permian Lyons Sandstone in the Denver Basin. The Las Animas Arch is productive from shelf carbonates and channel sands of the Pennsylvanian System (Topeka Limestone, Cherokee Limestone, Morrow Sandstone), and shelf carbonates from the Mississippian System (Spergen Osage Formations).

The Hotline database contains over 29,000 well records for the NPA and represents approximately 66% of the wells drilled in Colorado. The Denver Basin and Las Animas Arch provinces have been prolific oil and gas producers since oil was first discovered in Boulder County in 1901 from fractures in the Pierre Shale. Donaldson and MacMillan (1980) provide a detailed history of Colorado oil and gas development.

Federal mineral ownership, exclusive of the Pawnee National Grasslands, is minor and widely scattered. Less than 1% of the wells drilled were on BLM managed lands (surface ownership or split estate).

PROSPECTIVELY VALUABLE FOR OIL AND GAS

Land described as prospectively valuable (PV) for oil and gas is based on criteria described in Appendix a. PV lands for the NPA include all lands east of the Front Range (approximately R. 70 W.).

OIL AND GAS POTENTIAL

Oil and gas potential rating criteria are described in Appendix b and is the basis for the ratings described below. Areas described by the U.S. Geological Survey (USGS) as a play have a high potential, and areas not PV have no potential unless otherwise noted.

Denver Basin

Oil and gas reservoirs in the Denver basin are both stratigraphically and structurally controlled, as well as combinations thereof. The Denver Basin play report has not been released by the USGS. For the purpose of this report, the Denver Basin, as shown on Figure 2, is predominantly high potential with medium around the basin margin.

Las Animas Arch

The USGS has defined three plays in the Las Animas Arch area. Play areas (Figure 2) have a high potential for oil and gas, which are structurally trapped in carbonate and siliciclastic rocks of late Paleozoic age (Merewether 1987). The principal plays are a Mississippian structural play, Early Pennsylvanian stratigraphic play, and a Middle and Late Pennsylvanian stratigraphic play.

OIL AND GAS ACTIVITY

Historical Background:

Since the discovery of the Boulder Field in 1901, over 27,500 wells have been drilled within the Planning Area. This analysis includes oil and gas activity from 1953 through 1988. During the period, 25,294 wells were drilled with 52.5% completed as dry holes (Figure 3). Development wells had a success rate of 72.8%, while wildcat wells were only 13.4%.

Table 1 is a matrix of drilling activity broken down by major mineral ownership (BLM, FS, and Fee/State) and by well type (development and wildcat). Only 171 wells or .68% of the total wells drilled were on BLM administered lands (exclusive of the Pawnee Grasslands). Total federal wells, including those on the grasslands is 336 (1.4%). Figure 3 illustrates the drilling history for federal lands during 1953 through 1988.

County drilling activity on Federal lands is shown in Table 2 and Figure 4. The majority of activity has been on FS lands in Weld County. Activity on BLM lands has been concentrated in Yuma County in and near the Eckley and Beecher Island fields, western Logan County, and scattered throughout Morgan County.

PRESENT ACTIVITY

Oil and gas activity in northeast Colorado has been on a down turn since 1984. This is due to market conditions resulting from the collapse of oil prices.

REASONABLY FORESEEABLE DEVELOPMENT ACTIVITY

Historical trends, USGS estimates, mineral ownership patterns, and professional judgment were the key ingredients in formulating the reasonable foreseeable development scenario.

Field size varies greatly within the Denver Basin. Fields that include federal lands have an average of one to two wells drilled on BLM lands. For instance, the Wattenberg Field has 2,930 wells, of which only four are on BLM lands. However, the Battle Canyon and Eckley Fields contain a much larger percentage of federal lands and have 15 of 43 and 35 of 99 wells completed on BLM lands, respectively. Therefore, it seems reasonable to expect future activity on BLM lands to be within the areas having the highest percentage of federal minerals.

Oil and gas activity has been concentrated in the eastern portion of the Pawnee National Grasslands and resulted in the discovery and development of the Sooner, Lilli, and West Lilli Fields. It is conceivable that similar activity could occur on BLM managed lands covered by this analysis. Therefore, the drilling forecast will include the federal wells drilled in the grasslands.

Forecasting Activity Based on Historical Trends

Since 1953, a total of 336 wells have been completed within the Planning Area. Future oil and gas activity is difficult to predict; however, a sudden increase in the demand for oil and gas or price increases could trigger a larger exploration and development program in the Planning Area. Evaluation of past activity and professional judgment indicates it is reasonable to expect at least one cycle of increased activity during the next 20 years.

Trend analysis and statistical forecasting based on historical activity indicate that 454 wells are forecast to be drilled within the high potential areas (Figure 2). An additional 22 wells are projected for the medium and low potential areas. This forecast is based on the following assumptions and is the worst case scenario:

- Best fit, forecast to historical trend
- 51% of the wells are development and 9% are wildcat
- 66% success rate for development and 13% for wildcat wells

Of the 454 wells forecast, 232 development and 222 wildcat wells will be drilled on BLM lands. One hundred fifty-three development and 30 wildcat wells are expected to be completed for production in the high potential areas. Four wells are forecast for the Las Animas Arch play area. An additional 20 wells, with three successful completions, are projected for the medium potential area, and two dry holes in the low potential area.

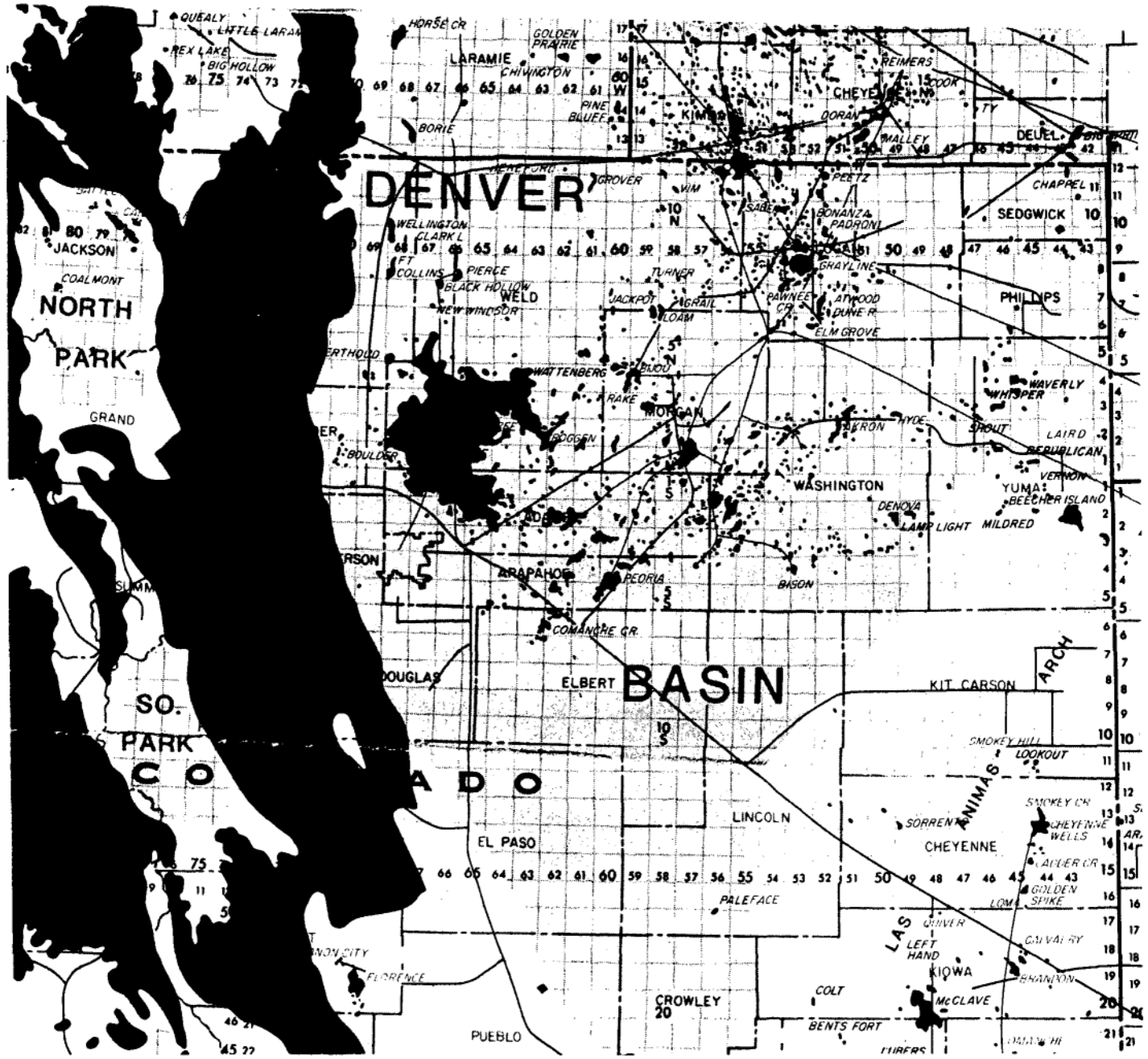


Figure 1. Major structural elements and oil and gas fields of Northeast Resource Area.

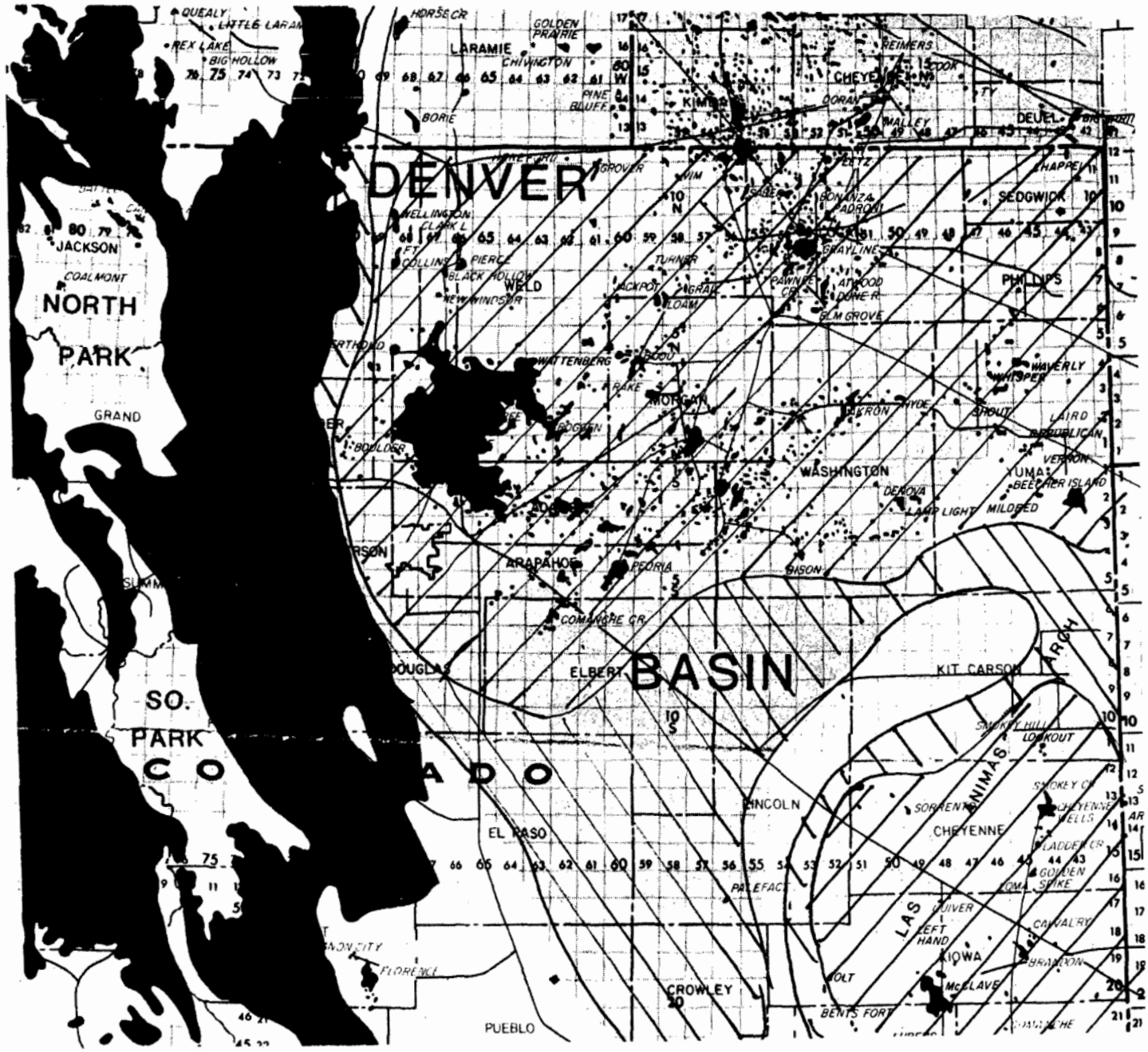


Figure 2. Oil and gas potential map of Northeast Resource Area (SW hatchure=high potential, SE hatchure=medium potential, no hatchure=low potential).

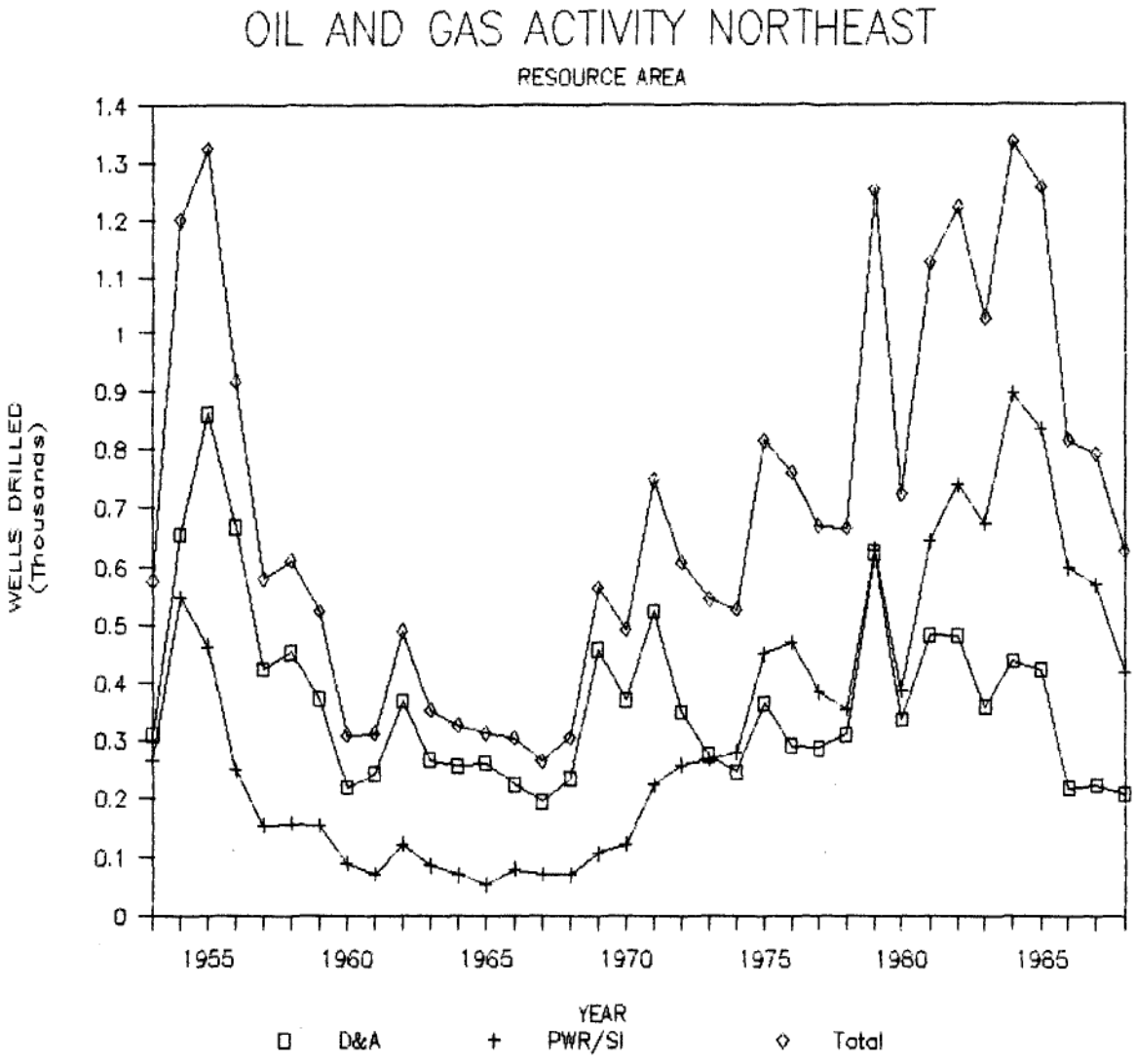


Figure 3. Oil and gas drilling activity graph for Northeast Resource Area (all lands).

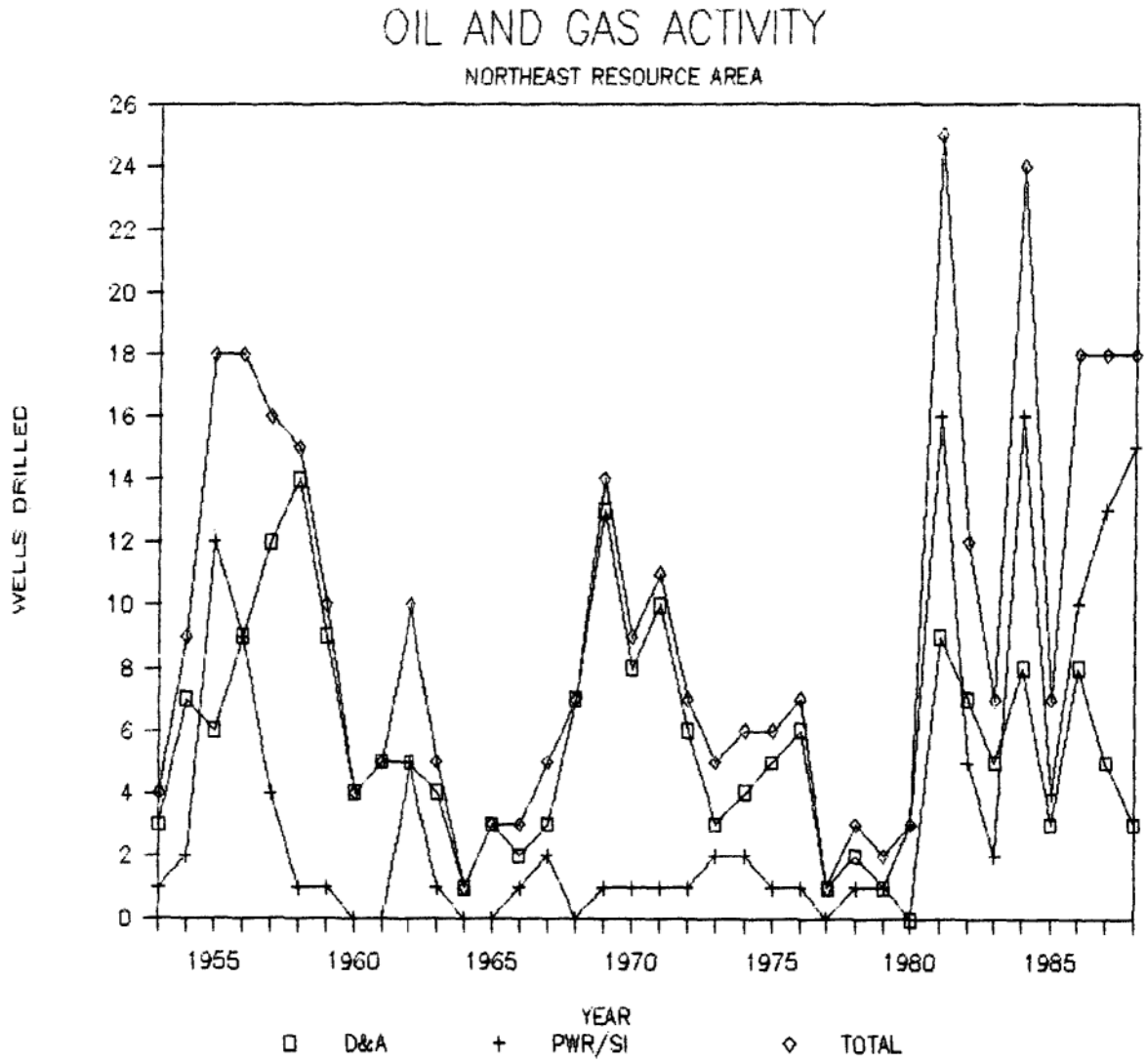


Figure 4. Oil and gas drilling activity graph for Northeast Resource Area (Federal lands: BLM and FS).

TABLE 1. NORTHEAST RESOURCE AREA OIL AND GAS DRILLING HISTORY

(1953 - 1988)

	BLM									FEDERAL						TOTAL			FEE/STATE						TOTAL						GRAND TOTAL		
	DEVELOPMENT			WILDCAT			TOTAL			DEVELOPMENT			WILDCAT			FEDERAL			DEVELOPMENT			WILDCAT			DEVELOPMENT			WILDCAT					
YEAR	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL
1953	1	0	1	1	1	2	2	1	3	1	0	1	2	1	3	3	1	4	55	223	278	252	41	293	56	224	280	254	42	296	310	266	576
1954	2	1	3	2	1	3	4	2	6	2	1	3	5	1	6	7	2	9	114	458	572	534	87	621	116	459	575	539	88	627	655	547	1202
1955	0	3	3	4	0	4	4	3	7	1	12	13	5	0	5	6	12	18	199	379	578	656	84	740	200	379	579	661	84	745	861	463	1324
1956	4	7	11	1	0	1	5	7	12	6	8	14	3	1	4	9	9	18	146	197	343	513	50	563	152	198	350	516	51	567	668	249	917
1957	2	1	3	2	0	2	4	1	5	3	2	5	9	2	11	12	4	16	88	117	205	325	33	358	91	119	210	334	35	369	425	154	579
1958	1	1	2	4	0	4	5	1	6	3	1	4	11	0	11	14	1	15	121	117	238	318	40	358	124	117	241	329	40	369	453	157	610
1959	1	1	2	2	0	2	3	1	4	1	1	2	8	0	8	9	1	10	103	119	222	259	34	293	104	119	223	267	34	301	371	153	524
1960	0	0	0	4	0	4	4	0	4	0	0	0	4	0	4	4	0	4	66	74	140	150	16	166	66	74	140	154	16	170	220	90	310
1961	0	0	0	3	0	3	3	0	3	0	0	0	5	0	5	5	0	5	72	60	132	166	10	176	72	60	132	171	10	181	243	70	313
1962	0	1	1	3	1	4	3	2	5	1	3	4	4	2	6	5	5	10	90	105	195	273	13	286	91	107	198	277	15	292	368	122	490
1963	1	0	1	3	0	3	4	0	4	3	0	3	1	1	2	4	1	5	88	77	165	175	7	182	91	78	169	176	8	184	267	86	353
1964	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	79	60	139	177	9	186	80	60	140	177	9	186	257	69	326
1965	1	0	1	1	0	1	2	0	2	1	0	1	2	0	2	3	0	3	76	50	126	182	3	185	77	50	127	184	3	187	261	53	314
1966	1	0	1	1	0	1	2	0	2	1	1	2	1	0	1	2	1	3	66	71	137	157	8	165	67	71	138	158	8	166	225	79	304
1967	1	1	2	1	0	1	2	1	3	1	2	3	2	0	2	3	2	5	75	60	135	117	10	127	76	60	136	119	10	129	195	70	265
1968	1	0	1	3	0	3	4	0	4	2	0	2	5	0	5	7	0	7	72	61	133	157	8	165	74	61	135	162	8	170	236	69	305
1969	0	0	0	6	0	6	6	0	6	2	0	2	11	1	12	13	1	14	81	91	172	363	14	377	83	92	175	374	15	389	457	107	564
1970	0	0	0	1	0	1	1	0	1	0	0	0	8	1	9	8	1	9	72	96	168	290	24	314	72	97	169	298	25	323	370	122	492
1971	2	0	2	5	0	5	7	0	7	3	1	4	7	0	7	10	1	11	107	173	280	407	52	459	110	173	283	414	52	466	524	225	749
1972	0	0	0	3	0	3	3	0	3	1	0	1	5	1	6	6	1	7	106	220	326	237	37	274	107	221	328	242	38	280	349	259	608
1973	0	1	1	0	1	1	0	2	2	1	1	2	2	1	3	3	2	5	60	242	302	212	25	237	61	243	304	214	26	240	275	269	544
1974	2	2	4	2	0	2	4	2	6	2	2	4	2	0	2	4	2	6	59	250	309	184	31	215	61	250	311	186	31	217	247	281	528
1975	1	0	1	2	1	3	3	1	4	1	0	1	4	1	5	5	1	6	106	417	523	254	32	286	107	418	525	258	33	291	365	451	816
1976	2	1	3	2	0	2	4	1	5	2	1	3	4	0	4	6	1	7	87	445	532	198	25	223	89	445	534	202	25	227	291	470	761
1977	1	0	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0	1	74	333	407	211	50	261	75	333	408	211	50	261	286	383	669
1978	0	1	1	1	0	1	1	1	2	0	1	1	2	0	2	2	1	3	99	284	383	210	71	281	99	284	383	212	71	283	311	355	666
1979	0	1	1	0	0	0	0	1	1	0	1	1	1	0	1	1	1	2	199	515	714	424	114	538	199	515	714	425	114	539	624	629	1253
1980	0	2	2	1	2	3	1	4	5	0	3	3	0	0	0	0	3	3	122	329	451	214	59	273	122	329	451	214	59	273	336	388	724
1981	1	12	13	4	2	6	5	14	19	3	14	17	6	2	8	9	16	25	182	561	743	292	79	371	185	563	748	298	81	379	483	644	1127
1982	3	2	5	0	0	0	3	2	5	5	5	10	2	0	2	7	5	12	213	669	882	261	72	333	218	669	887	263	72	335	481	741	1222
1983	0	0	0	2	0	2	2	0	2	2	2	4	3	0	3	5	2	7	152	608	760	201	66	267	154	608	762	204	66	270	358	674	1032
1984	1	14	15	2	0	2	3	14	17	1	16	17	7	0	7	8	16	24	187	843	1030	243	53	296	188	843	1031	250	53	303	438	896	1334
1985	1	0	1	1	1	2	2	1	3	2	2	4	1	2	3	3	4	7	168	768	936	251	63	314	170	770	940	252	65	317	422	835	1257
1986	1	6	7	1	0	1	2	6	8	2	9	11	6	1	7	8	10	18	96	575	671	115	21	136	98	576	674	121	22	143	219	598	817
1987	0	1	1	0	0	0	0	1	1	1	12	13	4	1	5	5	13	18	108	497	605	110	70	180	109	498	607	114	71	185	223	569	792
1988	0	2	2	0	1	1	0	3	3	2	13	15	1	2	3	3	15	18	100	401	501	105	14	119	102	403	505	106	16	122	208	419	627
Totals==>	31	61	92	68	11	79	99	72	171	58	114	172	143	21	164	201	135	336	3888	10545	14433	9193	1425	10618	3946	10566	14512	9336	1446	10782	13282	12012	25294

TABLE 2. COUNTY DRILLING ACTIVITY TOTALS ON FEDERAL LANDS **
(1953-1988)

	DEVELOPMENT			WILDCAT			TOTALS			
COUNTY	D&A	PWR	TOTAL	D&A	PWR	TOTAL	D&A	PWR	TOTAL	%
Adams	4	0	4	2	1	3	6	1	7	2.08%
Kit Carson	0	0	0	0	1	1	0	1	1	0.30%
Logan	7	0	7	15	2	17	22	2	24	7.12%
Morgan	6	15	21	29	3	32	35	18	53	15.73%
Sedgwick	0	2	2	1	0	1	1	2	3	0.89%
Washington	6	1	7	16	0	16	22	1	23	6.82%
Weld: FS	31	61	92	68	11	79	99	72	171	50.74%
Weld: BLM	0	3	3	12	2	14	12	5	17	5.04%
Yuma	4	32	36	1	1	2	5	33	38	11.28%
TOTALS==>	58	114	172	144	21	165	202	135	337	100.00%

** - Forest Service lands only in Weld County

POTENTIAL FOR OCCURRENCE AND DEVELOPMENT OF OIL AND GAS IN THE SAN JUAN/SAN MIGUEL PLANNING AREA

INTRODUCTION

The San Juan/San Miguel Planning Area (SJ/SMPA) is situated within the San Juan Basin and Paradox Basin petroleum provinces (Figure 1). Tectonic elements of the region are illustrated in Figure 2. Both basins are classified as craton-accreted margin basins, characterized by two or more cycles of deposition. The cycles typically consist of a carbonate shelf or platform sediments followed by a second cycle of orogenic clastics. The cycles occurred during the Paleozoic and upper Cretaceous to Oligocene, respectively.

PROSPECTIVELY VALUABLE FOR OIL AND GAS

Land described as prospectively valuable (PV) for oil and gas is based on criteria described in Appendix a. PV lands for the SJ/SMPA are shown in Figure 3. Areas not designated as PV are rated as having no potential.

OIL AND GAS POTENTIAL

Oil and gas potential rating criteria are described in Appendix b and is the basis for the ratings described below. Areas defined by the USGS as a play have a high potential for oil and gas.

San Juan Basin

Oil and gas reservoirs in the San Juan Basin are partially stratigraphically controlled. Huffman (1988) describes production from the central part of the basin as controlled by hydrodynamic forces and stratigraphy. Basin margin production is predominantly controlled by stratigraphy and structure. Pennsylvanian oil production is found along the northwestern margin of the basin and is restricted to porous biothermal carbonate buildups.

The USGS has defined seven plays in the San Juan Basin. Only six of the plays are found in the SJ/SMPA. They are the Pennsylvania, Dakota, Gallup, Mesaverde, Pictured Cliffs, and Fruitland/Kirtland plays (Figures 4-9). A detailed description of each play can be found in Huffman (1988).

Paradox Basin

Oil and gas reservoirs in the Paradox Basin are both structural and stratigraphic, as well as combination traps. The principal reservoirs are developed in the Pennyslvanian Hermosa Group. Porous carbonate bioherm buildups trap oil and gas (i.e., including CO_2 at McElmo Dome Field) in the Paradox Formation. The younger Honaker Trail Formation contains gas reservoirs in fluvial basin margin sandstones and conglomerates.

The USGS report on the Paradox Basin plays has not been released. However, the Pennsylvanian play boundary is shown in the San Juan Basin report (Huffman 1988; Figure 4).

The majority of the Planning Area (Figure 4) is within the Pennsylvanian play, as defined by the USGS.

OIL AND GAS ACTIVITY

Historical Background

Several dry holes were drilled prior to the discovery of the Red Mesa Field in the San Juan Basin in 1924 and the 1944 discovery of the McElmo Field in the Paradox Basin. Oil and gas exploration has accelerated through the 1930s, late 1940s to mid-1950s, through the 1960s, and peaked since the mid-1970s (Figure 10; Table 1). Present activity is due primarily to development of coal bed methane in the northern San Juan Basin.

Production has been from 16 fields in the Paradox Basin and nine fields in the San Juan Basin. Tables 2 and 3 illustrate development and wildcat wells drilled on BLM, FS, and Fee/State lands for the Paradox and San Juan Basins, respectively. Approximately 68% of the Paradox Basin wells are drilled on BLM lands, while only 7% in the San Juan Basin.

Cumulative production from all fields in the Paradox Basin, through 1987, has been 10,529,390 BO and 72,556,573 MCFG, as well as 555,198,284 MCFG of CO_2 produced from the McElmo Field (Table 4). San Juan Basin production during the same period was 8,349,066 BO and 850,944,153

MCFG (Table 5). Oil and gas production from federal wells has been 9,645,030 BO and 68,472,003 MCFG, as well as 555,198,284 MCF of CO_2 from the Paradox (Table 6), while production from the San Juan amounted to 8,987 BO and 52 MCFG (Table 1).

Federal wells account for approximately 91% of oil, 94% of gas, and 100% of CO_2 in the Paradox and less than 1% of oil in the San Juan Basin.

PRESENT ACTIVITY

Exploration and development activity has generally declined from the high activity of 1980-1981 (Table 1) for conventional reservoirs. However, tax incentives for the development of coal-bed methane has resulted in maintaining a fairly high level of activity.

REASONABLY FORESEEABLE DEVELOPMENT ACTIVITY

Historical trends, USGS estimates, present activity, and professional judgment were used to formulate the reasonably foreseeable development (RFD) scenario for oil and gas activity in the SJ/SMPA. The main problem encountered with this evaluation is that the USGS hydrocarbon play analysis (Huffman 1988; Unreleased Report on Paradox Basin) and the Planning Area boundaries do not coincide. For this reason, the RFD scenario will be based on forecasting activity based on historical trends.

Forecasting Activity Based on Historical Trends

Since 1902, a total of 919 wells have been completed within the Planning Area (exclusive of Indian lands). Future oil and gas activity is difficult to predict; however, a sudden increase in the demand for oil and gas or price increases could trigger a larger exploration and development program. Evaluation of past activity and personal judgment indicates it is reasonable to expect at least one cycle of increased drilling activity during the next 20 years.

Trend analysis and statistical forecasting based on historical activity (Gardner 1988) was developed on two main assumptions outlined below:

A. Tax credits for coal-bed methane and continued past 1990.

   1. Low development scenario.
      a. Best fit of forecast wells to actual historical wells drilled
      b. San Juan Basin
         (1) 55% total wells forecast
         (2) 7% on BLM: 43% development with 31% success rate and 57% wildcat with 10% success rate
      c. Paradox Basin
         (1) 45% total wells forecast
         (2) 68% on BLM: 60% development with 67% success rate and 40% development with 19% success rate

   2. High development scenario
      a. Best fit, statistically with lowest mean squared error
      b. As above in low development scenario
      c. As above in low development scenario

B. Tax credits for coal-bed methane not continued past 1990

   1. Low development scenario
      a. As above in A
      b. As above in A
      c. As above in A

   2. High development scenario
      a. As above in A
      b. As above in A
      c. As above in A

A total of 540 and 1,024 wells, respectively, are forecast under the low and high development scenarios of the forecast based on continuation of the tax credits; while 508 and 981 wells, respectively, are forecast under the forecast based on the tax credits being eliminated (Table 8).

The high development scenario is considered to be the worst case scenario that will be used to develop the oil and gas activity projection. Development drilling in the Paradox Basin is expected to be concentrated within and near existing fields, especially within the Blanding Basin and Four Corners Carbonate Platform (Figure 2). A total of 313 wells are projected

to be drilled on BLM lands, of which 188 will be development wells and 125 will be wildcat wells. This projection will result in 126 development and 24 exploratory wells completed for production within the areas shown on Figure 11 (Table 9).

The San Juan Basin portion of the Planning Area is expected to have about 40 wells drilled on BLM lands (Figure 11). Sixteen of the wells are projected to be development and 24 exploratory. Five of the development and three of the exploratory wells will be completed for production.

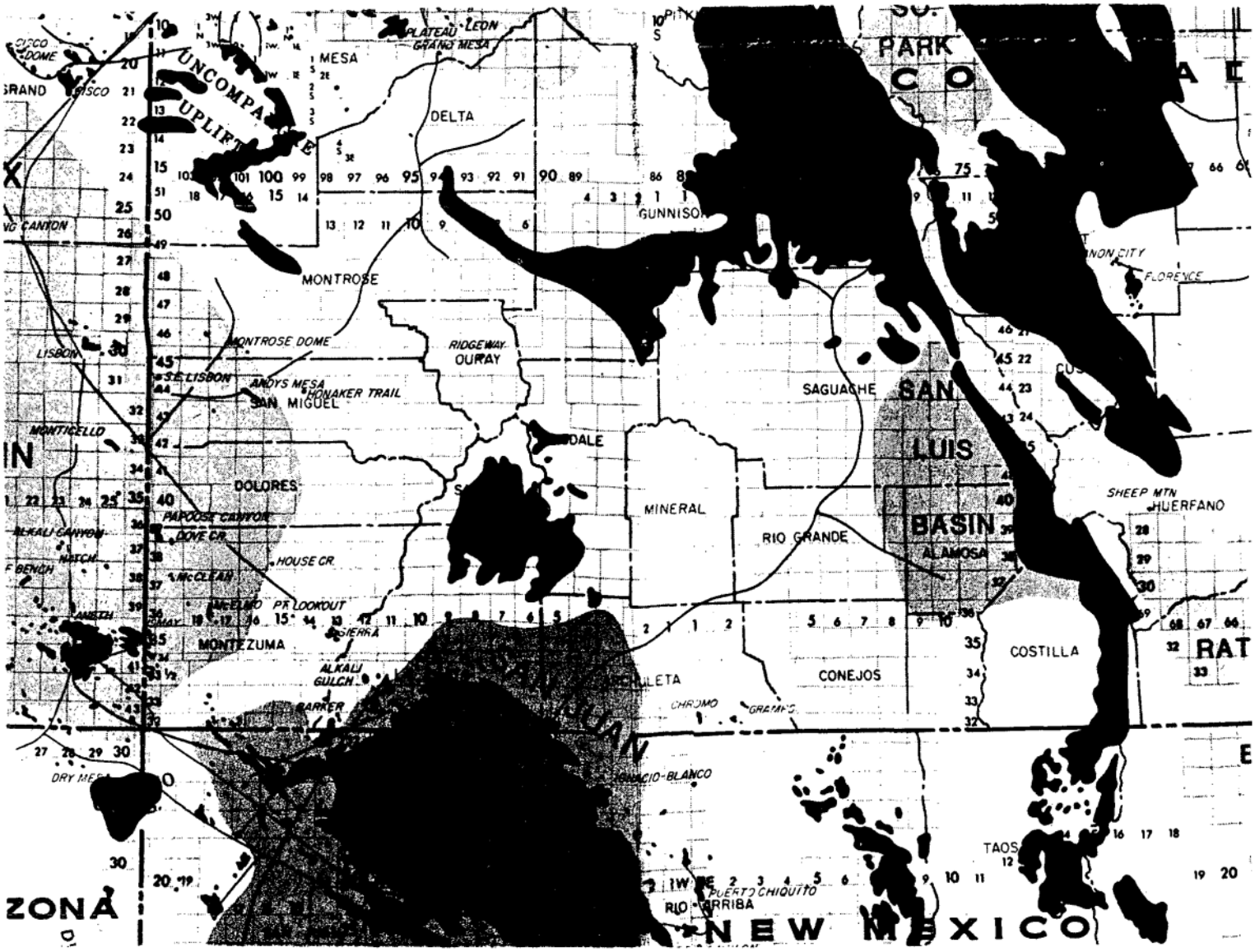


Figure 1. Generalized basin map and oil and gas fields, San Juan Resource area.

