Oil and Gas Leasing on the Thunder Basin National Grassland
Final Environmental Impact Statement

United States Forest Service

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OIL AND GAS LEASING ON THE THUNDER BASIN NATIONAL GRASSLAND

FINAL Environmental Impact Statement

DOUGLAS RANGER DISTRICT
Campbell, Converse, Crook, Niobrara and Weston Counties, Wyoming

Abstract: This final Environmental Impact Statement was conducted to analyze what lands on the Medicine Bow National Forest, Thunder Basin National Grassland in northeast Wyoming could be available for leasing and what conditions could be attached to future leases. Seven alternatives are described, and potential effects are disclosed and evaluated. These alternatives represent possible ways to manage oil and gas leasing on 520,000 acres that are available for leasing. The alternatives are: ALTERNATIVE 1, Leasing consistent with the Forest Plan (No Action); ALTERNATIVE 2, Leasing with standard and special stipulations, consistent with the Forest Plan; ALTERNATIVE 3, Leasing with standard and special stipulations, recreation emphasis; ALTERNATIVE 4, Leasing with standard and special stipulations, greater recreation emphasis; ALTERNATIVE 5, New leasing of National Forest System lands; ALTERNATIVE 6, Leasing with standard stipulations only; and, ALTERNATIVE 7, Leasing with standard and special stipulations, biological diversity and recreation emphasis. ALTERNATIVE 7, the Forest Service preferred alternative, is a modification of alternatives published in the draft EIS. Its effects lie within the range of impacts disclosed in the draft EIS.

Public Review: Reviewers should provide the Forest Service with their comments during the review period of the environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired for the timely preparation of the Record of Decision. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to reviewers’ position and contentsions. Vermont Yankee Nuclear Power Corp. v. NRC, 435 U.S. 519, 533 (1978). Environmental objections that could have been raised at the draft and final stage may be waived if not raised until after completion of the record of decision. City of Angoon v. Hoki (9th Circuit, 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1986). Comments on the final environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Comments will be received for 45 days following the date of the Notice of Availability published in the Federal Register. The Forest Supervisor will respond to those comments in a Record of Decision which will be issued several months from now. Comment should be sent in writing to the Project Coordinator.
SUMMARY

OIL AND GAS LEASING ON THE THUNDER BASIN NATIONAL GRASSLAND
ENVIRONMENTAL IMPACT STATEMENT

NATURE AND PURPOSE OF ACTION

The purpose of this Environmental Impact Statement is to disclose the effects of alternative decisions the Forest Service (FS) may make regarding availability of and authorization for the Bureau of Land Management (BLM) to lease, lands of the Thunder Basin National Grassland (TBNG) for oil and gas exploration and development.

In 1987, Congress passed the Federal Onshore Oil and Gas Leasing Reform Act referred to as the "Leasing Reform Act." The Leasing Reform Act expanded the role of the Secretary of Agriculture in the leasing decision process. Within the National Forest System, the Secretary of Agriculture is authorized to identify the lands for which leases can be sold and determine the appropriate stipulations to apply to the lease to protect the surface resources. Regulations to implement the Leasing Reform Act were developed by the Forest Service and became effective April 20, 1990, (36 CFR, Part 228, 100 et seq.; 55 FR 10423). A review of the Medicine Bow National Forest and Thunder Basin National Grassland Land and Resource Management Plan (Forest Plan) for compliance with the new regulations was made and concluded that adequate analysis for leasing decisions for specific lands required by the new regulations (36 CFR 228.102(e)) had not been completed. Oil and gas leasing on the Medicine Bow National Forest and Thunder Basin National Grassland has been suspended pending completion of a leasing amendment to the Forest Plan and compliance with National Environmental Policy Act (NEPA) and 1 leasing Reform Act.

DECISIONS TO BE MADE

The Forest Supervisor will make three related decisions in a Record of Decision based on this the final Environmental Impact Statement (EIS):

1. The first decision will identify which lands will be administratively available for leasing based on disclosure and analysis provided in a "Leasing Analysis." No rights are granted by the government to other parties when the Leasing Analysis is completed and the decision described in 36 CFR 228.102(d) is made. The EIS is being prepared to satisfy the requirements of the National Environmental Policy Act (NEPA) for the Leasing Analysis.

2. The second decision will identify the specific lands the BLM will be authorized to offer for lease. This is the "leasing decisions for specific lands" required by 36 CFR 228.102(e). Transmittal of the specific lands decision occurs when the FS has received and reviewed a request for a lease parcel report from the BLM. The regulations implementing the Leasing Reform Act require the following before the BLM can be authorized to offer National Forest System lands for lease:
   a. Verifying that oil and gas leasing on the specific lands has been adequately addressed in a NEPA document and is consistent with the Forest Land and Resource Management Plan.
   b. Ensuring that conditions of surface occupancy identified in section 228.102(c)(1) are properly included as stipulations in resulting leases.
   c. Determining that operations and development could be allowed somewhere on each proposed lease, except where stipulations will prohibit all surface occupancy.

3. The third decision will be to make an amendment to the Forest Plan, by revising Appendix D, Standard and Special Stipulations for Mineral Leasing. The Uniform Form for Oil and Gas Lease Stipulations, March 1989, will be used. Whether this will be a significant amendment per 36 CFR part 219, will depend on the alternative selected.

The BLM is responsible for management of all federally owned leasing minerals. Under the terms of the Interagency Agreement between the BLM and FS, dated August 31, 1981, and November 19, 1991, the BLM is a joint lead agency for this Environmental Impact Statement and contributed substantially to the leasing analysis. The BLM, acting for the Secretary of the Interior, may lease the National Forest System (NFS) lands identified in the decision of the Forest Supervisor. The BLM is responsible to advertise the lease, sell it and is responsible for monitoring all subsurface activities relating to exploration and development. Decisions of the BLM that result from this EIS will be in a separate Decision Document from the decisions by the Forest Supervisor.

This EIS describes the nature of the physical, biological, social and economic effects of the alternative types of management the Forest Supervisor is contemplating for oil and gas leasing on the TBNG. As part of each alternative, necessary and reasonable mitigation measures are prescribed to protect surface resource uses and values and monitoring requirements are prescribed to ensure mitigation measures work. This EIS is "tiered" from the final EIS for the Medicine Bow National Forest Land and Resource Management Plan to reduce paper work as stated in 40 CFR 1500.4 and 40 CFR 1502.20.

The Forest Supervisor will make the decisions only after making this final EIS available for 30 days for public comment and studying the comments received. The Forest Supervisor will respond to those comments in a Record of Decision at a later date (approximately two months after the release of the final EIS). The Forest Supervisor will describe all decisions in the Record of Decision.

LANDS INVOLVED

The Thunder Basin National Grassland (TBNG) is located in northeastern Wyoming in the counties of Campbell, Converse, Crook, Niobrara and Weston (see vicinity Map). The TBNG is administered by the Douglas Ranger District, Medicine Bow National Forest, in Douglas, Wyoming.

Land ownership within the boundaries of the TBNG analysis area is an intricate system of intermingled federal, state and private lands. Total acreage within the analysis area is 1.8 million acres. All federal surface (572,224 acres) is administered by the Forest Service as the TBNG. The Federal Government owns the mineral estate on 52,000 acres of the total 572,224 acres. The remaining mineral estate (approximately 52,000 acres) is in non-federal ownership (state and private).

In addition, the BLM manages 580,000 acres of federally owned oil and gas mineral rights on lands with private surface. The total federal oil and gas mineral estate, for both federal and private surface, within the TBNG is 1.1 million acres.

There are no wilderness areas, wilderness study areas, or other special areas within the TBNG analysis area withdrawn from mineral development through legislative action or a formal withdrawal process.

The Forest Service decision will apply only to lands with federal surface (TBNG lands) and with federal oil and gas mineral lands (320,000 acres).
OIL AND GAS LEASING

In 1987, the Leasing Reform Act authorized the Secretary of Agriculture to identify the National Forest System lands which are available for leasing, and determine the appropriate stipulations to apply to the lease to protect the surface resources. The Leasing Reform Act also established a statutory requirement for processing the Surface Use Plan of Operations prior to ground-disturbing activities. This established a staged decision process for sale of a lease and approval of permit to drill and operate. That is, the Forest Service must first authorize sale of a lease. The BLM then offers the lease for sale. If the lease is sold, the Forest Service must approve or disapprove a detailed Surface Use Plan of Operation, submitted as part of an application for Permit to Drill or Notice of Staking. The lease decision is based on, among other things, an environmental analysis in accord with the requirements of the National Environmental Policy Act (NEPA) that identifies stipulations needed to protect the environment. The approval of drilling is also based on an environmental analysis in accord with NEPA, which is specific to the proposed plan of operation (see Leasing Flow Chart).

Standard lease terms include standard stipulations in the Offer to Lease and Lease for Oil and Gas, Form 3181-1, U.S. Department of Interior, Bureau of Land Management, June 1988. These standard lease terms provide the lessee the right to use the leased land as needed to explore for, drill for, extract, remove and dispose of oil and gas deposits located under the leased lands. Operations must be conducted in a manner that minimizes adverse impacts to the land, air, water, cultural, biological and visual elements of the environment, as well as other land uses or users. Federal environmental protection laws such as the Clean Water Act, Endangered Species Act and Historic Preservation Act, are included in the standard lease stipulations. If threatened or endangered species, objects of historic, cultural or scientific value, or substantial unanticipated environmental effects are encountered during construction, all work affecting the resource or value is stopped, and the land management agency is contacted. Operations which would destroy or harm these species or objects are prohibited.

The standard lease terms can be modified by special, or supplemental, stipulations which may be attached to the lease. Supplemental stipulations are standardized into three types (Uniform Format for Oil and Gas Leasing Stipulations, March 1989).

- **Controlled Surface Use (CSU)** stipulations are intended to be used when fluid mineral occupancy and use are generally allowed on all or portions of the lease year-round, but because of special resource concerns or values, lease activities must be strictly controlled and/or modified.

- **Timing Limitation** stipulations prohibit oil and gas exploration and development activities for specific time periods but for less than a year.

- **No Surface Occupancy (NSO)** stipulations are intended for use only when other stipulations are determined insufficient to adequately protect the public interest.

These additional stipulations were developed to meet resource concerns that cannot be mitigated by Standard Lease terms. The amendment to the Forest Plan, Appendix D, will contain both standard and special stipulations which may be applied. Supplemental stipulations for each alternative are summarized in the ALTERNATIVE COMPARISON AND IMPACT SUMMARY table at the end of this SUMMARY.
SCOPING

Scoping is an integral part of the environmental analysis process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action (36 CFR 1501.7).

Scoping for the TBNG Oil and Gas Leasing EIS began September 10, 1990, with a meeting of concerned groups and agencies in Douglas, Wyoming. On June 14, 1991, a Notice of Intent to Prepare an Environmental Impact Statement on the TBNG Oil and Gas Leasing was published in the Federal Register, Vol. 56, No. 115, pages 27494 and 27495. On June 18, 1991, a news release announcing the preparation of the TBNG Oil and Gas leasing EIS was sent to 56 newspapers, 21 radio and 8 television stations in Wyoming and Northern Colorado. On June 19, 1991, a Preliminary Scoping Statement was sent to 1,313 individuals, groups, organizations and agencies. An additional 12 Preliminary Scoping Statements were sent after the initial mailing to individuals requesting one and to Native American organizations identified by the interdisciplinary team. There were 31 responses with comments on the Preliminary Scoping Statement and Notice of Intent. Each comment received from the initial scoping effort was published in the draft Environmental Impact Statement with Forest Service Response to the Comment.

The draft Environmental Impact Statement (DEIS) was made available for public review on June 4, 1992. Copies of the DEIS were originally sent to 136 individuals, organizations and agencies. An additional 1,065 individuals were notified by letter that the DEIS was available. Subsequent to the initial mailing another 45 individuals and groups received copies of the DEIS. The DEIS was distributed to a total of 181 individuals, organizations and agencies. On June 8, 1992, a news release announcing availability of the DEIS and a public meeting to be held June 30, 1992, was sent to 26 newspapers (plus Associated Press), 15 radio and 7 television stations in Wyoming and Northern Colorado. On June 18, 1992, a second news release announcing the June 30, 1992, public meeting was sent to 13 newspapers. A Notice of Availability on the DEIS was published in the Federal Register June 19, 1992. Vol. 57, No. 119, page 27460. On June 30, 1992, nine individuals attended the public involve-out meeting in Douglas, Wyoming. On July 27, 1992, a news release announcing the extension of the comment period to August 18, 1992, was sent to the same mailing list as the June 8, 1992, news release.

There were 92 responses with comments on the DEIS. Each comment received was duplicated and included in APPENDIX A of the FEIS.

The following significant issues that helped the ID Team develop alternatives, mitigation measures and monitoring requirements were identified:

**Issue 1** - Oil and gas development could affect important cultural resources and Native American religious sites.
Leasing with standard and special stipulations, greater recreation emphasis.

ALTERNATIVE 5 - No new leasing of National Forest System lands.

ALTERNATIVE 6 - Leasing with Standard Stipulations only

ALTERNATIVE 7 - Leasing with standard and special stipulations, biological diversity and recreation emphasis. ALTERNATIVE 7 is the Forest Service preferred alternative.

ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY

In order to consider an adequate range of alternatives, the interdisciplinary team tried to develop an alternative whereby less than the entire Thunder Basin National Grassland was available for leasing. This alternative was eliminated from detailed study because: 1) The Forest Plan presently makes the entire TBNG available for oil and gas leasing; 2) Leasing and oil and gas development have occurred on the TBNG since the 1950’s and for the majority of that time the entire TBNG has been leased; 3) Concerns identified during scoping for this EIS can be adequately protected with stipulations; and 4) Alternatives considered in detail include a "No Lease" alternative for the entire National Grassland.