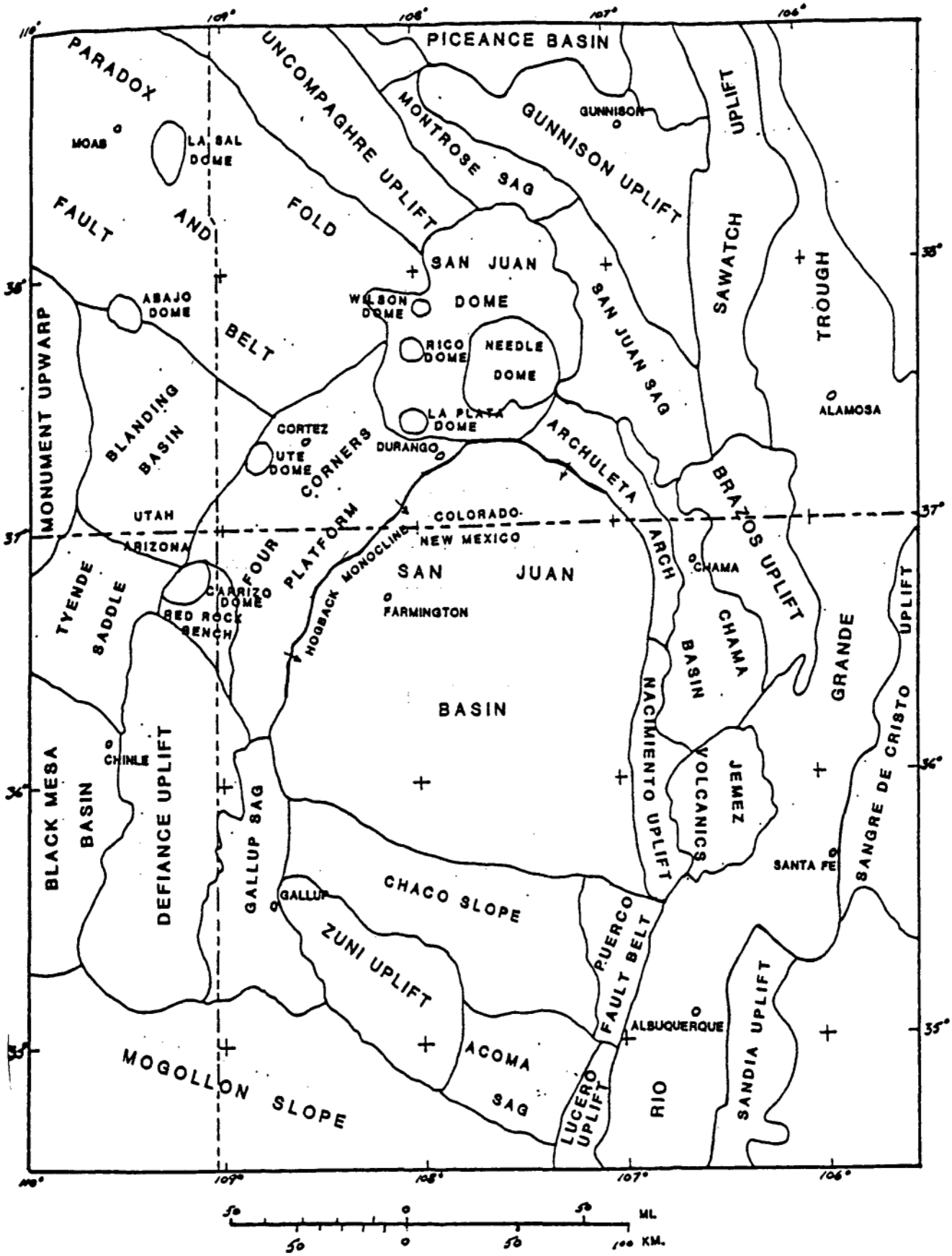
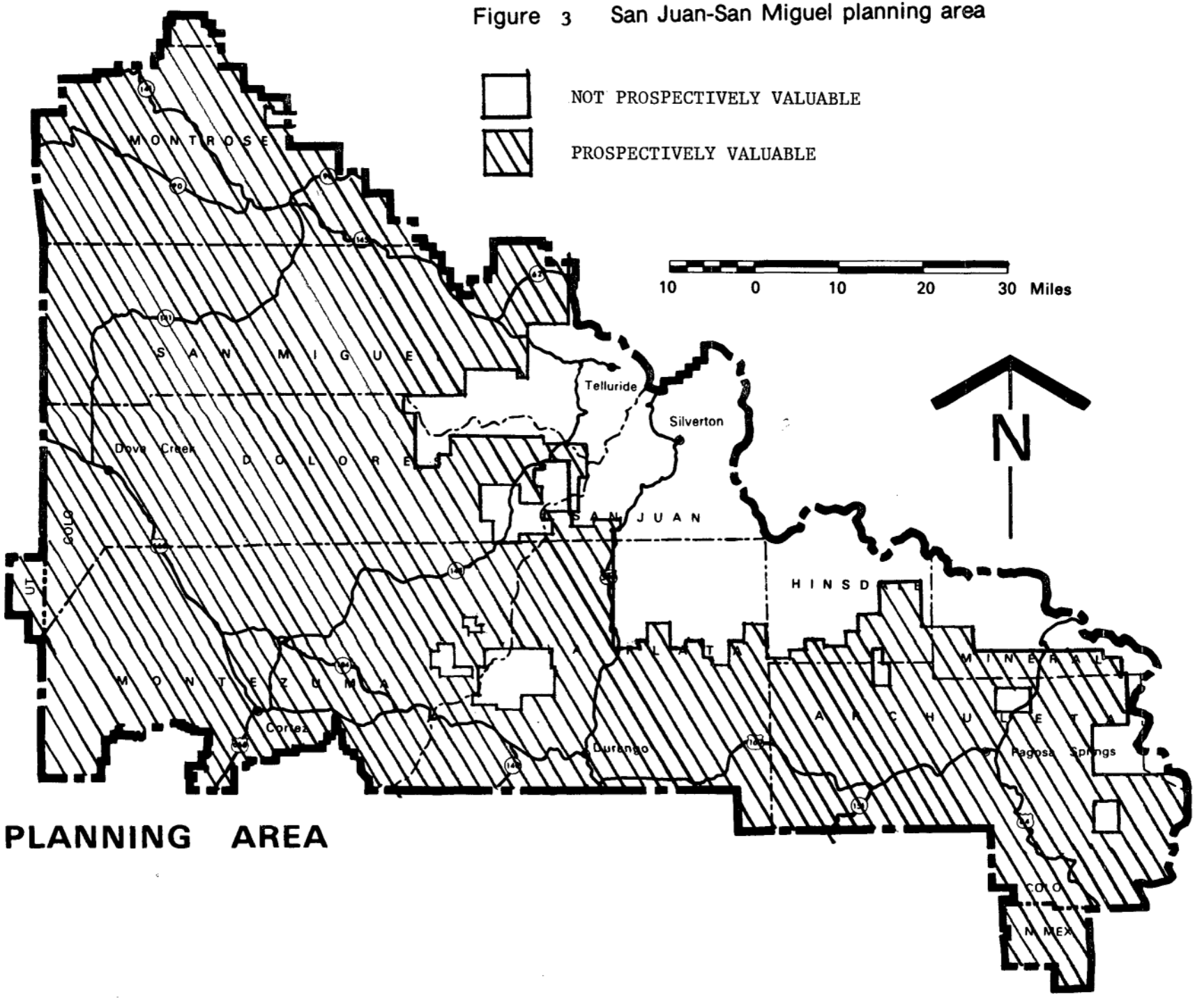


Figure 2.--Structural elements in the vicinity of the San Juan Basin petroleum province (modified after Kelley and Clinton, 1960; Grose, 1972; and Woodward, 1974).

Figure 3 San Juan-San Miguel planning area



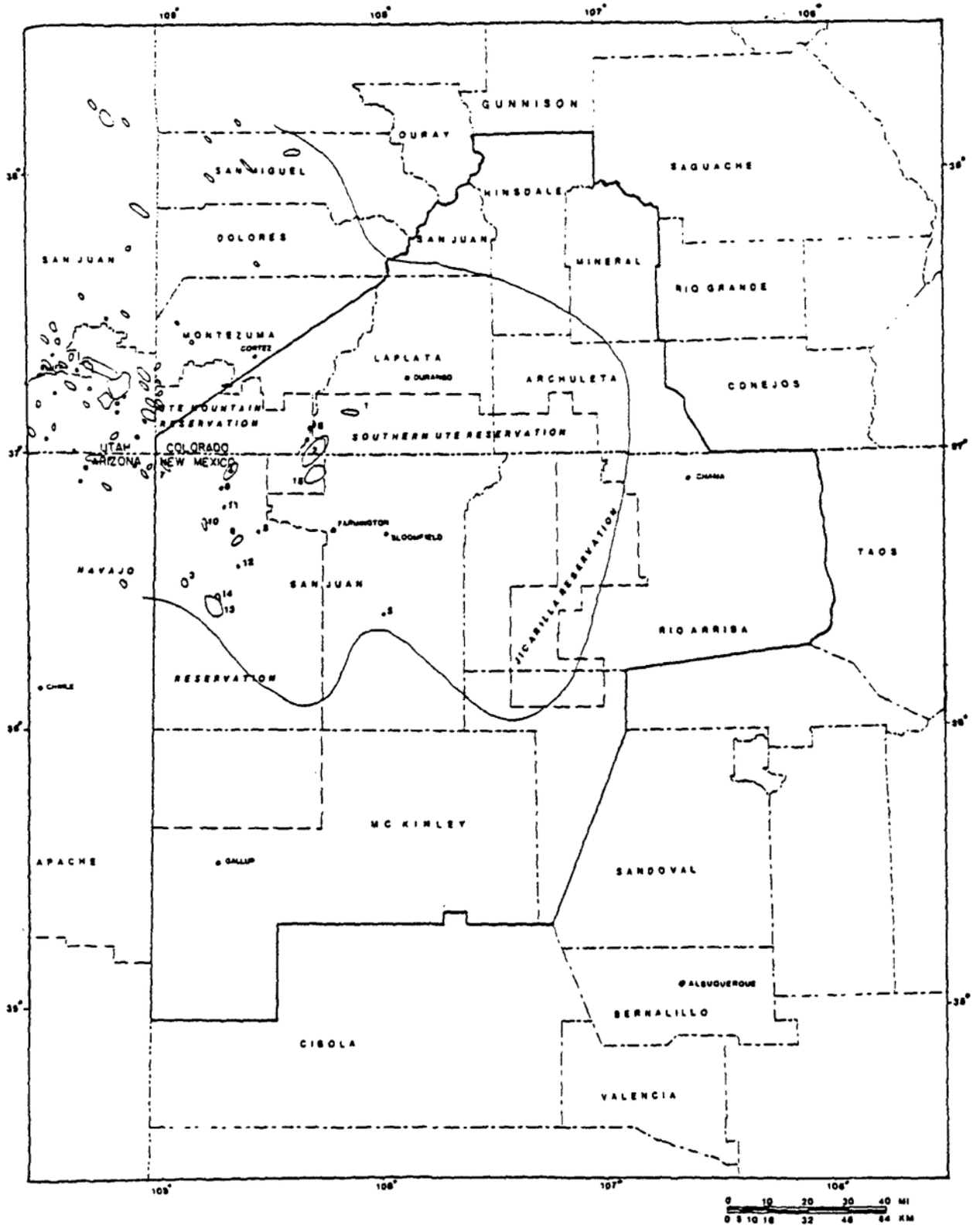


Figure 4 -Pennsylvanian play outline and developed oil and gas fields, San Juan Basin petroleum province. Numbered fields from table 1.

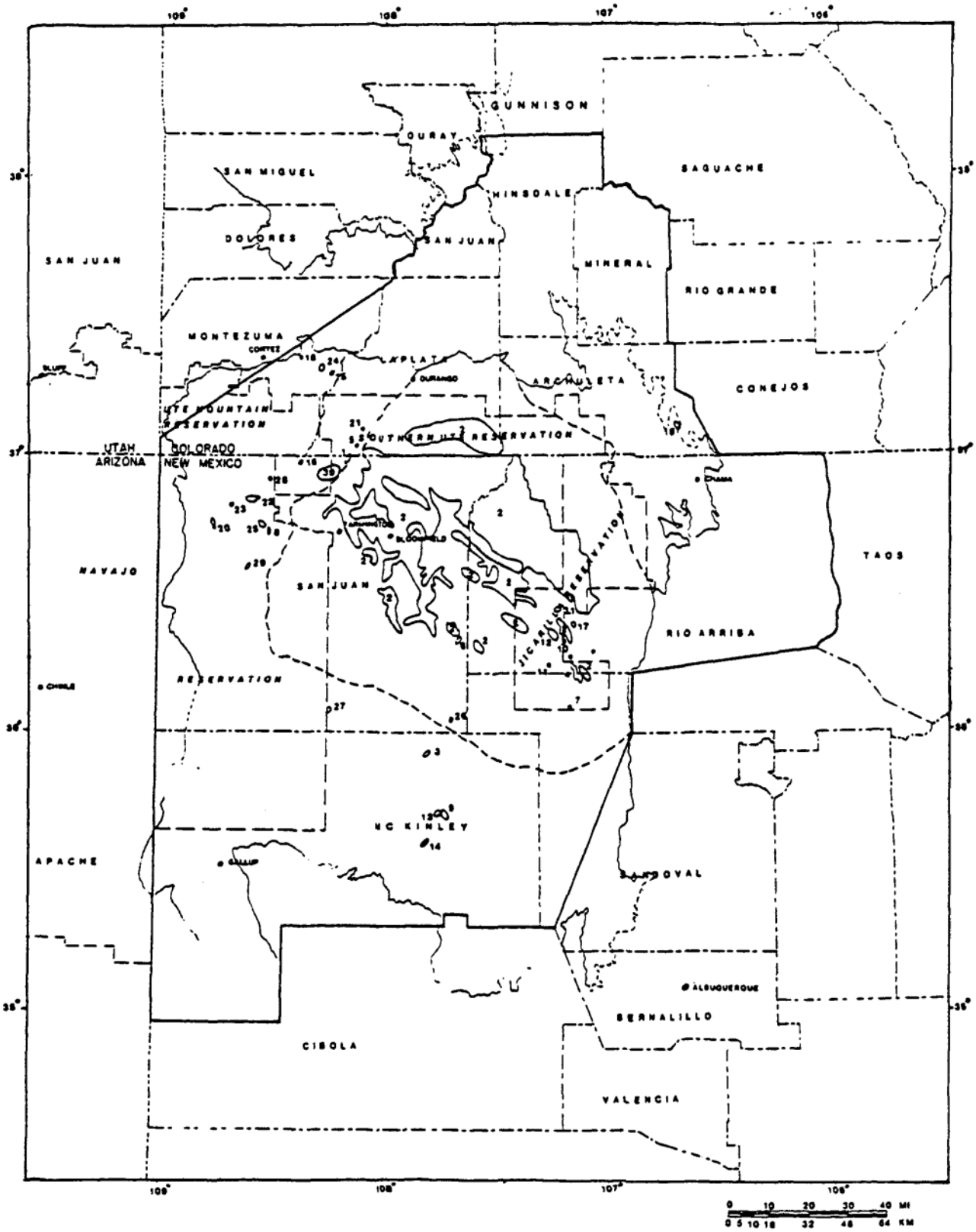


Figure 5 --Dakota play outline and developed oil and gas fields, San Juan Basin petroleum province. Broken line separates basinal and basin flank parts of play. Numbered fields from table 3.

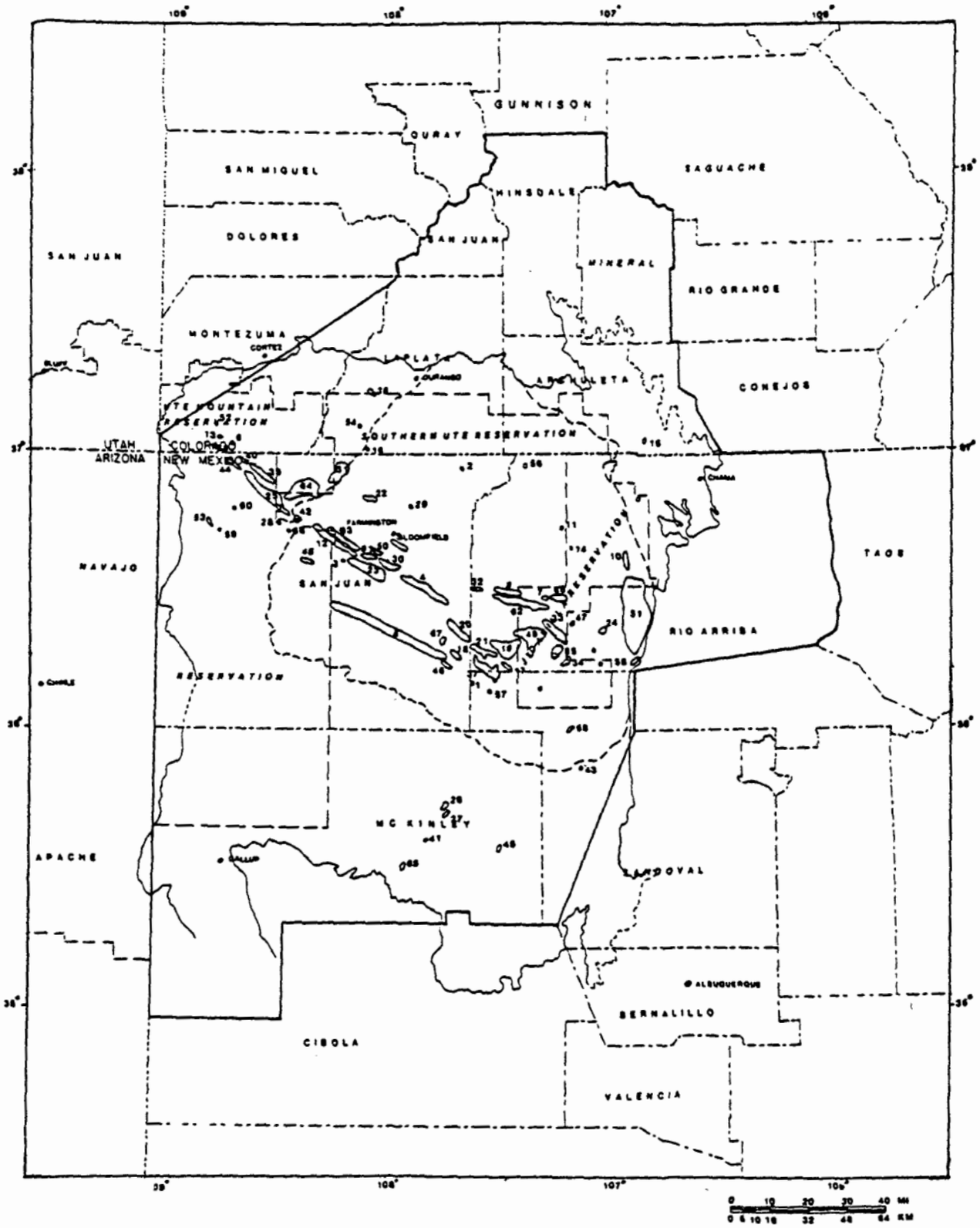


Figure 6 --Gallup play outline and developed oil and gas fields, San Juan Basin petroleum province. Broken line separates basinal and basin flank parts of play. Numbered fields from table 4.

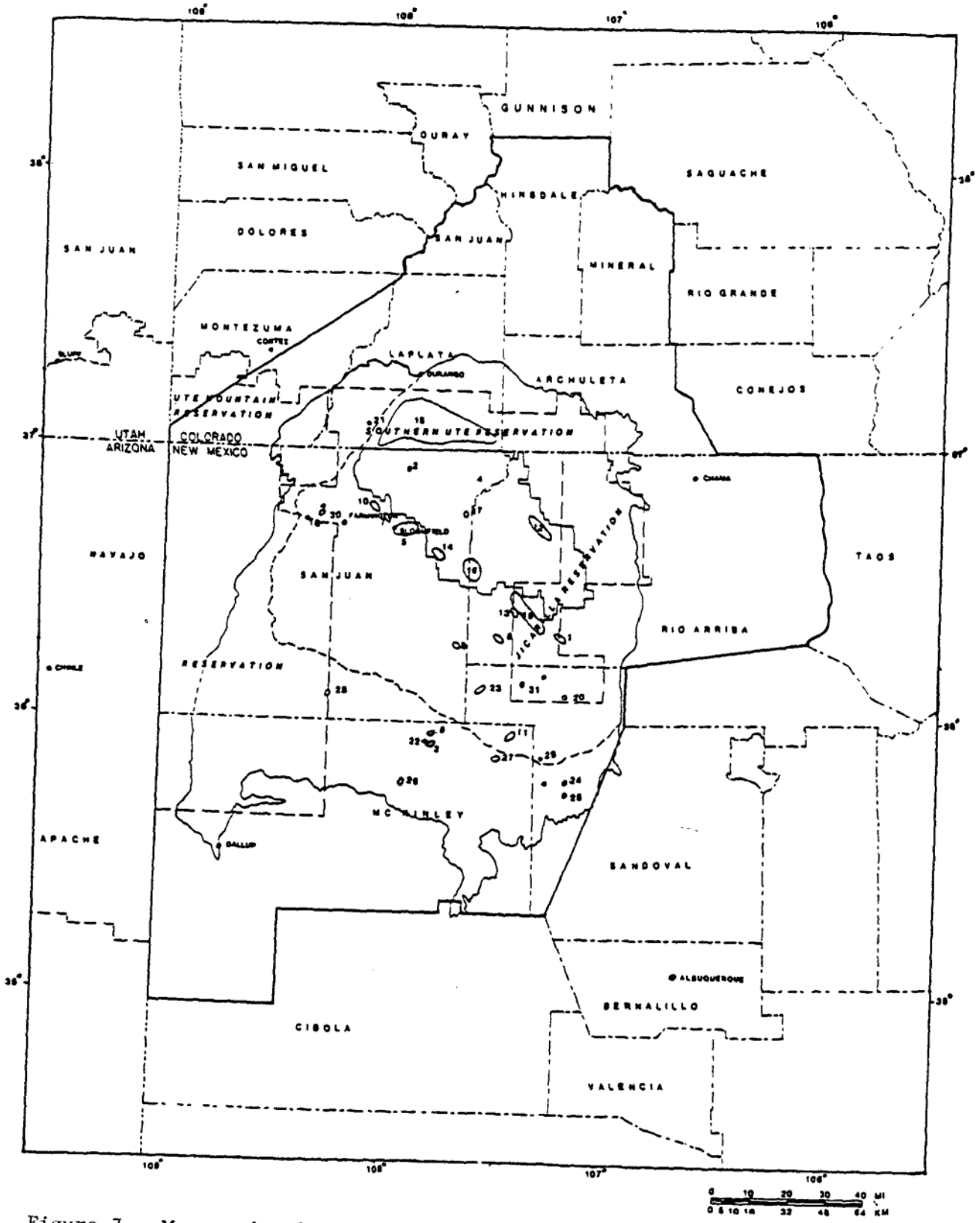


Figure 7 --Mesaverde play outline and developed oil and gas fields San Juan Basin petroleum province. Broken line separates basinal and basin flank parts of play. Numbered fields from table 5.

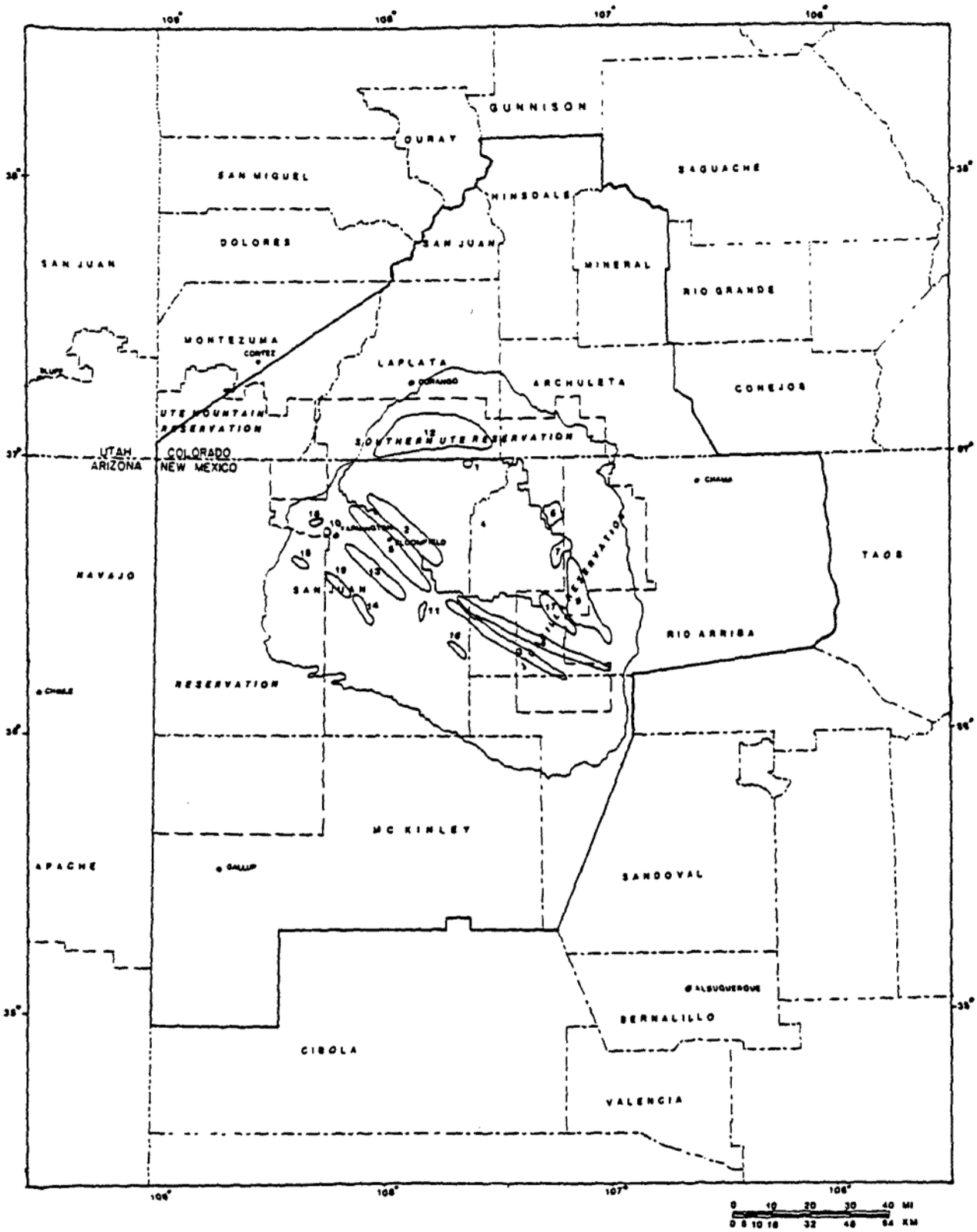


Figure 8 --Pictured Cliffs play outline and developed gas fields, San Juan Basin petroleum province. Numbered fields from table 6.

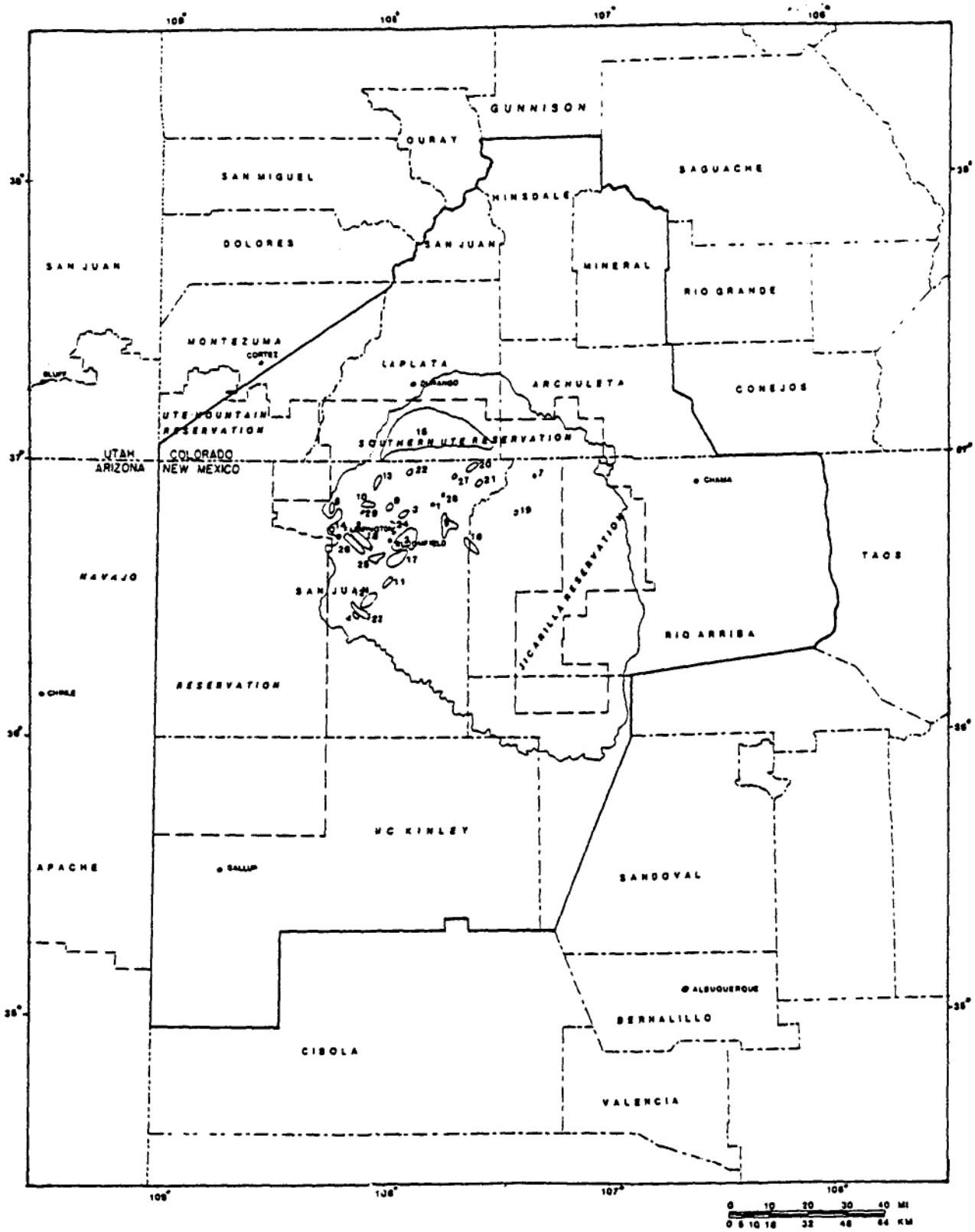


Figure 9 --Fruitland/Kirtland play outline and developed gas fields, San Juan Basin petroleum province. Numbered fields from table 7.

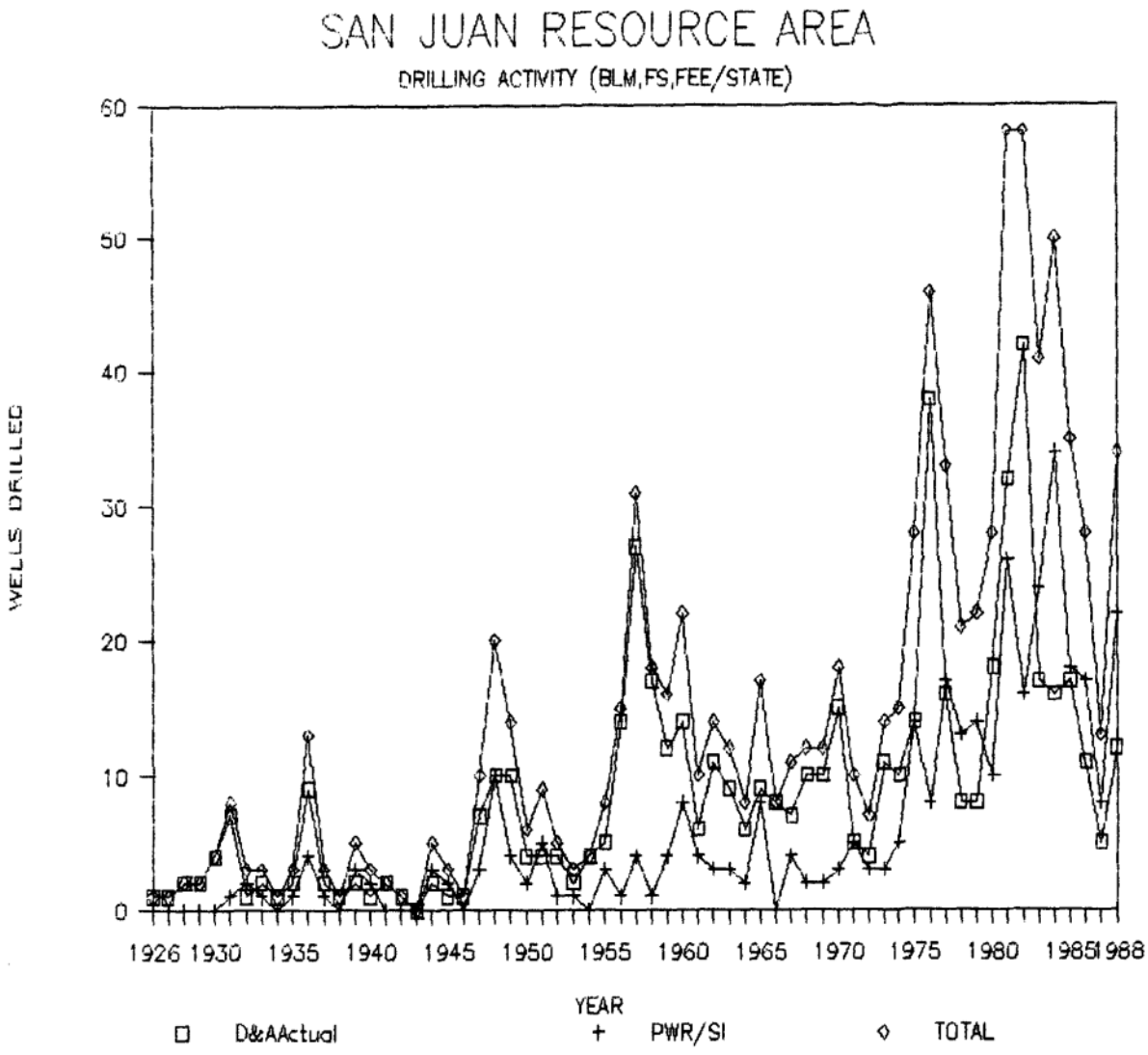


Figure 10. Oil and gas activity graph for the San Juan Resource Area (1926 - 1988).

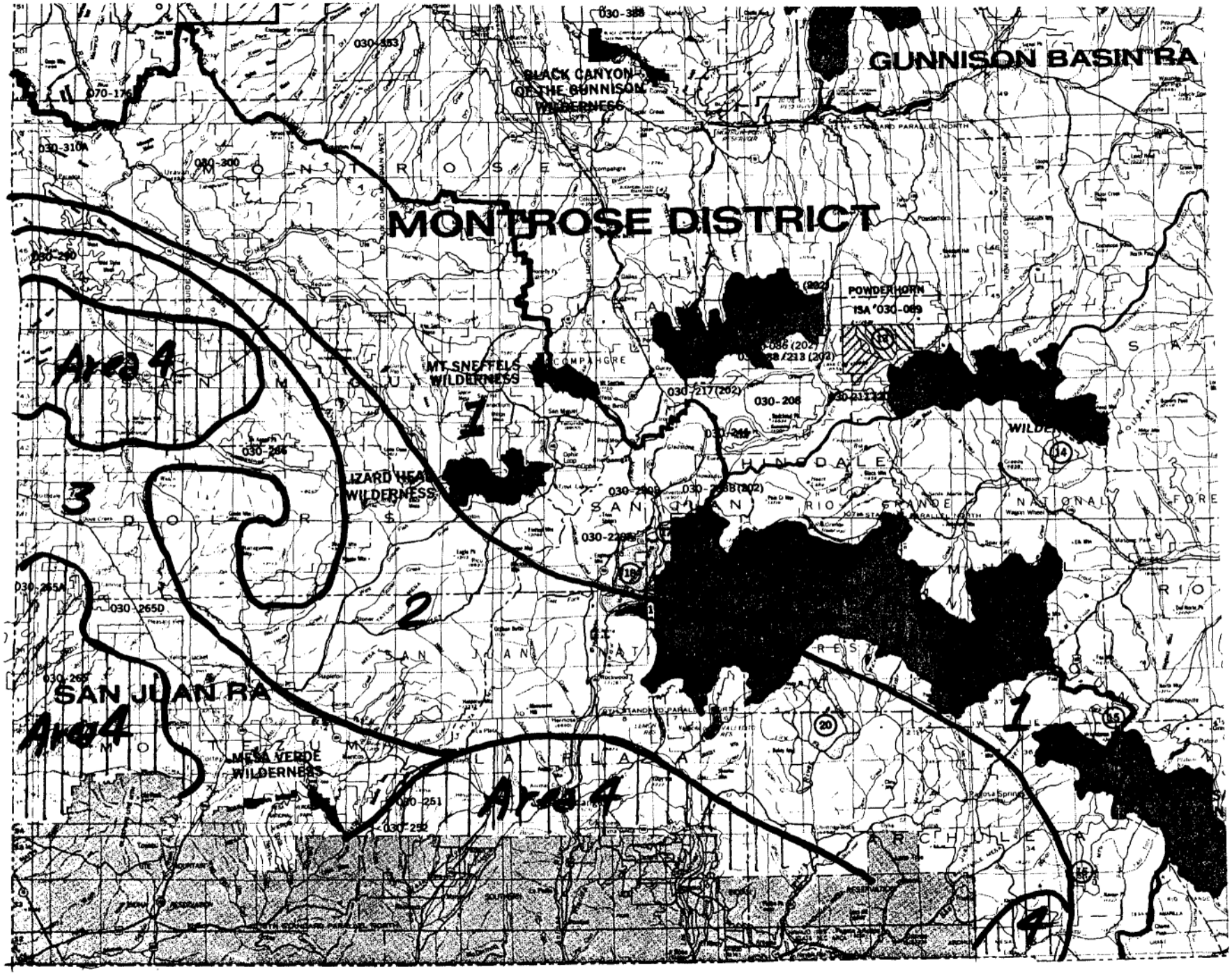


Figure 11. Oil and gas potential map of San Juan Resource Area (4 = high, 3 = medium, 2 = low, and 1 = no potential).