COMPARISON OF ALTERNATIVES

The main features of each alternative, the stipulations that apply to each alternative and the response to each issue by alternative are summarized in the following table. The user is cautioned; numbers in this table are not additive. The calculation of the numbers displayed here can be found in CHAPTER IV.
### ALTERNATIVE COMPARISON AND IMPACT SUMMARY

<table>
<thead>
<tr>
<th>Main Features of Each Alternative</th>
<th>ALTERNATIVE 1, No Action</th>
<th>ALTERNATIVE 2, Forest Plan</th>
<th>ALTERNATIVE 3, Recreation Emphasis</th>
<th>ALTERNATIVE 4, Greater Recreation Emphasis</th>
<th>ALTERNATIVE 5, No New Leasing</th>
<th>ALTERNATIVE 6, Standard Lease Terms</th>
<th>ALTERNATIVE 7, Diversity/Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Features of Each Alternative</td>
<td>Follows the Forest Plan Standards and Guidelines. Leases would be issued according to the current method of lease-by-lease issuance. This would result in slower pace of leasing than under the other leasing alternatives.</td>
<td>Follows the Forest Plan Standards and Guidelines. Amends Forest Plan Appendix D, Standard and Special Stipulations for Mineral Leasing to current standards. All TBNG lands available for lease.</td>
<td>Applies Forest Plan Standards and Guidelines and amends Forest Plan Appendix D similar to ALTERNATIVE 2. Applies NSO to 3 inventoried semi-primitive motorized areas and a CSU to 5 fishing reservoirs.</td>
<td>Applies Forest Plan Standards and Guidelines and amends Forest Plan Appendix D similar to ALTERNATIVE 2. Applies NSO to 4 inventoried semi-primitive motorized areas and a CSU to 2 areas of higher recreation values.</td>
<td>No new leasing would be allowed. Existing leases would continue to operate under existing terms. Once existing leases are relinquished, the areas would not again be offered for lease.</td>
<td>All areas would be subject to lease under standard lease terms. All currently unleased federal tracts would be authorized for lease.</td>
<td>Applies Forest Plan Standards and Guidelines and amends Forest Plan Appendix D similar to ALTERNATIVE 3 and 4. Applies NSO to 4 areas with special values (including both biological diversity and recreation) and a CSU to 5 fishing reservoirs and a CSU to 2 areas with special values (including both biological diversity and recreation).</td>
</tr>
<tr>
<td>Forest Plan Amendment</td>
<td>Not Applicable</td>
<td>Forest Plan Appendix D would be updated according to Uniform Format for Oil and Gas Leasing Stipulations, March 1989. This amendment is not significant.</td>
<td>Same as ALTERNATIVE 3</td>
<td>The Forest Plan would be amended to make the TBNG administratively unavailable for leasing. This would be a significant amendment because it alters the long term mix of goods and services projected by the Forest Plan.</td>
<td>As in ALTERNATIVE 2, the Forest Plan Appendix D would be updated according to Uniform Format for Oil and Gas Leasing Stipulations, March 1989. Forest Plan Standards and Guidelines would be amended to 1) allow oil and gas development roads on crucial winter range on the TBNG, and 2) protect Golden eagle nests anytime. This amendment is not significant.</td>
<td>As in ALTERNATIVE 2, the Forest Plan Appendix D would be updated according to Uniform Format for Oil and Gas Leasing Stipulations, March 1989. Forest Plan Standards and Guidelines would be amended to 1) allow oil and gas development roads on crucial winter range on the TBNG, and 2) protect Golden eagle nests anytime. This amendment is not significant.</td>
<td></td>
</tr>
</tbody>
</table>
### ALTERNATIVE COMPARISON AND IMPACT SUMMARY (continued)

<table>
<thead>
<tr>
<th>Main Features of Each Alternative</th>
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<th>ALTERNATIVE 2, Forest Plan</th>
<th>ALTERNATIVE 3, Recreation Emphasis</th>
<th>ALTERNATIVE 4, Greater Recreation Emphasis</th>
<th>ALTERNATIVE 5, No New Leasing</th>
<th>ALTERNATIVE 6, Standard Lease Terms</th>
<th>ALTERNATIVE 7, Diversity/Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing Limitation</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Trivial Winter Range</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>4,600 acres north of Osage</td>
<td>Stipulations do not apply to this alterna-</td>
<td>Supplemental stipula-</td>
<td>Same as ALTERNATIVE 3</td>
<td>Same as ALTERNATIVE 1</td>
</tr>
<tr>
<td>Indicator Species</td>
<td>Bald eagle nests and roosts, peregrine falcon and golden eagle nests, ferruginous hawk, Swainson’s hawk, goshawk, osprey, or prairie falcon nests and any rookery.</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>tive. Standard lease terms, also called standard stipulations would apply to all lands that come up for lease.</td>
<td>tations do not apply to this alternative. Standard lease terms, also called standard stipulations would apply to all lands that come up for lease.</td>
<td>Same as ALTERNATIVE 3</td>
<td>Same as ALTERNATIVE 1</td>
</tr>
</tbody>
</table>

SUMMARY-10
### ALTERNATIVE COMPARISON AND IMPACT SUMMARY (continued)

<table>
<thead>
<tr>
<th>Main Features of Each Alternative</th>
<th>ALTERNATIVE 1, No Action</th>
<th>ALTERNATIVE 2, Forest Plan</th>
<th>ALTERNATIVE 3, Recreation Emphasis</th>
<th>ALTERNATIVE 4, Greater Recreation Emphasis</th>
<th>ALTERNATIVE 5, No New Leasing</th>
<th>ALTERNATIVE 6, Standard Lease Terms</th>
<th>ALTERNATIVE 7, Diversity/Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controlled Surface Use</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Crucial Winter Range Indicator Species</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 3</td>
<td>Same as ALTERNATIVE 1</td>
<td>Stipulations do not apply to this alternative.</td>
<td>Same as ALTERNATIVE 3</td>
</tr>
<tr>
<td>Fishing Experience</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>5 reservoirs</td>
<td>5 reservoirs</td>
<td>Rochelle Hills (15,245 acres) and Upton- Osage (26,000 acres)</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 4</td>
</tr>
<tr>
<td>Roaded Natural Recreation</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Same as ALTERNATIVE 4</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
</tr>
<tr>
<td>Soil Mass Wasting</td>
<td>Slopes with mass wasting potential and slopes under 60% and over 34%</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
</tr>
<tr>
<td>Soil Productivity</td>
<td>Slopes with mass wasting potential over 34% and riparian soils</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
</tr>
<tr>
<td>Riparian Areas</td>
<td>Riparian areas, playas, floodplains and wetlands as identified in the project file maps</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
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</tbody>
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<th>ALTERNATIVE 6, Standard Lease Terms</th>
<th>ALTERNATIVE 7, Diversity/Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No Surface Occupancy</strong></td>
<td></td>
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</tr>
<tr>
<td>Crucial Winter Range</td>
<td>4,600 acres north of Osage</td>
<td>Same as ALTERNATIVE 1</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Stipulations do not apply to this alternative.</td>
<td></td>
<td>Supplemental stipulations do not apply to this alternative. Standard lease terms, also called standard stipulations would apply to all lands that come up for lease.</td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>Walker Tepee Ring site (320 acres). Not Applicable</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1 19,850 acres</td>
<td>Same as ALTERNATIVE 1 27,130 acres</td>
<td>Same as ALTERNATIVE 1 19,850 acres</td>
<td>Same as ALTERNATIVE 1 27,130 acres</td>
<td>Same as ALTERNATIVE 1 18,130 acres</td>
</tr>
<tr>
<td>Semi-Primitive</td>
<td>4,600 acres</td>
<td>4,600 acres</td>
<td>10,160 acres</td>
<td>18,130 acres</td>
<td></td>
<td></td>
<td>24,530 acres</td>
</tr>
<tr>
<td>Motorized Recreation</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Biological Diversity</td>
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</tr>
</tbody>
</table>

SUMMARY - 12
### ALTERNATIVE COMPARISON AND IMPACT SUMMARY (continued)

<table>
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<tr>
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<th>ALTERNATIVE 6, Standard Lease Terms</th>
<th>ALTERNATIVE 7, Diversity/Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESOURCE ISSUES</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>1. Cultural Resources</td>
<td>The National Historic Preservation Act and standard lease terms provide for necessary cultural resource inventories. Cultural resources would be avoided or mitigated as provide for by the National Historic Preservation Act. An NSO would be applied to the 320 acre Walker Tepee ring site.</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>No New Leasing would not cause any impacts to cultural resources. The number of cultural resource inventories conducted by oil and gas interests would decline.</td>
<td>Same as ALTERNATIVE 1 except that mitigation would be applied at the APD stage of development.</td>
<td>Same as ALTERNATIVE 1</td>
</tr>
<tr>
<td>2. Riparian Areas</td>
<td>Riparian areas would be protected with Standard Lease Terms (200 meter stipulation) and CSU stipulation. Forest Plan Standards and Guidelines would be met or exceeded.</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>No New Leasing would cause no impact to riparian areas. Some wells would be displaced to private lands with less control where impacts could be higher.</td>
<td>Same as ALTERNATIVE 1 except mitigation would be applied at the APD stage of development. Impacts to riparian areas could exceed Forest Plan Standards and Guidelines.</td>
<td>Same as ALTERNATIVE 1</td>
</tr>
<tr>
<td>Main Features of Each Alternative</td>
<td>ALTERNATIVE 1, No Action</td>
<td>ALTERNATIVE 2, Forest Plan</td>
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<td>ALTERNATIVE 4, Greater Recreation Emphasis</td>
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<td>ALTERNATIVE 6, Standard Lease Terms</td>
<td>ALTERNATIVE 7, Diversity/Recreation</td>
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</tr>
<tr>
<td>3. Endangered Species</td>
<td>Threatened and Endangered Species (T&amp;E) are protected by the Endangered Species Act of 1973, as amended. Standard Lease terms and supplemental stipulations. Three T&amp;E species of concern are: bald eagle, black-footed ferret and peregrine falcon. No significant effects on T&amp;E species are anticipated (9/23/92, the U.S. Fish and Wildlife Service concurred with conditions).</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>There would be no impacts to T&amp;E species by No New Leasing</td>
<td>Same as ALTERNATIVE 1 except, mitigation measures would be applied at the APD stage of development. To the extent consistent with lease rights granted these measures would be the same as applied in ALTERNATIVES 1 thru 4. Impacts to bald eagle could exceed Forest Plan Standards and Guidelines.</td>
<td>Same as ALTERNATIVE 1</td>
</tr>
<tr>
<td>4. Prairie Dog Management</td>
<td>Prairie dogs are managed in accordance with the Prairie Dog Management Plan, as amended in 1991. Impacts to prairie dogs either positive or negative are not expected to be measurable.</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>No New Leasing would cause no impacts to prairie dogs</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
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<td>5. Waivers, Modifications and Exceptions</td>
<td>Waivers, modifications and exceptions would be considered in accordance with 36 CFR 228. Public involvement and environmental analysis in accordance with NEPA would be conducted in considering the request.</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Not applicable</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
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<td>Main Features of Each Alternative</td>
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<td>ALTERNATIVE 4, Greater Recreation Emphasis</td>
<td>ALTERNATIVE 5, No New Leasing</td>
<td>ALTERNATIVE 6, Standard Lease Terms</td>
<td>ALTERNATIVE 7, Diversity/Recreation</td>
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<td>6. Visual Character</td>
<td>Forest Plan VQO is modification except in riparian areas where the VQO is partial retention. Forest Plan VQO's would be maintained by application of Standard Lease Terms and CSU stipulations. Visual quality would be protected as a secondary benefit on 4,920 acres where NSO is applied (for cultural resources and crucial winter range).</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1 except, visual quality would be protected as a secondary benefit on 20,170 acres where NSO is applied (for cultural resources and inventoried semi-primitive motorized areas).</td>
<td>Same as ALTERNATIVE 1 except, visual quality would be protected as a secondary benefit on 28,140 acres where NSO is applied (for cultural resources and inventoried semi-primitive motorized areas) and 41,245 acres where CSU is applied (for higher recreation values).</td>
<td>No New Leasing would cause no impacts to the visual character.</td>
<td>Forest Plan VQO is modification except in riparian areas where the VQO is partial retention. Forest Plan VQO would be maintained by application of Standard Lease Terms (60 days and 200 meters). Forest Plan Standards and Guidelines would be applied at the APD stage of development. Impacts to riparian areas could exceed Forest Plan Standards and Guidelines.</td>
<td>Same as ALTERNATIVE 1 except, visual quality would be protected as a secondary benefit on 24,850 acres where NSO is applied (for cultural resources and special values) and on 41,245 where a CSU is applied (for special values). Special values include biological diversity and recreation.</td>
</tr>
<tr>
<td>7. Water Resources</td>
<td>By application of Wyoming DEQ, Water Quality Rules and Regulations, Wyoming State Engineer water rights administration, Rules and Regulations of the Wyoming Oil and Gas Conservation Commission and site specific mitigation measures at the APD stage of development, no adverse impacts to water are expected.</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1, No New Leasing would cause no impacts to water resources</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
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## ALTERNATIVE COMPARISON AND IMPACT SUMMARY (continued)

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<th>ALTERNATIVE 4, Greater Recreation Emphasis</th>
<th>ALTERNATIVE 5, No New Leasing</th>
<th>ALTERNATIVE 6, Standard Lease Terms</th>
<th>ALTERNATIVE 7, Diversity/Recreation</th>
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<td><strong>8. Unique Recreation Areas</strong></td>
<td>Recreation would be managed in accordance with the Forest Plan Standards and Guidelines. Oil and gas activities would be allowed. There would be no protection of inventoried semi-primitive ROSE class areas, recreation fishing experience (from noise), or areas of higher recreation values (Rochelle Hills and Upton Osage).</td>
<td>Same as ALTERNATIVE 1</td>
<td>In addition to Forest Plan Standards and Guidelines, recreation fishing experience would be protected from noise of oil and gas production facilities at 5 reservoirs by CSU stipulation. NSO would be applied to three of 4 inventoried semi-primitive motorized areas (19,850 acres).</td>
<td>In addition to Forest Plan Standards and Guidelines, as in ALTERNATIVE 3 recreation fishing experience would be protected from noise of oil and gas production facilities at 5 reservoirs by CSU stipulation. ALTERNATIVE 4 differs from 3 in that NSO would be applied to all 4 inventoried semi-primitive motorized areas (27,820 acres). Further, CSU would be applied to areas of higher recreation values (41,245 acres).</td>
<td>No New Leasing would cause no impacts to recreation areas.</td>
<td>Same as ALTERNATIVE 1</td>
<td>In addition to Forest Plan Standards and Guidelines, as in ALTERNATIVE 3 and 4 recreation fishing experience would be protected from noise of oil and gas production facilities at 5 reservoirs by CSU stipulation. ALTERNATIVE 7 applies an NSO to 4 areas with special values (24,850 acres total) which include 18,130 acres of inventoried semi-primitive motorized areas. Further, a CSU stipulation is applied to areas of higher recreation values (41,245 acres).</td>
</tr>
<tr>
<td><strong>9. Economic Stabililty</strong></td>
<td>Average Annual Net Present Value</td>
<td>1,467,000</td>
<td>1,474,000</td>
<td>1,434,000</td>
<td>1,396,000</td>
<td>981,000</td>
<td>1,478,000</td>
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<tr>
<td>Average Annual Revenue Cost Ratio</td>
<td>5.37</td>
<td>11.34</td>
<td>11.03</td>
<td>10.73</td>
<td>10.40</td>
<td>9.63</td>
<td>9.77</td>
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<tr>
<td>Average Annual Revenues</td>
<td>Total Revenues</td>
<td>3,929,000</td>
<td>3,944,000</td>
<td>3,678,000</td>
<td>3,325,000</td>
<td>2,565,000</td>
<td>3,964,000</td>
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<td></td>
<td>Payments to States</td>
<td>1,965,000</td>
<td>1,972,000</td>
<td>1,839,000</td>
<td>1,663,000</td>
<td>1,263,000</td>
<td>1,977,000</td>
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<tr>
<td></td>
<td>Federal Revenues</td>
<td>1,965,000</td>
<td>1,972,000</td>
<td>1,839,000</td>
<td>1,663,000</td>
<td>1,263,000</td>
<td>1,977,000</td>
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<td>10. Fish and Wildlife</td>
<td>Wildlife habitat would be managed in accordance with Forest Plan Standards and Guidelines. Both Timing and CSU stipulations would be implemented to mitigate impacts on Featured, Indicator, Threatened and Endangered Species. NSO would be applied to Crucial Winter range.</td>
<td>Same as ALTERNATIVE 1</td>
<td>Wildlife habitat would be managed in accordance with Forest Plan Standards and Guidelines the same as in ALTERNATIVE 1 except that both CSU and Timing stipulations would be applied to Crucial Winter range rather than a NSO.</td>
<td>Same as ALTERNATIVE 3</td>
<td>No New Leasing would cause no impacts to wildlife.</td>
<td>Wildlife habitat would be managed in accordance with Forest Plan Standards and Guidelines the same as in ALTERNATIVE 1 except that mitigation measures would be limited to those available in Standard Lease Terms (60 days and 200 meters). Impacts to indicator species nests, roosts and rookeries and to crucial winter range could exceed Forest Plan Standards and Guidelines.</td>
<td>Same as ALTERNATIVE 3</td>
</tr>
<tr>
<td>11. Leasing Availability</td>
<td>All TBNG oil and gas minerals would be available for leasing with Standard Lease terms and supplemental stipulations (approximately 520,000 acres).</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>No TBNG oil and gas minerals would be available for leasing. Existing leases, when they expire, would not be renewed.</td>
<td>All TBNG oil and gas minerals would be available for leasing with Standard Lease terms (no supplemental stipulations).</td>
<td>Same as ALTERNATIVE 1</td>
</tr>
<tr>
<td>12. Subsurface Drainage of Oil and Gas</td>
<td>Leasing assigns to the lessee the responsibility of protecting the federal oil and gas resource from drainage and minimizes the loss of revenues.</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>The oil and gas resource would be subject to drainage by wells on non-federal surface. Efficient reservoir management would be precluded which, in some cases, could affect non-federal oil and gas.</td>
<td>Same as ALTERNATIVE 1</td>
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<td>13. Hazardous Substances</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Under No New Leasing</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
<td>Same as ALTERNATIVE 1</td>
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<td>By application of the Wyoming DEQ Water Quality Rules and Regulations which govern chemicals, produced waters, hazardous wastes and cleanup of spills, no measurable effects are anticipated in any of the alternatives.</td>
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<td>14. Biological Diversity</td>
<td>Same as ALTERNATIVE 1</td>
<td>As in ALTERNATIVE 1 Forest Plan Standards and Guidelines would be implemented. Impacts to the genetic and species scales of biological diversity such as to Featured species, Indicator species, and Threatened and Endangered species would be mitigated by Timing and CSU stipulations. Landscape and community scale biological diversity concerns would be mitigated by NSO on 10,160 acres with higher biological diversity.</td>
<td>As in ALTERNATIVE 1 Forest Plan Standards and Guidelines would be implemented and genetic and species level biological diversity concerns mitigated. Landscape and community scale biological diversity concerns would be mitigated by NSO on 10,160 acres with higher biological diversity.</td>
<td>As in ALTERNATIVE 1 Forest Plan Standards and Guidelines would be implemented and genetic and species level biological diversity concerns mitigated. Landscape and community scale biological diversity concerns would be mitigated by NSO on 10,160 acres with higher biological diversity.</td>
<td>No New Leasing would cause no impact to biological diversity. All 65,775 acres identified with higher biological diversity values would be protected from the impacts of oil and gas development.</td>
<td>Forest Plan Standards and Guidelines would be implemented to the extent consistent with the rights granted under Standard Lease Terms. Impacts to the genetic and species scales of biological diversity such as to Featured species, Indicator species, and Threatened and Endangered species could exceed Forest Plan Standards and Guidelines. At the landscape and community scale, oil and gas roads would continue to fragment communities and landscapes.</td>
<td>As in ALTERNATIVE 1 Forest Plan Standards and Guidelines would be implemented and genetic and species level biological diversity concerns mitigated. Landscape and community scale biological diversity concerns would be mitigated by NSO on 24,550 acres and a CSU on 41,245 acres with higher biological diversity.</td>
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No Surface Occupancy Stipulation
Culturally and Historically Significant Areas
Lease Notice
Baseline Water Quality Monitoring
Waivers, Exceptions and Modifications to the Stipulations
Area Excluded from Further Study
Monitoring Features Common Among All Alternatives

ALTERNATIVE DESCRIPTIONS

ALTERNATIVE 1 - Leasing consistent with the Forest Plan (No Action).
ALTERNATIVE 2 - Leasing with standard and special stipulations, consistent with the Forest Plan.
ALTERNATIVE 3 - Leasing with standard and special stipulations, recreation emphasis.
ALTERNATIVE 4 - Leasing with standard and special stipulations, greater recreation emphasis.
ALTERNATIVE 5 - No new leasing of National Forest System lands.
ALTERNATIVE 6 - Leasing with standard stipulations only.
ALTERNATIVE 7 - Leasing with standard and special stipulations, biological diversity and recreation emphasis.

ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY

COMPARISON OF ALTERNATIVES

Issue 1 - Oil and gas development could affect important cultural resources and Native American religious sites.
Issue 2 - Oil and gas development could affect riparian areas.
Issue 3 - Oil and gas development could affect threatened or endangered species.
Issue 4 - Oil and gas development could affect prairie dog management.
Issue 5 - How will waivers, modifications, and exceptions to lease stipulations be implemented?
Issue 6 - Oil and gas development could modify the visual character of the landscape.

Table 2-3 AREA WHERE VISUAL QUALITY IS PROTECTED TO A HIGHER STANDARD THAN REQUIRED BY THE FOREST PLAN, BY ALTERNATIVE

Issue 7 - Oil and gas development could affect permanent water sources on the Thunder Basin National Grasslands.
Issue 8 - Oil and gas development could affect unique recreation areas such as Rochelle Hills and Upton-Opal area.
Issue 9 - There is a concern about maintaining the economic stability of the area.

Table 2-4 AVERAGE ANNUAL EXPENDITURES AND IMPACTS ON FEDERAL SURFACE BY ALTERNATIVE

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Table 2-5 AVERAGE ANNUAL REVENUE TO LOCAL GOVERNMENT BY ALTERNATIVE

Issue 10 - Oil and gas development could affect both game and non-game fish and wildlife and their habitat.

Table 2-6 SUMMARY OF WILDLIFE SPECIES PROTECTED BY TYPE OF STIPULATION AND ALTERNATIVE WHERE APPLIED

Issue 11 - Availability of Federal lands for oil and gas leasing affects industry decisions to lease and develop intermingled State and private lands.

Table 2-7 ESTIMATED LAND AREA AFFECTED BY NSO AND NO LEASING

Issue 12 - Failure to lease Federal lands could result in loss of revenue due to subsurface drainage of the Federal oil and gas by wells on State and private lands.

Issue 13 - There is concern about management of chemicals and hazardous wastes, generated and used at oil and gas sites.

Issue 14 - Oil and gas development could affect important biological community relationships and biological diversity.

CHAPTER III. AFFECTED ENVIRONMENT

SUMMARY OF CHANGES BETWEEN THE DRAFT AND FINAL EIS

GENERAL

Map 3-1 MAJOR STRUCTURAL FEATURES ASSOCIATED WITH THE POWDER RIVER BASIN

GEOLoGY

Map 3-2 GENERALIZED GEOLOGY MAP OF TONG

WATER RESOL. "ES

Map 3-3 MAJOR rivers DRAINAGES BASINS AFFECTED BY THE THUNDER BASIN NATIONAL GRASSLAND

Table 3-1 DRAINAGE SIZE AND PERCENT FOREST SERVICE OWNERSHIP WITHIN THESE DRAINAGES FOR THE THUNDER BASIN NATIONAL GRASSLANDS

Map 3-4 RESERVOIRS TARGETED FOR FISHERY MANAGEMENT ON THE THUNDER BASIN NATIONAL GRASSLAND

Table 3-2 RESERVOIRS TARGETED FOR FISHERIES MANAGEMENT ON THE THUNDER BASIN NATIONAL GRASSLAND

Figure 3-1 GENERALIZED EAS.T.WIL 3N SECTION ACROSS THE POWDER RIVER BASIN

Groundwater

Water quality

Flowplains, riparian areas, wetlands and playas

Designated uses

SOILS

MINERALS
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CHAPTER I
PURPOSE AND NEED

SUMMARY OF CHANGES BETWEEN THE DRAFT AND FINAL EIS FOR CHAPTER I

CHAPTER I was changed in response to public comment and for clarity. Minor editorial changes occur throughout. A summary of changes in sections of CHAPTER I is presented below.

LANDS INVOLVED - This section was rewritten to clarify how the analysis area boundary was derived.

ECOSYSTEM MANAGEMENT - This section was added to explain how compliance with the Chief's directive on Ecosystem Management, June 4, 1992, was attained.

SCOPING - in response to public comment an issue on biological diversity was added.

NATURE AND PURPOSE OF ACTION

The purpose of this final Environmental Impact Statement is to disclose the effects of alternative decisions the Forest Service (FS) may make regarding availability of and authorization for the Bureau of Land Management to lease lands of the Thunder Basin National Grassland (TBNG) for oil and gas exploration and development. Throughout this document we shall refer to these lands as the "TBNG".

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

In 1987, Congress passed the Federal Onshore Oil and Gas Leasing Reform Act referred to as the "Leasing Reform Act." The Leasing Reform Act expanded the role of the Secretary of Agriculture in the leasing decision process. Within the National Forest System, the Secretary of Agriculture is authorized to identify the lands for which leases can be sold and to determine the appropriate stipulations to apply to the lease to protect the surface resources. Regulations to implement the Leasing Reform Act were developed by the Forest Service and became effective April 20, 1990 (36 CFR, Part 228, 100 et. seq., 55 FR 10420).

A review of the Medicine Bow National Forest, Thunder Basin National Grassland Land and Resource Management Plan (Forest Plan) for compliance with the new regulations was made and concluded that adequate analysis for leasing decisions for specific lands required by the new regulations (36 CFR 228.102(e)) had not been completed. Oil and gas leasing on the Medicine Bow National Forest and Thunder Basin National Grassland has been suspended pending completion of a leasing amendment to the Forest Plan and compliance with National Environmental Policy Act (NEPA) and Leasing Reform Act.

DECISIONS TO BE MADE

An Environmental Impact Statement is not a decision document. It is a document disclosing the environmental consequences of implementing the proposed action and alternatives to that action. Other federal, state and local jurisdictions have assisted in the analysis and disclosure of the environmental consequences and in the development of alternatives to the proposed action (see CHAPTER VI, AGENCIES AND ORGANIZATIONS CONSULTED). Environmental consequences on lands and activities administered by other jurisdictions resulting from the proposed action are also disclosed in this EIS. Decisions by other jurisdictions to issue or not issue approvals related to this proposal may be aided by the disclosure of impacts available in this document.

The Forest Supervisor will make three related decisions based on this final Environmental Impact Statement (FEIS).

1. The first decision will identify which lands will be administratively available for leasing based on disclosure and analysis provided in a "Leasing Analysis." No rights are granted by the government to other parties when the Leasing Analysis is completed and the decision described in 36 CFR 228.102 (d) is made. The EIS is being prepared to satisfy the requirements of the National Environmental Policy Act for the Leasing Analysis.

2. The second decision will identify the specific lands the BLM will be authorized to offer for lease. This is the "Leasing decisions for specific lands" required by 36 CFR 228.102(e). Transmission of the specific lands decision occurs when the FS has received and reviewed a request for a lease parcel report from the BLM. The regulations implementing the Leasing Reform Act require the following before the BLM can be authorized to offer National Forest System lands for lease:

   a. Verifying that oil and gas leasing on the specific lands has been adequately addressed in a NEPA document and is consistent with the Forest Land and Resource Management Plan.

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

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

3. The third decision will be to make an amendment to the Forest Land and Resource Management Plan (Forest Plan), by revising Appendix D, Standard and Special Stipulations for Mineral Leasing. The Uniform Format for Oil and Gas Lease Stipulations, March 1989, will be used. Whether this will be a significant amendment per 36 CFR part 219, will depend on the selected alternative. The description of each alternative contains a statement of Forest Plan consistency and significance for the required amendment.
The BLM is responsible for management of all federally owned leasable minerals. Under the terms of the Interagency Agreement between the BLM and FS, dated August 31, 1991, and November 19, 1991, the BLM is a joint lead agency for this Environmental Impact Statement and contributed substantially to the leasing analysis. The BLM, acting for the Secretary of the Interior, may lease the National Forest System (NFS) lands identified in the decision of the Forest Supervisor. The BLM is responsible to advertise the lease, sell it, and is responsible for monitoring all subsurface activities relating to exploration and development. Decisions of the BLM that result from this EIS will be in a separate Decision Document from decisions by the Forest Supervisor.

This final EIS describes the nature of the physical, biological, social, and economic effects of the alternative types of management the Forest Supervisor is contemplating for oil and gas leasing on the TBNG. As part of each alternative, necessary and reasonable mitigation measures are prescribed to protect surface resource uses and values, and monitoring requirements are prescribed to ensure mitigation measures work. This EIS is "tiered" from the final EIS for the Medicine Bow National Forest Land and Resource Plan to reduce paper work as stated in 40 CFR 1500.4 and 40 CFR 1502.20.

The Forest Supervisor will make the decisions only after making this final EIS available for public comment, and studying the comments received. The Forest Supervisor will respond to those comments in a Record of Decision at a later date (approximately two months after the release of the final EIS). The Forest Supervisor will describe all decisions in the Record of Decision.

The FS Record of Decision will be referenced to a series of maps that will be used in implementation. Information disclosed on the maps will include the surface resource values being protected and the stipulations, if required, to provide the protection. The maps will not be generally distributed but will be available for review at the Laramie and Douglas offices of the Forest Service.

**LANDS INVOLVED**

The Thunder Basin National Grassland (TBNG) is located in northeastern Wyoming in the counties of Campbell, Converse, Crook, Niobrara, and Weston. The TBNG is administered by the Douglas Ranger District, Medicine Bow National Forest, in Douglas, Wyoming. The geographic scope for this FEIS is identified by the boundaries on the Vicinity Map. This area is referred to as the FEIS study area throughout this document. The FEIS study area boundary was determined by including all federal surface managed by the Forest Service within the boundary. Outside of the boundary federal surface is managed by the BLM.

The southern boundary of the FEIS study area is located 35 miles north of Douglas, the eastern boundary lies 5 miles west of Newcastle, the western boundary is 11 miles west of Wright and the northern boundary lies 15 miles south of the Montana/Wyoming state line (see attached Vicinity Map).

1 The Mineral Leasing Act of 1920 as amended, and the Mineral Leasing Act of 1947 for Acquired Lands, provide the legislative authority for federal leasing. Title 43, Parts 3000 and 3100 of the Code of Federal Regulations provides the regulatory basis for administering federal leasing by the BLM.
Land ownership within the Thunder Basin National Grassland FEIS study area is a complicated intricate system of intermingled federal, state and private lands. Total acreage within the study area is 1.8 million acres. All federal surface (577,224 acres) is administered by the Forest Service as the TBNG. The Federal Government owns the mineral estate on 520,000 acres of the total 577,224 acres. The remaining mineral estate (approximately 52,000 acres) is in non-federal ownership (state and private).

In addition the BLM manages 500,000 acres of federally owned oil and gas mineral rights on lands with private surface. The total federal oil and gas mineral estate, for both federal and private surface, within the FEIS study area boundary is 1.1 million acres.

There are no Wilderness areas, Wilderness Study areas, or other special areas within the TBNG withdrawn from mineral development through legislative action or a formal withdrawal process.

The Forest Service decision will apply only to lands with federal surface (TBNG lands) and with federal oil and gas mineral rights (520,000 acres).

**ECOSYSTEM MANAGEMENT**


The Chief defined ecosystem management as using an ecological approach to achieve the multiple-use management of the National Forests and Grasslands. It means blending the needs of people and environmental values in such a way that the National Forests and Grasslands represent diverse, healthy, productive, and sustainable ecosystems.