TABLE 1a. OIL AND GAS ACTIVITY FOR SAN JUAN RESOURCE AREA (1902 - 1988)

YEAR	BLM			FS			FEE/ST			GT		
	P&A	PWR/SI	TOTAL	P&A	PWR/SI	TOTAL	P&A	PWR/SI	TOTAL	P&A	PWR/SI	TOTAL
1902	1		1			0			0	1	0	1
1903			0		1	0	4		4	4	0	4
1904			0			0			0	0	0	0
1905			0			0			0	0	0	0
1906			0			0			0	0	0	0
1907			0			0			0	0	0	0
1908			0			0			0	0	0	0
1909			0			0			0	0	0	0
1910			0			0			0	0	0	0
1911	1		1			0			0	1	0	1
1912			0			0			0	0	0	0
1913			0			0			0	0	0	0
1914			0			0			0	0	0	0
1915			0			0			0	0	0	0
1916			0			0			0	0	0	0
1917			0			0			0	0	0	0
1918			0			0			0	0	0	0
1919			0			0			0	0	0	0
1920			0			0	2		2	2	0	2
1921			0			0			0	0	0	0
1922		1	1			0			0	0	1	1
1923			0			0			0	0	0	0
1924			0			0			0	0	0	0
1925			0			0	1		1	1	0	1
1926			0			0	1		1	1	0	1
1927			0			0	1		1	1	0	1
1928	1		1			0	1		1	2	0	2
1929			0			0	2		2	2	0	2
1930			0	1		1	3		3	4	0	4
1931			0			0	7	1	8	7	1	8
1932		1	1			0	1	1	2	1	2	3
1933		1	1			0	2		2	2	1	3
1934			0			0	1		1	1	0	1
1935			0			0	2	1	3	2	1	3
1936			0			0	9	4	13	9	4	13
1937			0			0	2	1	3	2	1	3
1938			0			0	1		1	1	0	1
1939			0			0	2	3	5	2	3	5
1940			0			0	1	2	3	1	2	3
1941			0			0	2		2	2	0	2
1942			0			0	1		1	1	0	1
1943			0			0			0	0	0	0
1944			0			0	2	3	5	2	3	5
1945			0			0	1	2	3	1	2	3
1946			0			0	1		1	1	0	1
1947	1		1			0	6	3	9	7	3	10
1948	1	3	4	2		2	7	7	14	10	10	20
1949	2		2	1		1	7	4	11	10	4	14
1950	1		1			0	3	2	5	4	2	6
1951	2		2			0	2	5	7	4	5	9
1952			0			0	4	1	5	4	1	5
1953			0			0	2	1	3	2	1	3
1954	1		1	1		1	2		2	4	0	4
1955	3		3			0	2	3	5	5	3	8
1956	2	1	3	1		1	11		11	14	1	15
1957	11		11			0	16	4	20	27	4	31
1958	9	1	10	1		1	7		7	17	1	18
1959	9	2	11		1	1	3	1	4	12	4	16
1960	9	6	15	2		2	3	2	5	14	8	22
1961	2	3	5	1	1	2	3		3	6	4	10
1962	3	3	6	2		2	6		6	11	3	14
1963	8	2	10			0	1	1	2	9	3	12
1964	2	2	4	1		1	3		3	6	2	8
1965	5	8	13			0	4		4	9	8	17
1966	5		5	1		1	2		2	8	0	8

TABLE 1b. OIL AND GAS ACTIVITY FOR SAN JUAN RESOURCE AREA (1902 - 1988)

1967	2	4	6	2		2	3		3	7	4	11
1968	6	2	8	2		2	2		2	10	2	12
1969	4	1	5	1		1	5	1	6	10	2	12
1970	8	3	11	6		6	1		1	15	3	18
1971	3	3	6	1		1	1	2	3	5	5	10
1972	2	3	5			0	2		2	4	3	7
1973	4	3	7	2		2	5		5	11	3	14
1974	3	2	5	1		1	6	3	9	10	5	15
1975	6	3	9			0	8	11	19	14	14	28
1976	5	3	8			0	33	5	38	38	8	46
1977	7	3	10	1	1	2	8	13	21	16	17	33
1978	2	6	8		2	2	6	5	11	8	13	21
1979	3	5	8			0	5	9	14	8	14	22
1980	4	2	6			0	14	8	22	18	10	28
1981	3	2	5	4	3	7	25	21	46	32	26	58
1982	5	6	11	6	2	8	31	8	39	42	16	58
1983	4	15	19		1	1	13	8	21	17	24	41
1984	7	25	32		1	1	9	8	17	16	34	50
1985	8	9	17	2	2	4	7	7	14	17	18	35
1986	7	1	8	1	8	9	3	8	11	11	17	28
1987	3	3	6		1	1	2	4	6	5	8	13
1988	4	1	5	2	3	5	6	13	24	12	22	34
TOTALS==	179	139	318	45	26	71	339	191	530	563	356	919

TABLE 2. FIELD SUMMARY SJRA PARADOX BASIN

	BLM			FS			FEE/ST			GT			BLM
FIELD	D&A	PWR/SI	TOTAL	D&A	PWR/SI	TOTAL	D&A	PWR/SI	TOTAL	D&A	PWR/SI	TOTAL	%
Andy's Mesa	2	5	7							2	5	7	100.00%
Cache	0	9	9							0	9	9	100.00%
Cahone	1	0	1							1	0	1	100.00%
Dove Ck	2	1	3				7	2	9	9	3	12	25.00%
Dry Ck	1	0	1							1	0	1	100.00%
Egnar	1	1	2				1	0	1	2	1	3	66.67%
Flodine Pk	12	8	20							12	8	20	100.00%
Flodine Pk, E.	0	1	1							0	1	1	100.00%
Goodman Pt	4	0	4							4	0	4	100.00%
Hamilton Ck	1	1	2				0	3	3	1	4	5	40.00%
Kernan Canyon	2	0	2				0	4	4	2	4	6	33.33%
Lisbon, SE	2	2	4							2	2	4	100.00%
McClean	2	2	4				0	1	1	2	3	5	80.00%
McElmo	12	50	62	1	0	1	2	6	8	15	56	71	87.32%
Papoose Canyon	14	33	47				2	5	7	16	38	54	87.04%
Squaw Ck							1	1	2	1	1	2	0.00%
Wildcat	91	21	112	17	7	24	59	15	74	167	43	210	53.33%
TOTALS==>	147	134	281	18	7	25	72	37	109	237	178	415	67.71%

TABLE 3. FIELD SUMMARY SJRA SAN JUAN BASIN

FIELD	BLM D&A	BLM PWR/SI	BLM TOTAL	FS D&A	FS PWR/SI	FS TOTAL	FEE/ST D&A	FEE/ST PWR/SI	FEE/ST TOTAL	GT D&A	GT PWR/SI	GT TOTAL	BLM %
Chromo							19	23	42	19	23	42	0.00%
Iganco Blanco				2	15	17	3	36	39	5	51	56	0.00%
Mancos River	3	0	3				22	2	24	25	2	27	11.11%
Menefee Mtn	1	0	1				12	14	26	13	14	27	3.70%
Navajo							1	4	5	1	4	5	0.00%
Point Lookout	1	0	1				7	1	8	8	1	9	11.11%
Price Gramps	1	1	2				24	41	65	25	42	67	2.99%
Red Mesa							1	0	1	1	0	1	0.00%
Sierra	5	4	9				38	20	58	43	24	67	13.43%
Wildcat	21	0	21	25	4	29	140	13	153	186	17	203	10.34%
TOTALS==>	32	5	37	27	19	46	267	154	421	326	178	504	7.34%
GT======>	179	139	318	45	26	71	339	191	530	563	356	919	34.60%

TABLE 4. TOTAL FIELD PRODUCTION SJRA PARADOX BASIN

FIELD	SI	PWR	1987 OIL	1987 GAS	CUMULATIVE OIL	CUMULATIVE GAS
Andy's Mesa	0	7	0	429,356	21,184	17,405,075
Cache	3	9	64,272	36,463	3,906,168	7,020,736
Cahone	0	1	6,398	14,972	17,791	40,430
Dove Ck	1	0	0	0	82,961	946,234
Flodine Pk	2	7	33,662	98,367	2,340,832	8,531,211
Flodine Pk, E.	0	1	50,951	0	50,951	0
Goodman Pt	0	0	0	0	1,401	552
Hamilton Ck	3	0	0	215,270	0	925,481
Kernan Canyon	0	0	0	0	150	0
Lisbon, SE	3	2	41	274,718	156,037	14,089,322
McClean	2	2	39,430	45,537	246,008	248,833
McElmo	0	2	0	12,051	1,097	891,617
Papoose Canyon	7	24	336,536	1,936,621	3,693,621	22,432,750
Squaw Ck	0	0	0	0	11,189	24,332
TOTALS==>	21	55	531,290	3,063,355	10,529,390	72,556,573
McElmo(CO2)	5	23	0	173,560,252	0	555,198,284

TABLE 5. TOTAL FIELD PRODUCTION SJRA SAN JUAN BASIN

FIELD	SI	PWR	1987 OIL	1987 GAS	CUMULATIVE OIL	CUMULATIVE GAS
Chromo	7	3	646	0	162,964	6,342
Iganco Blanco*	96	938	5,204	27,004,071	42,145	849,611,960
Mancos River	0	2	427	0	25,242	0
Menefee Mtn	3	0	44	0	48,883	255
Navajo	0	3	4,132	0	4,686	0
Point Lookout	0	0	0	0	0	23,000
Price Gramps	4	26	50,862	0	6,524,698	0
Red Mesa*	15	88	93,467	104,016	1,419,441	1,273,575
Sierra	2	4	2,310	0	121,007	29,021
TOTALS==>	127	1064	157,092	27,108,087	8,349,066	850,944,153

* Includes Indian production

TABLE 6. TOTAL FIELD PRODUCTION SJRA PARADOX BASIN - FEDERAL

FIELD	SI	PWR	1987 OIL	1987 GAS	CUMULATIVE OIL	CUMULATIVE GAS
Andy's Mesa	0	7	0	429,356	21,184	17,405,075
Cache	3	9	64,272	36,463	3,906,168	7,020,736
Cahone	0	1	6,398	14,972	17,791	40,430
Dove Ck	1	0	0	0	82,961	946,234
Flodine Pk	2	7	33,662	98,367	2,340,832	8,531,211
Flodine Pk, E.	0	1	50,951	0	50,951	0
Goodman Pt	0	0	0	0	1,401	552
Hamilton Ck	2	0	0	146,953	0	391,442
Kernan Canyon	0	0	0	0	0	0
Lisbon, SE	3	2	41	274,718	156,037	14,089,322
McClean	0	1	19,465	23,141	130,673	109,078
McElmo	0	2	0	12,051	1,097	891,617
Papoose Canyon	3	20	114,687	1,152,059	2,935,935	19,046,306
Squaw Ck	0	0	0	0	0	0
TOTALS==>	14	50	289,476	2,188,080	9,645,030	68,472,003
McElmo(CO2)	5	23	0	173,560,252	0	555,198,284

TABLE 7. TOTAL FIELD PRODUCTION SJRA SAN JUAN BASIN - FEDERAL

FIELD	SI	PWR	1987 OIL	1987 GAS	CUMULATIVE OIL	CUMULATIVE GAS
Chromo	0	0	0	0	0	0
Iganco Blanco	0	0	0	0	0	0
Mancos River	0	0	0	0	0	0
Menefee Mtn	0	0	0	0	0	0
Navajo	0	0	0	0	0	0
Point Lookout	0	0	0	0	0	0
Price Gramps	0	0	0	0	0	0
Red Mesa	0	0	0	0	0	0
Sierra	0	0	0	0	8,987	52
TOTALS==>	0	0	0	0	8.987	52

TABLE 8. FORECAST MATRIX FOR BLM DRILLING ACTIVITY
FOR 1989 THROUGH 2010.

	PARADOX BASIN							SAN JUAN BASIN				
	D&A	WC PWR	WC TOTAL	DEV D&A	DEV PWR	DEV TOTAL	SUB TOTAL	D&A	WC PWR	WC TOTAL	DEV D&A	DEV PWR
Tax Credits												
Low Dev.	79	18	97	48	98	146	243	10	2	12	5	3
High Dev.	101	24	125	62	126	188	313	21	2	23	12	5
No Tax Credit												
Low Dev.	50	12	62	31	62	93	155	10	2	12	5	3
High Dev.	97	23	120	60	120	180	300	20	2	22	11	5

TABLE 9. FORECAST MATRIX FOR BLM DRILLING ACTIVITY
WITHIN OIL AND GAS POTENTIAL AREAS (FIGURE 11)

	PARADOX BASIN						SAN JUAN BASIN						
	D&A	WC PWR	WC TOTAL	DEV D&A	DEV PWR	DEV TOTAL	D&A	WC PWR	WC TOTAL	DEV D&A	DEV PWR	DEV TOTAL	GRAND TOTAL
Area 4	65	15	80	40	80	120	21	3	24	11	5	16	240
Area 3	32	8	40	20	40	60	0	0	0	0	0	0	100
Area 2	4	1	5	3	5	8	0	0	0	0	0	0	13
Area 1	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX C

STANDARD LEASE TERMS AND CONDITIONS

APPENDIX C

STANDARD LEASE TERMS AND CONDITIONS

The standard terms and conditions for oil and gas leasing are part of all federal leases regardless of other considerations. These terms and conditions will automatically apply to all alternatives.

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

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

The "lease rights granted," as used in this section have also been partially defined in the Code of Federal Regulations, part 3101.1-2, shown below.

A lessee shall have the right to use so much of the leased lands as is necessary to explore for, drill for , mine, extract, remove and dispose of all the leased resource in a leasehold subject to: Stipulations attached to the lease; restrictions deriving from specific, nondiscretionary statutes; and such reasonable measures as may be required by the Authorized Officer to minimize adverse impacts to other resource values, land uses or users not addressed in the lease stipulations at the time operations are proposed. To the extent consistent with lease rights granted, such reasonable measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. At a minimum, measures shall be deemed consistent with lease rights granted provided that they do not: require relocation of proposed operations by more than 200 meters; require that operations be sited off the leasehold; or prohibit new surface-disturbing operations for a period in excess of 60 days in any lease year.

The lease form is shown as Figure C-1.

Figure C-1

Form 3100-11
(June 1988)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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, as amended and supplemented (30 U.S.C. 181 et seq.), the Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351-359), the Attorney General's Opinion of April 2, 1941 (40 Op. Atty. Gen. 41), or the

READ INSTRUCTIONS BEFORE COMPLETING

1. Name
   Street
   City, State, Zip Code

2. This application/offer/lease is for: *(Check only One)* ☐ PUBLIC DOMAIN LANDS ☐ ACQUIRED LANDS (percent U.S. interest _____)
   Surface managing agency if other than BLM: _____ Unit/Project _____
   Legal description of land requested: *Parcel No.:_____ *Sale Date (m/d/y):____ / ____ / ____
   ***SEE ITEM 2 IN INSTRUCTIONS BELOW PRIOR TO COMPLETING PARCEL NUMBER AND SALE DATE.**

T.	R.	Meridian	State	County

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 $ _____

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

NOTE: This lease is issued to the high bidder pursuant to his/her duly executed bid or nomination form submitted under 43 CFR 3120 and is subject to the provisions of that bid or nomination and those specified on this form.

Type and primary term of lease:

☐ Noncompetitive lease (ten years)

☐ Competitive lease (five years)

☐ Other _____

THE UNITED STATES OF AMERICA

by _____
(Signing Officer)

_____ _____
(Title) (Date)

EFFECTIVE DATE OF LEASE _____

(Continued on reverse)

4. (a) Undersigned certifies that (1) offeror is a citizen of the United States; an association of such citizens; a municipality; or a corporation organized under the laws of the United States or of any State or Territory thereof; (2) all parties holding an interest in the offer are in compliance with 43 CFR 3100 and the leasing authorities; (3) offeror's chargeable interests, direct and indirect in either public domain or acquired lands do not exceed 246,080 acres in Federal oil and gas leases in the same State, of which not more than 200,000 acres are held under option, or 300,000 acres in leases and 200,000 acres in options in either leasing District in Alaska; (4) offeror is not considered a minor under the laws of the State in which the lands covered by this offer are located; (5) offeror is in compliance with qualifications concerning Federal coal lease holdings provided in sec. 2(a)(2)(A) of the Mineral Leasing Act; (6) offeror is in compliance with reclamation requirements for all Federal oil and gas lease holdings as required by sec. 17(g) of the Mineral Leasing Act; and (7) offeror is not in violation of sec. 41 of the Act.

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

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

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

(Signature of Lessee or Attorney-in-fact)

LEASE TERMS

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

(a) Noncompetitive lease, $1.50 for the first 5 years; thereafter $2.00;
(b) Competitive lease, $1.50; for primary term; thereafter $2.00;
(c) Other, see attachment, or
as specified in regulations at the time this lease is issued.

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

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

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

(a) Noncompetitive lease, 12½%;
(b) Competitive lease, 12½%;
(c) Other, see attachment; or
as specified in regulations at the time this lease is issued.

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

Minimum royalty in lieu of rental of not less than the rental which otherwise would be required for that lease year shall be payable at the end of each lease year beginning on or after a discovery in paying quantities. This minimum royalty may be waived, suspended, or reduced, and the above royalty rates may be reduced, for all or portions of this lease if the Secretary determines that such action is necessary to encourage the greatest ultimate recovery of the leased resources, or is otherwise justified.

An interest charge shall be assessed on late royalty payments or underpayments in accordance with the Federal Oil and Gas Royalty Management Act of 1982 (FOGRMA) (30 U.S.C. 1701). Lessee shall be liable for royalty payments on oil and gas lost or wasted from a lease site when such loss or waste is due to negligence on the part of the operator, or due to the failure to comply with any rule, regulation, order, or citation issued under FOGRMA or the leasing authority.

Sec. 3. Bonds—A bond shall be filed and maintained for lease operations as required under regulations.

Sec. 4. Diligence, rate of development, 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-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

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

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

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

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

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

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

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

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

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

Sec. 13. Proceedings in case of default—If lessee fails to comply with any provisions of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation unless or until the leasehold contains a well capable of production of oil or gas in paying quantities, or the lease is committed to an approved cooperative or unit plan or communitization agreement which contains a well capable of production of unitized substances in paying quantities. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time. Lessee shall be subject to applicable provisions and penalties of FOGRMA (30 U.S.C. 1701).

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

☆ U.S. GOVERNMENT PRINTING OFFICE: 1988—673-016/95010

APPENDIX D

CONDITIONS OF APPROVAL-- ALL ALTERNATIVES

APPENDIX D

CONDITIONS OF APPROVAL COMMON TO ALL ALTERNATIVES

Mitigation Authority: Section 6 of Oil and Gas Lease Form

Introduction

Post-lease operations proposals are reviewed to ensure conformance with the plan. The mitigative measures listed in this appendix represent the post-lease environmental protection to which the BLM is committed as a result of the analysis in the plan/EIS. Note that there is no commitment to the specific wording of a Condition of Approval (COA).

The listed mitigative measures may apply to all oil and gas exploration and development activities and associated rights-of-way for all three alternatives. The Authorized Officer will choose among these measures at the field development stage to mitigate or avoid environmental impacts identified on a site specific basis. When attached to an approval document, the measures are known as COAs. The Authorized Officer is not limited to the list of COAs shown here, but may development others as unforeseen impacts occur so long as the new COAs conform with the limitations of the granted lease rights and the guidance set forth in this plan and subsequent amendments.

In addition to the COAs shown here others are derived from lease stipulations in the Proposed Action and Continuation of Present Management Alternatives. The application of those COAs will depend upon the alternative chosen in the Record of Decision. The COAs shown in this Appendix apply to all three alternatives, and will apply to the alternative chosen in the Record of Decision.

COA's are not added to applications if they are unnecessary (do not apply to the case in question) or, are duplicative, as when the mitigative measure is already incorporated in the operator's submittal.

1. GEOPHYSICAL OPERATIONS

The following guidance is for the development of standards to be attached, as appropriate, to the Notice of Intent (NOI) for geophysical operations at the discretion of the Authorized Officer and in accordance with the Resource Management Plan/Environmental Impact Statement (RMP/EIS) Record of Decision. The statements below will be used as guidance by BLM field personnel in determining what protective measures will be used on geophysical operations. Only those items pertaining to a given operation will be appended to the NOI, and only if they are not already contained in the proposed plan of operation.

A. NOTIFICATION

If noncompliance with terms and conditions occurs, the operator will be notified by BLM and instructed as to the appropriate action. If the operator fails to take appropriate action, the operator will be subject to enforcement action in accordance with 43 CFR 3163.

Wildfires begun or sighted during seismic operations will be reported immediately to the Grand Junction Fire Dispatch Office at 303/243-6555 and the Resource Area Office of jurisdiction. The operator is liable for the full cost of fire suppression of all fires on or in the vicinity of the project set or caused by his employees, whether set directly or indirectly as a result of operations.

The operator shall notify the Authorized Officer, or his representative at least 48 hours prior to beginning operations. The operator shall also report progress on a weekly basis until completion. A pre-work conference may be required.

Immediately upon completion of operations, a Notice of Completion of Oil & Gas Exploration Operations and an updated BLM planimetric map or USGS topographic map showing revisions to the original NOI shall be submitted to the Authorized Officer. The map will be used to perform a final compliance inspection of the exploration area.

A copy of all COAs, along with a copy of the submitted NOI, shall be kept in the field by each seismic crew, for inspection by BLM personnel.

Any exploration greater than 1/4 mile from the proposed seismograph line route filed with the NOI will require prior approval from the Authorized Officer.

In addition, all affected livestock operators, would be notified by BLM prior to starting seismic operations. This notice would contain information as to the expected timing, location, and type of exploration conducted.

B. AGENCY RESPONSIBILITIES

The Authorized Officer will notify all affected District Wildlife Managers or Area Supervisors (Colorado Division of Wildlife) and livestock operators prior to commencement of seismic operations. This notice will contain information as to the expected timing, location, and type of exploration conducted.

C. CULTURAL RESOURCES

A Class III cultural resource inventory is required on those portions of a seismic line crossing BLM surface and any staging areas proposed on BLM surface. The BLM will inform the operator when the BLM will be able to complete the inventory. If the time frame provided proves unacceptable to the operator, the operator has the option of contracting for the necessary report. Approval of the contracting archaeologist must be obtained from the Resource Area Office at least 48 hours prior to beginning work on the cultural resource inventory.

The operator shall immediately bring to the attention of the Authorized Officer any and all antiquities or other objects of historic, paleontological, or scientific interest including, but not limited to, historic, or prehistoric ruins or artifacts discovered as a result of operations. The operator shall suspend all activities in the immediate area of the object and shall leave such discoveries intact until told to proceed by the Authorized Officer. The operator shall either redesign the project to eliminate further effects, or follow the mitigation requirements set forth by the Authorized Officer concerning protection, preservation, or disposition of any sites or material discovered.

Geophysical operations may be conducted without a cultural resource inventory when the following conditions exist: a) one hundred percent of the ground is snow covered within a 30-foot radius of where drilling or shot points are proposed, and b) there is at least six inches of snow depth, or if the ground is frozen and less than six inches of snow exists.

A 100 percent cultural resources inventory of the areas where "surface disturbance will likely occur" including seismic line(s), staging area(s), and access roads must be completed prior to any surface disturbance. A written "Report of Examination for Cultural Resources" will be submitted to and approved by the Area Manager. Contract archaeologists must be approved by the BLM, and inventories and reports must follow The Secretary of the Interior Standards and Guidelines: "Guidelines and Procedures for Inventory; Evaluation and mitigation of cultural resources--Montrose District." Copies of this document are available upon request.

The seismic operator will not remove, injure, deface, or alter any object of scenic, archaeological, historical, or scientific interest. All employees of the operator and any subcontractors must be informed by the operator before commencement of operations that any disturbance to, defacement of, or removal of archaeological or historical material (including pot shards and arrowheads) will be treated as law enforcement issues and/or administrative issues under current regulations on public lands. Operators will be held accountable for the conduct of their employees and subcontractors in this regard.

Seismic operations will not be conducted within 500 feet of a known standing wall, or ruin, or fragile cultural resources which may be damaged by seismic or sonic vibrations.

If subsurface cultural resources are unearthed during operations, all work in the vicinity of the resource will cease and the Area Manager notified immediately. A cultural resource monitor (permitted archaeologist) may be required during operation and/or reclamation activities if operations are in a particularly sensitive area and/or reclamation is not done immediately following operations. Operator will undertake additional measures requested by the Authorized Officer to protect cultural resources that may be affected as a result of the operation.

Inventory will be performed in all areas where surface disturbance, such as blading, road construction, shot points, or other activities will take place if prior inventory is not available and if there is reason to believe there are significant historic properties in the area of disturbance. The Authorized Officer will determine whether there may be a potential effect on historic properties.

Shot points will be inventoried in a 50-foot radius around the stake, if surface disturbance will occur. Other areas will be limited to the area of direct impact and disturbance.

The use of any kind of explosive device(s) will not be allowed within a 500-foot radius of standing structures, rock shelters, standing walls, wickiups, and other sensitive features, such as pictographs and petroglyphs.

There are also some exclusions for Class III surveys found in Appendix B of the BLM/Colorado archaeological programmatic agreement.

D. THREATENED, ENDANGERED, AND SENSITIVE SPECIES

An inventory for threatened and endangered plant species is required on any portions of the line or staging area proposed in known or potential habitat for threatened, endangered, or candidate plant species.

E. CONSTRUCTION

All infestations of noxious or poisonous weeds, resulting from surface disturbance caused by the operator, will be controlled before spreading occurs into the surrounding area. Method of weed control will be reviewed by the Authorized Officer prior to commencement.

No dirt work or clearing of vegetation will occur without specific approval. All merchantable timber and/or firewood shall be purchased by the operator at the total appraised price that is determined by the BLM.

During periods of adverse conditions such as thawing, heavy rains, snow, or flooding, all activities off existing maintained roads that create excessive surface rutting will be suspended. When adverse conditions exist, the operator will contact the Authorized Officer for an evaluation and decision based on soil type, slope, vegetation, and cover.

Drill hole cuttings will be returned to the hole if possible, or at a minimum, raked and spread out so as not to impede regrowth of vegetation or to create erosion problems.

Operations shall be done in a manner which prevents damage, interference, or disruption of water flows and improvements associated with all springs, wells, or impoundments. It is the operator's responsibility to enact the precautions necessary to prevent damage, interference, or disruptions. However, in no instance will blasting or vibrating occur within 1/4 mile of springs, wells, or impoundments unless specifically approved by the Authorized Officer.

During periods of adverse conditions caused by climatic factors such as thawing, heavy rains, snow, or flooding, all activities off existing maintained roads that create excessive surface rutting will be suspended. When adverse conditions exist, the operator will contact the Authorized Officer for an evaluation and decision based on soil types, slope, vegetation, and cover.

No fence will be cut unless no other alternative exists. Before cutting through any fences, the operator shall firmly brace the fence on both sides of the cut; a temporary gate will be installed for use during the

course of operations unless the fence is immediately repaired. Upon completion of operations, fences shall be restored to at least their original condition.

Activities of the seismic operators shall not prevent, obstruct, or unduly interfere with any activities of authorized users of the public lands. Removal or alteration of existing improvements (fences, cattle guards, etc.) is not allowed without prior approval. Fences are to be braced to BLM's standards prior to cutting them.

All debris, such as paper, cans, wire, flagging, or other trash, shall be removed and properly disposed of upon completion. No oil or lubricants shall be drained onto the ground.

All vehicles (including drills) will be limited to existing roads, except in approved areas. Improvement of existing roads and trails is not permitted, unless prior approval is obtained.

Water for drilling purposes will not be obtained from federally owned or controlled water sources such as reservoirs and springs unless specific permission is obtained from the Authorized Officer.

Any available information concerning water sands or artesian flows must be reported to the Resource Area Office.

Whenever possible, a portable mud pit shall be used when drilling with fluids.

There will be no straight line of sight dozing. Any path dozed through a timbered area will take an irregular path. Any pushed trees are to be stockpiled adjacent to the line so they are readily retrievable without additional disturbance. All trees are to be pulled and spread back onto the line or access route.

Tall brush, sagebrush parks and open areas: There will be no removal of brush or grass by blading. Brush may be crushed or removed by keeping the blade six inches off the ground surface. In open or brush areas, vehicle paths will take an irregular path to discourage line of sight paths.

Improvement of existing roads or trails: Blading will be allowed only if the trail is impassable by vehicles or geophysical equipment. No widening or realignment will be allowed. Existing trails may have to be reclaimed or closed.

New trails can be constructed only when vehicle and equipment passage is impossible and only with the concurrence of the Authorized Officer. No straight line of sight trails will be allowed. All trails will be reshaped to original contour (including bench cuts). Waterbars will be placed on slopes as directed by the Authorized Officer.

Construction of drainage crossings which cannot otherwise be crossed: Existing fords are to be used if possible. A cut and stockpile process will be used to create a low water crossing or upgrade an existing crossing unless otherwise specified by the Authorized Officer.

F. EXPLOSIVES

Powder magazine sites on public lands must be approved in writing by the Area Manager prior to use. No live explosive charges shall be left unattended or uncovered in such a manner as to cause a safety hazard. Powder magazines will be located at least one-quarter mile from traveled roads. Loaded shot holes will not be left unattended. The area around the powder magazine will be kept clean of trash.

G. RIGHTS-OF-WAY

Access to federal lands across non-federal lands is not guaranteed by the government. Permission to enter or cross private, or state-owned lands must be obtained from the landowner(s).

H. MISC.

All personnel (contractors, subcontractors) working in the field with the seismic operator will be familiar with and follow the conditions appended to the NOI.

No seismic work will take place three days prior or during the following applicable hunting seasons:
Applicable:
YES_ NO_ Archery; beginning ___ and ending ___.
YES_ NO_ Muzzle loading, beginning and ending__.
YES_ NO_ 1st Rifle, beginning ___ and ending ___.
YES_ NO_ 2nd Rifle, beginning ___ and ending ___.

Helicopters operating between staging areas and seismic lines shall: 1) remain within corridors not more than 1/2 mile wide, unless safety precautions prevent, 2) maintain a minimum altitude of 1,000 feet in sensitive areas (production/nesting areas, winter habitat, etc.), 3) maintain a minimum of 500 feet in all other areas.

Aircraft landing sites on public lands must be approved in writing by the Area Manager prior to use.

No helicopter or motor vehicle use would be allowed in the Wild Horse Herd Management Areas March 2 - June 30; foaling season for wild horses.

No geophysical exploration operations are permitted within a one mile radius of (Water Source) located at (Location) to allow wild horses uninhibited and undisturbed use of their critical drinking water source from March 1 to December 1. This is the period of no snow availability for wild horse use.

I. RECLAMATION

All surface disturbance would be recontoured and revegetated according to an approved reclamation plan.

Reclamation of disturbed areas shall be completed, as directed by the Authorized Officer, within 30 days of terminating seismograph work on any line. Delay of reclamation for any reason, such as weather, must be approved by BLM. Adequate vegetative cover (and seed mixture, based on site-specific analysis, to be used) shall be established by the Authorized Officer.

APPLICATION FOR PERMIT TO DRILL OPERATIONS

The following guidance will be used to develop COAs which are attached, as appropriate, to approved APDs, Sundry Notices, or oil and gas related right-of-way actions at the discretion of the Authorized Officer and in accordance with the RMP/EIS Record of Decision.

This appendix shows the most common COAs used; however, the reader is reminded that COAs are designed for specific operations. In practice, COAs shown below may or may not be used on any given approval document, and other COAs, not specifically stated here, will be written to accomplish the tasks envisioned in this plan. The categories shown below are a good representation of the list of mitigative measures considered by BLM resource specialists for every approved field operation.

A. NOTIFICATION

In order for BLM inspectors to check the initial construction operations, it is necessary that the BLM be notified when construction begins. To help insure that all parties understand the requirements for construction, the operator must assure that all employees and sub-contractors are adequately aware of the COAs. Examples of such notification requirements are shown below:

The operator or his contractor will contact the approving Resource Area Office 48 hours before beginning any work on public land.

The operator will give the dirt contractor a copy of the Surface Use Plan and any additional BLM COAs before any work begins. A copy of the approved Surface Use Plan will be available on-site for inspection during construction.

The operator or his contractor will contact the approving Resource Area office 48 hours before starting reclamation work and within 48 hours of completion of reclamation work.

Proper precautions shall be taken at all times to prevent or suppress fires. Range or forest fires will be reported to the BLM District or Resource Area Office. All other fires or explosions that cause damage to property, equipment, loss of oil or gas, or result in injuries to personnel will be reported to the Authorized Officer.

B. OTHER AGENCY APPROVALS

Some operations on Public Lands require approval by state, local, or other federal agencies. In most cases, it is solely the responsibility of the operator to be aware of these requirements and gain the necessary approvals. In a few cases, the BLM wants to make it clear that the "BLM approved" operations may not proceed until such approval is granted. In those cases, a COA is appended to the approved application such as: Use of water for operations will be approved by obtaining a temporary use permit from the Colorado State Water Resources Engineer and by receiving permission from the landowner or surface managing agency to use the land containing the water source.

C. CULTURAL RESOURCES

All actions on BLM administered lands that disturb the surface require protection of historical, paleontological, and archaeological resources. These lands include both federally owned surface and privately owned surface on which a federal action is taking place (such as drilling on a federal oil and gas lease). Surveys to detect the presence of cultural resources are generally required. Detection of resources after construction also requires protection of the resource and notification of the BLM. COAs are appended to approval documents, as needed, to accomplish these tasks and to require specific mitigative measures when resources are already identified. Shown below are several examples.

Depending upon the results of the appropriate surveys, APD conditions of approval will be developed that protect the cultural resources present. This can be anything from avoidance of a site to complete excavation of a site. The range of possible mitigation procedures is very wide. The mitigation developed depends in a large part on what the oil and gas or seismic operator can do to design the project in such a manner as to avoid conflict with a known cultural resource. In other words, if a project can be designed to avoid a site, then that is the mitigation. If not, other mitigative procedures need to be developed. Also included with these conditions, are the standard lease terms with regard to unidentified subsurface cultural resources. These inform the operator to notify the District or Resource Office if any cultural resources are encountered during surface-disturbing activities (36 CFR 800).

Historical, paleontological, and archaeological resources discovered during operations are to be protected from disturbance by the lessee, his employees, contractors, subcontractors, and their respective employees. Detailed technical guidance for protection of cultural and paleontological resources are available in all BLM offices. Upon discovery of any evidence of items of historical, paleontological, or archaeological value, lessee shall immediately cease operations in the immediate area of the object, shall leave the discovery intact, and contact the BLM Authorized Officer.

If subsurface cultural material is exposed during construction, work in that spot will stop immediately and the Resource Area Office will be contacted. All employees working in the area will be informed by the operator that they will be subject to prosecution for disturbing archaeological sites or picking up artifacts. Salvage or excavation of identified archaeological sites will only be done if damage occurs. All land altering activity will be confined to the areas surveyed for cultural resources.

1. An area of ten acres square, centered on the staked wellhead, will be inventoried. The operator may choose to do more or less than this amount, but is advised that more than one inventory may be required if there are changes in the location of the pad.

2. Access roads, and other associated rights-of-way will be inventoried to 50 feet along each side of the center line, for a total of 100 feet. If the proposed right-of-way is 100 feet or more in total width, then an additional 50 feet on each side of the right-of-way center line will be inventoried, for a total of the right-of-way plus 100 feet.

3. Location, access roads, and right-of-ways will not be inventoried unless the area has been accurately flagged prior to inventory. If alternative routes or locations need to be considered due to the presence of historic properties, the archaeologist will flag, for the convenience of the operator, all presently and previously inventoried alternative routes with distinctive flagging tape.

4. Class III inventory will not be performed until at least 70 percent of the area to be surveyed is snow-free. Snow cover policy shall conform to that outlined in Oil and Gas Onshore Order Number 1.

D. THREATENED, ENDANGERED, AND SENSITIVE SPECIES

The lessee may be required to provide inventory information for certain species if it is determined that inadequate information is available to make appropriate decisions relating to mitigation. These species could involve threatened, endangered, sensitive and/or rare plant or animal species, or other species protected by law or of high interest, such as bighorn sheep lambing areas, elk calving areas, raptors, etc.

Apply "Suggested Practices for Raptor Protection on Power lines" on all proposed transmission lines to be constructed to insure they are properly grounded to prevent unnecessary electrocution of raptors.