An ecosystem is a community of organisms and its environment that function as an interdependent unit. Ecosystems occur at many different scales. Forests are ecosystems. So are rotting logs, ponds, rivers, watersheds, rangelands, mountain ranges, and the planet.

As described by the Chief and Regional Forester ecosystem management means:

- Using knowledge of ecological systems to produce desired resource values, products, services and environments that are in concert with values shared by our society.
- Implementing integrated resource management at various scales of land areas within the long-term capability of the ecosystem.
- Managing to achieve the desired future condition of ecosystems—a common stewardship vision among agencies and individuals with differing missions and philosophies.
- Managing for a range of conditions for plant and animal species since sustaining diverse and resilient ecosystems will be more likely to occur if a desired mix of biological communities are represented.
- Recognizing that people are an integral part of ecosystems, and that resource management programs must be socially responsible.

In testimony before Congress the Chief stated the Forest Service will use ecosystem management to strive for the goals specified in our plans and programs. Ecosystem management is the management to an end. It is not an end in itself. The Forest Service will manage ecosystems for specific purposes such as producing, restoring, or sustaining desired resource uses and products; certain ecological conditions; vital environmental services; and aesthetic, cultural, or spiritual values. Under the Forest Service's multiple-use mandate, the purpose of ecosystem management is to make available desired resource values, uses, products, or services in ways that also sustain the diversity and productivity of ecosystems. Forest Plans will be a primary means to provide an ecological approach to resource management, ensure environmental protection, and maintain the long-term health and productivity of the land and resources in accordance with applicable laws, regulations, and Executive Orders. In some places, emphasis will be on ecological conditions and environmental services. In others, it will be on resource products and uses. Overall, the Forest Service's mandate is to protect environmental quality while making available resources that people need.

**Implementation of Ecosystem Management**

The Forest Plan sets forth the desired future condition of various areas of land and the expected resource products and uses. In order to fully implement the new ecosystem management philosophy, a biological diversity assessment was prepared (see Biological Diversity Technical Report for the Thunder Basin National Grassland located in the project file in the Forest Supervisors Office in Laramie, Wyoming). A description of the ecosystems involved has been included in CHAPTER III, AFFECTED ENVIRONMENT. The interdisciplinary team reviewed each of the alternatives considered in detail and assessed the expected impacts on ecosystem functioning. These impacts are discussed in detail in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES.

**RELATIONSHIP TO OTHER PLANS AND DOCUMENTS**

The Land and Resource Management Plan for the Medicine Bow National Forest and Thunder Basin National Grassland was approved November 29, 1985. Land and Resource Management Plans for the National Grassland are categorized into five Management Areas identified by the Forest Plan: Management Area 48. Emphasis on habitat for one or more indicator species; Management Area 5, Emphasis on big game winter range; Management Area 6, Emphasis on livestock grazing; Management Area 5A, Riparian area management; Management Area 12A, Provides for surface mining development. The Forest Plan goals for mineral and energy (page III-4) are:

- Accommodate and facilitate the exploration, development and production of mineral resources in a manner which adequately protects other resources and the environment.
- Whenever feasible, manage mineral related activities to aid in the accomplishment of other resource management objectives.

The Forest Plan goals for National Grassland (page III-5) are:

- Demonstrate grassland management and utilization of the Thunder Basin National Grassland's resources and values in harmony with nature's requirements and behavior to foster long-term economic stability and productivity of the land base and quality of life of the people and communities in the area.

The current Forest Plan makes the majority of lands on the Forest available for oil and gas leasing using standard lease terms and special stipulations found in the Forest Plan, Appendix D. Negative recommendations or consent denials will be based on site specific analysis (Forest Plan, 1993-59, Amend. 1, 3/86).
OIL AND GAS DEVELOPMENT OVERVIEW

Historical Program

Major portions of the TBNG lie within the Powder River Geologic Basin, a 12,000 square mile oil & gas and coal-bearing area. Activities relating to oil and gas exploration and development have been allowed on leased lands of the TBNG after FS approval of an Application for Permit to Drill (APD) or Notice of Staking (NDS). The authorized activities that have occurred in the past 45 years are a good indication of the level of activity that may be expected to continue. There are 58 developed fields on Thunder Basin National Grassland, each with its own road and pipeline system. Some of the old fields in the Newcastle area have been producing since the 1950's and production seems to be holding up very well. The rate of abandonment of recent producing wells is also very low. A detailed discussion of oil and gas development on the TBNG is in CHAPTER III, AFFECTED ENVIRONMENT.

Oil and Gas Field Development

Generally, any development of oil and gas resources will progress through five basic phases: (1) preliminary investigations; (2) exploratory drilling; (3) development; (4) production; and (5) abandonment. A lease will usually be sought during preliminary investigations. A lease is required prior to any drilling.

Preliminary Investigations

Preliminary investigations include geological and geophysical exploration. Published geologic maps, aerial photography, and satellite imagery are used to identify geologic characteristics that may indicate oil or gas deposition. Frequently, a subsurface geologic map is constructed from data obtained from wells drilled in the area. Further exploration can occur by planes, vehicle, or on foot if warranted. Once geologic indicators are identified, subsurface characteristics can be measured using geophysical methods.

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

Exploratory Drilling

To some degree, all of the exploration and leasing is speculative; only by drilling a hole in the ground can the existence of petroleum actually be verified. A well drilled to test for the presence of oil or gas in a previously undeveloped area is called a "wildcat well." Once an oil and gas exploration company has identified an area having sufficient oil or gas potential to warrant further exploration, a company will obtain the proper leases and other legal permits to drill a wildcat well.

The techniques for drilling a wildcat well are generally the same as for wells in areas of known production. The process usually begins by surveying precisely the location which has been selected by the geologist or geophysicist. Upon approval of the application for permit to drill, construction of the access road and preparation of the well site begins. The well site is cleared of vegetation and a level pad constructed to accommodate the drill rig, mud pumps, reserve pit, generators, pipe racks, and tool house. The drilling rig is then brought in and "rigged up." Getting the rig operational can take anywhere from several hours to three days, depending on how complicated the drilling equipment is. Other rigging-up operations including erecting or setting up stairways, walkways, guardrails, storage facilities, living quarters and auxiliary equipment. On the Thunder Basin National Grassland, water necessary for drilling operations is usually trucked to the drill site. Sometimes a water line is run from an existing water source and occasionally a water well is drilled. The equipment is then ready to drill a well.

The first step in drilling is to set a "surface pipe" several hundred feet deep. A string of surface pipe or casing is inserted into the hole and cemented into place. Cement is pumped down the inside of the pipe, followed by a plug used to wipe the cement from the inside of the casing. Drilling mud is pumped in on top of the plug to displace the cement to the bottom and out into the space between the exterior of casing and the wellbore. Once the cement has set the drilling operations are ready to resume.

The surface pipe is usually between 7 and 14 inches in diameter to allow the drill string and bit to pass through it for deeper drilling. A smaller bit is run down the inside of the casing and drills through the plug and a guide shoe at the bottom of the casing. Routine drilling then continues to the desired depth. The operator is required to seal off, protect, and isolate fresh water zones during and after drilling.

If the hole is found to be a potential producer, the final string of casing, called the production casing, is run into the well and cemented in place. The producing zone may be hydraulically fractured or treated to increase permeability and stimulate the recovery of oil and gas. The production casing is the final casing, making the well a permanent vehicle for the transmission of oil or gas to the surface (See Figure 1-2).

The time needed to drill a well to a total depth of 4,500 feet is normally one to two weeks. The greatest amount of human, vehicular, and equipment activity and accompanying noise occurs during drilling.

As a result of past experience and other data from previous drilling on the TBNG, an average drill pad is two acres in size (325 feet by 225 feet).
Development

When an oil producing reservoir is defined by the exploratory drilling program, field development begins. Oil and gas field development is limited by many factors such as market demands, topography, reservoir characteristics and others. A typical field on the TBNG consists of 5 to 15 individual wells with the associated roads and facilities. The existing surface use plan may be amended, or a new plan is written to address the production phase. The lessee, FS, and BLM representatives formulate this field development surface use plan to address roads, well site development, and additional facilities needed to make the production operation effective. The development of the surface use plan is an important step in ensuring that future operations meet oil company objectives and minimize environmental effects.

The surface area required for a flowing gas well is usually a 20' by 20' fenced area together with an access road and turnaround area. A valve/gauge assembly (referred to as a "Christmas tree") to control gas flow, metering, treatment facilities and compressor equipment would be installed on the well, in some instances a pump is needed to remove water and allow the gas to flow. Flowlines are installed when the well is to be placed into production. The flowlines transport the gas from the wellhead to a collector pipeline system which carries the gas to the gas plant. An electrical system may be needed at the well sites and other facilities. Flowlines, collector lines and powerline cables are buried to the extent practicable within the roadways to minimize surface disturbance.

Development of an oil producer is very similar to the natural gas producer described. Oil wells on the TBNG usually have a pump (see Figure 1-1). The surface facilities generally include storage tanks for the oil. Treatment facilities to remove water and other contaminants from the oil are normally present. On the TBNG, oil would normally be transported by truck from the storage tanks; however, where a sufficiently large field is involved, a pipeline would be installed to transport the oil. Sometimes wells are drilled to dispose of underground water (often called produced water) which is brought to the surface during production. Occasionally wells are used to inject water, steam, carbon dioxide, polymers and micellar fluids into the reservoir to increase production.

During the field development stage an oil field is a busy place. Along with the drilling operations, there is road, pipeline, powerline and facility construction. Wells are checked daily by the company to ensure that all the equipment is working properly. Federal agencies monitor frequently during field development for environmental concerns. Tanker trucks are often used to remove and transport oil from the storage tanks.
Production

During production, little activity would occur at the well site except for periodic maintenance and daily to weekly visits by the company to assure the well is operating properly. Again, tanker trucks are often present somewhere in the field, removing and transporting oil from the storage tanks. Wells are maintained numerous times during their life using workover rigs. These rigs are similar to, but smaller than, drilling rigs. The workover rigs are used to perform down-hole maintenance, and other activities that stimulate oil production. The estimated life of a typical field is 15 to 25 years. During production, federal agencies monitor for environmental concerns as needed, approximately annually.

Abandonment

Wells are plugged and abandoned upon economic depletion of the resource. Approval of plugging and abandonment is provided by the BLM after consultation with the FS. The FS is responsible for ensuring that the surface reclamation and other requirements of the FS to the land have been satisfied. A workover rig is used to plug formerly producing wells, all surface equipment is removed and the site is restored. Specific plugging and abandonment requirements vary based on the rock formations, subsurface water conditions and the specific wellsite.

Dry Hole Abandonment

If no economically producible oil or gas is discovered, the well is called a "dry hole." These are plugged and abandoned in accord with standard practices. During standard dry hole abandonment, the hole below the casing is filled with cement plugs and heavy drilling mud, a cement plug is installed at the bottom of the casing, the casing is filled with mud and a cement cap is installed at the top of the casing. To protect groundwater, a cement plug is required above and below each water bearing zone encountered to insure isolation. A pipe monument, extending at least 5 feet out of the ground on which is inscribed the legal description of the location, is required unless waived. Additional cement plugs may be required to protect ground water zones.

In some cases, a dry hole may intercept groundwater which can be used for various National Forest purposes. The Forest Service assumes responsibility for monitoring and maintaining wells which are converted to water production wells.

Abandonment of Depleted Production Wells

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

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

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

Reasonably foreseeable Development

The Regulations, in 36 CFR 228.102(1),(2), and (4), require the Forest Service to "Project the type/amount of post-leasing activity that is reasonably foreseeable as a consequence of conducting a leasing program consistent with that described in the proposal and for each alternative and analyze the reasonably foreseeable impacts of post-leasing activity under (1)(2) of this section" as a part of the analysis. This, then becomes the direction to forecast the activity that we will be implementing.

The Forest Service defined and mapped the analysis area for the study. This map was used by the staff specialists of the BLM to project the probable amount and pattern of future exploration and development. They have provided a "reasonably foreseeable development" (RFD) scenario [see Appendix C] to describe when and where oil and gas activities may take place. The RFD scenario provided by the BLM is the baseline for estimating environmental effects and cumulative effects of the proposed leasing program. The RFD provided by the BLM may be adjusted to reflect differing assumptions of the alternatives from the proposed action.

OIL AND GAS LEASING

In 1987, The Leasing Reform Act authorized the Secretary of Agriculture to identify the National Forest System lands which are available for leasing, and determine the appropriate stipulations to apply to the leases to protect the surface resources. The Leasing Reform Act also established a statutory requirement for processing the Surface Use Plan of Operations prior to ground-disturbing activities. This established a staged decision process for sale of a lease and approval of permit to drill and operate. That is, the Forest Service must first authorize sale of a lease. The BLM then offers the lease for sale. If the lease is sold, the Forest Service must approve or disapprove a detailed Surface Use Plan of Operation, submitted as part of an Application for Permit to Drill or Notice of Staking. The lease decision is based on, among other things, an environmental analysis consistent with the requirements of the National Environmental Policy Act (NEPA) that identifies stipulations needed to protect the environment. The approval of drilling is also based on an environmental analysis in accord with NEPA, which is specific to the proposed plan of operation (see Figure 1-3).

The legally required, staged decision process is designed to accommodate the tentative nature of oil and gas exploration and development. Exploration for oil and gas resources is costly and speculative. Those purchasing leases do not automatically or immediately drill exploratory wells on these leasesholds. The Federal Government wants to respond to industry concerns, but must ensure that future activities will neither unduly harm the environment nor unduly interfere with other uses of these public lands. The regulatory framework provides for public disclosure at the following decision points: (1) The determination of lands available for leasing, (2) The leasing specific lands decision, (3) Application for Permit to Drill (APD), and (4) Amendment of the permit to drill if field development occurs. Each decision is based on environmental analysis and disclosure of the probable effects in accord with the National Environmental Policy Act.

A lease conveys the right to explore and develop oil and gas resources found under the land. Leases are subject to terms and conditions. These are restrictions derived from legal statutes and measures to minimize adverse impacts to other resources and are generally characterized in a lease stipulation. Stipulations modify the rights the government grants to a lessee. The stipulations are known by potential lessees prior to any sale and must be applied at the time of APD.
Standard lease terms include standard stipulations in the Offer to Lease and Lease for Oil and Gas, Form 3100-11, U.S. Department of Interior, Bureau of Land Management, June 1998. A copy of Form 3100-11 is included in APPENDIX D. The standard lease terms provide the lessee the right to use the leased land as needed to explore for, drill for, extract, remove and dispose of oil and gas deposits located under the leased lands. Operations must be conducted in a manner that minimizes adverse impacts to the land, air, water, cultural, biological and visual elements of the environment, as well as other land uses or users. Federal environmental protection acts such as the Clean Water Act, Endangered Species Act and Historic Preservation Act, will be applied to all lands and are included in the standard lease stipulations. If threatened or endangered species, objects of historic, cultural or scientific value, or substantial unanticipated environmental effects are encountered during construction all work affecting the resource or value is stopped and the land management agency is contacted. Operations which would destroy or harm these species or objects are prohibited.

The standard lease terms can be modified by special, or supplemental, stipulations which may be attached to the lease. These supplemental stipulations will be developed to address these concerns that cannot be mitigated by existing stipulations. The amendment to the Forest Plan, Appendix D, will contain both standard and special stipulations which may be applied.

**SCOPING**

Scoping is an integral part of the environmental analysis process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action (36 CFR 1500.7).

Scoping for the TBNG Oil and Gas Leasing EIS began September 10, 1990, with a meeting of concerned groups and agencies in Douglas, Wyoming. On June 14, 1991, a Notice of Intent to Prepare an Environmental Impact Statement on the TBNG Oil and Gas Leasing was published in the Federal Register, Vol. 56, No. 115, pages 27484 and 27486. On June 18, 1991, a news release announcing the preparation of the TBNG Oil and Gas leasing EIS was sent to 96 news papers, 21 radio and 8 television stations in Wyoming and Northern Colorado. On June 19, 1991, a Preliminary Scoping Statement was sent to 1,313 individuals, groups, organizations and agencies. An additional 12 Preliminary Scoping Statements were sent after the initial mailing to individuals requesting one and to Native American groups. There were 31 responses with comments on the Preliminary Scoping Statement and Notice of Intent. Each comment received from the initial scoping effort was published in the Draft Environmental Impact Statement with Forest Service Response to the Comment.

The Draft Environmental Impact Statement was made available for public review on June 4, 1992.Copies of the DEIS were originally sent to 136 individuals, organizations and agencies. An additional 1495 individuals were notified by letter that the DEIS was available. Subsequent to the initial mailing another 45 individuals and groups received copies of the DEIS. The DEIS was distributed to a total of 181 individuals, organizations and agencies. On June 8, 1992, a news release announcing availability of the DEIS and a public meeting to be held June 30, 1992, was sent to 26 news papers (plus Associated Press), 15 radio and 7 television stations in Wyoming and Northern Colorado. On June 18, 1992, a second news release announcing the June 30, 1992, public meeting was sent to 13 newspapers. A Notice of Availability on the DEIS was published in the Federal Register June 19, 1992, Vol. 57, No. 119, page 27480. On June 30, 1992, nine individuals attended the public involvement meeting in Douglas, Wyoming. On July 27, 1992, a news release announcing the extension of the comment period to August 19, 1992, was sent to the same mailing list as the June 8, 1992, news release.
There were 92 responses with comments on the DEIS. Each comment along with a Forest Service response is duplicated in APPENDIX A.

The following significant issues that helped the ID Team develop alternatives, mitigation measures and monitoring requirements were identified:

**Issue 1 - Oil and gas development could affect important cultural resources and native American religious sites.**

**Issue Explanation:** Construction of oil well pads, pipelines, access roads and seismic exploration activities all have the potential to adversely affect significant cultural resources. Fiddleback Ranch and the Walker Teepee Ring sites are significant cultural resources which were specifically mentioned during scoping. There is also concern for other inventoried sites and for yet undiscovered sites which must be protected from oil and gas activities.

**Issue 2 - Oil and gas development could affect riparian areas.**

**Issue Explanation:** Riparian areas on the TBNG are a crucial source of biological diversity within the rangelands. They are a minor portion of the overall area and are generally more productive than the surrounding grassland. Because they do represent a scarce resource on the Grassland, they are critical for biological diversity and should be protected from the impacts of oil and gas development.

**Issue 3 - Oil and gas development could affect threatened or endangered species.**

**Issue Explanation:** Construction of oil well pads, pipelines, access roads and seismic exploration activities all have the potential to adversely affect threatened and endangered species such as the bald eagle, peregrine falcon and black-footed ferret. Increased human activity at the exploration of oil field facilities could also affect these species. There is concern that no adverse impact on these threatened and endangered species be allowed to jeopardize species survival.

**Issue 4 - Oil and gas development could affect prairie dog management.**

**Issue Explanation:** Prairie dog towns occur within several areas on the TBNG. Prairie dogs are a food source for a variety of predators including the endangered black-footed ferret. Hunting prairie dogs is an important recreation activity. Oil and gas activities which reduced prairie dog populations could have deleterious effects on predator populations and recreation.

Because prairie dogs actually prefer disturbed soil, a ground disturbing activity such as some oil and gas developments for example pipelines may increase prairie dog habitat. The corresponding decrease in range forage available for livestock and other wildlife species is a concern. Thus, both increasing and decreasing prairie dog populations is a concern.

**Issue 5 - How will waivers, modifications, and exceptions to lease stipulations be implemented?**

**Issue Explanation:** Stipulations are applied to oil and gas leases to protect other important resource values. Some people are concerned that changing stipulations in any way is inconveniences for those who review the changes or that necessary resource protection may inadvertently be waived. Others are concerned that oil and gas development not be uneas

**Issue 6 - Oil and gas development could modify the visual character of the landscape.**

**Issue Explanation:** The "rapsland is a vast open area with modest topographic relief. The vegetation is largely open grassland. Some tree vegetation occurs in woody draws and on hilltops. The tree density ranges from isolated individuals to small stands. Visual impacts to the landscape such as oil and gas developments are evident for several miles in most instances. There is concern that oil and gas developments will affect the vast open nature of the Grassland. Another concern is that the protection of visual quality would place unreasonable restrictions on oil and gas development.

**Issue 7 - Oil and gas development could affect permanent water sources on the TBNG.**

**Issue Explanation:** All water uses, water quantity and water quality are at issue. Ground water can be affected by drilling between aquifers resulting in the possibility of mixing water from one aquifer with that of another. Migration of salt water or water mixed with oil into aquifers used for potable water is of particular concern. Depending on the quality of water produced by an oil or oil well it could pollute surface waters or be a valuable water source on the arid grasslands.

**Issue 8 - Oil and gas development could affect unique recreation areas such as Rochelle Hills and Upton-Osage area.**

**Issue Explanation:** Oil and gas developments could reduce the quality of the recreation experience in the Rochelle Hills, Upton-Osage and Westen areas. Semi-primitive recreation opportunities could also be lost when roads for oil and gas development are constructed into inventoried semi-primitive motorized areas. Noise and visual impacts of oil and gas developments near areas of concentrated recreation activity such as fishing reservoirs is also of concern. Roads developed for oil and gas improve access for the recreationist, but also cause more disturbance to others and to wildlife.

**Issue 9 - There is concern about maintaining the economic stability of the area.**

**Issue Explanation:** Delays in leasing which result in less oil and gas activity also reduce the economic activity in the affected counties. Rentals, bonuses and royalties paid to the counties and to the Federal Government are also reduced. The combined effect of reduced economic activity and reduced county receipts affects the economic stability of counties in the area.

**Issue 10 - Oil and gas development could affect both game and non-game fish and wildlife and their habitat.**

**Issue Explanation:** Activities related to oil and gas exploration and development may have deleterious affects on wildlife and key habitat areas. Species of particular concern include, but are not limited to, elk, mule deer, whitetailed deer, pronghorn, sharp-tailed grouse, sage grouse, black-tailed prairie dog, golden eagle, ferruginous hawk and Swanson's hawk. Oil and gas activities can affect nesting areas, breeding areas, feeding areas, crucial winter ranges and security areas.

**Issue 11 - Availability of federal lands for oil and gas leasing affects industry decisions to lease and develop intermingled state and private lands.**
CHAPTER II
ALTERNATIVES

The National Environmental Policy Act (NEPA) regulations (40 CFR 1502.14) require rigorous exploration and objective evaluation of all reasonable alternatives including those not within the jurisdiction of the agency.

Federal agencies are also required to include and discuss appropriate measures to mitigate adverse environmental impacts that would result from implementing a proposed action.

This chapter examines a range of alternatives with different environmental impacts and protection measures. The alternatives were developed in response to the issues and to present a broad range of alternatives for analysis, as required under NEPA. Although different in many respects, all of the action alternatives contain some common features. These are presented first to reduce the length and redundancy of later descriptions of the individual alternatives.

The environmental consequences of each alternative based on the projected RFD are discussed in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, of this EIS.

ALTERNATIVES 5 and 6, if selected, would require a significant amendment to the Forest Plan. The Forest Service’s preferred alternative is ALTERNATIVE 7, which is changed from the draft EIS. ALTERNATIVE 4 was the preferred alternative in the DEIS.

SUMMARY OF CHANGES BETWEEN THE DRAFT AND FINAL EIS

In response to public comment on the DEIS, improved inventory information, and for clarity, the following changes have been made in CHAPTER II of the FEIS.

Because of public comment, the FEATURES COMMON AMONG ALL ALTERNATIVES section has been expanded to include discussions on:

- Water resource protection.
- Riparian, wetland and floodplain resource protection.
- Threatened and endangered species management.

Because of a change in the type of traffic using Highway 16 between Newcastle and Gillette, resulting in a change in the established Visual Quality Objective to modification, the Controlled Surface Use stipulation for Visual Quality has been deleted from the FEATURES COMMON AMONG ALL ALTERNATIVES section.

In response to public comment, the Recreation Opportunity Spectrum Inventory for the Thunder Basin National Grassland was reviewed. As a result of new information, minor boundary adjustments have been made to some of the inventoried semi-primitive motorized areas. Additionally, the area known as Downs, was reclassified from semi-primitive motorized to roaded natural because
of a constructed road biecting the area. These changes are reflected in the descriptions of ALTERNATIVES 3 and 4.

In response to new Forest Service direction and to public comment, a biological diversity assessment was conducted during the period between the draft EIS and final EIS. ALTERNATIVE 7 has been added in response to the new biological diversity issue.

A discussion of the new biological diversity, leave 14, has been added to the COMPARISON OF ALTERNATIVES section.

The Wyoming Department of Game and Fish, in their comment on the DEIS, expressed concern that golden eagles were not provided the same protection as other raptors. In response to their comment, ALTERNATIVE 7 considers adding golden eagle to the Indicator Species CSU stipulation, protecting nests, anytime, from any activities within 300 feet.

FEATURES COMMON AMONG ALL ALTERNATIVES

The Effects of Ownership Patterns

The ownership of lands and minerals within the Thunder Basin National Grassland study area boundary is shared. Surface ownership within the EIS study area boundary is approximately 1/3 federal and 2/3 non-federal (state and private). Mineral ownership, specifically relating to oil and gas, is approximately 2/3 federal and 1/3 non-federal (see CHAPTER I, PURPOSE AND NEED, LANDS INVOLVED). This can result in some confusion in public interpretation of the Forest Service’s control over activities within the study area. The Forest Service has administrative control over activities on federal surface only.

Federal management control varies between federal and non-federal ownership. Activities on non-federal surface that result from federal oil and gas leases can be managed, to some extent, by the BLM. Such leases can be offered with special restrictions, guidelines or stipulations that would apply to the leased oil and gas operations, and the potential lease purchaser would have to agree to abide by the federal lease guideline prior to issuance. In cases of split estates, where the mineral rights are non-federal and the surface is federal and managed by the Forest Service, the Forest Service must allow access to those minerals irrespective of surface resources. The BLM would issue leases on split-estate lands (private surface with federal minerals) under their authorities and procedures. As a general rule, the Forest Service does not have authority to deny the exercise of an outstanding mineral right (FSM 2300.1). It is important to point out that not all areas within the EIS study area boundary are included in the EIS analysis (see CHAPTER I, LANDS INVOLVED).

It is projected that there will be less than 20 wells drilled on federal surface per year and perhaps less than 10 (see APPENDIX C, REASONABLY FORESEEABLE DEVELOPMENT SCENARIO). This projection was based on past activity on the TBNG under the approved Forest Plan, and therefore, could obviously approximate the development scenario for ALTERNATIVE 2. As with any projections, actual future occurrences may deviate from the projected numbers. These projections are based on the best available information as explained in APPENDIX C.

Within the EIS study area, as a result of the interspersed ownership pattern, there will always be a potential for oil and gas development activity. There will continue to be only limited federal management authority of oil and gas development on non-federal minerals. Therefore, the terms of the leases issued by the BLM and the Forest Service authorization form the basis of each of the alternatives.

The various degrees of federal management control under each of the alternatives results in shifts in the projected locations of the wells. Bear in mind that this analysis is on federal surface with federal oil and gas. The more restrictive the controls on federally leased oil and gas development, the more wells will be located on non-federal surface and non-federal minerals. This is because federal restrictions can increase the cost of operations to the point where federal mineral leases become less attractive to the potential operator. Under No New Leasing, ALTERNATIVE 5, which would basically preclude any new development in all currently non-leased areas, and in other areas as leases expire, there is the greatest number of wells on non-federal surface and non-federal minerals. If the no new leasing alternative were to continue indefinitely into the future, the end result would be no oil and gas activity on federal surface with federal minerals. All wells in the EIS study area, under this alternative, would eventually be on non-federal surface and basically outside the control of the Forest Service.

Water Laws and Regulations

Comments on the DEIS revealed that additional information was needed on the relationship of water laws and regulations to oil and gas leasing. Several federal and state laws and regulations direct the protection of water and its associated resources in Wyoming. Compliance with laws and regulations is mandatory for all oil and gas activities, is required by standard lease terms and applies to each alternative under consideration.

In accordance with Section 97-8-001 of the Wyoming Constitution, all natural waters (surface and ground) in Wyoming are property of the State. Federal and state laws lay the foundation on which the Wyoming Department of Environmental Quality (DEQ), Water Quality Division, manages the quality of water in Wyoming. Protection of water quality in Wyoming from point and nonpoint sources of pollution is mandated through the Clean Water Act of 1977 and its 1987 amendment (federal law), and Wyoming Statutes 35-11-301 through 311 (state law). Water quality standards established by the Wyoming DEQ, Water Quality Rules and Regulations (Chapter II), must be maintained during oil and gas operations. A Memorandum of Understanding between the Forest Service and Wyoming DEQ (1985), assigns responsibility to the Forest Service to maintain water quality on National Forests in Wyoming. As a consequence, the Medicine Bow National Forest Land and Resource Management Plan (page III-53) requires that water quality on the Forest meet or exceed State standards.

According to the Memorandum of Understanding between the Forest Service and Wyoming DEQ (1985), monitoring non-point source pollution is the responsibility of the Forest Service. In some instances, installation of monitoring systems may be required of the operator under provisions of the Wyoming Oil and Gas Conservation Commission Rules and Regulations. Point source pollution is monitored by the Wyoming Department of Environmental Quality under National Pollutant Discharge Elimination System permit (provisions for self monitoring by the permittee are contained in Chapter VII of the Water Quality Rules and Regulations, Wyoming, DEQ, 1978).

Water quantity and beneficial uses of water in Wyoming are regulated by the State Engineer under authority of Article 8 of the State Constitution (Section 97-8-005). Any water quantity change, and its cumulative effect on streams and groundwaters, would be regulated by Forest Directive in the Medicine Bow National Forest Land and Resource Management Plan (page III-53).

Groundwater in Wyoming is regulated by the State Engineer under authority of Sections 41-121 through 147, Wyoming Statutes 1957, as amended by Chapter 213, Session Laws of Wyoming 1960, and Chapter 171, Session Laws of Wyoming 1973. Quality of groundwater, as outlined in Wyoming DEQ Water Quality, Rules and Regulations (Chapter VIII) must be maintained on the Grassland. Section III of the Rules and Regulations of Wyoming Oil and Gas Conservation Commi-
sion detailed operational and drilling procedures that minimize damage to groundwater. These procedures apply to all oil and gas operations in Wyoming. Federal requirements for oil well operators are found in 43 CFR 3182 and Onshore Order Number 1. These requirements apply to all operators on federal leases. Procedures to protect surface water and groundwater resources during the operations and drilling phases of oil and gas development have been established by Rules and Regulations of the Wyoming Oil and Gas Conservation Commission (Section 3). All operators of oil and gas wells within Wyoming are subject to the rules and regulations pertaining to drilling, production and well abandonment activities. Additional protection to water quality is provided in the Wyoming Nonpoint Source Management Plan, (Draft) 1989, Best Management Practices (BMPs). The BMPs have been approved by the Environmental Protection Agency.