The locations of all known populations of Colorado BLM sensitive plants and selected high priority remnant vegetation associations would be protected from human-induced surface disturbing activities to the extent such protection does not unduly hinder or preclude exercising valid existing rights. The area of protection will include the actual location of the populations or occurrences of important vegetation associated to receive protection, and shall be determined in consultation and coordination with the Colorado Natural Areas Program (CNAP).

Those populations/occurrences, upon which analysis determines protection to be necessary, shall be protected by: 1) requiring relocation or rerouting of proposed well sites, pipelines, roads, other surface facilities, etc., or 2) applying other protective mitigation (i.e., fencing). BLM will effectively mitigate potential impacts to important populations/occurrences to the degree that existing development rights are not unduly hindered or precluded.

E. RESOURCES (OTHER THAN OIL AND GAS)

Wind swept ridges and pinyon-juniper areas within identified wild horse areas will be avoided where necessary to insure availability of winter forage and year-round shelter for wild horses.

Surface-disturbing activities within or adjacent to intermittent or perennial water sources, associated floodplains, and riparian areas will only be allowed where mitigative measures can be employed to protect floodplains, water quality, and riparian values.

Well pads, roads, and facilities will be constructed and maintained to avoid unnecessary impacts to air quality.

Raptor and sandhill crane nests will be protected from human-induced surface-disturbing activities to the extent such protection does not unduly hinder or preclude exercising valid existing rights.

All trees requiring removal shall be disposed of by the operator. Where earth blading is required, stumps shall be removed and scattered or buried in an area designated by the Authorized Officer. Where earth blading is not required, stump height shall not exceed 12 inches. All slash less than four inches in diameter will be chipped, scattered outside the cleared area, or stockpiled for use during reclamation as directed by the Authorized Officer. All material four inches in diameter and greater will be removed from federal land unless otherwise directed. A wood permit from BLM for the wood removed (for the appraised value) will be required prior to any clearing.

Water sources used by wild horses will be avoided, unless otherwise approved by the Authorized Officer.

Water wells drilled to provide water for drilling purposes will be approved by, and offered to, the BLM for use prior to plugging the water well. Water rights will be held by

the BLM. The BLM will be notified of any water aquifers encountered during drilling which could be developed for water prior to final plugging of the well.

All operations will be conducted so as not to cause pollution or change the character of streams, lakes, ponds, water holes, seeps, or marshes. This relates directly to damages caused to fish and wildlife resources. Surface disturbance that causes active soil movement should be corrected.

F. CONSTRUCTION

Minimize pipeline and road crossings of streams and drainages. Crossing of streams with unstable banks or bottoms will be prohibited unless protective measures are incorporated. Crossings on perennial streams should be constructed during the periods of low flow. When crossings are necessary, culverts and drainage ditches will be designed to maintain the natural surface and subsurface drainages.

All cut and fill slopes should be constructed in such a way as to provide slope stability.

Linear-type facilities such as roads, power lines, and pipelines shall cohabit and follow a common route unless otherwise approved by the Authorized Officer. Surface disturbance will be minimized.

The operator shall clear all vegetation from the project area, where clearing is necessary, prior to any construction. All clearing work shall be completed without mixing soil with vegetation.

Well pads, roads, and facilities will be located to minimize visual impacts.

Install sediment traps to collect and settle out sediments where temporary use of equipment is necessary in or near ephemeral or perennial streams.

To protect watersheds from accelerated erosion, increased slumping, and increased sediment and salinity loading, all development activities may be curtailed during periods of soil water saturation at the discretion of the Authorized Officer.

Above-ground facilities will be painted to blend with the surrounding environment using a specified color from the Rocky Mountain Regional Committee Standard Environmental Color chart.

Trash and garbage must be contained in an closed receptacle or in an earthen pit. If an earthen pit is used, it must be covered to prevent contents from escaping. Burning and/or burying is not authorized. Contents from a trash receptacle or pit must be hauled to an approved county landfill.

Surface disturbance and vehicular travel will be limited to the approved location and approved access route. Any additional area needed must be approved in advance.

Upon completion of construction, the amount of surface rock present shall not exceed the amount present prior to construction. All excess rock will be used on the road surface or hauled off public land.

a. Roads (On Lease)

Existing roads should be used to the extent possible. Additional roads, if needed, shall be kept to an absolute minimum and the location of routes must be approved by BLM prior to construction. Upon determination of an impending field development, a transportation plan will be requested to reduce unnecessary access roads. Roads will be constructed and maintained to BLM road standards (BLM Manual Section 9113).

Companies controlling roads which provide access into crucial wildlife areas may be required to close the road with a lockable gate to prevent general use of the road during critical periods of the year when resource problems are experienced (during hunting seasons, winter, etc.). This restrictive measure would be applied where needed to protect wildlife resources or to minimize environmental degradation.

Use of closed road segments will be restricted to legitimate, authorized agents of: 1) the lessee and/or their subcontractor(s), 2) the BLM, 3) other agencies with a legitimate need (CDOW, other law enforcement agencies, etc.). Unauthorized use or failure to lock gates during specified time frames by the lessee or its subcontractors would be considered a violation of the terms of the APD or associated grants. This would apply

to BLM roads and other roads on public lands.

Every permanent pad, road, or facility site must have an approved surface drainage plan. A well site diagram depicting production facilities, recontoured slopes and stabilization measures shall be approved by the Authorized Officer prior to installation of production facilities. Drainage from disturbed areas will be confined or directed so that erosion of undisturbed areas is not increased. In addition, no runoff water (including that from roads) will be allowed to flow into intermittent or perennial waterways without first passing through a sediment-trapping mechanism. Erosion control structures may include: waterbars, berms, drainage ditches, sediment ponds, or other devices.

Access roads will be properly designed to prevent the blockage of existing drainages.

Surface disturbance and vehicular travel will be limited to the approved location and approved access route. Any additional area needed will be approved in advance.

If construction of a new road is necessary, the initial access to an exploratory well site may be needed as a permanent road later. Alignment, therefore, should be such that a permanent road can be constructed, and where possible, on routes identified in BLM transportation plans. Most of these roads will usually have little residual value for future access and will eventually be abandoned. Plans for this class of road will be developed toward their eventual closure and total rehabilitation.

Construction on steep hillsides and near watercourses will be avoided where alternate routes provide adequate access. Ridge tops offer the best winter access. Unnecessary disturbance of drainages and high erosion hazard areas should be avoided.

Drainages will not be plugged by road fills. Drainage crossings will be constructed so as not to cause siltation or accumulation of debris. All drainage structures must meet BLM standards for temporary and permanent roads.

Long, slight to moderate road grades should contain shallow drainage dips. They may be installed after temporary roadbeds have been constructed or during construction of permanent roads.

Temporary Roads: Temporary roads would be planned for only the minimum width needed for exploration. They should be kept approximately 16 feet wide to prevent unnecessary disturbance. They should follow natural contours to minimize cut and fill. Alignment shall have a grade no greater than eight percent.

Cuts and fills on temporary roads will be designed to minimize surface disturbance. When constructing a road that involves cuts and fills, consider the character of cut material and depth of cut. Also, consider where the fill material will be deposited. It will not be cast over hilltops or into drainages. Cut slopes should normally be no steeper than 3:1 and fill slopes no steeper than 2:1. When construction is necessary, surface soil materials will be wind-rowed and stockpiled for later rehabilitation of the roadway. Stockpiles should be located on the uphill side of the road. If surface soil material is expected to be stockpiled for more than one year, the stockpile would be seeded or otherwise protected from wind and water erosion. The stockpile shall be marked or segregated to avoid loss or mixing with other subsurface materials.

Low water crossings are preferred in temporary roads.

Surface soil material shall be stockpiled during upgrading or construction and redistributed on cut and fill slopes to aid revegetation.

Construction of roads to grades steeper than eight percent shall not be allowed.

The operator shall regularly maintain all roads used for access to the lease operation. A maintenance plan may be required. A regular maintenance program may include, but not be limited to, upgrading of existing roads, blading, ditching, culvert, drainage installation, and graveling or capping of the roadbed.

Abandonment and Rehabilitation: When a road is to be abandoned, rehabilitation may consist of scarifying, waterbarring, and barricading. Cut and fill slopes shall be

reduced to as gentle a grade as the topography permits. Stockpiled soil, debris, and fill materials shall be replaced on the roadbed and cut slopes so as to conform to the topography. All disturbed areas will be revegetated where practical. It is desirable to use native perennial species.

Culverts will be installed keeping the inlet and the outlet on original grade and sized to adequately drain the surface runoff. All fill material will be placed in layers not exceeding six inches. Fill material will be properly compacted to insure stability and to prevent washing out or dislocation of the culvert. The up and down stream fill slopes will be riprapped with a well graded mixture of rock sizes containing no material greater than two feet or smaller than three inches. The ratio of maximum to minimum dimension of any rock shall not exceed 6:1. Water turnouts needed to provide additional drainage will be constructed not to exceed two percent slope to minimize soil erosion.

Any access routes that had been previously available to the public will not be unnecessarily blocked off from public use.

Cattle guards will be installed whenever access roads are through pasture gates or fences. These cattle guards shall be maintained on a regular basis to assure their effectiveness at turning livestock. This includes cleaning out under cattle guard bases when needed.

Improvement to existing access will be necessary and limited to a 14-foot crowned and ditched road surface with turnouts as needed and minimum disturbance of surrounding soil and vegetation (abrupt back sloped borrow ditch). New construction will be limited to the same specifications as above. Cleared trees and brush along the road right-of-way will be wind-rowed to the side in convenient clearings. Surfacing material will not be placed on the access road or location without prior BLM approval.

Waterbars: The operator will be required to construct waterbars on abandoned roads and pipeline routes. General guidelines for installation of waterbars are: less than two percent grade--200-foot spacing, four to five percent grade--75-foot spacing, greater than five percent grade--50-foot spacing. Unstable soils may require a closer spacing, whereas the spacing may be greater on stable soils and rock outcroppings. The waterbars shall be constructed to drain freely to the natural ground level and to prevent siltation and clogging.

New roads constructed for oil and gas purposes within crucial big game winter range and isolated and/or roadless areas will be reclaimed upon completion of the oil and gas operation.

New oil and gas roads on public lands within crucial big game winter range will be closed to the public from December 15 to April 30.

New roads on public lands within isolated and/or roadless areas will be closed to the public year-round.

b. Pads

Selecting Locations for Well Sites, etc.: In planning for well sites, tank batteries, sump, reserve and mud pits, and pumping stations, the operator shall select locations that involve the least disruption to scenic values and other surface resources. The operator shall employ construction techniques and design practices, including selection of material, camouflage techniques, and rehabilitation practices that will preserve scenic aesthetic qualities. The following guidelines can be used by operators to assist in minimizing surface disturbance and as an aid in the maintenance of the best possible conditions for rehabilitation.

Construction: Steep slopes shall be avoided, the site shall be located on the most level location obtainable that will accommodate the intended use.

View the site location as to how it will affect the road location. What may be gained on a good location may be lost from an adverse access route.

Adjust the site layout to conform to the best topographic situation. Deep vertical cuts and steep long fill slopes should be avoided. All cut and fill slopes should be constructed to the least percent slope practical.

The top 12 inches of soil material will be removed from the location and stockpiled separate from the trees on the location.

Topsoil along the access will be reserved in place.

c. Pits

Excavations used for the permanent impoundment of usable water should be sloped at a 3:1 grade to establish safe access for humans, livestock, and wildlife.

A minimum of two feet of free board will be maintained between the maximum fluid level and the top of the berm. These pits will be designed to exclude all surface runoff.

The operator may be required to submit a plan at completion of drilling that contains the following:
1) Methodology showing how the reserve pit mud will be covered to prevent infiltration of water and to prevent puncturing the liner during back-filling.
2) A minimum of three feet of overburden over the reserve pit mud.
3) Final certification that the leak detection system (if used) produced no fluid during back-filling.

Final written certification is required that there are no hazardous chemicals on the RECRA list left in the drilling fluids within the mud pit. If the operator cannot provide certification, the drilling fluids and pit liner must be disposed at a federally approved hazardous materials site.

Reserve and other containment pits that are used during the exploration and/or operation of the lease may require fences and/or other devices to exclude livestock and/or wildlife. The need and type of protective requirement will be determined on a case-by-case basis.

Reserve and produced water pits containing oily residue must be overhead flagged. These pits must be fenced with 28 inch, sheep tight mesh with two strands barbed wire above and separated by approximately six inches. Berms will be required to keep runoff water out. A minimum of two feet of free board will be maintained between the maximum fluid level and the top of the berm.

Installed pit liners must be impermeable and must be resistant to weather, sunlight, hydrocarbons, aqueous acids, alkalies, salt, fungi, or other substances likely to be contained in the drilling fluids or produced water. Acceptable liners include those constructed of concrete, asphalt, or flexible synthetic membranes.

The reserve pit liner will be of sufficient strength and construction to insure impermeability. The liner will be underlain by a suitable bedding material and other measures taken as needed to protect the integrity of the liner.

A leak detection system will be installed to monitor lined reserve pits. This system must be installed in order to detect liner leakage. The leak detection plan must be submitted to and approved by the Authorized Officer during APD approval. This plan must include the system design including line installation, monitoring plan, and the individual responsible for the required monitoring.

Semi-closed or closed mud systems may be required where conditions warrant. Produced water will be injected, contained in a lined pit, or hauled to a federally approved disposal facility.

All pits, cellars, rat holes, and other bore holes unnecessary for further lease operations, excluding the reserve pit, will be back-filled immediately after the drilling rig is released to conform with surrounding terrain. Pits, cellars and/or bore holes that remain on location must be fenced as specified for the reserve pit.

Reserve pit fluids will be allowed to evaporate through the entire summer season (June-August) after drilling is completed, unless an alternate method of disposal is approved. After the fluids disappear, the reserve pit muds will be allowed to dry sufficiently to allow back-filling. The back-filling of the reserve pit will be done so that the muds and associated solids will be confined to the pit and not squeezed out and incorporated in the surface materials. There will be a minimum of three feet of cover (overburden) on the pit. When the work is complete, the pit area will support the weight of heavy equipment without sinking.

For lined pits, the liner and contents will be buried in place and effectively capped with clay or other impermeable materials, or disposed of in a non-polluting method acceptable to the Authorized Officer.

Movement of the liner and contents shall be kept to a minimum to avoid liner destruction and/or residue dispersal.

If air or gas drilling, the operator shall control the blooie line discharge dust by use of water injection or any other acceptable method. The blooie line discharge shall be a minimum of 100 feet from the blow out preventer and be directed into the blooie pit so that the cuttings and waste are contained in the pit.

If a portable trash cage is not used, a trash pit will be constructed near the mud tanks with steep sides and dug at least six feet into solid undisturbed material. It will be totally enclosed with a fine wire mesh before the rig moves in. Prior to burning trash, the County Sheriff must be notified.

The reserve pit will be constructed with the maximum pit volume in cut. The pit must be sealed to prevent fluid leakage.

Three sides of the reserve pit will be fenced with four strands of barbed wire before drilling starts. The fourth side will be fenced as soon as the drilling is completed. The fence will remain in good repair until pit is reclaimed.

Before any dirt work to restore the location takes place, the reserve pit must be completely dry. Any water remaining in the reserve pit should be disposed in an approved disposal facility.

Avoid excessive disturbance of drainage bottoms and locate reserve pits away from any watercourse. Reserve pits may have to be lined to prevent contamination of groundwater or soil.

d. Pipelines

Alignment, siting, and reclamation of pipelines and flow-lines should be designed to conform to adjacent terrain and to prevent or minimize vehicular travel. If maintenance is necessary in problem areas, consider use of an all terrain vehicle (ATV) or snowcat etc., in lieu of regular truck. Surface disturbance for pipeline construction would be restricted to the minimum amount necessary, as determined by the Authorized Officer.

For associated pipeline rights-of-way, except rights-of-way expressly authorizing a road after construction of the facility is complete, the right-of-way holder shall not use the right-of-way as a road for purpose other than routine maintenance. Necessary routine maintenance will be determined through consultation with the Authorized Officer.

Linear-type facilities such as roads, power lines, and pipelines shall cohabit and follow a common route unless otherwise approved by the Authorized Officer. Surface disturbance will be minimized to the maximum extent possible.

All pipelines shall be buried and trenches shall be compacted after back-filling, unless otherwise approved by the Authorized Officer. Pipeline routes will not be utilized as access roads unless a road is constructed to accepted specifications and design, and is approved by the Authorized Officer.

Existing telephone, telegraph, power lines, pipelines, roads, trails, fences, ditches, and like improvements shall be protected during construction, operation, maintenance, and termination of an oil and gas facility. Damage caused by such activities shall be properly repaired to a condition which is satisfactory to the Authorized Officer or the facility owner/operator.

Surface disturbance for pipeline construction would be restricted to the minimum amount necessary as determined by the Authorized Officer.

Construction: Steep hillsides and water courses shall be avoided in the location of pipelines and flow-lines. Flow-line routes should take advantage of road locations to minimize surface disturbance.

Cuts and fills on pipelines shall be made only where necessary. Cut and fill slopes should normally be no steeper than 3:1 and graded to conform to the adjacent terrain.

Pipeline routes will be graded to conform to the adjacent terrain, waterbarred, and reseeded.

When clearing is necessary, the width disturbed will be kept to a minimum. Bladed materials shall be placed back into the cleared route upon completion of construction.

Pipeline construction shall not block, dam, or change the natural course of any drainage. Suspended pipelines will provide adequate clearance for runoff.

Surface soil material shall be stockpiled to the side of the routes where cuts and fills or other surface disturbance occur during pipeline construction. Surface soil material shall be segregated and will not be mixed or covered with subsurface material.

Pipeline trenches shall be compacted during back-filling. These trenches will be maintained in order to correct settlement and prevent erosion. Waterbars and other erosion control devices will be repaired as necessary.

Pumping stations shall be kept in a neat and well-maintained condition.

Abandonment and Rehabilitation: Reclamation and abandonment of pipelines and flow-lines may involve: replacing fill in the original cuts, reducing and grading cut and fill slopes to conform to the adjacent terrain, replacement of surface soil material, waterbarring, and revegetating in accordance with rehabilitation practices.

Crossing of pipelines owned by other companies shall be accomplished in accordance with an agreement secured with that company.

G. DRILLING

Any water well drilled to provide water for drilling purposes will be analyzed and offered to the BLM for use following the completion of the drilling phase. Water rights will be filed on behalf of BLM.

Water for drilling purposes will not be obtained from federally owned or controlled water sources such as reservoirs and springs unless specified permission is obtained from the Area Manager.

The BLM will be notified of any strong water aquifers encountered during drilling which could be developed for water prior to final plugging of the dry hole. Water rights will be held by the BLM.

All freshwater and prospectively valuable minerals encountered during drilling will be recorded by depth, cased, and cemented. Temperature surveys and/or bond log will be required should cement fail to circulate to surface on casing strings.

H. PRODUCTION

Compaction and construction of the berms surrounding tank batteries will be constructed prior to storage of fluids and designed to prevent lateral movement of fluids through the utilized materials. The berms must be constructed to contain at minimum 120 percent of the storage capacity of the largest tank within the berm. All loading lines will be placed inside the berm.

Other Guidelines: Surface buildings, supporting facilities, and other structures, which are not required for present or future operations, shall be removed upon termination of use.

All improvements, including fences, gates, cattle guards, roads, trails, pipelines, bridges, water developments, and control structures will be maintained in a serviceable and safe condition.

Any release of production water on or across the land will need prior approval by the BLM.

Mud, separation pits, and other containments used during the exploration or operation of the lease for the storage of oil and other hazardous materials shall be adequately fenced, posted, or covered. Additional protective measures may be needed to minimize hazards and prevent access to humans, livestock, waterfowl, and other wildlife. The pits should be allowed to dry before back-filling and rehabilitation.

All production and storage facilities must have adequate protection from spills. The Spill Prevention Control and Countermeasure Plan required by the Environmental Protection Agency must be available for inspection at all appropriate field offices. All spills must be reported to the Authorized Officer.

The reserve pit and that portion of the location and access road not needed for production or production facilities will be reclaimed as described in the reclamation section. Enough topsoil will be kept to reclaim the remainder of the location at a future date. This remaining stockpile of topsoil will be seeded in place using the prescribed seed mixture.

The access shall be upgraded to BLM resource road specifications (either 14-foot or 20-foot running surface crowned and ditched road). Rock surfacing will be required for all-weather operation. The roads shall be maintained reasonably smooth, and free of ruts, soft spots, chuckholes, rocks, slides, and washboards.

Any noxious weeds which may be introduced due to the soil disturbance and reclamation may be required to be treated at a future date.

A gate may be required to limit public access during the wildlife winter use periods (December 1 - April 15).

If the well is located within 2,500 feet (1/2 mile) of residences, appropriate noise mitigation (i.e., hospital muffler, vegetation screening, electric motors, etc.) will be employed to ensure that federal, state, and local noise standards are adhered to during operation of the well.

Within 60 days of completion of construction, the holder shall provide the Authorized Officer an as-built survey of facilities as constructed.

I. RECLAMATION

Prior to well site construction, topsoil will be stripped from the site and, if stockpiled for more than one year, the stockpile shall be seeded or otherwise protected from wind and water erosion. The stockpile shall be marked or segregated to avoid loss or mixing with other subsurface materials.

All disturbed areas will be revegetated as soon as possible. The operator will re-establish perennial vegetation that is compatible to surrounding undisturbed vegetation. The plant species to be seeded will be approved by the Authorized Officer prior to seeding. Successful revegetation will be considered completed when the percent canopy cover is equal to surrounding undisturbed vegetation. The species considered in measuring percent cover will be those seeded as well as desirable preexisting species. Undesirable weedy species such as kuchia, cheatgrass, and other noxious weeds will not be included unless otherwise directed by the Authorized Officer. The operator will continue revegetation efforts until this standard is met.

Areas being reclaimed may require fencing. The need will be determined on a case-by-case basis.

Waterbar construction is required on pipeline routes and abandoned roads. Spacing will be determined by the surface owner/manager, dependent upon soil stability and/or erosion potential. Waterbars shall be constructed to drain freely on natural ground.

Trash and garbage must be contained in a closed receptacle or if an earthen pit is utilized, it must be covered to prevent contents from escaping. Burning and/or burying is not authorized; contents from trash receptacle or pit must be hauled to an approved county landfill.

Noxious weeds which may be introduced due to soil disturbance and reclamation will be treated by methods to be approved by the Authorized Officer. These methods may include biological, mechanical, or chemical. Should chemical methods be approved, the lessee must submit a Pesticide Use Proposal to the Authorized Officer 60 days prior to the planned application date.

In the event a producing well is developed, the unused disturbed areas surrounding the well location will be recontoured to appropriate confirmation (one which allows lease operations and avoids steep cut and fill slopes) as soon as possible. Some or all of the stockpiled topsoil will be evenly disturbed over these recontoured areas. Brush cleared prior to construction of the well site shall be scattered back over the recontoured area.

Following redistribution of topsoil, a seed-bed will be prepared by disking to a depth of four to six inches.

All disturbed areas will be reseeded with an appropriate seed mixture prescribed by the surface owner/manager. Seed will be applied

using a rangeland drill wherever practical. Where terrain does not permit drill seeding, broadcast seeding will be permitted. The rate of application of seed will be determined by the surface owner/manager.

Mulching of the seed-bed following seeding may be required under certain conditions (i.e., expected severe erosion), as determined by the surface owner/manager.

Seeding of disturbed areas shall be undertaken in the fall of the year.

In the event that seeding does not result in successful revegetation, as determined by the surface owner/manager, reseeding and/or additional measures will be required for reclamation. Additional measures may include, but are not limited to: soil analysis to determine the need for fertilizer, fertilizing additional seed-bed preparation, mulching, wind management, snow fencing, modification of the seed mixture, and fencing to exclude livestock.

Surface soil material, if available, will be stripped from all areas where surface disturbance is necessary and stockpiled in a manner and location that will allow easy replacement. These stockpiles shall be protected from loss.

The depth of surface soil material to be removed and stockpiled will be specified by BLM. After reshaping the site, soil material should be distributed to a uniform depth that will allow the establishment of desirable vegetation. The disturbed areas shall be scarified prior to replacement of surface soil material.

Disturbed areas will be revegetated after the site has been satisfactorily prepared. Site preparation may include contour furrowing, terracing, reduction of steep cut and fill slopes, water-barring, etc. The operator will be advised as to species, methods of revegetation, and seasons to plant. Seeding shall be done by drilling on the contour whenever practical. Seeding and/or planting will be repeated until satisfactory revegetation is accomplished, as determined by BLM. Mulching, fertilizing, fencing, or other practices may be required.

Immediately on completion of drilling, all trash and debris will be collected from the location and surrounding area. All trash and debris will be disposed in the trash pit or cage, and will then be compacted and buried under a minimum of two feet of compacted soul.

All disturbed areas will be recontoured to blend as nearly as possible with the natural topography. This includes removing all berms and refilling all cuts. All compacted portions of the pad will be ripped to a depth of 12 inches unless in solid rock.

The stockpiled topsoil will be spread evenly over the disturbed area.

All disturbed areas will be contour cultivated to a depth of four inches.

Seed will be broadcast between September 1 and December 1 using a BLM site specific seed mixture. Seed may be drilled at half the rate of broadcast seeding. Seed depth = 1/2 inch. All seeding rates in pounds of pure live seed. Seed should be adapted varieties.

After application of the seed, and prior to placement of the brush, dry fertilizer (18-46-0) should be applied (300 lbs/acre) and worked into the soil.

After seeding and mulching are complete, the stockpiled trees will be scattered evenly over the disturbed areas. The access will be blocked to prevent vehicular access.

Seed certification tags will be submitted to the Authorized Officer for seed used in reclamation.

Disturbed areas shall be seeded between September 1 and December 1 using a BLM site specific seed mixture. Seed may be drilled at half the rate of broadcast seeding. Seed depth = 1/2 inch. All seeding rates in pounds per acre pure live seed for broadcast application.

The area is considered to be satisfactorily reclaimed when the following criteria have been met.

1) All disturbed areas have been recontoured to blend with the natural topography.
2) All soil erosion associated with the operation has been stabilized.
3) The rock content of the surface 12 inches of soil material off road is no greater than the pre-disturbance condition.
4) An acceptable vegetative cover has been established. An acceptable vegetative cover will consist of a vegetative cover at least equal to that of the pre-disturbance condition.

Prior to abandonment of the facilities authorized by this grant, the holder shall contact the Authorized Officer to arrange a joint inspection of the right-of-way. The inspection will be held to agree on an acceptable abandonment and rehabilitation plan. The Authorized Officer must approve the plan in writing prior to the holder commencing any abandonment and/or rehabilitation activities. The plan may include removal of surfacing material from the road, recontouring, replacement of topsoil, seeding, mulching, etc.

Abandonment and Rehabilitation: Rehabilitation shall be planned on the sites of both producing and abandoned wells. The entire site or portion thereof, not required for the continued operation of the well, should be restored as nearly as practical to its original condition. Final grading of back-filled and cut slopes will be done to prevent erosion and encourage establishment of vegetation.

Cut and fill slopes shall be reduced and graded to conform the site to the adjacent terrain. The disturbed sites will be prepared to provide a seed-bed for re-establishment of desirable vegetation and reshaped to blend with the natural contour. Such practices may include contouring, terracing, gouging, scarifying, mulching, fertilizing, seeding, and planting.

All excavations, pits, or drill holes will be closed by back-filling when they are dry and made to conform to the surrounding terrain. Waterbars and terracing may be necessary to prevent erosion of fill material.

J. MISCELLANEOUS

Upon determination by the Authorized Officer of an impending field development, a transportation plan will be required to reduce unnecessary access roads.

Additional site surveys, grading plans, and engineering designs may be required in VRM Class II areas.

Should additional site-specific environmental analyses at the time of exploration or development reveal the need for additional restrictions or the continuance of existing lease stipulations, these restrictions will become part of the development or operational plan.

Survey Monuments: All survey monuments, witness corners, reference monuments, and bearing trees shall be protected against destruction, obliteration, or damage. Any markers so affected must be re-established at the lessee's expense in accordance with accepted BLM survey practices defined in the "Manual of Surveying Instructions for the Survey of the Public Lands of the United States."

Burning of solid or liquid wastes usually requires a burning permit. The permit must be obtained from the state air quality agency.

APPENDIX E

PROPOSED ACTION ALTERNATIVE

LEASE STIPULATIONS

APPENDIX E

PROPOSED ACTION ALTERNATIVE LEASE STIPULATIONS

INTRODUCTION

Oil and gas leases are issued granting the lessee the right to extract the oil and gas resource. Section 6 (see Appendix C) of the lease restricts the lease rights granted by requiring protection of other resources during development of the oil and gas. If it is necessary to restrict the rights more than in the standard lease contract, stipulations are appended to the lease. The additional restrictions needed to protect resources and values under this alternative are shown below, categorized by type of stipulation and Resource/Planning Area (GSRA, KRA, LSRA, NPA, and SJ/SMPA) to which they are applicable.

These stipulations are evaluated for use on all federal mineral estate regardless of surface ownership, with the exception of the federal mineral estate underlying surface administered by the U. S. Forest Service.

The regulations covering modification and waiver of stipulations are found in the Code of Federal Regulation (CFR), Title 43, Subpart 3101.1-4. Generally a waiver, exception, or modification may be approved if the record shows that circumstances or relative resource values have changed or if the lessee can demonstrate that operations can be conducted without causing unacceptable impacts, and that less restrictive stipulations will protect the public interest. Waivers, exceptions, or modifications can only be granted by the Authorized Officer. If the proposed waiver, exception, or modification is inconsistent with the plan, the plan will be amended or the change to the stipulation will be disallowed. Even where no exception criterion is identified, exceptions are considered on a case-by-case basis. The Glossary in Chapter 7 contains the definitions used by the BLM for waiver, exception, and modification.

Exceptions to leasing stipulations will be granted by the Authorized Officer if the reason for the exception is consistent with that analysis. No public notice is required for exceptions to lease stipulations which conform to the plan. Other possible exceptions may be granted only upon plan amendment and public notification.

Modifications to stipulations are made if and when resource management determines the stipulation is no longer effective as written. This situation occurs when new information (for example from a monitoring program, technical data, etc.) shows that the protective measure is unnecessarily restrictive. Modification of a stipulation requires the preparation of an environmental assessment to determine the potential impacts and plan amendment or maintenance needs. If the modification is determined by the Authorized Officer to be substantial, a 30-day public notice will be given prior to modifying the lease stipulation.

Waiver means the complete elimination of a stipulation from a particular lease contract. A stipulation is waived by the Authorized Officer after preparation of an environmental assessment and a decision is made that the stipulation in question is no longer required for a particular lease. The decision to waive a substantial stipulation requires a plan amendment and a 30 day public notice period prior to waiver.

The stipulations common to two or more Resource/Planning Areas are listed first and the areas to which they apply are coded in a [ ] following the stipulation.

I. No Surface Occupancy Stipulations (NSO)

The No Surface Occupancy stipulation is intended for use only when other stipulations are determined insufficient to adequately protect the public interest. The plan amendment analysis shows that less restrictive stipulations are inadequate to protect the resource in question. These resources/values to be protected are also considered for no leasing areas, but it is determined that no surface occupancy is adequate for resource/value protection. An NSO stipulation is not needed if the desired protection does not require relocation of proposed operations by more than 200 meters (43 CFR 3101.1-2).

The Uniform Oil and Gas Lease Stipulation Format, shown in Figure 1, will be used to append all new NSO stipulations to the lease document.

Serial No._____

NO SURFACE OCCUPANCY STIPULATION

No Surface Occupancy or use is allowed on the lands described below (legal subdivision or other description).

For the purpose of:

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

Form #/Date

Figure E-1
Uniform Oil and Gas Lease Stipulation Format

NSO stipulations common to two or more Resource/Planning Areas--applicable areas are shown in a [ ] following the stipulation.

1. Grouse (includes sage, mountain sharp-tailed, and prairie chicken): Protection of breeding habitat. 1/4 mile radius of the lek, however, topographic features or other factors specific to a particular lek will dictate the actual size of the NSO: Exception criterion includes evidence of permanent abandonment. [All]

2. Bald Eagle Nests: Protection of nests: 1/4 mile radius of the nest: Exception criterion includes evidence of permanent abandonment, or the proposed location does not impact the nest due to topography, or other factors. [All]

3. Golden Eagles Nests: Protection of nesting areas: 1/4 mile radius of nest: Exception criterion includes evidence of permanent abandonment, or the proposed location does not impact the nest due to topography, or other factors. [All]

4. Ferruginous/Red tailed Hawk Nests: Protection of nesting areas: 1/4 mile radius of nest: Exception criterion includes evidence of permanent abandonment, or the proposed location does not impact the nest due to topography, or other factors. [All]

5. Peregrine Falcon Nests: Protection of nesting areas: 1/4 mile radius of scrape: Exception criterion includes evidence of permanent abandonment, or the proposed location does not impact the nest due to topography, or other factors. [GSRA, LSRA, NPA, SJ/SMPA]

6. Prairie Falcon Nests: Protection of nesting areas: 1/4 mile radius of nest: Exception criterion includes evidence of permanent abandonment, or the proposed location does not impact the nest due to topography, or other factors. [GSRA, LSRA, NPA, SJ/SMPA]

Glenwood Springs Resource Area --(NSO)

1. Major River Corridors: Protection of 1) threatened and endangered and sensitive fish and wildlife species, 2) riparian values, 3) waterfowl production areas, and 4) the lower Colorado River ACEC: 1/2 mile either side of the high water mark of the river: No exception criterion is identified.

2. Rifle Falls and Glenwood Springs Fish Hatcheries: Protection of water quality and quantity supplying the Rifle Falls and Glenwood Springs Fish Hatcheries: Two mile radius of the hatcheries: Exception criterion would include special mitigative measures developed in consultation with Colorado Division of Wildlife.

3. Deep Creek ACEC/SRMA/VRM Class I: Protection of primitive and semi-primitive non-motorized recreational values, and visual values: No exception criterion is identified.

4. Bull Gulch ACEC/SRMA/VRM Class I: Protection of semi-primitive and non-motorized recreational values, and visual values: No exception criterion identified.

5. Thompson Creek ACEC/SRMA/VRM Class I: Protection of semi-primitive non-motorized recreational and visual values: No exception criterion is identified.

6. Hack Lake SRMA: Protection of semi-primitive non-motorized recreational and visual values: Exception criterion includes mitigative measures to screen operations from scenic view sheds; eliminate drill rig and other equipment noise; and fence or otherwise protect recreating public from operations.

7. Rifle Mountain Park: Protection of recreational and visual values: Exception criterion includes mitigative measures to screen operations from scenic view sheds; eliminate drill rig and other equipment noise; and fence or otherwise protect recreating public from operations. Exception mitigation will be developed in consultation with Park authorities.

8. Sunlight Peak Area: Protection of semi-primitive non-motorized recreational and visual values: Exception criterion includes mitigative measures to screen operations from scenic view sheds; eliminate drill rig and other equipment noise; and fence or otherwise protect recreating public from operations.

9. Visual Resource Management Class II Areas: Protection of visual values: Exception criterion includes mitigative measures to screen operations from scenic view sheds and restoration of disturbed areas to a condition unnoticeable to casual observer.

10. Colorado River SRMA: Protection of recreational and visual values: Exception criterion includes mitigative measures to screen operations from scenic view; eliminate drilling and other equipment noise; and fence or otherwise protect recreation public from operations.

Kremmling Resource Area--(NSO)

1. Wetlands: Protection of important wetland habitat for waterfowl and shorebirds: No exception criteria is identified.

2. Raptor Nesting Sites: Protection of nesting habitat: 1/4 mile radius of nest site. Exception criteria includes evidence of permanent abandonment.

3. Kremmling Cretaceous Ammonite ACEC/RNA: Protection of ammonite fossils: No exception criterion is identified.

4. North Park Phacelia ACEC/RNA: Protection of a known endangered plant species: No exception criterion is identified.

5. Windy Gap Cultural RMA: Protection of archaeological sites: No exception criterion is identified.

6. Colorado River SRMA: Protection of recreational and scenic values along part of the Colorado River: No exception criterion is identified.

7. North Sand Hills SRMA: Protection of recreational values: No exception criterion is identified.

Little Snake Resource Area--(NSO)

1. Greater Sand Hill Crane habitat: Protection of habitat: Exception criterion includes evidence of permanent abandonment or proposed location does not impact nest due to topography or other factors.

2. Limestone Ridge ACEC: Protection of remnant plant associations and sensitive plant species, and scenic values: No exception criterion is identified.

3. Cross Mountain Canyon ACEC: Protection of sensitive plants, endangered species, scenic and recreational values: No exception criterion is identified.

4. Little Yampa/Juniper Canyon SRMA: Protection of flatwater boating opportunities and scenic values: No exception criterion is identified.

5. Cedar Mountain SRMA: Protection of recreational and educational opportunities, and scenic values: No exception criterion is identified.

6. Steamboat Lake State Park: Protection of recreational and scenic values: No exception criterion is identified.

7. Pearl Lake State Park: Protection of recreational and scenic values: No exception criterion is identified.

Northeast Planning Area--(NSO)

1. Bighorn Sheep Lambing Areas: Protection of habitat: Exception criterion includes evidence of permanent abandonment.

2. I-70 Corridor: Protection of scenic values along I-70 in Clear Creek county: Exception criterion includes mitigative measures to screen operations from scenic view sheds.

3. Navy Base: Protection of special purpose facilities and uses on 400 acres: Exception criterion includes development of mitigative measures in consultation with Navy designed to protect special facilities and uses.

4. Lowry Air Force Base: Protection of special facilities and uses of 40 acres for air base and 34 acres for munitions storage: Exception criterion includes mitigative measures developed in consultation with the Air Force for the protection of the special facilities and uses.