Riparian, Wetlands, and Floodplains Comments on the DEIS revealed that additional information was needed on the management of riparian areas, wetlands, and floodplains relative to oil and gas leasing. Floodplain management is directed on the federal level by Executive Order 11988. This mandates the protection of the special qualities of floodplains and limits human development in these areas. Wetlands and associated values are protected under Executive Order 11990. This provision states that long and short term adverse impacts to wetlands should be avoided. Wyoming DEQ Water Quality Rules and Regulations further protect naturally occurring Wyoming wetlands from destruction, damage or impairment by point or nonpoint sources of pollution. Forest Service policy for floodplains and wetlands, when under-taking federal actions on federal lands, is described in FSM 2527. Forest Service Manual 2525.03 requires the protection of riparian areas on federal lands, in relation to legal mandates on floodplains and wetlands. Specific standards and guidelines to protect and manage development in riparian areas are directed by the Medicine Bow National Forest Land and Resource Management Plan (pages III-213 through 215).

The Forest Service is required to identify the general location of floodplains and wetlands on National Forest System Lands during the land and resource planning process. To fulfill this direction, the Forest Service obtained wetland maps from the U.S. Fish and Wildlife Service (USFWS) through their National Wetland Inventory and conducted a broader mapping exercise for riparian and floodplains through a cooperative agreement with Cooperative Extension at the University of Wyoming. Floodplains at least 200 feet wide were mapped (scale = 1:24,000). Both riparian vegetation (USFWS) and wetlands (USFWS) have been mapped using 1:58,000 color infra-red photos and transferred to either 1:24,000 or 1:62,500 scale. U.S. Fish and Wildlife Service wetland maps are considered to have mapping resolution near 1 acre on the 1:24,000 quadrangles. Riparian mapping resolution is believed to be similar to that of the National Wetland Inventory. Some ground-truthing of the riparian mapping was conducted by graduate students from the University of Wyoming in the fall of 1991. All maps are available at the Forest Supervisors Office in Laramie, Wyoming.

Riparian areas, as defined by the Forest Plan, consist of the riparian ecosystem (as determined by distinct vegetation), aquatic ecosystem, and wetlands. Special attention is also given to land and vegetation for at least 100 feet from the edge of all perennial streams, lakes, and other water bodies (Forest Plan III-205). Riparian areas will be managed according to all legal mandates including, but not limited to, those associated with floodplains (Executive Order 11988), wetlands (Executive Order 11990), water quality (Section 401 and 402 of the Clean Water Act and the Wyoming Environmental Quality Act (W.S. 35-11-101 through 1304, specifically Article 3, Sections 35-11-301 and 35-11-302), and dredge and fill material (Section 404 of the Clean Water Act). Standards and Guidelines for protection of floodplains, wetlands and riparian areas are found on pages III-213 through III-218 of the Forest Plan.

Threatened and Endangered Species Comments on the DEIS revealed that additional information was needed on the management of threatened and endangered species relative to oil and gas leasing. Standard lease terms subject all lease rights granted to “applicable laws,” effectively incorporating the requirements of the Endangered Species Act of 1973 into all federal leases (applicable to all leasing alternatives).

In accordance with the Endangered Species Act of 1973, as amended, interagency cooperation (Section 7 of the Act) requires the Forest Service, as the agency proposing an action, to consult with the Fish and Wildlife Service and obtain a listing of threatened or endangered species to be considered in a Biological Assessment. This consultation was completed by letter from the Fish and Wildlife Service dated March 12, 1992.

A Biological Assessment was prepared and submitted to the FWS on May 29, 1992. The Biological Assessment concluded that oil and gas leasing on the Thunder Basin National Grassland was not likely to adversely affect threatened or endangered species. On September 23, 1992, the FWS concurred with conditions on implementing conservation measures on black-footed ferret habitat (see APPENDIX A, COMMENT #2).

Habitat management for potential re-introduction areas for the endangered black-footed ferret was a specific concern of the FWS. The black-footed ferret is listed in the Forest Plan, General Direction (page III-29) as a Recovery Species, discretely for the Grassland. General Direction (page III-30) (0600) provides for the Forest Service to “manage and provide habitat for recovery of endangered and threatened species.”

Should known populations of black-footed ferret (either fortuitously found, or introduced) become present in potential oil and gas development areas, input to the Surface Use Plan of Operations (required by 36 CFR 228.106) at the Application for Permit to Drill stage of development would be utilized to customize surface operations to be compatible with ferret habitat occupancy. The following are examples of conservation measures that would be applied:

1. To minimize raptor predation on black-footed ferrets, powerlines will be buried or power poles designed to preclude their use as hunting perches by raptor species such as great horned owls, ferruginous hawks, and golden eagles.
2. Night traffic will be minimized to reduce the possibility of vehicular mortality to black-footed ferrets.
3. Operators, contractors, and employees will be prohibited from taking dogs into the area to minimize contact with canine disperser.
4. To minimize raptor predation on black-footed ferrets, dry hole markers will be placed below the surface of the ground to preclude their use as hunting perches by raptor species.

Cultural Resources Comments on the DEIS revealed that additional information was needed on the management of cultural resources relative to oil and gas leasing. Standard lease terms subject all lease rights granted to “applicable laws,” effectively incorporating the requirements of the National Historic Preservation Act of 1966 into all federal leases (applicable to all leasing alternatives). Standard Lease Terms (Sec. 6) require the Lessee to conduct operations “in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources.”
Prior to disturbing the surface of the land, a Cultural Resource Inventory will be required, and under the provisions of Standard Lease Terms (Sec. 8), "Lessee may be required to complete minor inventories or short term special studies. Historic and cultural resources will be evaluated in accordance with Section 106 of the National Historic Preservation Act of 1966. If they are found to be historically significant, they will be protected."

Management Controls on Existing Federal Leases

Under all alternatives, existing federal leases cannot be changed to meet new requirements without the consent of the lessee. Leases held by production are governed by the terms of the lease at the time the lease was drilled, and these terms vary widely across the Grassland. As existing leases expire and are re-offered, the new lease will contain the minimum criteria established for the selected alternative. The management controls described under each alternative, as well as any additional mitigation measures, will be applied to new leases only.

Management Controls Available for New Leases

The terms of the lease are, in effect, management controls over the oil and gas activities resulting from the lease. The following information includes a description of the standard lease terms that would apply to all new leases (ALTERNATIVES 1, 2, 3, 4, 6, and 7). The supplemental stipulations described below are in addition to the standard lease terms (stipulations) and would apply to specific mapped areas in ALTERNATIVES 1, 2, 3, 4 and 7. The areas mapped for stipulations are discussed in the section entitled "ALTERNATIVE DESCRIPTIONS" in this chapter. Maps for areas with special stipulations are included in APPENDIX H.

Standard Lease Terms

Operations under standard lease terms are subject to certain constraints that may not be required of operators on non-federal minerals. Under standard lease terms, the lessee is required to conduct oil and gas 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. The federal lessor has the authority to require modifications in the siting and design of facilities, control the rate of development and the timing of activities, as well as to require other mitigation measures to protect threatened and endangered species or objects of historic or scientific interest. Under standard lease terms, the federal lessor can require relocation of proposed operations by up to 200 meters, prohibit new surface disturbing operations for up to a 90 day period in one lease year, and specify interim and final reclamation measures (43 CFR 3101.1-2).

Use of Specific Lease Stipulations to Protect Known Resources

A stipulation is a provision that modifies standard lease rights and is attached to, and made a part of, the lease. The Forest Plan applies constraints to all management activities. Stipulations required to meet Forest Plan constraints are described below by the category of lease stipulation. The stipulations associated with each constraint are in accordance with the Uniform Format for Oil and Gas Leasing Stipulations, as standardized March, 1989, by the Rocky Mountain Regional Coordinating Committee and adopted for nationwide use by the Chief of the Forest Service on May 31, 1989, (2620) letter by Larry D. Hanson, Associate Deputy Chief. These stipulations apply to ALTERNATIVES 1, 2, 3, 4 and 7. ALTERNATIVES 6 and 9 have no special stipulations. Details on supplemental stipulations for each alternative may be found in APPENDIX D.

Controlled Surface Use Stipulation

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 resource concerns or values, lease activities must be strictly controlled and/or modified. Under ALTERNATIVES 1, 2, 3, 4 and 7, CSU stipulations would be applied for the following constraints:

Riparian Areas, Wetlands and Floodplains - Riparian zones can vary considerably in size and vegetation complexity. General characteristics common to all riparian areas include the following:
1) they create well-defined habitat zones within the much drier surrounding areas;
2) they make up a minor portion of the overall area and are generally much more productive for both plant and animal life than the remainder of the area; and
3) they are a critical source of diversity within rangelands.

Standard lease terms permit the Forest Service to move proposed oil and gas operations 200 meters. Since riparian areas on TBNG are primarily linear, along stream courses, and less than 200 meters in width, most riparian areas are protected with standard lease terms (oil and gas activities would be moved out of riparian areas at the APD stage of development by application of standard lease terms). Riparian areas wider than 400 meters or where linear disturbances (eg, roads, pipelines, etc.) occur that cannot be avoided with standard lease terms, require protection with a CSU stipulation.

Unstable Soils on Steep Slopes - Mass wasting, defined as dislodgement and downslope transport of soil and rock material under gravitational stresses, is a potential in some areas of the Grassland. Areas where mass soil-movement could be triggered by disturbance, either natural or man caused, have been mapped on 1:24,000 scale maps on file in the Forest Supervisors Office in Laramie, Wyoming.

Standards and guidelines for Soil Resource Management are defined in the Forest Plan pages 74 thru 76. A CSU stipulation is applied to protect areas of mass soil movement potential.

Neat sites - In accordance with standards and guidelines for management indicator species as defined in the Forest Plan page 31 and 32, a CSU stipulation is applied which limits activities anytime, if they would cause nest abandonment, unless specific practices are successfully implemented to maintain or increase nesting opportunities at other sites.

| Table 2-1 WILDLIFE CONTROLLED SURFACE USE LIMITATIONS FROM THE FOREST PLAN STANDARDS AND GUIDELINES |
| Species | Purpose | Area |
| Bald Eagle or Peregrine Falcon | Nest Site | 1/2 mile from nest |
| Ferruginous Hawk, Swainson's Hawk, Goshawk, Osprey or Prairie Falcon | Nest Site | 300 feet (91.5 meters) from nest |

Note: For clarification, ALTERNATIVE 7, in addition to Forest Plan Standards and Guidelines, applies a limitation on activities within 300 feet of a golden eagle nest, anytime, if they would cause nest abandonment, unless specific practices are successfully implemented to maintain or increase nesting opportunities at other sites.
Breeding sites - In accordance with standards and guidelines to protect grouse breeding sites (lek) as defined in the Forest Plan page III-32, a CSU stipulation is applied which limits activities within one quarter mile of a Sage Grouse or Sharp-tailed Grouse lek site at anytime if they would cause abandonment of the lek, unless specific practices are successfully implemented to maintain or increase the existing habitat capability for grouse.

**Timing Limitations stipulation**

Timing Limitation Stipulations prohibit oil and gas exploration and development activities for specific time periods, but for less than a year. There are usually seasonal restrictions related to activities that contaminate key wildlife habitats needed in a certain area over a specific time period. A timing stipulation is not necessary if the time limitation involves the prohibition of new surface disturbing operations for a period of less than 60 days (see Standard Lease Terms above). Under ALTERNATIVES 1, 2, 3, 4 and 5, timing stipulations would be applied for the following constraints:

**Critical Timing Periods for Wildlife** - Management indicator species on the Thunder Basin National Grassland are listed in the Forest Plan on page III-30. Standards and guidelines for managing habitat for indicator species are listed on pages III-31 thru III-36. Timing Limitation Stipulations are necessary to implement the Forest Plan Standards and Guidelines for the following:

| Table 2-2 TIMING LIMITATIONS FROM THE FOREST PLAN STANDARDS AND GUIDELINES |
|-----------------------------|-----------------|------------------|
| Species                     | Purpose         | Area             | Timing Restriction |
| Bald Eagle or Peregrine Falcon | Nest Site       | 1 mile from nest | February 1 to July 31 |
| Bald Eagle or Peregrine Falcon | Roost Site      | 1 mile from roost | November 1 to April 1 |
| Golden Eagle                | Nest Site       | 1/4 mile from nest | February 1 to July 31 |
| Ferrugious Hawk, Swainson's Hawk, Gosnold, Orsay or Prairie Falcon | Nest Site | 1/4 mile from nest | March 1 to July 31 |
| Mountain Rockeries           | 1/4 mile from the | March 1 to July 31 |
| Plower Rockery               |                 |                  |

No Surface Occupancy Stipulation

The No Surface Occupancy (NSO) stipulation is intended for use only when other stipulations are determined insufficient to adequately protect the public interest. A NSO stipulation is not needed if the desired protection would not require relocation of proposed operations by more than 200 meters or timing restriction of more than 60 days (see Standard Lease Terms above). Under ALTERNATIVES 1, 2, 3, 4 and 7, the NSO stipulation would be applied to the following:

Culturally and Historically Significant Areas - The 320 acre Walker Tepee Ring site is eligible for nomination to the National Register of Historic Places, has unique scientific research potential, and is an excellent candidate for an interpretative project. This site will be protected by the NSO stipulation under ALTERNATIVES 1, 2, 3, 4 and 7.

**Lease Notice**

A lease notice is designed to be used when a condition exists that may require unusual measures of the lessee under Standard Lease Terms and the managing agency desires to give notice with the lease of such an condition.

**Baseline Water Quality Monitoring** - Limited baseline information regarding water resources is available on the Thunder Basin National Grassland. No activity will be approved that will violate the Clean Water Act of 1972, as amended, and associated federal and state regulations. In order to assure protection and antidegradation of water quality, the lessee may be required to collect baseline information for any surface or subsurface waters that could be adversely affected. This Lease Notice will be applied to all new leases in all leasing ALTERNATIVES 1, 2, 3, 4, 6, and 7.

**Waivers, Exceptions and Modifications to the Stipulations**

For alternatives with special stipulations (ALTERNATIVES 1, 2, 3, 4 and 7), waivers, exceptions, or modifications to the stipulation may be approved in accordance with 36 CFR 228.104. Approval is subject to: 1) a change in the circumstances or relative resource values; 2) demonstration by the lessee that operations can be conducted without causing unacceptable impacts; and 3) that less restrictive stipulations will protect the public interest. Waivers, exceptions or modifications can only be granted by the authorized officer following appropriate NEPA analysis. If the waiver, exception or modification is inconsistent with the Forest Plan, that Plan must be amended as necessary, or the change disabled.

**Areas Excluded from Further Study**

The area analyzed for this study is only the lands with federal surface within the boundaries of the Thunder Basin National Grassland study area (572,224 acres). The Forest Service decision will apply only to lands with federal surface and with federal oil and gas (520,000 acres). Federal minerals under non-federal surface are managed by the BLM under their authorities and procedures. There are no wilderness areas, wilderness study areas, or other special areas within the TNBG withdrawn from mineral development through legislative action or a formal withdrawal process.

**Monitoring Features Common Among All Alternatives**

Monitoring for oil and gas activities on both federal and non-federal lands are conducted under the authority of the State of Wyoming, Oil and Gas Conservation Commission. Section 6 of the Standard Lease Terms directs the lessee to minimize adverse impacts to the land, air, water, cultural, biological, visual and other resources. The lessee is required to take reasonable measures deemed necessary (including monitoring) by the Federal Government to protect the resources. Production related activity is monitored by the BLM.

There are a variety of monitoring features that would be common among all the alternatives for oil and gas activities under the management authority of the Forest Service and the BLM. The permitting processes for oil and gas operations, including the construction of new roads, are described in CHAPTER 1, OIL AND GAS LEASING. The review necessary for approval of these permits will serve as effective initial monitors of oil and gas activity that results from the final decision on this EIS. Additionally, the Forest Plan specifies monitoring criteria for various issues (Forest Plan pages IV-1 to IV-67), including compliance with terms of operating plans for minerals and consistency with the Forest Plan. Where applicable, these monitoring criteria and methods would be applied. Items that will be specifically monitored are listed at the end of CHAPTER 4.
ALTERNATIVE DESCRIPTIONS

Each alternative must address the basic actions required by the proposed action as described in CHAPTER I. DECISIONS TO BE MADE. Specifically, each alternative must make a determination of:

1. Lands administratively available for oil and gas leasing.

2. Specific lease stipulations to be applied to administratively available lands that the BLM is authorized to offer for lease (see CHAPTER I, PURPOSE AND NEED, LANDS INVOLVED).

3. Amendment to the Land and Resource Management Plan.

The following alternatives have been developed for consideration in the Oil and Gas Leasing Environmental Impact Statement for the Thunder Basin National Grassland from the issues identified by the Forest Service ID Team and from the purpose and need identified in CHAPTER I.

ALTERNATIVE 1 - Leasing consistent with the Forest Plan (No Action).

The National Environmental Policy Act requires us to study the No Action alternative in detail and use it as a baseline for comparing the effects of the other alternatives.

Under this alternative, the Forest Service would continue current management for oil and gas leasing on NFS lands with federal minerals. The entire Thunder Basin National Grassland would be available for oil and gas leasing in accordance with the approved Forest Plan. This is a "No Action Alternative" because there would be no deviation from the existing management direction in the Forest Plan.

Recreation would be managed in accordance with the Forest Plan Standards and Guidelines.

Site specific environmental analysis (NEPA compliance) would be conducted on a case-by-case basis, as lease applications are received.

The EIS would fulfill the requirements of NEPA and the Oil and Gas regulations for full disclosure of lands available to be leased and cumulative environmental effects from a projected RFD.

In addition to the supplemental stipulations described in the FEATURES COMMON AMONG ALL ALTERNATIVES section above, the following stipulation will be applied:

Crucial Winter Range - Crucial winter range is defined as that range or habitat component which has been documented as the determining factor in a population's ability to maintain itself at or above objective, eight out of ten years. Approximately 4,600 acres north of Upton, Wyoming, have been identified as crucial winter range for deer. This 4,600 acres has been identified in the Forest Plan as Management Area 5, Emphasis on Big Game Winter Range. Forest Plan Standards and Guidelines page III-148, standard (0792), for this area suggest a No Surface Occupancy stipulation to prevent road construction.

In accordance with standards and guidelines, ALTERNATIVE 1 applies a No Surface Occupancy stipulation to 4,600 acres of crucial winter range for deer (north of Osage, Wyoming).

When a new lease parcel is proposed, that parcel would undergo a site specific environmental analysis as required by NEPA. The analysis would determine if development can be allowed somewhere on the parcel, and what stipulations are necessary to protect resource values and ensure consistency with the Forest Plan. The Forest Supervisor would authorize the Bureau of Land Management to offer the parcel for lease, subject to stipulations deemed necessary to protect the environment and ensure Forest Plan consistency. To evaluate effects of this alternative, the assumption is made that site specific environmental analysis has been accomplished on the lease parcels and leases issued subject to supplemental stipulations (the same as ALTERNATIVE 2). However, due to the time required to make and document the site specific environmental analysis, leasing costs would be substantially higher for ALTERNATIVE 1 than for ALTERNATIVE 2 (see CHAPTER IV. ECONOMIC FACTORS).

A Forest Plan amendment is not required to implement this alternative. Supplemental stipulations currently in Forest Plan Appendix D would be used. These stipulations are not consistent with the Uniform Format for Oil and Gas Lease Stipulations, March 1989.

ALTERNATIVE 2 - Leasing with standard and special stipulations, consistent with the Forest Plan.

The difference between ALTERNATIVE 1 and ALTERNATIVE 2 is primarily in administrative processes. This alternative allows the Forest Service to make the availability determination and disclose the total effects of anticipated development in one document. ALTERNATIVE 1 provides for the analysis and documentation of the total effects of individual leases only on a site specific case-by-case basis, as lease applications are received.

Under this alternative, leasing would be consistent with existing Forest Plan Standards and Guidelines. The entire Thunder Basin National Grassland would be available for oil and gas leasing, consistent with the approved Forest Plan. Supplemental lease stipulations would be designed to implement the Forest Plan Standards and Guidelines and to assure protection of critical resources. The value of the critical resources may be based on social or environmental issues.

This alternative discloses lease stipulations for any parcel prior to lease advertisement and sale, allowing lease boundaries to be located according to resource needs. This would also allow lessees to better propose well locations on APO's, to maximize development opportunities and minimize resource impacts.

Recreation would be managed in accordance with the Forest Plan Standards and Guidelines.

This alternative is in conformance with the requirements of the Leasing Reform Act and the Forest Service Oil and Gas Regulations.

Lands available for leasing with standard and with supplemental stipulations are identified on maps in APPENDIX H.

The supplemental stipulations and the justification for each stipulation can be found in APPENDIX D.

The environmental consequences, as a result of the Reasonably Foreseeable Development Scenarios (APPENDIX C) for all the alternatives, are fully disclosed in this EIS (required NEPA compliance).

The lands available for leasing under this alternative are identified as the entire Thunder Basin National Grassland.
In addition to the supplemental stipulations described in the_FEATURES COMMON AMONG ALL_ALTERNATIVES_section above, the same as in ALTERNATIVE 1, the following stipulation would be applied:

**Crucial Winter Range** - In accordance with standards and guidelines for Management Area 5, emphasis on Big Game Winter range as described in the Forest Plan pages III-143 thru III-149, a No Surface Occupancy stipulation will be applied to 4,600 acres of crucial winter range for deer (north of Osage, Wyoming).

The implementation of ALTERNATIVE 2 would require a Forest Plan amendment. The Forest Plan Appendix D, Standard and Special Stipulations for Mineral Leasing would be updated using the Uniform Format for Oil and Gas Lease Stipulations, March 1989. The proposed Forest Plan amendment is not significant and proposed stipulations are included in APPENDIX D to this EIS.

**ALTERNATIVE 3 - Leasing with standard and special stipulations, recreation emphasis.**

This alternative is designed to respond to the concern that sensitive recreation areas be protected from oil and gas developments. This is accomplished by applying a Controlled Surface Use stipulation to five reservoirs with identified fishing potential, and a No Surface Occupancy stipulation to three inventoried semi-primitive motorized recreation areas.

As in ALTERNATIVE 2, the entire Thunder Basin National Grassland would be available for oil and gas leasing, consistent with the approved Forest Plan. ALTERNATIVE 3 is also similar to ALTERNATIVE 2, in that it discloses lease stipulations for any parcel prior to lease advertisement.

This alternative is in conformance with the requirements of the Leasing Reform Act and the Forest Service Oil and Gas Regulations, the same as ALTERNATIVE 2.

In addition to the supplemental stipulations described in the_FEATURES COMMON AMONG ALL_ALTERNATIVES_section above, ALTERNATIVE 3 would apply the following stipulations:

**Controlled Surface Use Stipulations**

**Recreation** - Viable fisheries are a scarce resource on the TBNG. The Forest Service, in cooperation with the Wyoming Game and Fish Department, has identified five reservoirs which have the potential to provide a quality fishing experience. The constant noise from oil and gas production facilities has the potential to degrade the fishing experience at these five reservoirs. ALTERNATIVE 3 would apply a CSU stipulation to ensure noise from oil and gas production facilities does not exceed 70 decibels at 400 meters from the high water mark (see APPENDIX D).

**Crucial Winter Range** - 4,600 acres have been identified in the Forest Plan as Management Area 5, emphasis on Big Game Winter Range. Forest Plan Standards and Guidelines page III-148, standard (0782), for this area suggest a No Surface Occupancy stipulation as in ALTERNATIVES 1 and 2, primarily to prevent road construction. Discussions with the Wyoming Game and Fish have revealed that a NSO stipulation may be too restrictive. ALTERNATIVE 3 considers applying both a Timing Limitation and a Controlled Surface Use stipulation to allow oil and gas development under controlled conditions (see APPENDIX D) in the Upton-Osage deer winter range:

**Timing Limitation**

**Crucial Winter Range** - As described above under Crucial Winter Range, ALTERNATIVE 3 would apply both a Timing Limitation and a Controlled Surface Use stipulation to the Upton-Osage deer winter range.

---

**No Surface Occupancy**

Recreation - One of the primary effects on recreation by oil and gas developments is the change of the Recreation Opportunity Spectrum (ROS) class. When oil and gas development occurs in primitive and semi-primitive settings, these settings are converted to roaded natural and, depending on the level of development, perhaps even rural. In this alternative, a NSO stipulation is applied to prevent surface disturbing oil and gas activities in inventoried semi-primitive motorized areas, with low to moderate oil and gas development potential (see ALTERNATIVE 3 map in APPENDIX H). ALTERNATIVE 3 protects three of four inventoried semi-primitive motorized recreation areas on the TBNG, a total of 19,850 acres, with NSO. These three areas are the Dugout (3,050 acres), Miller Hills (9,280 acres) and Cow Creek Buttes (6,640 acres). This is in addition to the NSO applied in all leasing alternatives to the Walker Tepee Ring (320 acres).

The implementation of ALTERNATIVE 3 would require a Forest Plan amendment. The Forest Plan Appendix D, Standard and Special Stipulations for Mineral Leasing, would be updated using the Uniform Format for Oil and Gas Lease Stipulations, March 1989. In addition, Forest Plan Standards and Guidelines would have to be amended to permit oil and gas activities in Management Area 5A. Emphasis on Big Game Winter Range, with the CSU and Timing stipulations rather than the NSO stipulation as in ALTERNATIVES 1 and 2. The proposed Forest Plan amendment is not significant, and proposed stipulations are included in APPENDIX D to this EIS.

**ALTERNATIVE 4 - Leasing with standard and special stipulations, greater recreation emphasis.**

Like ALTERNATIVE 3, ALTERNATIVE 4 is designed to respond to the concern that sensitive recreation areas be protected from oil and gas developments; however, ALTERNATIVE 4 provides additional protection to recreation resources. Under ALTERNATIVE 4, all inventoried semi-primitive motorized areas are protected from surface disturbing oil and gas activities by NSO stipulation (four areas in ALTERNATIVE 4 as opposed to three areas in ALTERNATIVE 3). In addition, a CSU stipulation is applied to two roaded natural areas with unique recreation values (Rochelle Hills and Upton Osage). Fishing reservoirs and crucial winter range are protected the same as in ALTERNATIVE 3.

ALTERNATIVE 4 is similar to ALTERNATIVES 1, 2, and 3, in that:

The entire Thunder Basin National Grassland would be available for oil and gas leasing consistent with the approved Forest Plan.

Stipulations for any parcel are disclosed prior to lease advertisement.

This alternative is in conformance with the requirements of the Leasing Reform Act and the Forest Service Oil and Gas Regulations.

In addition to the supplemental stipulations described in the_FEATURES COMMON AMONG ALL_ALTERNATIVES_section above, ALTERNATIVE 4 would apply the following stipulations:

**Controlled Surface Use Stipulations**

Recreation - Scoping identified three unique recreation areas, Rochelle Hills, Upton Osage, and Weston. Two of these areas, Rochelle Hills and Upton Osage, are in the Roaded Natural Recreation Opportunity Spectrum (ROS) class. The effect of oil and gas development on roaded natural settings would be to move the setting toward the more developed end of the ROS spectrum. A change in ROS class from Roaded Natural to Rural (one ROS class) would require extensive oil and gas development; however, developments which were not enough to cause a change in the ROS class could still be permitted by a recreation user. ALTER-
ALTERNATIVE 4 applies a CSU stipulation (see APPENDIX D) intended to maintain the Roaveled Natural character of the Rochelle Hills and Upton-Osage areas (41,245 acres).

Weston is another name for the Spring Creek area north of Gillette. A portion of the Weston area is inventoried semi-primitive motorized ROs class (Duck Creek) and is protected with a NSO stipulation described below.

Recreation - ALTERNATIVE 4 applies a CSU stipulation to protect the fishing experience at five reservoirs, the same as ALTERNATIVE 3.

Crucial Winter Range - ALTERNATIVE 4 applies a CSU stipulation to protect crucial winter range for deer, the same as ALTERNATIVE 3.

Timing Limitation

Crucial Winter Range - ALTERNATIVE 4 applies a Timing stipulation to protect crucial winter range for deer, the same as ALTERNATIVE 3.

No Surface Occupancy

Recreation - ALTERNATIVE 4 applies a NSO stipulation to four inventoried semi-primitive motorized recreation areas on the TBLG for a total of 27,820 acres. The stipulation is the same as in ALTERNATIVE 3 applied to three areas, totaling 19,850 acres, with moderate to low development potential. The difference is one area in the Spring Creek Unit (Duck Creek, 7,970 acres) with a high oil and gas development potential. This is in addition to the NSO applied to the Walker Teppe Ring (260 acres) in all leasing alternatives.

The implementation of ALTERNATIVE 4 would require a Forest Plan amendment, the same as ALTERNATIVE 3, except that one additional stipulation would be applied to protect recreation resources in the Upton-Osage and Rochelle Hills areas. The proposed Forest Plan amendment is not significant, and proposed stipulations are included in APPENDIX D to this EIS.

ALTERNATIVE 5 - No new leasing of National Forest System lands.

The Oil and Gas Regulations require the Forest Service to analyze potential impacts from post-lease activities as a result of the projected Reasonably Foreseeable Development Scenario (RFD) on the Forest. The Regulations require that one of the alternatives to be analyzed is "that of not allowing leasing" [36 CFR 228.102(c)(2)]. Under this alternative, existing federal oil and gas leases, which are not extended by production, would be allowed to expire. Currently, 28 percent of the leases are held by production. Exploration and development could occur on existing leased lands subject to standard lease terms, supplemental stipulations attached to the existing lease and Conditions of Approval applied to the APD. Information on NFS lands currently under lease is available at the Forest Supervisors' Office, 3449 Jackson, Laramie, Wyoming 82070.

Implementation of ALTERNATIVE 5 would require a Forest Plan Amendment to make all Forest Service administered lands on the TBGL administratively unavailable for leasing. The proposed Forest Plan amendment is significant because it would alter the long term level of goods (oil and gas) and services projected by the Forest Plan (FSH 1990, 12, 5.32, 3c).

The effect of no leasing on the projected RFD is not easily determined. Some drilling would occur on existing leases held by production. Some wells would be relocated to non-federal surface. It is estimated that drilling would be reduced by 1/2 to 2/3 of the projections in the RFD in the No Leasing Alternative (5 to 14 wells drilled per year).