San Juan/San Miguel Planning Area--(NSO)

1. Crucial Peregrine Falcon Nesting Habitat: Protection of peregrine falcon nesting habitat at Perins Peak and near Mesa Verde National Park: Exception criterion includes evidence of permanent abandonment, or the proposed location does not impact the nest due to topography or other factors.

The following areas (numbers 2 through 28) will have NSO stipulations appended to leases issued within them for the protection of scenic, natural, and cultural values and resources. Exception criterion includes performance of accredited archaeological excavation and/or study approved by the Authorized Officer, unless preservation "in situ" is directed by cultural resource allocations in an approved activity plan.

2. Cannonball Ruin

3. Lowry Ruin and Associations

4. Dominguez-Escalante Ruins

5. Tabeguache Cave II and Tabeguache Canyon

6. Dolores Cave

7. Tabeguache Pueblo

8. McLean Basin Towers and associations

9. Painted Hand Petroglyphs and associations

10. Painted Hand Ruin

11. Indian Henry's Cabin and associations

12. Lighting Tree Tower Group

13. Battle Rock

14. Easter Ruin

15. Seven Towers Ruin Group

16. Hovenweep Canyon

17. East Cortez

18. Goodman Canyon and Goodman Point Buffer Zone

19. Bass Ruin Complex

20. Sandstone Canyon

21. Brewer Well Complex

22. Yellowjacket Canyon

23. Basin Wickiup Village

24. Woods Canyon

25. Bridge Canyon

26. Ansell Hall Pueblo

27. Upper Ruin Canyon

28. Bowdish Canyon

29. Dolores River Canyon: Protection of recreational and visual values. Exception criterion includes mitigative measures to screen operations from river and scenic view sheds; eliminate drill rig and other equipment noise; and fence or otherwise protect recreating public from operations.

The following areas (numbers 33 through 37) will have NSO stipulations attached to leases in them. Exception criterion includes meeting objectives of special management for the area to the satisfaction of the Authorized Officer.

30. Bridge Canyon (McElmo) RNA: Protection of habitat for rare species of flora and fauna.

31. Menefee and Weber Mountains: Protection of recreational and visual values.

32. Sand and East Rock Canyons: Protection of archaeological values.

33. Squaw/Papoose, Cross, and Cahone Canyons: Protection of archaeological values.

34. Hovenweep National Monument Cooperative Management Strategies Area: Protection of the archaeological resources of Horseshoe/Holly House segment of the Hovenweep National Monument. No exception criterion identified.

35. Horse Range Mesa Paleontological site (40 acres): Protection of vertebrate fossils: Exception criterion includes funding of accredited paleontological excavation to recover all vertebrate fossils to the point of scientific insignificance.

II. Timing Limitation Stipulations (TL)

The Timing Limitation (often called seasonal) stipulation prohibits fluid mineral exploration and development activities for time periods less than year-long. The dates and location(s) limiting activity are as specific as possible. A timing limitation stipulation is not necessary if the time limitation involves the prohibition of new surface disturbing operations for periods of less than 60 days (43 CFR 3101.1-2).

Timing limitations shorter than 60 days do not require a lease stipulation. The restriction is added directly to the field operation approval as a condition of approval (see Appendices D and F), and are noted on the lease as Lease Notices (see Appendix E). However, in those cases where two or more time restrictions combine or overlap to form a restriction of more than 60 days, the closure will be attached to the lease as a stipulation, as a matter of Colorado BLM policy. Additional restrictions of 60 days or less may still be added to field operations for protection of resources/values other than those stipulated.

Serial No._____

TIMING LIMITATION STIPULATION

No surface use is allowed during the following time period(s). This stipulation does not apply to operation and maintenance of production facilities.

On the lands described below:

For the purpose of (reasons):

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

Form #/Date

Figure E-2.
Uniform Oil and Gas Stipulation Format

TL stipulations common to two or more Resource/Planning Areas--applicable areas are shown in a [ ] following the stipulation.

1. Grouse (Sage, Mountain Sharp-tailed, and Lesser and Greater Prairie Chickens) Winter Habitat: December 16 to March 15. [All]

2. Grouse (Sage, Mountain Sharp-tailed, and Lesser and Greater Prairie Chickens) Lek/Nesting Habitat: March 1 to June 15: 1 mile radius around each lek to protect nesting habitat. Exception criterion includes evidence of no nest sites in the vicinity of proposed development activities. [All]

3. Big Game (Mule Deer/Elk/Bighorn Sheep/Antelope) Crucial Winter Range: December 1 to April 30. [All, as applicable]

4. Bald Eagle Nesting Habitat: November 16 to July 31: 1/2 mile radius of nests. [GSRA, LSRA, NPA, SJ/SMPA]

5. Bald Eagle Winter Roost Sites: November 16 to April 15: 1/2 mile radius of roost site. [GSRA, LSRA, NPA, SJ/SMPA]

6. Ferruginous/Red Tailed Hawk Nesting Area: February 1 to July 15: 1 mile radius of nest. [GSRA, LSRA, NPA, SJ/SMPA]

7. Peregrine Falcon Cliff Nesting Complex Habitat: March 16 to July 31. [GSRA, LSRA, NPA, SJ/SMPA]

8. Raptor Nesting and Fledgling Habitat (Raptors include golden eagles, accipters, falcons, butteos, osprey, and owls.): 1/2 mile radius of nest. [GSRA, LSRA, NPA, SJ/SMPA]

9. Osprey Nesting Habitat: April 1 to August 31: 1/2 mile radius of nest. [GSRA, NPA, SJ/SMPA]

10. Greater Sand Hill Crane Nesting and Staging Area: March 1 to October 16. [KRA, LSRA]

Exception to these stipulations may be granted on a case-by-case basis by the Authorized Officer upon determination that specific habitat (nest sites, etc.) is not being used by the protected species or weather conditions are moderate; or that impacts can be mitigated to avoid abandonment of these areas by the species. In cases of crucial habitat, exceptions may be granted under mild winter conditions for the last 60 days of the restricted period.

Glenwood Springs Resource Area --(TL)

1. Elk Production Area: April 16 to June 30.

2. Golden Eagle Nesting Areas: February 1 to July 15: 1/2 mile radius of nest.

3. Greater Blue Heron Rookery: July 1 to February 28.

4. Turkey Nesting Habitat: April 1 to July 31: (Note: This stipulation will be placed on leases upon decision to implement the Proposed Action Alternative, however, the stipulation will not be implemented until turkeys have been transplanted into the proposed areas.)

5. Waterfowl Nesting/Production Areas: February 15 to July 15.

Kremmling Resource Area--(TL)

1. Big Game (Mule Deer, Elk, Antelope, Bighorn Sheep) Crucial Winter Range: December 15 to April 30.

Little Snake Resource Area--(TL)

1. Isolated and/or Roadless Areas: August 16 to November 14.

2. No helicopter or motor vehicle use would be allowed in the Wild Horse Herd Management Area (March 2 to June 30)--foaling season for wild horses.

3. No drilling or development operations activity would be permitted within a one mile radius of the location listed below, from March 1 to December 1 (This stipulation will apply to operation and maintenance of production facilities.):

Wild Horse Spring; NE1/4SE1/4 sec. 26, T. 10 N., R. 98 W.
Sheepherder Spring; SE1/4SE1/4 sec. 8, T. 10 N., R. 98 W.
Coffee Pot Spring; SE1/4NW1/4 sec. 22, T. 11 N., R. 98 W.
Two Bar Spring: SE1/4SW1/4 sec. 35, T. 9 N., R. 99 W.
Dugout Draw Spring; SW1/4SE1/4 sec. 33, T. 10 N., R. 97 W.

This restriction would allow wild horses the uninhibited and undisturbed use of their critical drinking water sources during the period when snow is generally unavailable. Exception criterion would include provision, by the operator, of an alternate dependable water source at a suitable location outside the mile radius of the spring prior to the authorized activity. The alternate source shall be installed and properly functioning in a continuous manner for a sufficient time, prior to activity, to allow the wild horses to locate and use the source. No activity will be allowed to commence until this stipulation is completely and satisfactorily complied with. Maintenance would be the sole responsibility of the operator.

Northeast Planning Area--(TL)

1. Cherokee Park State Wildlife Area (Middle, Lower, and Lone Pine Units): Protection of recreational values: May 1 to September 30.

2. White Pelican Nesting and Feeding Habitat: March 16 to September 30

San Juan/San Miguel Planning Area--(TL)

1. Elk Calving Area: May 1 to July 15.

2. Wild Horse Foaling Area: March 2 to June 30

III. Controlled Surface Use Stipulations (CSU)

The Controlled Surface Use (CSU) Stipulation is intended to be used when fluid mineral occupancy and use are generally allowed on all or portions of the lease area year-round, but because of special values or resource concerns, some aspects of lease activities must be strictly controlled. The CSU stipulation is used to identify constraints on surface use or operations which may otherwise exceed the mitigation available under Section 6 of the standard lease terms, regulations, and operating orders. The CSU stipulation is less restrictive than the NSO or TL stipulations, which prohibit all occupancy and use on all or portions of a lease for all or portions of a year. The use of this stipulation should be limited to areas where restrictions or controls are necessary for specific types of activities rather than all activity.

Serial No._____

CONTROLLED SURFACE USE STIPULATION

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

On the lands described below:

For the purpose of:

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

Form #/Date

Figure E-3

CSU stipulations common to two or more Resource/Planning Areas--applicable areas are shown in a [ ] following the stipulation.

1. Fragile Soil Areas. Prior to surface disturbance of fragile soils, it must be demonstrated to the Authorized Officer through a plan of development that the following performance objectives will be met. [GSRA, LSRA]

Performance Objectives:

I. Maintain the soil productivity of the site.

II. Protect off-site areas by preventing accelerated soil erosion (such as landsliding, gullying, rilling, piping, etc.) from occurring.

III. Protect water quality and quantity of adjacent surface and groundwater sources.

IV. Select the best possible site for development in order to prevent impacts to the soil and water resources.

Fragile soil areas, in which the performance objective will be enforced, are defined as follows:

a. Areas rated as highly or severely erodible by wind or water, as described by the Soil Conservation Service in the Area Soil Survey Report or as described by on-site inspection.

b. Areas with slopes greater than or equal to 35 percent, if they also have one of the following soil characteristics: (1) a surface texture that is sand, loamy sand, very fine sandy loam, fine sandy loam, silty clay or clay; (2) a depth to bedrock that is less than 20 inches; (3) an erosion condition that is rated as poor; or (4) a K factor of greater than 0.32.

Performance Standards:

I. All sediments generated from the surface-disturbing activity will be retained on site.

II. Vehicle use would be limited to existing roads and trails.

III. All new permanent roads would be built to meet primary road standards (BLM standards) and their location approved by the Authorized Offer. For oil and gas purposes, permanent roads are those used for production.

IV. All geophysical and geochemical exploration would be conducted by helicopter, horseback, on foot, or from existing roads.

V. Any sediment control structures, reserve pits, or disposal pits would be designed to contain a 100-year, 6-hour storm event. Storage volumes within these structures would have a design life of 25 years.

VI. Before reserve pits and production pits would be reclaimed, all residue would be removed and trucked off-site to an approved disposal site.

VII. Reclamation of disturbed surfaces would be initiated before November 1 each year.

VIII. All reclamation plans would be approved by the Authorized Officer in advance and might require an increase in the bond.

Glenwood Springs Resource Area --(CSU)

1. Compensation for Loss of Crucial Habitat Values: A mitigation measure will be used to recover habitat losses on areas defined either by: 1) the BLM, through the EA process; 2) the CDOW, through the Wildlife Resource Information System (WRIS); or 3) the USFWS, through Section 7 Consultation for Endangered or Threatened Species, as Crucial Habitat. (Crucial Habitat--A biological feature, that if lost, would adversely affect the species.) Included would be those habitats protected by law, such as wetland and riparian areas. This mitigation would generally apply to those species or habitats considered important enough to be addressed in this EIS.

Compensation would be for the limiting habitat value lost, via replacement with similar values (i.e., food production for food production, cover for cover, etc.). The location and method of the replacement will be determined through the EA press, with emphasis on replacing within the same general vicinity if possible (i.e., same lease, same winter range or habitat or Game Management Unit).

Mitigation needs and methods of accomplishing the required mitigation will be determined on a site-specific basis and could involve BLM, CDOW, USFWS, and industry/other organization representatives. Possible mitigating activities include prescribed fire, roto chopping, chaining, fertilization, special plantings, creation of new wetland or riparian areas, etc.

The mitigation process may be accomplished through industry: 1) carrying out prescribed mitigation under the supervision of the resource specialist responsible for requiring it or a mutually agreed upon representative; 2) contracting with a mutually acceptable entity, or 3) provision of the required funds directly into a special BLM habitat improvement account whereby the BLM will arrange for the mitigation.

Exception Criteria: This stipulation would not be applied unless it has been determined by the Authorized Officer, through the EA process, that the site-specific and/or cumulative loss of a particular habitat would result in adverse impacts to the specific species or habitat in question.

Kremmling Resource Area--(CSU)

None

Little Snake Resource Area--(CSU)

1. Irish Canyon ACEC. Inventory for sensitive plant and remnant vegetation associations will be required. Sensitive plants and associations identified will be avoided. Known geologic values and cultural resources will be avoided.

2. Lookout Mountain ACEC. Inventory for sensitive plant and remnant vegetation associations will be required. Sensitive plants and associations identified will be avoided.

Northeast Planning Area--(CSU)

None

San Juan/San Miguel Planning Area--(CSU)

None

IV. Special Administrative Stipulations (SA)

These are stipulations provided by another agency or organization. The BLM encourages other agencies to use the Rocky Mountain Regional Coordinating Committee's Uniform Stipulation Format, however, that is not always feasible.

Glenwood Springs Resource Area --(SA)

None

Kremmling Resource Area--(SA)

None

Little Snake Resource Area--(SA)

None

Northeast Planning Area--(SA)

1. Bureau of Reclamation Lands will be subject to Special Stipulations developed by that agency. The "Special Stipulation" currently in use by the Bureau of Reclamation is available for review in the Northeast Resource Area Office.

2. The Lowry Bombing Range (3657 acres) lands will be subject to Special Stipulations developed by the U. S. Air Force. The Special Stipulations currently in use by the U. S. Air Force concerning unexploded ordnance is available for review in the Northeast Resource Area Office.

San Juan/San Miguel Planning Area--(SA)

None

V. Lease Notices (LN)

Lease Notices are attached to leases to transmit information at the time of lease issuance to assist the lessee in submitting acceptable plans of operation, or to assist in administration of leases. Lease Notices are attached to leases in the same manner as stipulations, however, there is an important distinction between Lease Notices and stipulations. Lease Notices do not involve new restrictions or requirements. Any requirements contained in a Lease Notice must be fully supported in either a law, regulations, standard lease terms, or onshore oil and gas orders. Guidance in the use of Lease Notices is found in BLM Manual 3101 and CFR 3101.1-3.

If a situation or condition is known to exist that could affect lease operations, there should be full disclosure at the time of lease issuance via a Lease Notice. If a lessee may be prevented from extracting oil and gas through a prohibition mandated by a specific nondiscretionary statute, such as the Endangered Species Act, a stipulation may be used even though a Lease Notice would be sufficient. It is at the discretion of the Authorized Officer whether a situation is sufficiently sensitive to warrant the use of a lease stipulation.

Lease Notices common to two or more Resource/Planning Areas--applicable areas are shown in a [ ] following the stipulation.

1. Rocky Mountain Bighorn Sheep lambing areas will be closed to exploration and construction activity from May 1 to July 1 (by authority contained in CFR 3101.1-2). [All]

2. Desert Bighorn Sheep lambing areas will be closed to exploration and construction activity from March 15 to May 16 (by authority contained in CFR 3101.1-2). [All]

3. Pronghorn Antelope fawning areas will be closed to exploration and construction activity from May 16 to June 30 (by authority contained in CFR 3101.1-2). [All]

4. Surface-disturbing activities in Class I and II Paleontological Areas will have an inventory preformed by an accredited paleontologist approved by the Authorized Officer. [All]

5. Areas with prairie dog complexes are being assessed to determine their suitability for reintroduction of the federal endangered black-footed ferret, and may require inventory prior to operations. Search guidelines, developed by the U.S. Fish and Wildlife Service to determine the presence of the black-footed ferret, will be required in performance of these inventories. [GSRA, LSRA, NPA, SJ/SMPA]

6. Sensitive Species Areas: In areas of known or suspected habitat of sensitive plant or animal species, and high priority remnant vegetation associations, a biological and/or botanical inventory may be required prior to approval of operations. The inventory would be used to prepare mitigative measures (consistent with lease rights granted) to reduce the impacts of surface disturbance to the sensitive plant or animal species. These mitigative measures may include (but, are not limited to) relocation of roads, pads, pipelines, and other facilities, and fencing operations or habitat. [GSRA, LSRA]

Glenwood Springs Resource Area --(LN)

1. Blue Hill Archaeological ACEC: This area contains a high density of prehistoric and cultural resources. Mitigation will be required at the operator's expense upon discovery of any resources at the time of development. Mitigation would require the services of an archaeologist (private contractor) approved by the Authorized Officer to conduct extensive field work, such as excavation and monitoring of construction activities.

Kremmling Resource Area--(LN)

None

Little Snake Resource Area--(LN)

None

Northeast Planning Area--(LN)

1. Air Force Cable Notice: Proposed operations located near Air Force underground cables will be moved so as to not interfere with cable performance.

San Juan/San Miguel Planning Area--(LN)

None

VI. No Lease Areas (NL)

The 1920 Mineral Leasing Act subjects all federally owned mineral estate to oil and gas leasing, with certain exceptions (see 43 CFR 3100.0-3). Exceptions include units of the National Park System; incorporated towns, cities and villages; wilderness study areas; wilderness areas; and others. BLM may make discretionary closures to leasing if resource/values are of sufficient importance and there is no way to mitigate impacts through a less stringent stipulation.

This section lists those discretionary closures within the planning units.

Glenwood Springs Resource Area --(NL)

None

Kremmling Resource Area--(NL)

None

Little Snake Resource Area--(NL)

None

Northeast Planning Area--(NL)

1. Rocky Mountain Arsenal (17,707 Acres)
2. Denver Mountain Parks (2,845 Acres)
3. Colorado State Parks (2,845 Acres)
4. Boulder Mountain Park (1,840 Acres)
5. Boulder County Parks and Open Space (1,769 Acres)
6. Clear Creek Land Conservancy (240 Acres)
7. Rocky Mountain National Park (120 acres)
8. Bennett Army National Guard Facility (242 acres)

San Juan/San Miguel Planning Area--(NL)

None

APPENDIX F

PROPOSED ACTION ALTERNATIVE

CONDITIONS OF APPROVAL

APPENDIX F

PROPOSED ACTION ALTERNATIVE CONDITIONS OF APPROVAL

The conditions of approval (COAs) shown in Appendix D will be used to protect resources analyzed within this Alternative. In addition to the COAs common to all alternatives, the following COAs will be appended to approval documents, as needed.

THE FOLLOWING COAS ARE COMMON TO TWO OR MORE RESOURCE/PLANNING AREAS --APPLICABLE AREAS ARE SHOWN IN A [ ].

Class I and II Paleontological Areas will have an inventory performed by an accredited paleontologist approved by the Authorized Officer. [All]

Rocky Mountain Bighorn Sheep lambing areas will be closed to exploration and construction activity from May 1 to July 1. [All]

Desert Bighorn Sheep lambing areas will be closed to exploration and construction activity from March 15 to May 16. [All]

Pronghorn Antelope fawning areas will be closed to exploration and construction activity from May 16 to June 30. [All]

Prairie dog complexes are being assessed to determine their suitability for reintroduction of the federally endangered black-footed ferret. An inventory will be conducted prior to starting operations. [GSRA, LSRA, NPA, SJ/SMPA]

Sensitive Species Areas: A biological and/or botanical inventory may be required prior to starting operations. [GSRA, LSRA]

Fragile Soil Areas: 1) All sediments generated form the surface-disturbing activity will have to be retained on-site. 2) Construction or other surface-disturbing activities will not be allowed when the soils are saturated to a depth of more than 3 inches. 3) Vehicle use will be limited to existing roads and trails. 4) All new permanent roads will be built to meet primary road standards (BLM standards); their location will be approved by the Authorized Officer. For oil and gas purposes, permanent roads are those used for production. 5) All geophysical and geochemical exploration will be conducted by helicopter, horseback, on foot, or from existing roads. 6) Any sediment-control structures, reserve pits, or disposal pits will be designed to contain a 100-year, 6-hour storm event. Storage volumes within these structures will have a design life of 25 years. 7) Before reserve pits, production pits, or emergency pits can be reclaimed, all residue will be removed and trucked off-site to an approved disposal site. 8) Reclamation of disturbed surfaces will be initiated before November 1 each year. [GSRA, LSRA]

GLENWOOD SPRINGS RESOURCE AREA

Blue Hill Archaeological ACEC: This area contains a high density of prehistoric and cultural resources. Mitigation will be required at the operator's expense upon discovery of any resources at the time of development. Mitigation would require the services of an archaeologist (private contractor) approved by the Authorized Officer to conduct extensive field work, such as excavation and monitoring of construction activities.

LITTLE SNAKE RESOURCE AREA

Lambing grounds: Exploration (including seismic exploration, drilling, or other development or production activity) will not be allowed on sheep lambing grounds during lambing activity. Lambing activities usually fall between April 10 and June 30 and lasts

for approximately six weeks. Dates for the six week closure will be determined for each operation as local conditions dictate. An exception will be considered for this COA for drilling operations which would require more than nine months to complete and for which it was also shown to the satisfaction of the Authorized Officer that the drilling operations could not avoid taking place in lambing areas during lambing activities.

NORTHEAST PLANNING AREA

Operations located near Air Force underground cables will be moved so as not to interfere with cable performance.

APPENDIX G

PRESENT MANAGEMENT ALTERNATIVE

LEASE STIPULATIONS

APPENDIX G

PRESENT MANAGEMENT ALTERNATIVE LEASE STIPULATIONS

Stipulations would be attached to oil and gas leases when they are issued for the Present Management (No Action) alternative.

GLENWOOD SPRINGS RESOURCE AREA

1. No Surface Occupancy stipulations would be attached to leases issued in the following areas: Thompson Creek Natural Environment Area; Fryingpan, Roaring Fork, Eagle, Crystal, and Colorado River Corridors; Rifle Mountain Park and Rifle Fish Hatchery; Hack Lake Recreation Management Area; Municipal watersheds; Glenwood Springs Debris Flow Hazard Zone.

2. Wildlife seasonal stipulations would be attached to leases issued in the areas listed below, prohibiting oil and gas development during the time periods listed.

Type of Area Restricted	Dates Activity Prohibited
Sage grouse strutting grounds	March 20 - May 20
Sage grouse winter concentration areas	November 15 - March 15
Raptor nesting areas	April 1 - August 31
Critical deer and elk winter range	January 15 - April 30
Elk calving area.	May 1 - July 1

KREMMLING RESOURCE AREA

1. Wildlife seasonal stipulation would be attached to leases issued in the areas listed below, prohibiting oil and gas development during the time periods listed.

Type of Area Restricted	Dates Activity Prohibited
Greater sandhill crane nesting buffer zones	April 10 - July 1
Sage grouse strutting ground buffer zones	March 15 - June 15
Sage grouse critical winter range	December 16 - March 16
Critical raptor nest buffer zones	March 1 - August 28
Bald eagle wintering habitat	November 1 - March 15
Big-game critical winter range	December 15 - April 15
Elk calving	May 1 - June 16

2. No Surface Occupancy stipulations would be attached to leases issued in the Kremmling Createaceous Ammonite Area of Critical Environmental Concern (ACEC).

3. No Surface Occupancy stipulations would be attached to leases issued on known occurrences of Phacelia formosula and Osterhout's Milkvetch.

4. No Surface Occupancy stipulations would be attached to leases issued in the Windy Gap Cultural Resource Management Area.

5. No Surface Occupancy stipulations would be attached to leases issued in Colorado River and North Sand Hills Special Recreation Management Areas.

6. No Surface Occupancy stipulations would be attached to leases issued on sage grouse strutting grounds.

7. Notification is provided to oil and gas lessees on known recoverable coal areas that coal development may present conflicts with recovery of oil and gas resources.

LITTLE SNAKE RESOURCE AREA

1. Wildlife seasonal stipulation would be attached to leases issued in the areas listed below, prohibiting oil and gas development during the time periods listed.

Type of Area Restricted	Dates Activity Prohibited
Greater sandhill crane nesting and staging area buffer zones	March 1 - October 15
Sage grouse strutting ground buffer zone	March 1 - May 31
Critical raptor nest buffer zones	February 1 - July 31
Bald eagle habitat	November 1 - April 15
Sharptail grouse dance ground buffer zone	March 15 - June 15
Mule deer, bighorn sheep, pronghorn antelope, mountain lion, elk critical winter range	December 1 - April 15
Elk calving, pronghorn antelope fawning, bighorn sheep lambing	May 1 - June 30

2. No Surface Occupancy stipulations would be attached to leases issued in wildlife habitat for raptors, the greater sandhill crane, wildlife watering areas, beaver colonies, sage grouse strutting grounds, and potential black-footed ferret habitat (some prairie dog towns).

3. The following performance objectives would be attached to leases issued in areas of fragile soils.

I. Maintain the soil productivity of the site by reducing soil loss from erosion and through proper handling of the soil material.

II. Reduce impact to off-site areas by controlling erosion and/or overland flow from these areas.

III. Protect water quality and quantity of adjacent surface and groundwater sources.

IV. Reduce accelerated erosion caused by surface-disturbing activities.

V. Select the best possible site for development in order to reduce the impacts to the soil and water resources.

Fragile soil areas, in which the performance objective will be enforced, are defined as follows:

a. Areas rated as highly or severely erodible by wind or water, as described by the Soil Conservation Service in the Area Soil Survey Report or as described by on-site inspection.

b. Areas with slopes greater than or equal to 35 percent, if they also have one of the following soil characteristics: 1) a surface texture that is sand, loamy sand, very fine sandy loam, fine sandy loam, silty clay, or clay; 2) a depth to bedrock that is less than 20 inches; 3) an erosion condition that is rated as poor; or 4) a K factor of greater than 0. 32.

Narrative: All proposed surface-disturbing activities within fragile soil areas will undergo a site-specific review at the resource area and/or district level.

To achieve the performance objectives, BLM has identified the following performance standards/stipulations that may apply to surface-disturbing activities. Depending on these variables, an applicant must demonstrate that the performance objectives have been met either through a plan of development, using alternative measures, or through use of the mitigative measures identified below. If the performance objectives through application of the performance standards/stipulations cannot be met, surface occupancy will not be authorized.

1) All sediments generated form the surface-disturbing activity will have to be retained on-site.

2) Construction or other surface-disturbing activities will not be allowed when the soils are saturated to a depth of more than 3 inches.

3) Vehicle use will be limited to existing roads and trails.

4) All new permanent roads will be built to meet primary road standards (BLM standards); their location will be approved by the Authorized Officer. For oil and gas purposes, permanent roads are those used for production.

5) All geophysical and geochemical exploration will be conducted by helicopter, horseback, on foot, or from existing roads.

6) Any sediment-control structures, reserve pits, or disposal pits will be designed to contain a 100-year, 6-hour storm event. Storage volumes within these structures will have a design life of 25 years.

7) Before reserve pits, production pits, or emergency pits can be reclaimed, all residue will be removed and trucked off-site to an approved disposal site.

8) Reclamation of disturbed surfaces will be initiated before November 1 each year.

4. No Surface Occupancy stipulations would be attached to leases issued in Limestone Ridge ACEC and Cross Mountain Canyon ACEC.

5. An avoidance stipulation will be attached to that portion of any oil and gas lease issued within Irish Canyon ACEC, Lookout Mountain ACEC, Ace-in-the-Hole Area, Hells Canyon Area, G-Gap Area, Vermillion Creek Area, Vermillion Bluffs Area, and Horse Draw Area and any other area where sensitive plants are found.

The avoidance stipulation states:

On-the-ground surveys for Colorado BLM sensitive plant species will be required before any surface-disturbing activity takes place in areas of previously unsurveyed potential habitat.

The locations of all known populations of Colorado BLM sensitive plants and selected high priority remnant vegetation associations will be protected from human-induced surface disturbing activities.

The area of protection will include the actual location of the populations or occurrence and, if present, adjacent sites critical to their habitat. Selected occurrences of important vegetation associations to receive protection shall be determined in consultation and coordination with the Colorado Natural Areas Program (CNAP).

Those populations/occurrences, upon which analysis determines protection to be necessary, shall be protected by: 1) requiring relocation or rerouting of proposed well sites, pipelines, roads, other surface facilities, etc., or 2) applying other protective mitigation (i.e., fencing). BLM will effectively mitigate potential impacts to important populations/occurrences.

6. A No Surface Occupancy stipulation would be attached to that portion of any oil and gas lease within the Little Yampa/Juniper Canyon Special Recreation Management Area and the Cedar Mountain management unit.

7. A No Surface Occupancy stipulation would be attached to that portion of any oil and gas lease within Steamboat Lake State Park.

NORTHEAST PLANNING AREA

The table below summarizes the seasonal closure stipulations.

Type of Area Restricted	Dates Activity Prohibited
Important waterfowl breeding & nesting habitat	April 1 - June 30
Greater prairie chicken courtship & nesting habitat	March 28 - July 15
Bald eagle winter habitat	November 15 - April 15
Raptor nesting habitat	February 15 - June 30
Crucial mule deer & elk winter range	December 15 - May 31
Elk & bighorn winter range & birthing areas	December 15 - June 30
Turkey	April 1 - July 31
Nesting & feeding habitat for white pelicans	March 15 - September 30

The appropriate stipulations would be attached where necessary when the lease is

issued. The stipulations currently in use are listed below.

No Surface Occupancy Stipulation

1. No Surface Occupancy is allowed on the lands described below (legal subdivision or other description).

Within certain reservoir and railroad rights-of-way.

For the purpose of (reasons): Protecting structures within the rights-of-way, and because of the physical impossibility of occupying some of these lands.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that these lands can be occupied without damage to improvements.

This stipulation may be waived by the Authorized Officer if it is determined that the structures within the rights-of-way have been abandoned.

2. No Surface Occupancy is allowed on the lands described below (legal subdivision or other description).

Certain tracts that contain important riparian and wildlife values at or near:

South Platte River
Prewitt Reservoir
Julesburg Reservoir
Prospect Reservoir
Horsecreek Reservoir
Milton Reservoir
Lower Latham Reservoir
Riverside Reservoir
Empire Reservoir
Bijou Reservoir
Ft. Collins Reservoir
South Republican River

For the purpose of (reasons): Protecting important wildlife and riparian values associated with these areas.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that operations can be conducted without causing unacceptable impacts to the values being protected.

Timing Limitation Stipulation

No surface use is allowed during the following time period(s). This stipulation does not apply to operation and maintenance of production facilities.

1. May 15 to September 15

On developed recreation lands at North Sterling Reservoir.

For the purpose of (reasons): Protecting scenic and recreational values at North Sterling Reservoir.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that operations can be conducted without causing unacceptable impacts to the recreational values.

This stipulation may be waived by the Authorized Officer if North Sterling Reservoir is no longer used for recreational purposes.

2. March 31 to July 1

Buffer zones around important waterfowl breeding and nesting habitat.

For the purpose of (reasons): Protecting waterfowl from activities that would alter breeding behavior, increase the incidence of nest abandonment, and decrease nesting success.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that the waterfowl nesting area is not being utilized and is expected to remain so because of a temporary change in climate and/or habitat, or that impacts can be mitigated so as not to cause nest abandonment and decreased breeding success.

This stipulation may be waived by the Authorized Officer only upon a determination that waterfowl nesting areas do not exist within the lease.

3. March 28 to July 15

Buffer areas for greater prairie chicken courtship and nesting habitat.

For the purpose of (reasons): Protecting important habitat required by this species to maintain or increase its numbers in Colorado. The greater prairie chicken is a state endangered species.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that the courtship/nesting habitat is not being utilized and is expected to remain so because of a temporary change in climate and/or habitat.

This stipulation may be waived by the Authorized Officer only upon determination that courtship/nesting habitat does not exist within the lease.

4. November 15 to April 15

Buffer areas for bald eagle winter habitat including roost, perch, and hunting habitat.

For the purpose of (reasons): Protecting important bald eagle wintering habitat from disturbance which might cause the birds to abandon these areas for less suitable habitat.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that the winter habitat is not being used and is expected to remain so because of a temporary change in climate and/or habitat, or that impacts can be mitigated to avoid the abandonment of winter habitat.

5. February 15 to July 1

On the lands described below:

Buffer areas around known or suitable potential raptor nesting habitat.

For the purpose of (reasons): Protecting nesting habitat from disturbance which could cause raptors to abandon areas that contain suitable nesting habitat, possibly resulting in an overall reduction in numbers in the state.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that the nesting habitat is not being utilized and is expected to remain so, or that impacts can be mitigated to avoid the abandonment of occupied nesting habitat.

This stipulation may be waived by the Authorized Officer only upon the determination that potential nesting habitat does not exist within the lease.

6. December 15 to April 1

Crucial mule deer and elk winter range.

For the purpose of (reasons): Protecting crucial mule deer and elk winter range from activities that would cause these species to abandon areas of crucial winter cover and forage for less suitable areas.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that the crucial winter range is not being utilized and is expected to remain so because of a temporary change in climate and/or habitat, or that impacts can be mitigated to avoid the abandonment of crucial winter range and forage.

This stipulation may be waived by the Authorized Officer only upon the determination that crucial winter range does not exist within the lease.

7. December 15 to July 1

Crucial elk and bighorn sheep winter habitat and calving and lambing areas.

For the purpose of (reasons): Protecting crucial elk and bighorn sheep winter range, as well as calving and lambing areas, from activities that could cause these species to abandon these areas and be forced to use less suitable ranges.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that the crucial winter range, calving, or lambing areas are not being utilized and are expected to remain so because of a temporary change in climate and/or habitat, or that impacts can be mitigated to avoid the abandonment of these areas.

This stipulation may be waived by the Authorized Officer only upon the determination that crucial winter range, elk

calving, or bighorn lambing areas do no exist within the lease.

8. March 15 to October 1

Important nesting, feeding, and resting areas for white pelicans.

For the purpose of (reasons): Protecting important nesting, feeding, and resting areas for white pelicans from activities that could cause the birds to abandon these areas for less suitable habitat.

An exception to this stipulation may be approved if it can be demonstrated to the satisfaction of the Authorized Officer that the habitat is not being utilized and is expected to remain so because of a temporary change in climate and/or habitat, or that impacts can be mitigated to avoid the abandonment of these areas, and reduction of nesting success.

This stipulation may be waived by the Authorized Officer only upon the determination that important white pelican habitat does not exist within the lease.

In addition to the stipulations described above, certain lands will not be leased for oil and gas. These lands are those that are not within one-half mile of occupiable lands which are generally associated with large reservoirs, and within incorporated towns and cities.

On other lands that may or may not contain important surface use values, stipulations will be attached to the lease, or made part of the APD on a case-by-case basis. These are lands where the BLM does not have surface management authority. Generally, they are the lands associated with military bases and with certain state parks, and lands in the Front Range where oil and gas potential is considered very low.

SAN JUAN/SAN MIGUEL PLANNING AREA

1. Mule Deer and Elk Crucial Winter Ranges

To protect important seasonal wildlife habitat, exploration, drilling, and other developmental activity will be prohibited from December 1 to April 15 on crucial mule deer and elk winter ranges. 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 BLM's Authorized Officer.

2. Sage Grouse Strutting Grounds

To protect important seasonal wildlife habitat, exploration, drilling, and other developmental activity will be prohibited from March 15 to May 15 on sage grouse strutting grounds. 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 BLM's Authorized Officer.

3. Bald Eagle Winter Concentration Areas - (under the Bald and Golden Eagle Protection Act and Threatened and Endangered Species Act)

To protect important seasonal wildlife habitat, exploration, drilling, and other developmental activity will be prohibited from December 1 to April 15 on bald eagle winter concentration areas. 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 BLM's Authorized Officer.

4. Crucial Peregrine Falcon Nesting Habitat (Perins Peak and Mesa Verde National Park)

No Surface Occupancy. Operations on these lands will not be approved in order to protect crucial peregrine falcon habitat.

5. Important Peregrine Falcon Nesting Habitat (Paradox Valley Area)

To protect important seasonal wildlife habitat, exploration, drilling, and other developmental activity will be prohibited from March 1 to August 31 on important peregrine falcon habitat. 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.

6. Elk Calving Area

To protect important seasonal wildlife habitat, exploration, drilling, and other developmental activity will be prohibited from May 1 to July 15 on elk calving areas. 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 BLM's Authorized Officer.

7. Dolores River Canyon, Menefee, and Weber Mountains

These areas are receiving special management for their significant recreational and visual values. No Surface Occupancy on the described lands will be approved unless it is shown to the satisfaction of the Authorized Officer that the objectives of such special management can still be met.

8. McElmo Research Natural Area (RNA)

The McElmo Research Natural Area is receiving special management for its important habitat for rare species of flora and fauna. No Surface Occupancy on the described lands will be approved unless it is shown to the satisfaction of the Authorized Officer that the objectives of such special management can still be met.

9. Cultural Resources

The following areas are receiving special management for their important archaeological and historical values. No Surface Occupancy on the described lands will be approved unless it is shown to the satisfaction of the Authorized Officer that the objectives of such special management can still be met.

a. Sand and East Rock Canyons
b. Cannonball Ruin
c. Lowery Ruin and Associations
d. Dominguez-Escalente Ruins
e. Tabeguache Cave II and Tabeguache Canyon
f. Dolores Cave
g. Bull Canyon Rockshelter
h. Tabeguache Pueblo
i. McLean Basin Towers
j. Squaw/Papoose, Cross, and Cahone Canyons
k. Painted Hand Petroglyphs
l. Painted Hand Ruin
m. Indian Henry's Cabin
n. Lightning Tree Tower Group
o. Buffer for Hovenweep National Monument
p. Battle Rock
q. Easter Ruin
r. Seven Towers Ruin Group

APPENDIX H

PRESENT MANAGEMENT ALTERNATIVE

CONDITIONS OF APPROVAL

APPENDIX H

PRESENT MANAGEMENT ALTERNATIVE CONDITIONS OF APPROVAL

The conditions of approval (COAs) shown in Appendix D will be used to protect resources analyzed within this alternative. In addition to the COAs common to all alternatives, a COA will be appended to approval documents, as needed, to implement the Fragile Soil Areas and Lambing Grounds oil and gas leasing stipulations shown in Appendix G for Little Snake Resource Area.

LITTLE SNAKE RESOURCE AREA

Lambing grounds: Exploration (including seismic exploration, drilling, other development or production activity) will not be allowed on sheep lambing grounds during lambing activity. Lambing activities usually fall between May 1 and June 15 and last for approximately six weeks. This condition may be waived for drilling operations which would require more than nine months to complete and for which it was also shown to the satisfaction of the Authorized Officer that the drilling operations could not avoid taking place in lambing areas during lambing activities.

Fragile Soil Areas: 1) All sediments generated form the surface-disturbing activity will have to be retained on-site. 2) Construction or other surface-disturbing activities will not be allowed when the soils are saturated to a depth of more than 3 inches. 3) Vehicle use will be limited to existing roads and trails. 4) All new permanent roads will be built to meet primary road standards (BLM standards); their location will be approved by the Authorized Officer. For oil and gas purposes, permanent roads are those used for production. 5) All geophysical and geochemical exploration will be conducted by helicopter, horseback, on foot, or from existing roads. 6) Any sediment-control structures, reserve pits, or disposal pits will be designed to contain a 100-year, 6-hour storm event. Storage volumes within these structures will have a design life of 25 years. 7) Before reserve pits, production pits, or emergency pits can be reclaimed, all residue will be removed and trucked off-site to an approved disposal site. 8) Reclamation of disturbed surfaces will be initiated before November 1 each year.

APPENDIX I

STANDARD TERMS AND CONDITIONS ALTERNATIVE

CONDITIONS OF APPROVAL

APPENDIX I

STANDARD TERMS AND CONDITIONS ALTERNATIVE

CONDITIONS OF APPROVAL

The conditions of approval (COAs) shown in Appendix D will be used to protect resources analyzed within this alternative. In addition to those COAs, more extensive use of Code of Federal Regulations (CFR) 3101.1-2 (Surface use rights) will be made. This section of the CFR defines the BLM ability to influence the location and timing of a drilling operation. Since lease stipulations can not be written for this alternative, the regulatory authority to limit operations by as much as 60 days would be used to restrict the timing of operations to give at least partial protection to wildlife habitat. The regulatory flexibility of moving a proposed operation 200 meters would be employed as needed to protect raptor nests, fragile soils, riparian areas, etc.

APPENDIX J

CLIMATIC DATA

TABLE J-1. CLIMATIC DATA (TEMPERATURES)

Station	Elevation (ft; Mean Sea Level)	Temperature (degrees F)				
		Extreme Minimum	Mean Minimum	Annual Mean	Mean Maximum	Extreme Maximum
Glenwood Springs Resource Area						
Aspen	7928	-33	26	41	56	93
Climax	11300	-33	20	31	42	78
Eagle	6497	-51	24	42	60	99
Glenwood Springs	5823	-26	31	47	63	102
Rifle	5400	-38	30	47	64	101
Kremmling Resource Area						
Dillon	9065	-45	18	35	53	86
Fraser	8560	-53	13	32	51	98
Grand Lake	8680	-43	18	35	52	90
Green Mtn Dam	7740	-44	25	40	56	89
Hot Sulfur Springs	7800	-42	21	38	54	93
Red Feather Lakes	7600	-39	28	41	54	97
Spicer	8379	-48	22	37	52	91
Walden	7749	-49	20	36	52	91
Little Snake Resource Area						
Craig	6285	-45	27	42	58	99
Hayden	6300	-45	26	42	58	100
Steamboat Springs	6770	-43	18	35	52	90
Yampa	7892	-24	25	39	54	88
Northeast Planning Area						
Akron	4663	-29	35	49	63	105
Allenspark	8500	-38	28	41	53	91
Bonny Dam	3647	-24	36	51	65	109
Boulder	5445	-22	40	53	66	104
Burlington	4165	-25	36	52	67	112
Byers	5200	-31	34	50	66	106
Cheesman	6875	-41	29	46	64	99
Cherry Creek Dam	5647	-32	34	50	66	102
Cheyenne Wells	4250	-23	36	52	67	106
Denver Airport	5283	-25	36	50	64	102
Estes Park	7497	-39	30	43	57	92
Flagler	4975	-26	33	49	65	104
Forder	4739	-29	34	51	68	105
Ft. Collins	5001	-41	34	48	62	102
Ft. Lupton	4888	-37	34	50	66	108
Ft. Morgan	4321	-41	34	49	64	105
Georgetown	8500	-26	31	43	56	92
Greeley	4648	-39	33	48	64	106
Grover	5090	-27	34	49	64	104
Holyoke	3746	-23	35	51	66	110
Idaho Springs	7555	-32	28	43	58	94
Julesburg	3469	-24	36	51	66	109
Kassler	5495	-29	37	52	66	102
Kauffman	5250	-30	31	47	63	105
Kit Carson	4284	-24	34	51	68	109
Limon	5560	-29	33	49	64	104
Longmont	4950	-36	33	49	64	105
Parker	6300	-38	32	48	64	103
Sterling	3939	-29	34	49	64	106
Stratton	4334	-22	36	51	66	108
Waterdale	5260	-31	33	49	64	102
Wray	3575	-24	36	52	68	112
Yuma	4125	-27	36	51	67	108
San Juan/San Miguel Planning Area						
Cortez	6177	-27	33	49	65	100
Durango	6550	-30	29	47	64	97
Ft. Lewis	7595	-35	27	43	58	93
Ignacio	6424	-34	29	46	64	102
Mesa Verde NP	7070	-20	37	50	63	99
Northdale	6693	-26	29	45	61	97
Pagosa Springs	7238	-46	24	42	60	98
Palisade Lakes	8092	-25	22	39	56	89
Rico	8842	-36	22	39	56	87
Silverton	9322	-37	19	36	53	85
Vallecito Dam	7650	-35	27	43	59	92

Source: PEDCO Environmental, Inc. (1981)

TABLE J-2. CLIMATIC DATA (PRECIPITATION AND FROST)

	Precipitation (inches)				Frost-free Period		
Station	Annual Mean	Monthly Maximum	Monthly Minimum	Mean Snowfall	Days	Mean Begin Date	Mean End Date
Glenwood Springs Resource Area							
Aspen	19.3	2.1	1.2	140	76	6/13	8/28
Climax	23.6	2.6	1.3	278	9*	6/27*	7/6*
Eagle	10.4	1.2	0.6	48	70	6/19	8/28
Glenwood Springs	16.0	1.7	1.1	63	138	5/17	10/2
Rifle	11.3	1.4	0.7	42	109	5/28	9/14
Kremmling Resource Area							
Dillon	15.7	1.9	0.9	158	6	6/28	7/4
Fraser	19.6	1.8	1.2	119	4	6/29	7/3
Grand Lake	20.2	2.4	1.1	155	7	6/29	7/6
Green Mtn Dam	15.6	1.8	1.0	98	82	6/10	8/31
Hot Sulfur Springs	12.7	1.5	0.8	92	--	----	----
Red Feather Lakes	16.5	2.3	0.5	90	71	6/16	8/26
Spicer	13.8	1.9	0.8	149	40	6/21	7/31
Walden	9.9	1.5	0.4	49	40	6/22	8/1
Little Snake Resource Area							
Craig	13.4	1.6	0.8	85	94	6/8	9/10
Hayden	16.4	1.6	1.2	107	76	6/11	8/26
Steamboat Springs	24.0	2.8	1.6	165	28	6/23	7/21
Yampa	16.0	2.1	1.1	120	87*	6/19*	9/14*
Northeast Planning Area							
Akron	16.1	3.1	0.4	39	142	5/13	10/2
Allenspark	20.8	2.8	1.0	156	71	6/12	8/22
Bonny Dam	15.3	2.7	0.2	27	161	5/4	10/12
Boulder	18.3	3.3	0.6	83	152	5/9	10/8
Burlington	15.7	2.8	0.4	19	151	5/5	10/3
Byers	15.0	2.5	0.4	48	138	5/15	9/30
Cheesman	15.8	2.6	0.4	61	120	5/26	9/23
Cherry Creek Dam	15.5	2.6	0.4	55	146*	5/13*	10/6*
Cheyenne Wells	15.5	2.9	0.2	21	151	5/6	10/4
Denver Airport	15.5	2.6	0.5	62	160	5/5	10/12
Estes Park	14.2	2.2	0.4	--	95	6/6	9/9
Flagler	15.7	3.4	0.3	28	153*	5/6*	10/6
Forder	11.6	2.5	0.2	28	--	----	----
Ft. Collins	14.7	2.9	0.4	46	146	5/8	10/1
Ft. Lupton	11.7	2.2	0.3	--	148	5/10	10/5
Ft. Morgan	12.7	2.5	0.2	23	151	5/7	10/5
Georgetown	15.9	2.5	0.5	78	120	5/27	9/24
Greeley	11.7	2.4	0.3	27	142	5/11	9/30
Grover	14.2	2.6	0.2	37	132	5/18	9/27
Holyoke	17.6	3.7	0.3	35	145	5/11	10/3
Idaho Springs	15.4	2.4	0.4	86	107	6/3	9/18
Julesburg	17.5	3.6	0.4	20	150	5/7	10/4
Kassler	17.0	3.0	0.5	80	150	5/12	10/9
Kauffman	13.5	2.7	0.2	35	135*	5/8*	9/20*
Kit Carson	13.6	2.2	0.2	23	140	5/9	9/26
Limon	14.5	2.7	0.2	27	143	5/14	10/4
Longmont	12.6	2.5	0.3	39	144	5/9	9/30
Parker	12.6	2.2	0.3	61	131	5/19	9/27
Sterling	14.7	3.1	0.2	21	139	5/10	9/26
Stratton	15.6	2.5	0.3	31	153	5/7	10/7
Waterdale	15.6	2.8	0.4	47	126	5/20	9/23
Wray	17.4	3.2	0.3	23	145	5/8	9/3
Yuma	17.2	3.0	0.4	34	143	5/13	10/3
San Juan/San Miguel Planning Area							
Cortez	12.5	1.7	0.4	43	126	5/29	10/2
Durango	18.6	2.6	0.7	67	113*	6/8*	9/29*
Ft. Lewis	17.5	2.2	1.1	79	96	6/13	9/17
Ignacio	13.9	1.8	0.6	40	106	6/7	9/21
Mesa Verde NP	17.8	2.2	0.7	79	158	5/14	10/19
Northdale	11.9	1.6	0.4	37	98	6/10	9/16
Pagosa Springs	19.0	2.5	0.7	124	58	6/21	8/18
Palisade Lakes	21.7	3.1	1.0	130	--	----	----
Rico	25.7	2.9	1.1	171	11*	6/21*	7/2*
Silverton	22.4	3.0	1.2	140	10	6/28	7/8
Vallecito Dam	25.1	3.1	1.1	130	112	6/4	9/24

*U.S. Department of Commerce (1982)

Source: PEDCO Environmental, Inc. (1981)

TABLE J-3. SELECTED ATMOSPHERIC DISPERSION DATA

	Annual	Winter	Spring	Summer	Fall
Mixing Depth (m) Statewide*					
Morning	350	300	450	350	250
Afternoon	2300	1300	2900	3200	2000
Stability (percent)					
Akron					
Unstable	16	9	14	26	14
Neutral	58	62	65	49	56
Stable	26	29	21	25	30
Aurora					
Unstable	25	16	25	35	24
Neutral	36	36	44	31	32
Stable	39	48	31	34	44
Craig+					
Unstable	9	3	18	7	7
Neutral	51	54	55	43	53
Stable	40	43	27	50	40
Denver					
Unstable	23	13	23	34	22
Neutral	40	43	49	32	38
Stable	37	44	28	34	40
Eagle					
Unstable	23	16	21	33	24
Neutral	35	38	44	24	32
Stable	42	46	35	43	44

*Mixing depths are statewide averages.

+BLM, 1983 (GRHF II DEIS)

Source: PEDCO Environmental, Inc. (1981)

TABLE J-4. STATE AND FEDERAL AIR QUALITY STANDARDS (MICROGRAMS PER CUBIC METER)

		Ambient b/				Increment c/					
		Federal		Colorado		Federal			Colorado		
	Averaging Time a/	Primary	Secondary	Primary	Secondary	Class I	Class II	Class III	Category I	Category II	Category III
Carbon Monoxide	8 hours	10,000	10,000	10,000	---	---	---	---	---	---	---
	1 hour	40,000	40,000	40,000	---	---	---	---	---	---	---
Lead	Quarterly	1.5	1.5	---	---	---	---	---	---	---	---
Nitrogen Dioxide	Annual				---						
	(Arith.)	100	100	100	---	2.5	25	50	---	---	---
Oxidants (Ozone)	1 hour	235	235	160	---	---	---	---	---	---	---
Sulfur Dioxide	Annual										
	(Arith.)	80	---	---	---	2	20	40	2	10	15
	24 hours	365	---	---	---	5	91	182	5	50	100
	3 hours	---	1300	700	---	25	512	700	25	300	700
Total Suspended Particulates	Annual (Geom.)	75 d/	60 d/	75	60 e/	5	19	37	---	---	---
	24 hours	260 d/	150 d/	260	150	10	37	75	---	---	---
Inhalable Particulates (PM10)	Annual (Arith.)	50	50	f/	f/	---	---	---	---	---	---
	24 hours	150	150			---	---	---	---	---	---

Sources: National Primary and Secondary Ambient Air Quality Standards (40 CFR 50 et seq. as revised July 1, 1988).

Requirements for Preparation, Adoption and Submittal of Implementation Plans (40 CFR 51.166, as revised July 1, 1988).

Code of Colorado Regulations (Volume 5, Part 14, as amended May 27, 1980).

a/ Short-term standards (those other than Annual and Quarterly) are not to be exceeded more than once each year, except the federal ozone and PM10 standards. Under federal regulations, the "expected number of days" with ozone or PM10 levels above the standard is not to be exceeded more than once per calendar year.

b/ Ambient standards are the absolute maximum level allowed to protect either public health (primary) or welfare (secondary).

c/ Incremental (Prevention of Significant Deterioration) standards are the maximum incremental amounts of pollutants allowed above the baseline in regions of clean air.

d/ Federal TSP standards were superseded by the Federal PM10 standards, effective July 31, 1987. The TSP standards will be phased out over time.

e/ The Colorado annual secondary TSP standard was established as a guide in assessing implementation plans to achieve the 24-hour standard.

f/ Colorado is developing PM10 standards at least as stringent as the Federal standards.

TABLE J-5. ASSUMED BACKGROUND POLLUTANT CONCENTRATION VALUES (MICROGRAMS PER CUBIC METER)

	CO		Lead	NO2	03	S02			TSP		PM10	
Location	1 hr Max	8 hr Max	Quart Mean	Ann Arit Mean	2nd 1 hr Max	Ann Arit Mean	2nd 3 hr Max	2nd 24 hr Max	Ann Geo Mean	2nd 24 hr Max	Ann Arti Mean	2nd 24 hr Max
Glenwood Springs Resource Area												
Rural	2300	2300	.05	28	167	3	131	210	25	85	25	85
Aspen	20700	6900	.1	28	167	3	131	210	70	230	50	110
Avon	20700	6900	.3	28	167	3	131	210	35	110	35	110
Eagle	2300	2300	.3	28	167	3	131	210	95	210	50	110
Snowmass	20700	6900	.3	28	167	3	131	210	30	75	30	75
Vail	20700	6900	.3	28	167	3	131	210	75	270	35	110
Kremmling Resource Area												
Rural	2300	2300	.05	28	167	3	131	210	40	105	40	105
Kremmling	2300	2300	.05	28	167	3	131	210	40	105	40	105
Breckenridge	20700	6900	.3	28	167	3	131	210	70	245	35	110
Little Snake Resource Area												
Rural	1725	1150	.06	4	167	5	29	18	20	70	20	70
Craig	2300	2300	.06	4	167	5	29	18	70	185	30	110
Glenwood Spgs	2300	2300	.06	4	167	5	29	18	60	205	40	80
Rifle	2300	2300	.06	4	167	5	29	18	80	315	40	160
Steamboat Spgs	20700	6900	.3	47	167	3	131	--	84	300	50	110
Northeast Planning Area												
Lincoln Rural	2300	2300	.05	2	169	0	8	5	30	90	30	90
Jeffco Rural	3910	2530	.4	23	196	18	176	47	30	75	30	75
Weld Rural	2300	2300	.05	8	167	3	18	8	25	100	25	100
Castlerock	39100	25300	.5	30	196	18	176	47	80	195	40	110
Downtown Denver	42550	25300	.8	90	225	31	320	128	135	415	45	260
Estes Park	11500	8050	.3	8	172	3	18	8	35	100	35	100
Ft. Collins	32545	16330	.5	8	178	3	18	8	60	165	35	100
Ft. Lupton	11500	8050	.3	8	172	3	18	8	50	150	40	110
Greeley	26795	14605	.5	8	202	3	18	8	55	185	40	90
Johnstown	11500	8050	.3	8	172	3	18	8	90	350	40	110
Limon	2300	2300	.04	2	169	0	8	5	35	110	35	110
Loveland	11500	8050	.3	8	172	3	18	8	70	225	35	100
Platteville	11500	8050	.3	8	172	3	18	8	70	195	40	110
Sterling	2300	2300	.15	23	169	3	--	21	65	175	40	110
San Juan/San Miguel Planning Area												
Rural	2300	2300	.05	4	98	13	26	26	15	50	15	50
Durango	2300	2300	.7	4	98	13	26	26	65	195	30	90
Mesa Verde NP	2300	2300	.01	4	98	13	26	26	10	50	10	50

Source: Chick (1989)

Underlined values indicate potential Ambient Air Quality Standard violations.

Air quality values are generalized indicators for broad geographic regions. Site-specific monitoring is necessary to determine local conditions.

APPENDIX K

EXISTING ENVIRONMENT-- GLENWOOD SPRINGS RESOURCE AREA

APPENDIX K

EXISTING ENVIRONMENT --GSRA

TABLE K-1. THREATENED, ENDANGERED, AND SENSITIVE FEDERAL AND STATE LISTED SPECIES HAVING SOME POTENTIAL TO OCCUR IN GLENWOOD SPRINGS RESOURCE AREA.

SPECIES	STATUS Federal, Colorado	REMARKS
MAMMALS		
Black-Footed Ferret	E, e	GSRA has very limited prey base.
Wolverine	Cat 2, e	Occasional unconfirmed sightings in and near GSRA.
River Otter	None, e	Widespread in northern hemisphere; once extinct in Colorado, recently reintroduced in upper reaches of Colorado River, Delores & Gunnison Rivers. None known in the GSRA.
Lynx	Cat 2, e	Common in Canada, Alaska, rare in lower 48. Recent evidence it occurs in Vail area on White River National Forest.
BIRDS		
Bald Eagle	E,e	About 14,000 in 48 states, Colorado 8-10th ranked; Resource Area winters an average of 35 per winter, public land is crucial.
Golden Eagle	B	Nests throughout GSRA.
Peregrine Falcon	E,e	Worldwide species rare, no known eyries in GSRA but breeding populations exists in GJRA and occasional sightings occur in GSRA.
Greater Sandhill Crane	None, e	A portion of the population migrates through the Resource Area every year. Only nesting population in Colorado considered endangered and located near Steamboat Springs.
Whooping Crane	E, e	Only one established flock and one experimental flock. Often associated with Greater Sandhill Cranes.
Great Blue Heron	M, r	Five heronries located on Colorado River between Silt and Debeque and two heronries on Eagle River between Dotsero and Gypsum.
Prairie Falcon	M, none	Several scrapes located in Resource Area.
Sage Grouse	Cat 2, None	Scattered throughout Eagle County.
Columbian Sharptail Grouse	Cat 2, None	Reported on NOSR.
FISH		
Colorado River Squawfish	E, e	Found in Colorado, Yampa, White and Green Rivers. No longer thought to occur in GSRA.
Humpback Chub	E, e	Colorado River in Grand Junction RA has two of the three or four populations, none thought to occur in GSRA.
Razorback Sucker	1, e	Much less common than squawfish; no evidence of reproduction in upper Colorado River, both thought to occur as far east as Rulison.
Bonytailed Chub	E,e	One caught in GJRA in 1984; known around Lake Mojave. Also Black Rocks on Colo/Utah line.
Colorado River Cutthroat Trout	2, s	Trappers lake in White River National Forest has strong population, GSRA has population in nine streams and one lake.

TABLE K-1 (cont'd.)

PLANTS		
Uinta Basin Hookless Cactus	T, 1	Occurs in Wasatch Formation in Hookless Cactus western portion of GSRA.
Debeque milkvetch	2	May extend into western portion of GSRA in Wasatch Formation.
Debeque phacelia	3c, 1	May extend into western portion of GSRA in Wasatch Formation.
Utah fescue	3c, 4	Occurs in Green River Formation shale scree - May be impacted by oil shale development.
Piceance Bladder Pod	3c, 1	Occurs in Green River Formation shale scree - May be impacted by oil shale development.
Sun-loving Meadowrue	3c, 4	Occurs in Green River Formation shale scree - May be impacted by oil shale development.
Herrington Beardtongue	2, 1	Occurs in Pinyon-juniper hills west of McCoy.
Dragon Milkvetch	3c, 4	Occurs in Green River Formation shale scree - May be impacted by oil shale development.
Bisquitroot	s,None	
Wild Bisquitroot	Cat 2, 3	
Hanging Garden Sullivantia	Cat 2, 3	Occurs near waterfalls or seeps at higher elevations.
Shale Columbine	s, 4	Occurs near waterfalls or seeps at higher elevations.
Meadow Milkvetch	s, 3	
Wetherill Milkvetch	s, 3	Located in Wasatch formation North of Rifle, CO.

FEDERAL: E = Endangered species; T = Threatened species; 1 = Category 1 Species (insufficient data to list); 2 = Category 2 species (ready for listing); M = Migratory species of high interest; B = Bald Eagle Act protection; 3c = Category 3c species are now considered more abundant or widespread and/or less subject to identified threats than previously thought.

STATE: e = endangered species; t = threatened species; s = sensitive species; r = rare species; 1*= plant species presumed extinct; 2*= plant species presumed extirpated from Colorado; 2 = plant species which are rare in Colorado but relatively common elsewhere within their range; 3 = plant species which appear to be rare but for which conclusive information is lacking; 4 = plants of limited distribution or special interest which appear secure at this time.

TABLE K-2. POPULATIONS OF COLORADO RIVER CUTTHROAT TROUT IN THE GLENWOOD SPRINGS RESOURCE AREA.

Location	Miles Surface Area	Year Sampled	Rating
Abrams Creek	1.9	1980	A-
Hack Lake	2.0	1980	A
Mitchell Creek	0.8	1984	A+
East Fork Parachute Creek	6.4	1983	B+
JQS Gulch	1.4	1983	B+
East Middle Fork			
Parachute Creek	1.2	1981	C
Northwater Creek	4.2	1983	C
Possum Creek	4.7	1980	C
Red Dirt Creek	1.0	1986	C
Tropper Creek	5.7	1983	C

APPENDIX L

EXISTING ENVIRONMENT-- LITTLE SNAKE RESOURCE AREA

APPENDIX L

EXISTING ENVIRONMENT --LSRA

TABLE L-1. COLORADO BLM SENSITIVE PLANTS KNOWN TO OCCUR IN MOFFAT COUNTY

Scientific Name	Common Name
Aster perelegans	Nuttall aster
Astragalus aretiooides	cushion milkvetch
Astragalus detritalis	debris milkvetch
Astragalus duchesnensis	Duchesne milkvetch
Astragalus hamiltonii	Hamilton milkvetch
Astragalus jejunus	starving milkvetch
Astragalus nelsonianus	Nelson milkvetch
Astragalus wetherilli	Wetherill's milkvetch
Cirsium owenbeyi	Owenby thistle
Cryptantha caespitosa	caespitose cryptantha
Cymopterus duchesnensis	Duchesne bisquitroot
Draba junipera	juniper draba
Erigeron uintahensis	Uintah fleabane
Eriogonum acaule	mat buckwheat
Eriogonum saurinum	Dinosaur buckwheat
Eriogonum tumulosum	tumor buckwheat
Eriogonum viridulum	little green buckwheat
Leptodactylon watsonii	Watson's buckwheat
Minuartia nuttallii	Nuttall's sandwort
Nama densum vary. parviflorum	small-flowered nama
Parthenium ligulatum	Uintah Basin feverfew
Penstemon gibbensii	Gibbon's beardtongue
Penstemon yampaensis	Yampa beard tongue
Sphaeromeria capitata	capitate chicken-sage
Townsendia strigosa	hairy townsendia
Trifolium andinum	Andy's clover

Note: Specific information on each taxon's habitat, biology, localities, and status is contained in the files at the Craig District Office and in the report submitted by the Colorado Natural Heritage Inventory prepared by J. Scott Peterson entitled, "Botanical Field Survey Study on BLM Public Lands, Volume II," 1983, which is also available at the Craig District Office.

TABLE L-2. WILD HORSE CENSUS DATA

Year	Mode of Observation	Bands	Studs	Mares	Yearlings	Colts	Total
1971	Fixed Wing	NI 1/	NI	NI	NI	NI	65
1974	Helicopter	18	25	78	2	27	132
1976	Ground Sample	14	38	50	9	19	116
1977	Helicopter	20	NI	NI	NI	NI	124
1977	Ground Sample	56	NI	NI	NI	NI	350
1979	Helicopter	52	NI	NI	NI	NI	335 2/
1980	Helicopter	23	NI	NI	NI	23	184
1981	Helicopter	24	NI	NI	NI	24	183
1982	Helicopter	11	NI	NI	NI	NI	125
1985	Helicopter	24	NI	NI	NI	NI	173
1987	Helicopter	25	NI	NI	NI	NI	205
1988	Helicopter	32	NI	NI	NI	91	418 3/

1/ Not Identified

2/ Roundup removed 112 of these horses.

3/ Roundup removed 239 of these horses.

3/ Part of these horses moved back into Wyoming.

TABLE L-3. ARCHAEOLOGICAL SITE TYPES

Kind	Characteristics
Lithic scatter (open lithic, chippings, chipping station)	Area where the waste from the manufacture of stone tools or the tools themselves are found.
Campsite (habitation, camp, burnt spots, fire pots, hearths)	A lithic scatter with the addition of features connected spots, fire pots, hearths)with fire making: charcoal, ash, fire-cracked rocks, or burnt bone. A campsite may also be a hearth, with no associated cultural materials.
Quarry (chippings, manufacturing areas)	An area containing a natural source of rocks suitable for making tools. Unmodified rock, waste, and tools in all stages of manufacture are found.
Kill site (trap, jump)	An area containing stone and/or bone tools in association with the remains of one or more animals.
Rock shelter (cave, overhang)	An area protected from the weather by an overhanging rock formation. Usually has a drip line. May or may not have surface culture material.
Rock art (a) pictograph (b) petroglyph	Any artistic expression or message on a rock surface. (a) Painted figures of people, animals, plants, letters, numbers, or abstracts. (b) Incised figures of people, animals, plants, letters, numbers, or abstracts.
Burial	Remains of human beings, fragmentary or whole.
Tipi rings (stone circles, tipis)	Circular arrangement of spaced rocks, three to 15 meters in diameter.
Wickiup (tipi poles)	Poles or branches of pinyon or juniper laid up against living trees. Interior floored with juniper bark.
Granary (cist, corncrib)	Mud-mortared sandstone slab structures, usually about 1.5x1.5x1.5 meters. Most often built into sandstone ledges, sometimes mud-lined and capped or lidded with a large slab.
Rock walls (forts)	Alignments or walls of mud-mortared or dry-laid stone masonry. May be single or multiple. May have "doorway," usually built on ridge.

Words in parentheses are synonyms for that kind of site.

TABLE L-4. HISTORIC SITE TYPES

Kind	Characteristics
Trails	Identified routes followed by early explorers or by many emigrants. Physical evidence may (Overland) or may not (Dominguez-Escalante) remain.
Forts	Military establishments for the protection of persons or property. Also gathering and exchange points before the establishment of towns.
Stage stations	Wayfarers' resting places and fresh harness animal acquisition points.
Homestead	One or more structures of varied size, shape, and materials used to shelter isolated Euro-American families claiming land under various homestead laws.
Ranch	Cluster of structures of single and multiple uses associated with a livestock-based family economic operation.
Railroad	Roadbed, tracks, trestles, bridges, depots, and rolling stock associated with early (and continued) industrial transportation of goods and people.
Town	Aggregation of structures sheltering domestic, business, education, social, political, and religious activities. Individual structures may be single or multiple use, but population is multifamily.
Unique structure	Any structure's merit is associated with a particular person.
Site	The location where a historic event occurred but no tangible evidence remains of the action itself.
Architectural	A structure's merit is its manner or style of construction.
School	A structure built for educational purposes but whose historical function is as a community center in the absence of nearby towns.
Community center	A structure, often a public school, which provides a relatively local meeting place for residents of areas with few towns.
Mine	An outcropping of valuable mineral resource and the structures associated with the removal activity.
Reclamation projects	Structures associated with irrigation, water and soil retention, or flood control. These are usually engineering features.

APPENDIX M

EXISTING ENVIRONMENT-- SAN JUAN/SAN MIGUEL PLANNING AREA

APPENDIX M

EXISTING ENVIRONMENT--SJ/SMPA

TABLE M-1. MILES OF STREAM AND RIPARIAN HABITAT NOT INVENTORIED WITHIN SAN JUAN/SAN MIGUEL PLANNING AREA.*

Stream name	BLM miles
San Miguel River	25.0
Huff Gulch	1.5
Goat Creek	0.5
Little Bucktail Creek	1.5
Big Bucktail Creek	3.0
Coal Canyon	11.0
Campbell Creek	7.0
Spring Creek	8.0
Subtotal	57.5
Dolores River	120.0
Little Gypsum Creek	4.0
San Miguel Creek	6.0
Bush Canyon	6.0
Bill Creek (tributary to Bush Canyon)	2.0
Spring Creek (tributary to Disappointment Creek)	9.0
Subtotal	147.0
Animas River	15.0
Ruby Creek	1.0
Elk Creek	1.5
Molas Creek	1.5
Cement Creek	4.0
Subtotal	23.0
Streams (SW portion of RMP Area)	
Cross Canyon	16.0
Hovenweep Canyon	10.0
Yellowjacket Canyon	8.0
Sandstone Canyon	9.0
Rock Canyon	5.0
Sand Canyon	3.0
Goodman Canyon	4.0
Subtotal	55.0
Total	282.5

* These estimated stream miles and riparian habitat areas are considered to have enough potential to warrant further investigation for watershed and aquatic/riparian habitat improvement.
Source: BLM Data, 1989

TABLE M-2. MILES OF STREAM AND STREAM HABITAT QUALITY IN THE SAN JUAN/SAN MIGUEL PLANNING AREA.

Stream name	BLM miles	Aquatic/ riparian habitat condition	Species Present[1]	Pool riffle (ratio percent)[2]	CDOW fishery values[3]
Atkinson Creek	5	Fair	None	40:60	None
Beaver Creek	17	Fair	Rb,Ct,U	ND	Poor
Big Bear Creek	5	Fair	Bk,Ct	30:70	Below Average
Coyote Wash	4	Good	U	20:80	None
Disappointment Creek	22	Poor	U	10:80	ND
Elk Creek	1	Excellent	Ct	80:20	Below Average
Fall Creek	7	Fair	Rb,Bk,Bn,Ct,U	70:30	Below Average
LaSal Creek	12	Fair	S,D,Sc	30:70	ND
Leopard Creek	4	Fair	Rb,Bk,Ct	10:90	Excellent
Mesa Creek (South fork)	11	Fair	Rb,D,U	45:55	Below Average
Naturita Creek	32	Poor	Rb,S,D	10:90	Poor
Roc Creek	4	Fair	Ct,U	40:60	ND
Saltado Creek	3	Good	Bk,U	50:50	Average
Specie Creek	2	Fair	None	70:30	None
Tabeguache Creek	15	Poor	Rb,Bn,S	ND	None
Total	144				

[1] Rb=rainbow, Bn=brown, Bk=brook, Ct=cutthroat, U=unidentified species, Sc=sculpin, S=sucker, D=Dace.

[2] Assuming that higher quality streams would approach a 50:50 ratio.

[3] Fishery value is not necessarily representative of potential habitat quality in terms of BLM's philosophy of habitat management as opposed to species management.

Source: BLM Data, 1989.

TABLE M-3. SENSITIVE SPECIES

Federally Listed Species	
Bald eagle	Haliaeetus leucocephalus
Peregrine falcon	Falco peregrinus
Black-footed ferret	Mustela nigripes
Colorado squawfish	Ptychocheilus lucius
Humpback chub	Gila cypha
Bonytail chub	Gila elegans
Federal Candidate Species	
Boreal western toad	Bufo boreas boreas
North American wolverine	Guloluscus
Swift fox	Vulpes velox
White-faced ibis	Plegadis chihi
Ferruginous hawk	Buteo regalis
Southwestern otter	Lutra canadensis

APPENDIX N

CONSULTATION AND COORDINATION

Memorandum

To: RMP/EIS Team Leader

From: Glenwood Springs Coordinator

Subject: Coordination with White River National Forest

The scoping meeting for the E.I.S. was held on 3/30/89 in the Glenwood Springs Resource Area and was attended by the Deputy Supervisor for the White River National Forest. He was given a briefing on the proposed resource plan amendment and Environmental Impact Statement and how it relates to the USFS.

An additional meeting was held with the Forest Service mineral staff on July 18 to update them on the status of the E.I.S. and the plan amendment and a request for their review and input.

IN REPLY REFER TO:

3100
(190)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
KREMMLING RESOURCE AREA
116 Park Avenue
P.O. Box 68
Kremmling, Colorado 80459

OCT 17 1989

Mr. Jack Weissling
Forest Supervisor
Pike National Forest
1920 Valley Drive
Pueblo, Colorado 81008

Dear Mr. Weissling:

The Kremmling Resource Area is participating in a statewide Resource Management Plan (RMP) amendment for oil and gas leasing. The preliminary draft environmental impact statement (PDEIS) will be available on November 1, 1989 and comments will be due on November 30, 1989.

We want to ensure that our oil and gas lease stipulations are consistent with your land use plans for portions of the Forest next to the Kremmling Resource Area. We will be available to discuss the lease stipulations following your review of the PDEIS.

Please contact Rich McClure at 303-724-3437 for additional information.

Sincerely,

David Atkins
Area Manager

cc: Bob Kline, GJDO

IN REPLY REFER TO:

United States Department of the Interior

3100
(190)

BUREAU OF LAND MANAGEMENT
KREMMLING RESOURCE AREA
116 Park Avenue
P.O. Box 68
Kremmling, Colorado 80459

OCT 17 1989

Mr. Jerry Schmidt
Forest Supervisor
Routt National Forest
29587 W. Highway 40
Steamboat Springs, Colorado 80487

Dear Mr. Schmidt:

The Kremmling Resource Area is participating in a statewide Resource Management Plan (RMP) amendment for oil and gas leasing. The preliminary draft environmental impact statement (PDEIS) will be available on November 1, 1989 and comments will be due on November 30, 1989.

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Sincerely,

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Area Manager

cc: Bob Kline, GJDO

IN REPLY REFER TO:

United States Department of the Interior

3100
(190)

BUREAU OF LAND MANAGEMENT
KREMMLING RESOURCE AREA
116 Park Avenue
P.O. Box 68
Kremmling, Colorado 80459

OCT 17 1989

Mr. Thomas Hoots
Forest Supervisor
White River National Forest
P O Box 948
Glenwood Springs, Colorado 81602

Dear Mr. Hoots:

The Kremmling Resource Area is participating in a statewide Resource Management Plan (RMP) amendment for oil and gas leasing. The preliminary draft environmental impact statement (PDEIS) will be available on November 1, 1989 and comments will be due on November 30, 1989.

We want to ensure that our oil and gas lease stipulations are consistent with your land use plans for portions of the Forest next to the Kremmling Resource Area. We will be available to discuss the lease stipulations following your review of the PDEIS.

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Sincerely,

David Atkins
Area Manager

cc: Bob Kline, GJDO

IN REPLY REFER TO:

United States Department of the Interior

3100
(190)

BUREAU OF LAND MANAGEMENT
KREMMLING RESOURCE AREA
116 Park Avenue
P.O. Box 68
Kremmling, Colorado 80459

OCT 17 1989

Mr. Skip Underwood
Forest Supervisor
Arapaho and Roosevelt National Forests
240 West Prospect Road
Fort Collins, Colorado 80526

Dear Mr. Underwood:

The Kremmling Resource Area is participating in a statewide Resource Management Plan (RMP) amendment for oil and gas leasing. The preliminary draft environmental impact statement (PDEIS) will be available on November 1, 1989 and comments will be due on November 30, 1989.

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cc: Bob Kline, GJDO

IN REPLY REFER TO:

3100
(190)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
KREMMLING RESOURCE AREA
116 Park Avenue
P.O. Box 68
Kremmling, Colorado 80459

NOV 29 1989

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Forest Supervisor
Pike National Forest
1920 Valley Drive
Pueblo, Colorado 81008

Dear Mr. Weissling:

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Please contact Rich McClure at 303-724-3437 if any additional information is required.

Sincerely,

David Atkins
Area Manager

cc: Bob Kline, GJDO

IN REPLY REFER TO:

3100
(190)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
KREMMLING RESOURCE AREA
116 Park Avenue
P.O. Box 68
Kremmling, Colorado 80459

NOV 29 1989

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Routt National Forest
29587 W. Highway 40
Steamboat Springs, Colorado 80487

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Prior to you receiving the draft, we would appreciate your review of our initial work on the document. Enclosed is a map that indicates projected drilling activity in the Kremmling Resource Area over the next 20 years. Also enclosed is a map depicting areas adjacent to the forest where we propose special lease stipulations. The other public lands adjacent to the forest would be leased with standard terms and conditions. We would appreciate any information you could provide relative to the consistency of this leasing scenario with forest plans or objectives.

Please contact Rich McClure at 303-724-3437 if any additional information is required.

Sincerely,

David Atkins
Area Manager

Enclosure

cc: Bob Kline, GJDO

IN REPLY REFER TO:

3100
(190)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
KREMMLING RESOURCE AREA
116 Park Avenue
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Kremmling, Colorado 80459

NOV 29 1989

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Sincerely,

David Atkins
Area Manager

cc: Bob Kline, GJDO

Enclosure

IN REPLY REFER TO:

United States Department of the Interior

3100
(190)

BUREAU OF LAND MANAGEMENT
KREMMLING RESOURCE AREA
116 Park Avenue
P.O. Box 68
Kremmling, Colorado 80459

Mr. Thomas Hoots
Forest Supervisor
White River National Forest
P O Box 948
Glenwood Springs, Colorado 81602

NOV 29 1989

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Please contact Rich McClure at 303-724-3437 if any additional information is required.

Sincerely,

David Atkins
Area Manager

cc: Bob Kline, GJDO

Enclosure

89 DEC 1 P12:31
RECEIVED
BUREAU OF LAND MGMT.

June 25, 1987

District Ranger
Yampa Ranger District
P.O. Box 7
Yampa, CO 80483

Dear District Ranger:

As we near completion of the Little Snake Resource Mangement Plan (LSRMP), we are beginning to gather more site-specifc data in order to implement the land use decisions in terms of leasing Federal oil and gas. The LSRMP states that we will develop an oil and gas activity plan to analyze cummulative, primary, and secondary environmental impacts from oil and gas leasing and development. It will identify potential oil and gas leasing/development impacts and the resultant mitigation/stipulation needed at the leasing stage, similar to our current Oil and Gas Umbrella Environmental Assessment. The plan will include all Federal lands and mineral estate within the Little Snake Resource Area under administration by BLM. Lands administered by other agencies will not be included in the analysis.

If an enviromental document is prepared, the U.S. Forest Service will receive the draft document for review for consistency with Forest Service land use plans sometime in late 1987.

At this time, we would like to know any issues your office may be able to identify concerning oil and gas leasing and development on public or split-estate lands adjacent to national forests within the Resource Area. This includes any concerns on Forest Service lands that would be incompatible with oil and gas leasing and development, as well as areas your forest plan establishes a particular land use with which we need to be consistent during oil and gas leasing and development on adjacent public or split-estate lands.

Any information your office can provide at this time would be greatly appreciated.

Sincerely;

/s/ Gene R. Keith

Roy S. Jackson
Area Manager

Enclosure

CC: CO-161, CO-120 6/30/87
CO-922, CO-934 6/30/87
170:JHook:mr:5/28/87:x721

June 25, 1987

District Ranger
Bears Ears Ranger District
356 Ranney
Craig, CO 81625

Dear District Ranger:

As we near completion of the Little Snake Resource Mangement Plan (LSRMP), we are beginning to gather more site-specifc data in order to implement the land use decisions in terms of leasing Federal oil and gas. The LSRMP states that we will develop an oil and gas activity plan to analyze cummulative, primary, and secondary environmental impacts from oil and gas leasing and development. It will identify potential oil and gas leasing/development impacts and the resultant mitigation/stipulation needed at the leasing stage, similar to our current Oil and Gas Umbrella Environmental Assessment. The plan will include all Federal lands and mineral estate within the Little Snake Resource Area under administration by BLM. Lands administered by other agencies will not be included in the analysis.

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Any information your office can provide at this time would be greatly appreciated.

Sincerely;

Gene R. Kelm

Roy S. Jackson
Area Manager

Enclosure

CC: CO-161, CO-120 6/30/87
CO-922, CO-934 6/30/87
170:JHook:mr:5/28/87:x721

United States Department of Agriculture
Forest Service
Routt National Forest
Yampa Ranger District
P.O. Box 7
Colorado, 80487

Reply to: 1950

Date: 6/30/87

Roy S. Jackson
Area Manager
Bureau of Land Management
Little Snake Resource Area
1280 Industrial Ave.
Craig, CO 81625

Dear Roy:

In reference to your 6/25/87 memo, ref. 1610.1 (170), we have several areas of concern that are adjacent to the Resource Area. These areas are wildlife winter range areas and restrictions should be placed on the time of operation dependent on the area and the current weather conditions. These areas are as follows:

1. NW1/4 Sec. 2, T3N., R87W.

2. Area west of Dunkley Pass

3. Adjacent lands to Eagle Rock Lakes, east of Yampa.

4. Adjacent lands to Crowner Creek, southeast of Yampa.

5. Adjacent lands in the North Dunkley area, Fish Creek, Austrian Creek, West Fish Creek, Middle Fish Creek, Willow Creek, and Salt Creek.

Since no motorized equipment is allowed in these areas during the winter months, restrictions pertaining to time of operation and road closures are needed.

Another area of concern are lands adjacent to the Service Creek Further Planning Area. Cumulative affects off of the National Forest must be addressed.

If I can be of any additional service to you, please don't hesitate to contact me.

Sincerely,

Raymond D. Brown

RAYMOND D. BROWN
District Ranger

RECEIVED
1987 JUL -6 PM 12:44
BUREAU OF LAND MGMT.
LITTLE SNAKE R.A.
CRAIG, CO. 81625

FS-6200-28(7-82)

United States Department of Agriculture | Forest Service | Routt National Forest | Bears Ears Ranger District
356 Ranney Street
Craig, Colorado 81625

Reply to: 2820

Date: July 20, 1987

Roy S. Jackson, Area Manager
Bureau of Land Management
1280 Industrial
Craig, CO 81625

Dear Roy:

In reference to your June 25th letter (Refer 1610.1 (170)) requesting any concerns we might have with regard to incompatibility of oil and gas leasing and development on public or split-estate lands that are adjacent to National Forest System Lands.

We see no abnormal conflicts with our current or proposed management or with our Forest Land Management Plan concerning the Bears Ears District that would require special mitigation/stipulations at the leasing stage. If development occurs, there may be activities such as access, vehicle and road management, protection of sensitive wildlife areas that might be considered on a case by case basis.

Sincerely,

Allan K. Green

ALLAN K. GREEN
District Ranger

AGREEN/vlr

RECEIVED
1997 JUL 22 PM 12: 29
BUREAU OF LAND MGMT.
LITTLE SNAKE R.A.
CRAIG, CO. 81626

Post Office Box 471 • Boulder, Colorado 80306

Boulder County

Parks and Open Space Department

Administrative Office: 2045 13th Street • Boulder, Colorado 80302 • (303) 441-3950/772-8110 x3950
Fairgrounds: 9595 Nelson Road • Longmont, Colorado 80501 • (303) 772-5572/441-3927

October 14, 1988

Evelyn W. Axelson, Chief
Fluid Minerals Adjudication Section
Bureau of Land Management
Colorado State Office
2850 Youngfield Street
Lakewood, CO 80215-7076

Dear Ms. Axelson:

Thank you for your memo regarding a proposed oil and gas sale on lands leased by Boulder County from BLM under the Recreation and Public Purposes Act. The lands, all located in T1S R71W are as follows: Tract 139 in Sec. 25; Tracts 143-146 in Sec. 26; Tracts 148-150 in Sec. 27; Tract 127 in Sec. 34, Tracts 129, 130B-130-D, 153-156 in Sec. 35. The County will be requesting a patent on such lands in the coming month as the archaeological clearance and trail improvements have been completed.

The lands are part of the South Boulder Creek Recreation Area, a project that has been worked on by many citizens and government agencies since the late 1960s. The majority of lands are publicly owned and include lands owned by City of Boulder Mountain Parks, City of Boulder Open Space, State of Colorado Parks and Recreation (Eldorado Canyon State Park), Boulder County Parks and Open Space, BLM and Denver Water Board. Together the lands form a relatively undisturbed foothills canyon that is popular for hiking, horseback riding, fishing, picnicking and rock climbing. The natural and undisturbed nature of these lands is important to the recreational experience of the users.

The lands are also important habitat for wildlife. Besides the concerns for raptor and mule deer habitat in the Northeast Resource Management Plan for subject properties, the lands are extremely important black bear habitat. The Colorado Division of Wildlife had identified the lands as part of a high concentration area for black bear in Boulder County. Black bear are considered a Colorado Species of Concern and a declining species in Boulder County. Increasing human presence in the area would be considered detrimental.

LET.AXEL.EV.PA1702.288

Josephine W. Heath
County Commissioner

Ronald K. Stewart
County Commissioner

Herbert E. "Buz" Smith, Jr.
County Commissioner

Based on the stated recreational and wildlife values of the area, we request that the properties be withdrawn from this and future Competitive Oil and Gas Sales. Any surface occupancy would cause adverse impacts to the natural and undisturbed recreation and wildlife qualities. Location of oil and gas wells on adjacent private lands would have the same types of impacts and we do not view slant-drilling as an appropriate option.

Thank you for the opportunity to comment. If you have any questions, please contact me or Dave Hallock in our office.

Sincerely,

Carolyn Holmberg

Carolyn Holmberg
Director

CH:pl
cc: Jim Crain
Bob Toll

mail list w/ file copy

3100
(CO-058)JW

JUL 0 5 1989

A

Dear Sirs:

The Bureau of Land Management, Northeast Resource Area, is in the process of preparing an Environmental Impact Statement (EIS) and amendment to our Resource Management Plan. The EIS and amendment will result in a determination as to which federal lands and minerals should be made available for oil and gas development through leasing, and if leasing is permitted, what lease stipulations may be necessary to protect other resource values.

The plan will encompass the following counties in Colorado:

Adams	Jefferson
Arapahoe	Kit Carson
Boulder	Larimer
Cheyenne	Lincoln
Clear Creek	Logan
Denver	Morgan
Douglas	Phillips
Elbert	Sedgewick
El Paso	Washington
Gilpin	Weld
	Yuma

We would like to document in our plan which lands managed by your agency in this area are available for leasing. On lands that are available, what lease stipulations are necessary to protect other values? We will not lease lands within incorporated towns, and areas more than one-half mile from occupiable land.

If your agency has not completed a land use plan which addresses oil and gas leasing, we would be willing to work with you to determine if leasing is suitable.

Due to our tight schedule for completion, a response by July 31, 1989, would be appreciated.

If you have any questions, please contact me or Mitch Wainwright at the phone number or address shown above.

Sincerely,

MWainwright:kt:6/29/89:Doc. 11M

Frank R. Young

Frank R. Young
Area Manager

Bureau of Reclamation
Missouri Regional Office
P. O. Box 36900
Billings, MT 59107

U.S. Army Corps of Engineers
P. O. Box & Court
215 N. 17th Street
Omaha, NE 68102-4190

U.S. Department of Energy
Buffer Zone Information
Attn: Director of Engineering
800 Werner Ct., Suite 342
Casper, WY 82601

U.S. Air Force
Cable Affairs Office/LGMN
2149th Communications Squad.
AFCS
FE Warren AFB, WY 82005

General Services Administration
Regional Counsel
Attn: John Matthews
Denver Federal Center, Bldg. 41
Denver, CO 80225

EXHIBIT K

Lease Number

MISSILE CABLE SYSTEM

The lands embraced in this lease are crossed by an underground communication cable installed by the U.S. Army Corps of Engineers and maintained by Francis E. Warren Air Force Base, Wyoming. Because severence or disturbance of a missile cable would likely cause a catastrophic failure, the lessee is required to comply with the following stipulations which are made part of the lease terms:

1. The lessee or operator will contact the Commanding Officer, through the Cable Affairs Officer, 2149th Communication Squadron, prior to conducting any exploration or development work, in order to prevent possible damage to a communications cable routed through part of the leased lands.

2. Blasting, drilling, and/or excavation will be postively controlled to insure cable segments are not disturbed.

3. Blasting will not be done within 1/4 mile of any cable segment.

4. Drilling and/or excavation will not be conducted within 50 yards of any buried cable segment.

5. Vehicles and equipment will be kept out of the 16.5 foot permanent right-of-way easement.

6. Blasting with Class 1.1 explosives (including bulk explosives, some propellants, mines, bombs, demolition charges, or any explosive having mass-detonation characteristics) will not be conducted within 1250 feet of any missile launch facility. Drilling or excavation will not be conducted within the 25 foot easement of any missile launch facility. Futhermore, any drilling or excavation within the 1250 foot radius must be coordinated with F. E. Warren AFB Missile Engineering Office.

7. Since F. E. Warren Air Force Base, Wyoming is responsible for the maintenance, restoration and repair of the Missile Cable System, right-of-way gates, marker posts, and the 16.5 foot permanent easement along the cable right-of-way, the lessee will be pecuniarily liable to that agency for any and all damages resulting from the lessee's activities.

8. In the event the cableline is relocated or lowered by the Air Force to accomodate pipe lines, sump basins or other facilities, the lessee will reimburse the Air Force for costs incurred.

NOTE: Cable Affairs Office/LGN, 2149th Communications Squadron, AFCS, F. E. Warren AFB, WY. 82005 should be the first office of contact. The telephone number is (307) 775-2700. Prior to any activity on the surface where a missile launch facility is located, the lessee or operator must contact the 90 CSG/DEL, F. E. Warren AFB, WY. 82005-5000. Telephone number (307) 775-2438/2502.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102-4978

RECEIVED
USDI BLM
Northeast Resource Area
AUG 17 '89

Route	Act	Inf	Init
AM			
LANDS			
LANDS			
MRS	X		
FORESTRY			
SEC DIV			
CLEAR/FILE			

REPLY TO
ATTENTION OF

August 14, 1989

Management & Disposal Branch

Frank R. Young, Area Manager
Department of Interior
Bureau of Land Management
Northeast Resource Area
Building 41, Denver Federal Center
P.O. Box 25047
Denver, Colorado 80225-0047

Dear Mr. Young:

As requested in your letter dated July 5, 1989, listed below are the Federal lands situated within and administered by the Corps of Engineers, Omaha District, which may be available for leasing:

Bear Creek Lake - Jefferson County
Chatfield Lake - Jefferson & Douglas Counties
Cherry Creek Lake - Arapahoe County
Solar Energy Research Institute - Jefferson County
Falcon Air Force Station - El Paso County
Lowry Air Force Base & Training Annex - Arapahoe County
Peterson Air Force Base - El Paso County

The list does not include Federal land which may not be available for leasing due to their small size, close proximity to occupiable land or being within an incorporated town. Federal land which may be available in Counties of Colorado other than those listed above can be obtained from the Corps of Engineers, Albuquerque District, P.O. Box 1580, Albuquerque, New Mexico 87103-1580.

Enclosed is a copy of the required stipulations to be included in all mineral leases on Army-controlled real property. It may be necessary to include additional site specific stipulations regarding cultural resources, surface occupancy, time of operations, control of access routes or any other stipulations necessary for the protection of project resources. Due to each tract of land being unique, it is impossible to provide additional stipulations prior to review of each tract of land being considered for leasing.

If you need additional information, or have questions concerning the information provided, please call Bob Incontro of my staff at (402)221-4379.

Sincerely,

Robert R. Bourne
Chief, Management & Disposal Branch
Real Estate Division

Enclosure

REQUIRED STIPULATIONS IN MINERAL LEASES ON ARMY-CONTROLLED REAL PROPERTY

1. The Secretary of the Army or designee reserves the right to require cessation of operations in a national emergency or if the Army needs the premises for a use incompatible with lease operations. On approval by higher authority, the commander will notify the lessee in writing or, if time permits, request the BLM to notify the lessee. The lessee understands that rights granted by this lease do not include the period of any such cessation, and the United States has no obligation to compensate the lessee for damages or contractual losses resulting from exercise of this stipulation. The lessee shall include this stipulation in contracts with third parties to supply oil and gas. This stipulation shall not affect the lessee's right to seek suspension of the lease term from BLM.

2. If the commander or the commander's authorized representative finds an imminent danger to safety or security for which there is no time to consult the BLM that person may order an immediate stop of such activities. The regional director of BLM will be notified immediately, will review the order and will determine the need for further remedial action.

3. The operator will immediately stop work if contamination is found in the operating area and ask the commander or the commander's authorized representative for help.

4. Lessee liability for damage to improvements shall include improvements of the Department of Defense.

5. Prior to commencement of drilling operations, the Lessee must consult with any third parties authorized to use real estate in the leased area and to take into consideration programs for which the third party grantee has contractual responsibility.

6. A license to conduct geophysical tests on the leased area must be separately obtained from the installation commander or the District Commander.

7. (Civil works only) Conditions contained in BLM Form 3109-2, Stipulation for Lands Under Jurisdication of Department of the Army, Corps of Engineers or successor form.

DEPARTMENT OF THE ARMY
OMAHA DISTRICT, CORPS OF ENGINEERS
6014 U.S. POST OFFICE AND COURTHOUSE
OMAHA, NEBRASKA 68102-4978

February 20, 1986

REPLY TO
ATTENTION OF

Real Estate Division

'86 FEB 28 A10:00

Ms. Evelyn W. Axelson
Chief, Mineral Leasing Section
Bureau of Land Management
2020 Arapahoe Street
Denver, Colorado 80205

T5S R63W
SEC 29

Dear Ms. Axelson:

This is in response to your letter dated January 16, 1986 concerning oil and gas lease offer C-26307-Acquired, involving lands located at the Bennett Army National Guard Facility, Colorado.

The availability of these lands is denied. The National Guard Bureau has determined that this facility is excess to its needs and should be reported to the General Services Administration (GSA) for disposal. Due to the pending disposal, it is unfeasible to make the lands available at this time.

If you have any questions, please contact Mr. Rick Noel at FTS 864-4359.

Sincerely,

Gary D. Blair
Chief, Real Estate Division

CO-943A(JAS)
C-25395 Acq
C-25396 Acq
C-28230 Acq
C-28232 Acq
C-28234 Acq

APR 7 1983

Oil and Gas

George H. Tissaw, Colonel, USAF
Chief, Real Property Division
Directorate of Engineering & Services
Washington, D. C. 20332

Dear Colonel Tissaw:

This is in regard to your letters of April 16, 1982, and July 16, 1982, concerning outstanding oil and gas lease offers on Lowry Training Annex, Colorado. It is our understanding that the entire installation may be leased as long as certain requirements are met prior to leasing and as long as certain stipulations are included in any lease that issues.

The moratorium which suspended these applications since November 1, 1979, was recently lifted. We would like to clarify the requirements for these proposed leases before proceeding further.

- We concur that the lessee must provide adequate proof of Federal ownership of the mineral rights at the Training Annex. We will forward this information to the District Corps of Engineer's office as soon as received.

- A no surface occupancy stipulation will be required for the three parcels indicated in your July 16 letter. However, we would appreciate a more detailed legal description for inclusion in a lease.

- A draft "hold harmless" stipulation is enclosed for your review. Please provide the information necessary to complete the third paragraph and any additions you consider necessary. This stipulation was drafted by our Regional Solicitor to provide maximum protection to the Government.

- A draft of other special stipulations is also enclosed.

- You indicated that rents and royalties should be deposited to BLM account 14500.3. This account is normally for public domain minerals and is not normally used for acquired minerals. We would appreciate your verification of the applicability of this account number for acquired minerals.

- Copies of this letter are being forwarded to HQ ATC/DEPE, Randolph Air Force Base and The Commander, Lowry Air Force Base, for their review. Three copies of the executed lease instruments will be provided to HQ USAF/LEER as requested.

- In order to comply with the requirements of the National Environmental Policy Act (NEPA), an environmental assessment must be completed for the lands at the Training Annex. A reapresentative of our Northeast Area Resource Office will be contacting the base commander to make arrangements regarding an environmental review.

Thank you very much for your cooperation in this matter. If you have further questions, please contact Jean Steffen of my staff (phone 303/837-5551 or FTS 827-5551).

Sincerely yours,

/S/ Rodney A. Roberts

Rodney A. Roberts
Chief, Mineral Leasing Section

Enclosures

cc:
HQ ATC/DEPE, Randolph Air Force Base
Base Commander, Lowry Air Force Base

bc: Richard Watson, Northeast RA

JSteffen/htf

DEPARTMENT OF THE AIR FORCE

Special Stipulations

In addition to the provisions of this lease:

1. Well siting, as well as ingress and egress, will require the approval of the Commander, Lowry Air Force Base. In addition, coordination must also be obtained from current lessees who are using the property contained in this lease for agricultural purposes. Information regarding current lessees may be obtained from the Commander, Lowry Air Force Base.

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

   (legal description as applicable for 400 acres outgranted to U.S. Navy, 40 acres used by Lowry AFB for training, and 34 acres used for munitions storage)

DEPARTMENT OF THE AIR FORCE

Additional Lease Term

Sec. _____

(a) The lease lands were formerly a part of the Lowry Bombing Range. Live bombs, shells and other missiles have been dropped on or fired into the lands. In a report dated June 6, 1963, the United States Air Force stated that the leased lands had been "thoroughly searched and are cleared of all explosive ordnance and ordnance residue reasonably possible to detect." It is, however, understood and agreed that the leased lands have been used for the above purposes and that despite the efforts of the United States to detect and remove unexploded ordnance, there may yet exist unlocated and unexploded ordnance which may be extremely hazardous. It is specifically understood that the United States does not guarantee, warrant, or represent that the area is free from unexploded ordnance (rockets, bombs, shells, etc.) or other explosive objects, or that it is safe to explore for oil or gas. Accordingly, the lessee covenants and agrees, for itself and its assigns, to assume all risk of claims for personal injuries and property damage arising out of operations on the leased lands and the lessee further covenants and agrees to indemnify and save harmless the United States of America, its agents, officers and employees, against any and all liability, claims, causes of actions or suits due to, arising out of, or resulting from operations on the leased lands whether or not immediately or remotely related to the existence of any unexploded bomb, shell, missile or other explosive object on or under the leased lands.

(b) The lessee agrees to include this section in any subsequent assignment of this lease or in any agreement transferring operating rights. The lessee, its assignees or transferrees, must specifically notify in writing any employee who may enter the leased lands, or any other person invited by the lessee to enter the leased lands of the possibility of the existence of unexploded ordnance or other explosive objects and attendant hazards and insure that appropriate notices of hazardous working conditions are prominently displayed in work rooms and the working area.

(c) In the event that operations on the leased lands result in the discovery of any unexploded ordnance or other explosive object, all operations within _____ yards of such ordnance or object shall immediately cease and the _____ will be immediately notified. Operations within _____ yards of the ordnance or object will not commence until approved by the _____ _____.

_____
Lessee

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO 80022

REPLY TO
ATTENTION OF:

SARRM-IS

3 November 1982

Mr. Rodney A. Roberts
Chief, Mineral Leasing Section
United States Department of the Interior
Bureau of Land Management
1037 20th Street
Denver, Colorado 80202

82 NOV -5 AM 11:

Dear Mr. Roberts:

Lt Colonel Richard W. Smith has requested that I respond to your 27 October 1982 letter.

At this time there are no portions of the Arsenal that have been determined to be suitable for oil and gas leasing. RMA is presently conducting extensive groundwater and surface area contamination studies to determine corrective action required.

It is expected that no areas of Rocky Mountain Arsenal can be considered for such leasing until the studies have been completed.

Sincerely,

DAVID L. HEIM
Director of Installation Services

289-0115

2880711

3100
(CO-058)JW

U.S. Forest Service
Pike & San Isabel National Forests
1920 Valley Drive
Pueblo, Colorado 81008

Dear Sirs:

The Bureau of Land Management (BLM), Northeast Resource Area (NERA), is in the process of preparing an Environmental Impact Statement (EIS) and amendment to our Resource Management Plan. The EIS and amendment will result in a determination as to which federal lands and minerals should be made available for oil and gas development through leasing, and if leasing is permitted, what lease stipulations may be necessary to protect other resource values.

The NERA's portion of the plan will encompass the following counties:

Adams	Kit Carson
Arapaho	Larimer
Boulder	Lincoln
Cheyenne	Logan
Clear Creek	Morgan
Douglas	Phillips
Elbert	Sedgewick
El Paso	Washington
Gilpin	Weld
Jefferson	Yuma

The purpose of this letter is to initiate consultation with the U.S. Forest Service in order to coordinate consistent protection measures, and to document the planning and National Environmental Policy Act coverage by your Forest Plan.

Please let us know who we should contact to obtain this information.

Sincerely,

Frank R. Young
Area Manager

JWainwright:kt:7/17/89:Doc. 12M

3100
(CO-058)JW

U.S. Forest Service
Arapaho & Roosevelt National Forests
240 W. Prospect
Ft. Collins, Colorado 80521

Dear Sirs:

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Adams	Kit Carson
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Cheyenne	Logan
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El Paso	Washington
Gilpin	Weld
Jefferson	Yuma

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Please let us know who we should contact to obtain this information.

Sincerely,

Frank R. Young
Area Manager

JWainwright:kt:7/17/89:Doc. 12W

STATE OF COLORADO
Roy Romer, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER
Perry D. Olson, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192

REFER TO: 6000

RECEIVED
USDI BLM
Northeast Resource Area
AUG 1 '89

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CLERK/FILE			

Southeast Regional Office
2126 North Weber Street
Colorado Springs, CO 80907
Telephone: (719) 473-2945

July 27, 1989

Mr. Mitch Wainwright
Bureau of Land Management
2850 Youngfield
Lakewood, CO 80215

RE: CDOW Review of Current BLM N.E. Resource Management Area Oil and Gas Lands Stipulations.

Dear Mitch,

As we discussed, I am submitting a written response to document Colorado Division of Wildlife review of the above referenced lands within the S.E. Region.

Response from our field personnel was "spotty" at best, and very general. Therefore my comments will be brief. It appears current BLM designations - stipulations on oil and gas lands, BLM and split estate, are acceptable.

I would, however, direct your attention once again to Chips Barry's letter of May 19, 1989 to Mr. Greg Shoop regarding oil and gas leasing as it affects wildlife. Please keep the points of this letter in mind, especially the invitation to consult with the CDOW on a site specific basis as individual extraction proposals proceed from concept to enactment. As was stated, the Division welcomes the opportunity to draw on WRIS data and the knowledge of our individual District Wildlife Managers in making comments as to specific operations plans. Please call on us for this purpose.

I appreciate your taking the time to meet with me for review of the project and to assemble materials for review by our personnel. Please let me know if I can be of further assistance

Sincerely,

Bruce Goforth
Senior Wildlife Biologist

BG:bap
xc: R. Desilet T. Lytle D. Clippinger

DEPARTMENT OF NATURAL RESOURCES, Hamlet J. Barry, Executive Director
WILDLIFE COMMISSION, George VanDenBerg, Chairman • Robert L. Freidenberger, Vice Chairman • William R. Hegberg, Secretary
Eldon W. Cooper, Member • Rebecca L. Frank, Member • Dennis Luttrell, Member • Gene B. Peterson, Member • Larry M. Wright, Member

Department of Energy
Naval Petroleum and Oil Shale Reserves
in Colorado, Utah and Wyoming
800 Werner Ct., Suite 342
Casper, Wyoming 82601

July 28, 1989

Serial No:DJN/033.785

Frank R. Young, Area Manager
Bureau of Land Management
Northeast Resource Area
Building 41, Denver Federal Center
P.O. Box 25047
Denver, Colorado 80225-0047

RECEIVED
JUL 31
BLM
NORTHEAST
RESOURCE AREA

Subj: Northeast Resource Area Management Plan Environmental Impact Statement (EIS)

Ref: BLM Letter, Serial No. 3100 (CO-058) JW, dated July 5, 1989

This office does not manage any lands in the area specified in your letter. The only lands we manage in Colorado are in Garfield County, in the Grand Junction District. The lease stipulations we request for protection of our lands from drainage would not be applicable to your EIS. Thank you for consulting with us.

If there is further question, please contact Dan Newquist (FTS 328-5073 or 307/261-5073).

C. Ray Williams
C. RAY WILLIAMS

sc/5416/ms

United States Department of Agriculture
Forest Service
Arapaho and Roosevelt National Forests
Pawnee National Grassland
240 West Prospect Road
Fort Collins, CO
80526-2098

Reply to: 1920/5500

Date: AUG 0 4 1989

Mr. Frank Young, Area Manager
Bureau of Land Management
Northeast Resource Area
Building 41, Denver Federal Center
P.O. Box 25047
Denver, Colorado 80225-0047

Dear Frank:

I received your letter regarding initial consultation with the Arapaho and Roosevelt National Forests related to the EIS and Amendment to the Resource Management Plan for the Northeast Area. I appreciate the notification.

Larry Gash will be the contact person for this consultation. Larry can be reached at this address or at (FTS) 323-1197.

Sincerely,

Michael W. Haley

for AUSTIN W. CONDON
Acting Forest Supervisor

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Northeast Resource Area
AUG 8 '89

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Caring for the Land and Serving People

FS-6200-28(4/88)

United States Department of the Interior
BUREAU OF RECLAMATION
Great Plains Region
P.O. Box 36900
Billings, Montana 59107-6900

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

GP-420

AUG 25 1989

Memorandum

To: Area Manager, Northeast Resource Area, Bureau of Land Management, Denver, Colorado

From: Acting Regional Director, Billings, Montana

Subject: Oil and Gas Leasing Information (Your Letter Dated July 11, 1989) (Oil And Gas)

This responds to your letter dated July 11, 1989, requesting information pertaining to the availability of lands for oil and gas leasing purposes within the State of Colorado.

The Bureau of Reclamation (Reclamation) administers lands within the Armel Unit, Colorado-Big Thompson Project, Fryingpan-Arkansas Project, and Upper South Platte Project in the State of Colorado. Within each Unit/Project, Reclamation administers 23 dam and reservoir sites, the approximate locations of which are shown on Attachment A enclosed.

Dam and reservoir sites, as well as other project lands, are open for oil and gas leasing and mineral development subject to the lessee's acceptance and adherence to our GP-135 Special Stipulations, copy enclosed. These stipulations set forth certain standard requirements designed to protect lands administered by Reclamation. Other than meeting these requirements, Reclamation has no further stipulations or mitigating measures to propose at this time.

If you have any questions, please contact Jerry Jacobs (FTS 585-6556 or 406-657-6556) of this office.

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Northeast Resource Area
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James M. Verzuh

Enclosures 2

N-33

Attachment "A"

LOCATION OF COLORADO DAMS

	Dam	Maximum Water Surface	Sec.	T.& R.	County	Project
1.	Bonny	3736.2	9,15,16&22	5S43W	Yuma	Armel
2.	Carter Lake	5763.0	10	4N70W	Larimer	CBT
3.	Flatiron	5472.8	26,27	5N70W	Larimer	CBT
4.	Granby	8280.5	10,11	2N76W	Grand	CBT
5.	Green Mtn.	7954.0	15	2S80W	Summit	CBT
6.	Horsetooth	5437.0	1	7N70W	Larimer	CBT
7.	Horsetooth	5437.0	6	7N69W	Larimer	CBT
8.	Dixon Canyon	5437.0	20	7N69W	Larimer	CBT
9.	Soldier Canyon	5437.0	7	7N69W	Larimer	CBT
10.	Spring Canyon	5437.0	32	7N69W	Larimer	CBT
11.	Santanka Dike	5437.0	1	7N69W	Larimer	CBT
12.	Marys Lake	8045.0	2	4N73W	Larimer	CBT
13.	Mt. Elbert	9647.0	8	11S80W	Lake	Fry-Ark
14.	Olympus	7475.0	29	5N72W	Larimer	CBT
15.	Pueblo	4919.0	36,25	20S66W	Pueblo	Fry-Ark
16.	Pueblo	4919.0	1	21S66W	Pueblo	Fry-Ark
17.	Rattlesnake	6589.0	30	5N70W	Larimer	CBT
18.	Ruedi	7781.8		8S84W	Eagle	USP
19.	Shadow Mt.	8367.0	24	3N76W	Grand	CBT
20.	Shadow Mt.	8367.0	19	3N75E	Grand	CBT
21.	Sugar Loaf	9873.0	19	9S80W	Lake	Fry-Ark
22.	Twin Lakes	9202.3	23	11S80W	Lake	Fry-Ark
23.	Willow Creek	8132.2	7	2N76W	Grand	CBT

GP-135
(3/89)

SPECIAL STIPULATION - BUREAU OF RECLAMATION

To avoid interference with recreation development and/or impacts to fish and wildlife habitat and to assist in preventing damage to any Bureau of Reclamation dams, reservoirs, canals, ditches, laterals, tunnels, and related facilities, and contamination of the water supply therein, the lessee agrees that the following conditions shall apply to all exploration and developmental activities and other operation of the works thereafter on lands covered by this lease:

1. Prior to commencement of any surface-disturbing work including drilling, access road work, and well location construction, a surface use and operations plan will be filed with the appropriate officials. A copy of this plan will be furnished to the Regional Director, Great Plains Region, Bureau of Reclamation, P.O. Box 36900, Billings, MT 59107-6900, for review and consent prior to approval of the plan. Such approval will be conditioned on reasonable requirements needed to prevent soil erosion, water pollution, and unnecessary damages to the surface vegetation and other resources, including cultural resources, of the United States, its lessees, permittees, or licensees, and to provide for the restoration of the land surface and vegetation. The plan shall contain provisions as the Bureau of Reclamation may deem necessary to maintain proper management of the water, recreation, lands, structures, and resources, including cultural resources, within the prospecting, drilling, or construction area.

Drilling sites for all wells and associated investigations such as seismograph work shall be included in the above-mentioned surface use and operation plan.

If later explorations require departure from or additions to the approved plan, these revisions or amendments, together with a justification statement for proposed revisions, will be submitted for approval to the Regional Director, Great Plains Region, Bureau of Reclamation, or his authorized representative.

Any operations conducted in advance of approval of an original, revised, or amended prospecting plan, or which are not in accordance with an approved plan constitute a violation of the terms of this lease. The Bureau of Reclamation reserves the right to close down operations until such corrective action, as is deemed necessary, is taken by the lessee.

2. No occupancy of the surface of the following excluded areas is authorized by this lease. It is understood and agreed that the use of these areas for Bureau of Reclamation purposes is superior to any other use. The excluded areas are:

a. Within 500 feet on either side of the centerline of any and all roads or highways within the leased area.

b. Within 200 feet on either side of the centerline of any and all trails within the leased area.

c. Within 500 feet of the normal high-water line of any and all live streams in the leased area.

d. Within 400 feet of any and all recreation developments within the leased area.

e. Within 400 feet of any improvements either owned, permitted, leased, or otherwise authorized by the Bureau of Reclamation within the leased area.

f. Within 200 feet of established crop fields, food plots, and tree/shrub plantings within the leased area.

g. Within 200 feet of slopes steeper than a 2:1 gradient within the leased area.

h. Within established rights-of-way of canals, laterals, and drainage ditches within the leased area.

i. Within a minimum of 500 feet horizontal from the centerline of the facility or 50 feet from the outside toe of the canal, lateral, or drain embankment, whichever distance is greater, for irrigation facilities without clearly marked rights-of-way within the leased area.

3. No occupancy of the surface or surface drilling will be allowed in the following areas. In addition, no directional drilling will be allowed that would intersect the subsurface zones delineated by a vertical plane in these areas.

a. Within 1,000 feet of the maximum water surface, as defined in the Standing Operating Procedures (SOP), of any reservoirs and related facilities located within the leased area.

b. Within 2,000 feet of dam embankments and appurtenance structures such as spillway structures, outlet works, etc.

c. Within one-half (1/2) mile horizontal from the centerline of any tunnel within the leased area.

4. The distances stated in items 2 and 3 above are intended to be general indicators only. The Bureau of Reclamation reserves the right to revise these distances as needed to protect Bureau of Reclamation facilities.

5. The use of explosives in any manner shall be so controlled that the works and facilities of the United States, its successors and assigns will in no way be endangered or damaged. In this connection, an explosives use plan shall be submitted to and approved by the Regional Director, Great Plains Region, Bureau of Reclamation, or his authorized representative.

6. The lessee shall be liable for all damage to the property of the United States, its successors and assigns, resulting from the exploration, development, or operation of the works contemplated by this lease, and shall further hold the United States, its successors and assigns, and its officers, agents, and employees, harmless from all claims of third parties for injury or damage sustained or in any way resulting from the exercise of the rights and privileges conferred by this lease.

7. The lessee shall be liable for all damage to crops or improvements of any entryman, nonmineral applicant, or patentee, their successors and assigns, caused by or resulting from the drilling or other operations of the lessee, including reimbursement of any entryman or patentee, their successors and assigns, for all construction, operation, and maintenance charges becoming due on any portion of their said lands damaged as a result of the drilling or other operations of the lessee.

8. In addition to any other bond required under the provisions of this lease, the lessee shall provide such bond as the United States may at any time require for damages which may arise under the liability provisions of sections six (6) and seven (7) above.

_____	_____
Date	Signature of Lessee

CITY AND COUNTY OF DENVER

FEDERICO PEÑA
Mayor

DEPARTMENT OF PARKS - RECREATION

1805 BRYANT STREET
DENVER, COLORADO 80204-1789

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Northeast Resource Area
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September 13, 1989

Mr. Mitch Wainwright
United States Department of the Interior
Bureau of Land Management
Northeast Resource Area
Building 41, Denver Federal Center
P.O. Box 25047
Denver, Colorado 80225-0047

Dear Mr. Wainwright:

This letter is in reference to your letter to Guenther Vogt concerning the exclusion of Denver Mountain Parks land from oil and gas leasing (C-058 3100). We would definitely support that exclusion.

As the Denver area grows, these park parcels grow in increased recreation and scenic value. We are concerned that the recreation and scenic values of these parcels will be severely damaged by oil and gas development on or near these lands.

As a means of protecting our recreation resource, we ask you to do whatever is necessary to exclude the Denver Mountain Parks and surrounding areas from oil and gas leasing. The pristine nature of these parks is of great value to the Denver metropolitan area.

Sincerely,

Neil Sperandeo
Parks and Recreation Planning

cc: Guenther Vogt

Post Office Box 471 • Boulder, Colorado 80306

Parks and Open Space Department

Administrative Office: 2045 13th Street • Boulder, Colorado 80302 • (303) 441-3950/678-6060 x3950
Fairgrounds: 9595 Nelson Road • Longmont, Colorado 80501 • (303) 772-5572/441-3950

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September 8, 1989

Mitch Wainwright
Bureau of Land Management
Northeast Resource Area Office
Denver Federal Center
Bldg. 41, Room 166
P.O. Box 25047
Denver, CO 80225

Dear Mr. Wainwright:

We would like to comment on the offering of oil and gas sales on lands affecting Boulder County Parks leased or patented from BLM and other Boulder County parklands affected by potential oil and gas sales. In general, we are not in favor of the sales on or adjacent to parklands due to adverse impacts to wildlife and scenic qualities. Specifically, we have comments pertaining to the following properties (see attached map for site reference):

1) Lands in and around South Boulder Creek and Walker Ranch - Most of these lands are currently being leased by the county from BLM and will soon be patented. The lands are part of the South Boulder Creek Recreation Area, a project that has been worked on by many citizens and government agencies since the 1960s. The majority of lands are publicly owned and include lands owned by City of Boulder, State of Colorado (Eldorado Canyon State Park), Boulder County Parks and Open Space, BLM and Denver Water Board. Together, the lands form a relatively undisturbed foothills canyon that is popular for hiking, horseback riding, fishing, picnicking and rock climbing. The natural and undisturbed nature of these lands is important to the recreational experience of the users. The lands are also important habitat for wildlife and have been identified by the Colorado Division of Wildlife as a high concentration area for black bear.

2) Fourmile Canyon Creek - This BLM parcel has been patented to Boulder County for recreation and is part of Fourmile Canyon Creek Park. The fragile riparian environment and scenic qualities would make drilling and associated roads incompatible with the park.

3) Lefthand Canyon - This BLM parcel has been applied for by the County and will be a part of a recreation area that combines Buckingham Park with USFS lands.

4) Lyons area - Boulder County has expressed interest in applying for these BLM parcels under the Recreation and Public Purposes Act. The western parcels are recognized as Critical Winter Range for elk and are designated as Environmental Conservation Areas on the Boulder County Comprehensive Plan.

5) Rabbit Mountain - This land is owned by the County as a park. It is recognized and designated by the County as a Critical Wildlife Habitat, Critical Plant Association, Natural Landmark and Archaeologically Sensitive Area.

Again, we do not view these parcels suitable for oil and gas drilling and feel they should be removed from consideration.

Thank you for the opportunity to comment.

Sincerely,

Dave Hallock
Parks Planner

DH:pl

LET.WAIN.MI.PA1702.251

STATE OF COLORADO
Roy Romer, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER
Perry D. Olson, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192

REFER TO: 6821

Northeast Regional Office
317 W. Prospect
Fort Collins, Colorado 80526

September 13, 1989

U.S. Department of the Interior
Bureau of Land Management
Northeast Resource Area
Building 41, Denver Federal Center
P.O. Box 25047
Denver, Colorado 80225-0047

RE: Oil and Gas EIS

Dear Mitch,

My apologies for being so slow on this, but be assured that the situation was out of my hands.

I took a page out of the regulations and xeroxed it so you can have the specific information as to closures and special regulations. The areas that you inquired about are listed in the regulations as the middle unit, lower unit and Lone Pine unit in the regulations.

As you are perhaps aware, the vehicle closures are to maintain the animals in the units as much as possible for the hunting season and to protect them from harassment on the winter range to the extent possible.

It is realized that if exploration for oil or gas is done, there must necessarily be equipment such as vehicles and drills allowed in the area. We would like to have such equipment kept on roads to the extent possible in order to prevent damage to the range resource. Also, these activities should be restricted to the warmer months of the year as May through September. Neither should there be any exploration in meadows, field or developed areas such as residences and corrals.

If we can be of further assistance in developing an EIS, please advise us.

Sincerely,

Don Bogart
Environmental Biologist

RECEIVED
USDI BLM
Northeast Resource Area
SEP 1 5 '89

Enclosure 1

DB/vt

cc: Moss
Hoover
R. Brown

DEPARTMENT OF NATURAL RESOURCES, Hamlet J. Barry, Executive Director
WILDLIFE COMMISSION, George VanDenBerg, Chairman • Robert L. Freidenberger, Vice Chairman • William R. Hegberg, Secretary
Eldon W. Cooper, Member • Rebecca L. Frank, Member • Dennis Luttrell, Member • Gene B. Peterson, Member • Larry M. Wright, Member

3100 (163)

Mr. William T. Sexton
Forest Supervisor
San Juan National Forest
701 Camino del Rio
Durango, Colorado 81301

JUL 24 1989

Dear Mr. Sexton:

The San Juan Resource Area is one of five Bureau of Land Management (BLM) Resource Areas in the state of Colorado participating in the preparation of an oil and gas plan amendment environmental impact statement. During this process, we are consulting with the appropriate National Forest Supervisors whose forest boundaries are adjacent to the BLM Planning Areas to provide an opportunity for them to participate in the plan amendment.

The objectives of this participation and consultation are:

1. To coordinate consistent protection measures where allowed by differing agency missions.

2. To clarify Forest Service provision of Oil and Gas Leasing Stipulations and coordination of surface protection on private surface/federal mineral estate within, or mostly surrounded by, National Forest Lands. These lands will be shown on an appropriate map in the plan amendment.

3. To produce a description in the plan amendment of the planning and National Environmental Policy Act (NEPA) coverage by the appropriate Forest Plan for oil and gas leasing. This statement will also include a description of Bureau of Land Management (BLM) participation in the Forest Plan, present and future.

Enclosed is a copy of our planning map which shows the emphasis areas addressed in the San Juan - San Miguel Resource Management Plan for your use in this evaluation.

To ensure that we are able to incorporate Forest Service information into the plan amendment, we request that you submit your response to this office by August 18, 1989. If you have any questions concerning this request, please feel free to call Bob Kershaw at (303) 247-4082.

Sincerely,

/s/ Sally Wisely

Sally Wisely
Area Manager

bc: Suspense:Kershaw
MDO Read
SJRA Read
RKershaw:rk/rp:7/24/89:sjnfletr

Enclosure

3100 (163)

Mr. Richard E. Greffenius
Forest Supervisor
Grand Mesa, Uncompahgre, and Gunnison
National Forests
2250 Highway 50
Delta, Colorado 81416

JUL 24 1989

Dear Mr. Greffenius:

The San Juan Resource Area is one of five Bureau of Land Management (BLM) Resource Areas in the state of Colorado participating in the preparation of an oil and gas plan amendment environmental impact statement. During this process, we are consulting with the appropriate National Forest Supervisors whose forest boundaries are adjacent to the BLM Planning Areas to provide an opportunity for them to participate in the plan amendment.

The objectives of this participation and consultation are:

1. To coordinate consistent protection measures where allowed by differing agency missions.

2. To clarify Forest Service provision of Oil and Gas Leasing Stipulations and coordination of surface protection on private surface/federal mineral estate within, or mostly surrounded by, National Forest Lands. These lands will be shown on an appropriate map in the plan amendment.

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Sincerely,

/s/ Sally Wisely

Sally Wisely
Area Manager

bc:
Suspense:Kershaw
MDO Read, SJRA Read
RKershaw:rk:rp:7/24/89:fscoorlr

Enclosure

United States Department of Agriculture
Forest Service
Grand Mesa, Uncompahgre and Gunnison National Forests
2250 Highway 50
Delta, Colorado
81416
303-874-7691

Reply to: 1950-3

Date:

United States Department of the Interior
Bureau of Land Management, San Juan Resource Area
Federal Building, 701 Camino Del Rio
Durango, CO 81301

Dear Ms. Wisely:

We appreciate the opportunity to participate in the preparation of an oil and gas plan amendment environmental impact statement.

We have consulted with the San Juan National Forest and understand that they plan to participate in the plan amendment. Since the San Juan National Forest is located in Durango and within the Resource Management Area Boundaries, we believe it would be appropriate to have the San Juan National Forest represent the Grand Mesa, Uncompahgre and Gunnison National Forests in this planning process. We have requested that they inform us of the progress and issues/concerns as they are addressed.

Thank you for your consideration in this matter.

R. E. GREFFENIUS
Forest Supervisor

cc: Norm Andos, San Juan National Forest
Meshew

AREA MANAGER
R & M STAFF
MULTI-RES. STAFF
AHC STAFF
RECEIVED
BLM AUG 21 1989
Durango, Colorado
ADMIN.

United States Department of Agriculture
Forest Service
San Juan National Forest
701 Camino Del Rio, #301
Durango, CO 81301
303-247-4874

REPLY TO: 1950-3

DATE: September 18, 1989

Sally Wisely
U. S. Department of Interior
Bureau of Land Management
San Juan Resource Area
Federal Building, 701 Camino Del Rio
Durango, CO 81301

Dear Ms. Wisely:

Thank you for the opportunity to participate in the preparation of an oil and gas plan amendment environmental impact statement.

Glen Raby (Forest Geologist) and Norm Ando of my staff met with Bob Kershaw of your staff on August 22 and 30 in regard to this matter. Norm has additionally consulted Larry Meshew on the Grand Mesa, Uncompahgre and Gunnison National Forest (GMUG) regarding their participation in this effort (reference: August 18, 1989 letter). As a result of these meetings and in response to your request for input, I recommend that you utilize the San Juan and GMUG National Forests' Land and Resource Management Plans and maps to review management direction for applicability across common boundaries. Norm supplied copies of both plans to Bob on August 30 for this purpose.

If you have questions, comments, or need additional information, please contact Glen at 264-2268, Norm at 247-4874, or Larry at 874-7691.

Sincerely,

Bill

WILLIAM T. SEXTON
Forest Supervisor

cc: Glen Raby
Pagosa R.D.

Larry Meshew
GMUG N.F.

FS-6200-28a (5/84)

APPENDIX O

SOCIAL AND ECONOMIC TABLES

APPENDIX O

SOCIAL AND ECONOMIC

TABLE O-1. SOCIOECONOMIC INDICATORS GLENWOOD SPRINGS RESOURCE AREA

				% Change	
	1977	1982	1987	1977-82	1982-87
Mesa County					
Population	67,294	94,075	86,498	39.8	-8.1
Employment	34,169	49,186	43,515	43.9	-11.5
Personal Income *	496.8	1,063.2	1,126.3	114.0	5.9
Garfield County					
Population	18,992	28,751	25,655	51.4	-10.8
Employment	9,799	17,031	14,893	73.8	-12.6
County Revenue	4.5	13.4	11.9	294.2	-10.9
Personal Income *	146.4	376.0	365.4	156.8	-2.8

* Million dollars.

TABLE O-2. POPULATION--KREMMLING RESOURCE AREA

					Percent Change		
	1960	1970	1980	1987	o1960-70	o1970-80	o1980-87
Grand County	3,557	4,107	7,475	9,548	15	82	28
Fraser-Winter Park	N/A	509	950	1,438	N/A	87	50
Granby	503	554	963	1,341	10	74	39
Grand Lake	170	189	382	508	11	102	33
Hot Sulphur Springs	237	220	405	458	-7	84	13
Kremmling	576	764	1,296	1,461	33	70	13
Jackson County	1,758	1,811	1,863	1,653	3	3	-11
Walden	809	907	947	832	12	4	-12
Total Resource Area	5,315	5,918	9,338	11,201	11	58	20
State of Colorado	1,753,925	2,207,259	2,888,834	3,296,269	26	31	14
United States	179,323,175	203,212,926	226,504,825	243,399,000	13	11	7

TABLE O-3. LABOR FORCE, EMPLOYMENT & UNEMPLOYMENT RATE KREMMLING RESOURCE AREA

	1975	1980	1986
GRAND COUNTY			
Labor Force	3,995	5,626	4,979
Employment	3,817	5,450	4,726
Unemployment Rate	4	3	5
JACKSON COUNTY			
Labor Force	891	842	959
Employment	849	792	908
Unemployment Rate	4	5	5
ECONOMIC STUDY AREA			
Labor Force	4,886	6,468	5,938
Employment	4,666	6,242	5,634
Unemployment Rate	4	3	5
GRAND COUNTY			
Population	6,446	7,547	9,682
JACKSON COUNTY			
Population	1,724	1,889	1,603
ECONOMIC STUDY AREA			
Population	8,170	9,436	11,285

TABLE O-4. EMPLOYMENT BY SECTOR. WAGE AND SALARY EMPLOYMENT KREMMLING RESOURCE AREA

				PERCENT OF TOTAL		
GRAND COUNTY	1975	1980	1986	1975	1980	1986
TOTAL	3,052	4,517	5,949	100	100	100
AGRICULTURE SERV.	23	29	36	1	1	1
MINING	18	W	W	1	N/A	N/A
CONSTRUCTION	728	543	432	24	12	7
MANUFACTURING	168	218	242	6	5	4
TRANSPORT & PU	106	114	139	3	3	2
WHLSL TRADE	17	25	31	1	1	1
RETAIL TRADE	596	1,086	1,351	20	24	23
FINANCE,INSUR, RE	183	472	791	6	10	13
SERVICES	794	1,423	2,111	26	32	35
GOVERNMENT	419	605	815	14	13	14

Source: Bureau of Economic Analysis
W: Withheld to avoid disclosing confidential information
Note: Percent of total detail may not add to 100 percent because of rounding
N/A: Not Available

TABLE O-5. EMPLOYMENT BY SECTOR. WAGE AND SALARY EMPLOYMENT KREMMLING RESOURCE AREA

				PERCENT OF TOTAL		
JACKSON COUNTY	1975	1980	1986	1975	1980	1986
TOTAL	638	764	710	100	100	100
AGRICULTURE SERV.	19	0	0	3	0	0
MINING	42	130	22	7	17	3
CONSTRUCTION	20	31	47	3	4	7
MANUFACTURING	123	106	126	19	14	18
TRANSPORT & PU	39	31	44	6	4	6
WHLSL TRADE	0	0	0	0	0	0
RETAIL TRADE	122	177	172	19	23	24
FINANCE,INSUR, RE	25	25	23	4	3	3
SERVICES	89	84	88	14	11	12
GOVERNMENT	145	161	162	23	21	23

Source: Bureau of Economic Analysis
W: Withheld to avoid disclosing confidential information
Note: Percent of total detail may not add to 100 percent because of rounding
N/A: Not Available

TABLE O-6. EMPLOYMENT BY SECTOR. WAGE AND SALARY EMPLOYMENT KREMMLING RESOURCE AREA

				PERCENT OF TOTAL		
TOTAL RESOURCE AREA	1975	1980	1986	1975	1980	1986
TOTAL	3,690	5,281	6,659	100	100	100
AGRICULTURE SERV.	55	0	0	1	0	0
MINING	60	0	0	2	0	0
CONSTRUCTION	748	574	479	20	11	7
MANUFACTURING	291	324	368	8	6	6
TRANSPORT & PU	145	145	183	4	3	3
WHLSL TRADE	0	0	0	0	0	0
RETAIL TRADE	718	1,263	1,523	19	24	23
FINANCE,INSUR, RE	208	497	814	6	9	12
SERVICES	883	1,507	2,199	24	29	33
GOVERNMENT	564	766	977	15	15	15

Source: Bureau of Economic Analysis
W: Withheld to avoid disclosing confidential information
Note: Percent of total detail may not add to 100 percent because of rounding
N/A: Not Available

TABLE O-7. EMPLOYMENT BY SECTOR. WAGE AND SALARY EMPLOYMENT KREMMLING RESOURCE AREA

				PERCENT OF TOTAL		
COLORADO	1975	1980	1986	1975	1980	1986
TOTAL	1,204,940	1,567,530	1,875,300	100	100	100
AGRICULTURE SERV.	7,733	12,629	18,176	1	1	1
MINING	21,877	41,283	38,431	2	3	2
CONSTRUCTION	70,551	102,176	117,056	6	7	6
MANUFACTURING	140,510	185,022	194,579	12	12	10
TRANSPORT & PU	64,361	84,305	97,391	5	5	5
WHLSL TRADE	61,499	80,096	82,799	5	5	4
RETAIL TRADE	211,152	273,584	318,250	18	17	17
FINANCE,INSUR, RE	90,325	136,306	191,443	7	9	10
SERVICES	263,730	359,226	502,243	22	23	27
GOVERNMENT	273,199	292,903	314,934	23	19	17

Source: Bureau of Economic Analysis
W: Withheld to avoid disclosing confidential information
Note: Percent of total detail may not add to 100 percent because of rounding
N/A: Not Available

TABLE O-8. EARNINGS BY SECTOR--KREMMLING RESOURCE AREA

	THOUSAND DOLLARS			PERCENT OF TOTAL		
GRAND COUNTY	1975	1980	1986	1975	1980	1986
TOTAL	32,803	51,595	78,671	100	100	100
AGRICULTURE SERV.	190	296	501	1	1	1
MINING	698	352	281	2	1	0
CONSTRUCTION	13,482	12,490	10,949	41	24	14
MANUFACTURING	1,474	2,661	3,902	4	5	5
TRANSPORT & PU	1,590	2,064	3,173	5	4	4
WHLSL TRADE	202	405	669	1	1	1
RETAIL TRADE	4,071	8,152	11,072	12	16	14
FINANCE,INSUR, RE	1,001	2,985	6,793	3	6	9
SERVICES	6,833	14,923	26,272	21	29	33
GOVERNMENT	3,262	7,267	15,059	10	14	19

Source: Bureau of Economic Analysis
W: Withheld to avoid disclosing confidential information
Note: Percent of total detail may not add to 100 percent because of rounding
N/A: Not Available

TABLE O-9. EARNINGS BY SECTOR--KREMMLING RESOURCE AREA

	THOUSAND DOLLARS			PERCENT OF TOTAL		
JACKSON COUNTY	1975	1980	1986	1975	1980	1986
TOTAL	5,642	11,051	10,511	100	100	100
AGRICULTURE SERV.	212	W	W	4	N/A	N/A
MINING	911	3,900	726	16	35	7
CONSTRUCTION	286	437	798	5	4	8
MANUFACTURING	1,373	2,189	2,746	24	20	26
TRANSPORT & PU	486	502	739	9	5	7
WHLSL TRADE	112	W	W	2	N/A	N/A
RETAIL TRADE	682	1,136	1,586	12	10	15
FINANCE,INSUR, RE	197	321	347	3	3	3
SERVICES	407	546	566	7	5	5
GOVERNMENT	1,051	1,834	2,679	19	17	25

Source: Bureau of Economic Analysis
W: Withheld to avoid disclosing confidential information
Note: Percent of total detail may not add to 100 percent because of rounding
N/A: Not Available

TABLE O-10. EARNINGS BY SECTOR--KREMMLING RESOURCE AREA

	THOUSAND DOLLARS			PERCENT OF TOTAL		
TOTAL RESOURCE AREA	1975	1980	1986	1975	1980	1986
TOTAL	38,445	62,646	89,182	100	100	100
AGRICULTURE SERV.	W	W	713	N/A	N/A	1
MINING	1,609	4,252	1,007	4	7	1
CONSTRUCTION	13,768	12,927	11,747	36	21	13
MANUFACTURING	2,847	4,850	6,648	7	8	7
TRANSPORT & PU	2,076	2,566	3,912	5	4	4
WHLSL TRADE	W	W	781	N/A	N/A	1
RETAIL TRADE	4,753	9,288	12,658	12	15	14
FINANCE,INSUR, RE	1,198	3,306	7,140	3	5	8
SERVICES	7,240	15,469	26,838	19	25	30
GOVERNMENT	4,313	9,101	17,738	11	15	20

Source: Bureau of Economic Analysis
W: Withheld to avoid disclosing confidential information
Note: Percent of total detail may not add to 100 percent because of rounding
N/A: Not Available

TABLE O-11. EARNINGS BY SECTOR--KREMMLING RESOURCE AREA

	THOUSAND DOLLARS			PERCENT OF TOTAL		
COLORADO	1975	1980	1986	1975	1980	1986
TOTAL	12,119,900	23,604,800	37,138,400	100	100	100
AGRICULTURE SERV.	58,226	120,113	191,827	0	1	1
MINING	473,960	1,241,990	1,441,770	4	5	4
CONSTRUCTION	938,980	2,064,920	2,802,940	8	9	8
MANUFACTURING	1,845,720	3,757,330	5,696,720	15	16	15
TRANSPORT & PU	961,474	1,988,090	3,085,000	8	8	8
WHLSL TRADE	845,397	1,680,500	2,232,840	7	7	6
RETAIL TRADE	1,447,880	2,578,470	3,854,020	12	11	10
FINANCE,INSUR, RE	701,941	1492,,420	2,775,180	6	6	7
SERVICES	2,170,080	4,509,460	8,391,980	18	19	23
GOVERNMENT	2,676,220	4,171,560	6,666,080	22	18	18

Source: Bureau of Economic Analysis
W: Withheld to avoid disclosing confidential information
Note: Percent of total detail may not add to 100 percent because of rounding
N/A: Not Available

TABLE O-12. LOCAL GOVERNMENT FINANCIAL DATA 1986--KREMMLING RESOURCE AREA

	COUNTIES			COMMUNITIES					
	GRAND	JACKSON	FRASER	WINTER PARK	GRANBY	GRAND LAKE	HOT SULPHUR SPRINGS	KREMMLING	WALDEN
PER CAPITA ASSESSED VALUATION	18000	14360	6550	32050	4250	12850	3130	5440	2790
TOTAL MILL LEVY	14.53	10.5	9.96	4.08	9.31	9	3.13	7.8	19
PER CAPITA RETAIL SALES	11710	8820	17070	39690	16100	16470	2520	9500	9490
TOTAL SALES TAX RATE PERCENT	4	6	8	8	8	8	8	8	6
BUDGET GENERAL ACTIVITIES 000'S									
REVENUE	7444	1748	606	1611	738	482	81	537	304
OPERATING EXPENSES	6355	1451	329	1086	539	429	35	352	269
GENERAL OPERATING									
INDEBTEDNESS	0	0	0	0	0	0	40	180	0
OTHER INDEBTEDNESS	570	0	114	3928	115	221	0	0	0

Source: Local Government Financial Data Colorado Department of Local Affairs

TABLE O-13. CURRENT EMPLOYMENT IN MOFFAT COUNTY LITTLE SNAKE RESOURCE AREA

	Employment			Percent of Total		
	1980[a]	1982[a]	1985[b]	1980	1982	1985*
Agriculture	487	498	521	6	8	9
Mining	1,076	600	614	16	10	10
Construction	559	413	368	9	7	6
Manufacturing	278	135	114	4	2	2
Trans., Comm., Utilities	618	(D)	488	10	---	8
Trade	1,363	1,036	1,153	21	17	21
Finance, Inc., Real Estate	180	191	333	3	3	6
Services	519	661	600	8	11	11
Government	666	944	812	10	16	14
Unclassified	722	1,553	703	11	26	13
Total	6,472	6,031*	5,706	100*	100	100
Total Personal Income $(000)	146,063	157,058	142,328			
Percentage Unemployment	8.3	8.4*	10.9			

(D) Not shown to avoid disclosure of confidential data.
* Does not include confidential data (D)
[a] From the Draft EIS for the Little Snake RMP
[b] BLM Estimate

TABLE O-14. CURRENT EMPLOYMENT IN ROUTT COUNTY LITTLE SNAKE RESOURCE AREA

	Employment			Percent of Total		
	1980[a]	1982[a]	1985[b]	1980	1982	1985*
Agriculture	471	473	411	6	6	5
Mining	608	801	625	8	9	7
Construction	1,060	1,023	1,207	14	14	12
Manufacturing	70	100	117	1	1	1
Trans., Comm., Utilities	440	520	581	6	6	7
Trade	1,695	1,381	1,792	22	16	21
Finance, Inc., Real Estate	653	576	674	9	7	8
Services	1,130	1,442	2,007	14	17	23
Government	600	885	934	8	10	10
Unclassified	883	1,224	515	12	14	6
Total	7,610	8,629	8,687	100	100	100
Total Personal Income $(000)	189,146	192,806	203,359			
Percentage Unemployment	5.8	5.9	8.2			

* Percent is rounded
[a] From the Draft EIS for the Little Snake RMP
[b] BLM Estimate

TABLE O-15. EMPLOYMENT AND PERSONAL INCOME FOR MINERAL-RELATED ACTIVITY LITTLE SNAKE RESOURCE AREA

Activity	Activity Employment		Total Two County Labor Force		Percent of Total**		Total Wages		Total Personal Income LSRA All Categores		Percent of Total**	
	1982	1985	1982	1985	1982	1985	1982	1985	1982	1985	1982	1985
Coal	1,401	1,290	14,660	15,584	9.6	8.2	43,146,597	52,884,000	324,815,000	345,558,700	13.2	15.3
Oil & Gas	155	140	14,660	15,584	1.1	.9	4,119,280	3,858,790	324,815,000	345,568,700	1.3	1.1
Coal Power Plants	565	560	14,660	15,584	3.8	3.5	12,182,530	13,428,820	324,815,000	345,568,700	3.8	3.8
Total	2,121	1,990	14,660	15,584	14.5	12.6	59,448,407	70,171,610	324,815,000	345,568,700	18.3	20.2

* Bureau of Economic Analysis, Regional Economic Information System, April 1984. BEA Employment and Personal Income. U.S. Department of Commerce, Washington, D.C.
**Percentages rounded to nearest tenth.

TABLE O-16. AGRICULTURE EARNINGS (IN THOUSANDS) LITTLE SNAKE RESOURCE AREA

	Livestock Products		Crops		Total	
County	1982	1984	1982	1984	1982	1984
Moffat	$8,948	$10,261	$3,194	$3,464	$12,142	$13,725
Routt	$8,776	$12,241	$4,195	$3,673	$12,971	$15,914

Source: Bureau of Economic Analysis, Regional Economic Information System, 1983,4. BEA Farm Income and Expenditures. U.S. Department of Commerce, Washington, D.C. 1984, data is the most recent at time of analysis.

TABLE O-17. POPULATION IN MOFFAT AND ROUTT COUNTIES LITTLE SNAKE RESOURCE AREA

County	1980	1982	1986*
Moffat County	13,133	14,500	10,840
Craig	8,133	10,000	8,230
Dinosaur	313	1,000	910
Unincorporated	4,687	3,500	1,700
Routt County	13,404	14,700	14,711
Hayden	1,720	1,904	1,280
Oak Creek	929	1,010	850
Steamboat Springs	5,098	5,627	6,031
Yampa	472	505	430
Unincorporated	5,185	5,654	6,120

Source: Demographic Section, Colorado Division of Local Government, March, 1985.
* BLM Year End Estimate, 1986

TABLE O-18. HOUSING UNITS 1985
LITTLE SNAKE RESOURCE AREA

County	Occupied	Vacant
Moffat County		
Craig	897	390
Dinosaur	100	33
Routt County		
Hayden	559	51
Oak Creek	365	153
Steamboat Springs	2,111	1,320
Yampa	158	50

Source: U.S. Department of Commerce, 1980 Census of Population and Housing & 1985 BLM estimate.
Note: Data not available for Maybell, Milner, and Phippsburg.

TABLE O-19. LOCAL MUNICIPAL GOVERNMENT FINANCIAL DATA
LITTLE SNAKE RESOURCE AREA

	Craig	Dinosaur	Hayden	Oak Creek	Steamboat Springs	Yampa
Assessed Valuation (1985)						
Total (000)	$40,168	$ 1,141	$4,864	$2,100	$83,910	$1,335
Per Capita	$4,880	$ 1,253	$3,800	$2,470	$13,913	$3,104
Mill Levy	14.0	10.328	26.834	19,887	3.658	19,830
Sales Taxes (FY 85)						
Total (000)	$954	$52	$177	$66	$4,307	$0
Per Capita	$116	$57	$138	$78	$714	$0
Sales Tax Rate (%) (7/1/83)	2.0	2.0	2.0	3.0	7.5	0
Bonded Debt (12/31/82) (000)						
General Obligation	$0	$0	$09	$170	$830	$ 0
Revenue	$0	$0	$0	$0	$1,185	$0
Remaining Bonding Capacity (000)	*	$141	$486	$210	*	$0

Sources: Colorado Division of Property Taxation, Fifteenth Annual Report. Colorado Division of Local Government, 1985 Local Government Financial Compendium. Colorado Department of Revenue, Annual Report 1983.
Percents are: Community: 10% (3% of actual valuation which, at 30% assessment rate, equals 10% of assessed valuation) School Districts: 20%
*Two measures are used: bonding capacity and capital requirements. Bonding capacity is a limit established by the state legislature on the dollar value of general obligation bonds a local jurisdiction may have outstanding. It is based on assessed valuation, amounting to approximately 10 percent for communities and 20 percent for school districts. Home rule cities are not subject to this limit but, since voter resistance increases as more bonds are issued, a similar limit may well apply. General obligation bonds outstanding as of 12/31/84 (the latest published data) were subtracted from gross bonding capacity because the tracts are not included and because of the difficulty of projecting the assessed valuation of oil shale properties.

TABLE O-20. LOCAL COUNTY GOVERNMENT FINANCIAL DATA LITTLE SNAKE RESOURCE AREA

	Moffat County	Routt County
Assessed Valuation (1985)		
Total (000)10	$388,132	$211,096
Per Capita	$35,805	$14,349
Mill Levy	13.63	18.89
Sales Taxes (FY 85)		
Total (000)	$ 556	
Sales Tax Rate (%)1/ (12/31/85)	2.0	0
Bonded Debt (12/31/85) (000)		
General Obligation	$ 0	$ 0
Revenue	$ 0	$ 0
Remaining Bonding Capacity		
Where Limited (000)	$38,813	$21,109

Sources: Colorado Division of Property Taxation, Fifteenth Annual Report. Colorado Division of Local Government, 1985 Local Government Financial Compendium. Colorado Department of Revenue, Annual Report 1985.

1/ County rate does not include state sales tax rate.

TABLE O-21. LOCAL SCHOOL DISTRICT FINANCIAL DATA LITTLE SNAKE RESOURCE AREA

	South Routt School District	Hayden District	Steamboat Springs School District	Moffat County School District
Assessed Valuation (1985)				
Total (000)	$33,796	$58,909	$117,325	$388,132
Per Capita	$11,265	$18,502	$ 14,135	$ 35,805
Mill Levy (1985)	57.410	33.570	48.610	24.16
Sales Tax	N/A	N/A	N/A	
Sales Tax Rate	N/A	N/A	N/A	
Bonded Debt (000)				
General Obligation	$520	$328	$586	$ 737
Revenue	0			
Remaining Bonding Capacity (000) 1/	$ 6,655	$11,716	$23,347	$ 77,479

Sources: Colorado Division of Property Taxation, Eleventh Annual Report. Colorado Division of Local Government, 1985 Local Government Financial Compendium. Colorado Department of Revenue, Annual Report 1985.

1/ Percentage of assessed valuation, less general obligation bonded debt. Percents are: Community: 10% (3% of actual valuation which, at 30% assessment rate, equals 10% of assessed valuation) School Districts: 20%.

TABLE O-22. FEDERAL, STATE, AND LOCAL MINERAL REVENUE GENERATED FROM THE RESOURCE AREA IN 1985 LITTLE SNAKE RESOURCE AREA

County	Generated	50% Returned to State	County Share
Moffat	$10,838,3151	$5,419,157	$397,023
Routt	$14,159,398	$7,074,699	$416,550

TABLE O-23. POPULATION, PER CAPITA INCOME, AND EMPLOYMENT BY COUNTY--SAN JUAN/SAN MIGUEL PLANNING AREA

	Population[1]		Per Capita Income[2]		Employment[3]	
County	1980	1986	1980	1986	1980	1986
Archuleta	3,734	5,365	12,281	9,566	1,125	2,463
Dolores	1,664	1,562	12,363	13,194	560	772
La Plata	27,437	30,171	12,001	12,869	13,736	15,113
Montezuma	16,669	17,412	11,383	11,471	6,301	8,214
Montrose	24,543	25,240	10,482	10,681	11,649	12,102
San Juan	863	784	11,350	11,940	488	636
San Miguel	3,201	3,791	9,425	9,909	1,767	2,170
Total	78,111	84,325	11,300	11,579	35,626	41,470
Colorado	2,908,563	3,266,149	13,968	15,233	1,413,999	1,570,003

Source: Bureau of Economic Analysis.

1 Mid-year population projection is reported in this table.

2 Per Capita Income is reported in constant 1986 dollars.

3 Employment is by place of work.

TABLE O-24. 1986 EMPLOYMENT BY SECTOR FOR COUNTIES SAN JUAN/SAN MIGUEL PLANNING AREA

	Archuleta[2]	Dolores[2]	La Plata	Montezuma	Montrose	San Juan[2]	San Miguel
Farm	216	204	869	726	1,259	0	135
Ag. Services	31	--	248	141	205	0	12
Mining	46	--	141	307	415	-	12
Construction	--	33	1,502	879	769	-	257
Manufacturing	46	--	646	438	829	10	59
Transportation & Public Utilities	48	16	610	336	1,001	-	28
Wholesale	--	31	327	203	284	-	0
Retail	531	115	3,795	1,558	1,743	-	465
Finance, Insurance & Real Estate	322	--	1,410	430	997	-	322
Services	--	47	5,662	1,613	2,690	53	570
Government	316	248	2,578	1,571	1,910	69	307
Total[3]	2,759	734	17,788	8,202	12,102	504	2,170

Source: Bureau of Economic Analysis

1 The information in this table is employment by place of residence. This differs from employment reported in table 3-54 which is employment by place of work.

2 Information is missing from some sectors of small counties so as not to divulge proprietary data.

3 Totals as reported by Bureau of Economic Analysis.

TABLE O-25. ESTIMATED IMPACT OF 1987 TOURISM ON COUNTIES SAN JUAN/SAN MIGUEL PLANNING AREA[1]

County	Archuleta	Dolores	La Plata	Montezuma	Montrose	San Juan	San Miguel
Expenditures	27.955	966	118.613	31.144	19.264	5.242	4.807
Payroll	6.012	155	25.837	6.769	4.154	1.125	1.058
State Tax	1.007	014	4.302	1.136	685	186	168
Local Tax	231	005	2.550	467	246	076	041
Employment[2]	754	15	3,237	844	511	142	131

Source: The Economic Impact of Travel on Colorado Counties 1984, Colorado Tourism Board. U.S. Travel Data Center Washington, D.C.

[1] Figures are 1984 projections given in millions of 1986 dollars.

[2] Employment figures are 1984 projections of the number of persons employed.

TABLE O-26. 1988 HUNTING AND FISHING EXPENDITURES IN THOUSANDS OF 1988 DOLLARS--SAN JUAN/SAN MIGUEL PLANNING AREA[1]

County	Archuleta	Dolores	La Plata	Montezuma	Montrose	San Juan	San Miguel
DEER							
Resident[2]	412.7	103.4	723.2	603.7	868.7	89.5	271.8
Nonresident	1228.7	318.0	1231.9	1220.5	1564.4	133.7	684.5
ELK							
Resident	664.1	126.7	889.6	513.5	560.5	99.6	266.4
Nonresident	1615.7	194.6	1318.5	595.2	692.5	126.2	373.2
OTHER BIG GAME							
Resident	31.6	5.4	47.7	26.1	33.1	3.4	9.7
Nonresident	3.2	.5	3.0	2.0	2.3	.3	.7
SMALL GAME							
Resident	128.3	9.4	194.1	530.3	1022.0	5.3	497.8
FISHING							
Resident	1349.2	467.7	1919.1	689.3	925.7	300.3	492.6
Nonresident	688.6	533.4	2646.1	895.6	391.8	314.9	830.7

Source: Colorado Division of Wildlife Economic Impact Model

[1] The calculation of wildlife economic impacts are reported by The Colorado Department of Wildlife to be preliminary and of uncertain accuracy.

[2] Colorado Resident

TABLE O-27. YEAR 2010--KREMMLING RESOURCE AREA

ESA	Populations	Impact	Percent as Impact
Scenario 1			
Current Trends and Conditions	11,285		
Development	11,307	22	less than 1 percent
Scenario 2			
Current Trends			
and Conditions	11,285		
Development	11,578	293	2.6 percent

TABLE O-28. YEAR 2009--LITTLE SNAKE RESOURCE AREA

COUNTY	POPULATION	IMPACT	PERCENT AS IMPACT
ROUTT			
Current Trends and Conditions	19,845		
Development	19,921	76	1%
MOFFAT			
Current Trend and Conditions	15,921		
Development	16,214	293	1%

TABLE O-29. YEAR 2010. PRESENT MANAGEMENT SAN JUAN/SAN MIGUEL PLANNING AREA

ESA	POPULATION	IMPACT	PERCENT AS IMPACT
Scenario 1			
Current Trends and Conditions	84,325		
Development	84,377	52	less than 1 percent
Scenario 2			
Current Trends and Conditions	84,325		
Development	84,334	1,009	1 percent

TABLE O-30. YEAR 2010. STANDARD TERMS AND CONDITIONS SAN JUAN/SAN MIGUEL PLANNING AREA

ESA	POPULATION	IMPACT	PERCENT AS IMPACT
Scenario 1			
Current Trends and Conditions	84,325		
Development	84,366	42	Less than 1 percent
Scenario 2			
Current Trends and Conditions	84,325		
Development	85,323	998	1 percent

TABLE O-31. YEAR 2010. PROPOSED ACTION SAN JUAN/SAN MIGUEL PLANNING AREA

ESA	POPULATION	IMPACT	PERCENT AS IMPACT
Scenario 1			
Current Trends and Conditions	84,325		
Development	85,377	52	less than 1 percent
Scenario 2			
Current Trends and Conditions	84,325		
Development	85,287	1,009	1 percent

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