ALTERNATIVE 6 - Leasing with standard stipulations only.

This alternative was developed to analyze the differences in environmental effects between the environmental stipulations contained in ALTERNATIVES 1, 2, 3, 4 and 7, and the less environmentally restrictive leasing terms of the standard lease form.

Under this alternative, all federally owned minerals in the study area would be made administratively available by the Forest Service. The BLM would be authorized to offer all currently non-leased federal minerals underlying National Forest System lands. These lands would be subject to standard lease terms only. No areas would be closed to leasing. Standard lease terms would not be modified by supplemental lease stipulations.

This alternative is in conformance with the requirements of the Leasing Reform Act and the Forest Service Oil and Gas Regulations.

Land available for leasing with standard stipulations are identified as all National Forest System Lands, with federal oil and gas minerals, within the Thunder Basin National Grassland.

Supplemental stipulations are not applicable to this alternative.

The environmental consequences as a result of the Reasonably Foreseeable Development Scenario (APPENDIX C) for all these alternatives are fully disclosed in this EIS (required NEPA compliance).

Forest Plan Standards and Guidelines would be applied at the APD stage of development. Activities protected by law, such as threatened and endangered species and cultural resources, would receive essentially the same protection as with supplemental stipulations. The extent to which other resources could be protected is generally limited to the protection afforded by standard lease stipulations. Basically, standard lease stipulations allow relocation of proposed operations up to 200 meters and prohibition of surface disturbing operations up to 60 days (43 CFR 3101.1-2).

Implementation of ALTERNATIVE 6 would require a Forest Plan amendment that would allow an exception to Forest Plan Standards and Guidelines for oil and gas leasing. The amendment would state:

1. Oil and Gas leasing on the Thunder Basin National Grassland would be authorized with the standard stipulations contained in the "Offer to Lease and Lease for Oil and Gas," BLM Form 3100-11.

2. Additional stipulations beyond those contained in the standard lease form are not authorized.

3. Forest Plan Standards and Guidelines would only be met to the extent possible with standard lease stipulations.

4. Where standard lease stipulations do not provide a level of protection sufficient to meet Forest Plan Standards and Guidelines, an exception to the standard or guideline is authorized (for oil and gas activities only).

The proposed Forest Plan amendment would be significant because it could change the desired future condition of the land, resources and anticipated goods and service to be produced (FSH 1990, 12, 5.32, 3f). Resources which could conceivably be affected by leasing with standard stipulations only are...
by a visitor. In terms of biological diversity, the integrity of the existing setting would be further divided and segmented by roads and developments needed for oil and gas. Biological community relationships and interactions could be affected.

**ALTERNATIVE 7** applies a CSU stipulation intended to maintain the existing character of the Rochelle Hills and Upton-Osage areas (41,245 acres). See **APPENDIX D** for the stipulation.

**Crucial Deer Winter Range - ALTERNATIVE 7** applies a CSU stipulation to protect crucial winter range for deer, the same as **ALTERNATIVES 3 and 4**.

**Indicator Species - ALTERNATIVE 7** adds golden eagle to the Indicator Species Stipulation applied in leasing **ALTERNATIVES 1, 2, 3 and 4**. This CSU stipulation prohibits any activities within 300 feet of a golden eagle nest, anytime, if they would cause nest abandonment, unless specific practices are successfully implemented to maintain or increase nesting opportunities at other sites.

**Timing Limitation**

**Crucial Deer Winter Range - ALTERNATIVE 7** applies a Timing stipulation to protect crucial winter range for deer, the same as **ALTERNATIVES 3 and 4**.

**No Service Occupancy**

**Areas with Special Values - ALTERNATIVE 7** applies a NSO stipulation to four areas with special values and limited or undeveloped road access (24,530 acres). These four areas are: Duck Creek (8,960 acres), Miller Hills (3,520 acres), Cow Creek Buttes (6,970 acres) and Downs (5,080 acres). This is in addition to the NSO applied in all leasing alternatives to the Walker Tepee Ring (320 acres).

Within the larger surrounding area, these four areas are unique in terms of: 1) vegetation; 2) the types of biological communities; 3) the excellent condition of biological communities; 4) the relationship of these communities to one another; 5) the kinds of species present; 6) the relationships among species; and 7) beauty of the land. The diversity of plants, animals, biological communities, the interconnectedness and character of habitats and landscapes provide for the health and resilience of ecological systems and processes. Access within these areas is primarily by undeveloped roads. Three of the areas are in the semi-primitive motorized R0S class. The Downs area is roaded natural because of a single developed road bordering the area. These area characteristics contribute significantly to higher biological diversity. In addition, except for the Downs area, these same characteristics contribute to semi-primitive recreation and scenic values.

The effect of oil and gas development in these areas would be to move the setting toward a more developed character. In terms of the Recreation Opportunity Spectrum (ROS), this would be toward the more developed end of the ROS. For semi-primitive motorized areas, the movement would be from roaded-natural to rural (one ROS class) could result from extensive oil and gas development; however, developments which were not enough to cause a change in the ROS class could still be perceived by a visitor. In terms of biological diversity, the integrity of the existing setting would be further divided and segmented by roads and developments needed for oil and gas. Biological community relationships and interactions could be affected.

The implementation of **ALTERNATIVE 7** would require a Forest Plan amendment the same as **ALTERNATIVE 4**, except that Forest Plan Standards and Guidelines would have to be amended to protect golden eagle nests, anytime, within 300 feet. The requirement to protect golden eagle nests, anytime, would be added to the Indicator Species CSU stipulation applied in **ALTERNATIVES 1, 2, 3 and 4**.

**1.** Riparian areas and wetlands greater than 400 meters in width.

**2.** Crucial winter range for deer.

**3.** Raptor nests and roost (other than threatened and endangered species).

**4.** Grouse strutting and breeding grounds.

**5.** Soils and soil productivity on areas of steep slope (>36%), areas with soil mass movement potential, and other areas of unstable soil (greater than 400 meters in width).

**ALTERNATIVE 7 - Leasing with standard and special stipulations, biological diversity and recreation emphasis.**

This alternative is the Forest Service preferred alternative.

On June 4, 1992, the Chief of the Forest Service, by letter to the Regional Foresters, issued his policy on Ecosystem Management. Because of this new direction, a biodiversity assessment was initiated on the TBNG which identified several areas of concern. Generally, these areas are coincident with areas previously identified as having unique recreation values (ALTERNATIVES 3 and 4). **ALTERNATIVE 7** is designed to consider maintaining the special values of these areas (including biological diversity considerations) and to respond to public comment.

**ALTERNATIVE 7** is similar to **ALTERNATIVES 1, 2, 3, and 4**, in that:

The entire Thunder Basin National Grassland would be available for oil and gas leasing consistent with the approved Forest Plan.

Stipulations for any parcel are disclosed prior to lease advertisement.

This alternative is in conformance with the requirements of the Leasing Reform Act and the Forest Service Oil and Gas Regulations.

In addition to the supplemental stipulations described in the **FEATURES COMMON AMONG ALL ALTERNATIVES** section above, **ALTERNATIVE 7** would apply the following stipulations:

**Controlled Surface Use Stipulations**

**Areas with Special Values - Two areas, the Rochelle Hills and the Upton-Osage, have been identified as having special values with developed road access. The Rochelle Hills is a tree covered escarpment in a larger grass-shrub area of low topographic relief. The Upton-Osage area is a transition area between grassland and the Black Hills with stringers of ponderosa pine forest interspersed with grassland and gently rolling hill topography.**

Within the larger surrounding area, these two areas are unique in terms of vegetation, topography, relationship to surrounding biological communities, relationships within the areas of plant and animal communities, number and relationship of both communities and species, community types, and aesthetics. This contributes significantly to higher wildlife, biological diversity, recreation and scenic values. Both areas have roaded-natural ROS classifications.

The effect of oil and gas development in these areas would be to move the setting toward a more developed character. In terms of the Recreation Opportunity Spectrum (ROS), this would be toward the more developed end of the ROS. For semi-primitive motorized areas, the movement would be from roaded-natural to rural (one ROS class) could result from extensive oil and gas development; however, developments which were not enough to cause a change in the ROS class could still be perceived by a visitor. In terms of biological diversity, the integrity of the existing setting would be further divided and segmented by roads and developments needed for oil and gas. Biological community relationships and interactions could be affected.
ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY

In order to consider an adequate range of alternatives, the Interdisciplinary Team tried to develop an alternative; whereby, less than the entire Thunder Basin National Grassland was available for leasing. This alternative was eliminated from detailed study because:

1. The Medicine Bow National Forest and Thunder Basin National Grassland and Resource Management Plan presently makes the entire TBNG available for oil and gas leasing (see the Forest Plan Management Area map). There is no requirement or direction in the Forest Plan with which leasing would be inconsistent if appropriate stipulations are applied (including consideration of the No Surface Occupancy stipulation).

2. Leasing and oil and gas development have occurred on the TBNG since the 1950's, and for the majority of that time, the entire TBNG has been leased (the exception has been in the two years when leasing has been temporarily stopped pending the outcome of this EIS). Experience has demonstrated oil and gas leasing on the TBNG, with appropriate stipulations to protect environmental concerns, is compatible with the environment and other resource values.

3. Concerns identified during scoping for this EIS (such as recreation, and cultural resources) can be adequately protected with stipulations (including the No Surface Occupancy stipulation).

4. Alternatives considered in detail includes a "No Lease" alternative for the entire National Grassland.

COMPARISON OF ALTERNATIVES

This section presents a comparison of the alternatives by issue. The following discussion includes environmental and economic effects presented in a comparative format with an explanation of the important differences between alternatives. Environmental effects of the alternatives are more fully displayed and discussed in CHAPTR IV, ENVIRONMENTAL CONSEQUENCES. Refer to the Impact Summary Table at the end SUMMARY to this EIS for a side-by-side analysis of the alternatives.

Issue 2—Oil and gas development could affect riparian areas.

The Forest Plan states that emphasis will be placed on all component ecosystems of riparian areas. These components include the aquatic ecosystem, the riparian ecosystem (characterized by distinct vegetation), and adjacent ecosystems that remain within approximately 100 feet (30.5 meters) measured horizontally from both edges of all perennial streams and from the shores of lakes and other still water bodies (Forest Plan III-205). Specific standards and guidelines for protection of riparian areas when management activities involve water use, mining law compliance, administration and transportation systems are outlined on pages III-213 to III-218 of the Forest Plan.

Standard lease terms allow the Forest Service to move a proposed well location 200 meters or more. Since riparian areas on the TBNG are primarily linear, along stream courses, and less than 200 meters in width, riparian areas are protected to a large degree with standard lease terms. Riparian areas wider than 400 meters or where linear disturbances (eg, roads, pipelines, etc.) occur that cannot be avoided with standard lease terms, require protection with a CSU stipulation.

A Controlled Surface Use stipulation in ALTERNATIVES 1, 2, 3, 4 and 7, protects riparian areas and wetlands unless: 1) No other reasonable alternatives exist; and 2) It is established to the authorized officer’s satisfaction, that the development will meet Forest Plan Standards and Guidelines about riparian, playas, flood-plains and wetland areas. ALTERNATIVE 6 protects riparian areas and wetlands with the 200 meter standard lease stipulation. Riparian areas and wetlands wider than 400 meters could be impacted in ALTERNATIVE 6 & ALTERNATIVE 5. No New Leasing, would cause no impacts to riparian areas.

Issue 3—Oil and gas development could affect threatened or endangered species.

Threatened and endangered species are protected by the Endangered Species Act of 1973, as amended, and will receive adequate protection in all alternatives. Standard Lease Terms, applied in all leasing alternatives, ensure compliance with all non-discretionary laws, such as the Endangered Species Act of 1973, as amended. Presently, there are three federally listed threatened and endangered species on the Thunder Basin National Grassland. They are the bald eagle, peregrine falcon, and black footed ferret. In accordance with Forest Plan Standards and Guidelines, special stipulations are applied in ALTERNATIVES 1, 2, 3, 4 and 7 to protect these species. ALTERNATIVE 5, No New Leasing, would cause no impacts to threatened and endangered species, the greatest amount of protection.
afforded by any of the alternatives. ALTERNATIVE 8, to the extent consistent with the rights conveyed by the lease, applies Forest Plan Standards and Guidelines at the APO stage of development. It is possible under ALTERNATIVE 8 that impacts to bald eagle nest and roost sites could exceed those allowed by Forest Plan Standards and Guidelines.

**Issue 4 - Oil and gas development could affect prairie dog management.**

Prairie dogs are managed in accordance with the Prairie Dog Management Plan for Thunder Basin National Grassland, as amended in 1991. ALTERNATIVES 1, 2, 3, 4, 6 and 7. the leasing alternatives, would affect prairie dogs similarly. Soil disturbance caused by oil and gas activities when added to the other man caused disturbances such as coal mining, other mining, and grazing, which tend to contribute to improved conditions for prairie dog town establishment and the existing trend for prairie dog population increase. A prairie dog population increase could lead to less available forage for livestock and other wildlife species. The prairie dog control program may have to be increased to offset the population trend. The contribution of oil and gas activities to increased prairie dog populations would not be measurable in any alternative.

Under ALTERNATIVE 5. No New Leasing, there would be no impacts to prairie dog populations or habitat from new leasing.

**Issue 5 - How will waivers, modifications, and exceptions to lease stipulations be implemented?**

Under all leasing alternatives, waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The resulting NEPA document would display the alternatives with the social and environmental consequences of each. The Deciding Officer’s decision will be based on this information.

**Issue 6 - Oil and gas development could modify the visual character of the landscape.**

The Grassland is a vast open area with modest topographic relief. The vegetation is largely open grassland. Some tree vegetation occurs in woody draws and on hillsides ranging from isolated trees to small stands of trees. Visual impacts to the landscape, such as oil and gas developments, are evident for several miles in most instances.

Except for riparian areas, the Forest Plan adopted Visual Quality Objective for the Thunder Basin National Grassland is modification. Riparian areas, Forest Plan Management Area 9A, must meet a VGO of partial retention. Forest Plan VGO’s are maintained or exceeded in all alternatives, in all locations, except in ALTERNATIVE 8. In ALTERNATIVE 8. visual quality in riparian areas may not meet the Forest Plan Standards and Guidelines of partial retention.

Areas where a No Surface Occupancy stipulation is applied, areas where no leasing is stipulated and areas where a Controlled Surface Use stipulation for special values is applied will have a secondary benefit of protecting visual quality. Acreage for these areas is listed below by alternative:

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<th>Alternative</th>
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<th>Protected By No Leasing (Acres)</th>
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Note: For detailed information see CHAPTER IV, VISUAL RESOURCES.

**Issue 7 - Oil and gas development could affect permanent water sources on the Thunder Basin National Grassland.**

State of Wyoming Department of Environmental Quality, Water Quality Rules and Regulations apply to all alternatives. Under these State regulations, both surface and ground water are protected from degradation. These rules also govern cleanup of spills of hazardous materials such as chemicals used in the drilling process or produced water which may contain toxic substances.

Existing water rights, both surface and groundwater, are protected by State Law and administered by the State Engineer (Section 41-121 through Section 41-147, Wyoming Statutes 1957, as amended by Chapter 213, Session Laws of Wyoming 1969, and Chapter 171, Session Laws of Wyoming 1973).

The drilling of wells is governed by Federal Regulations, 43 CFR 3180, and the Rules and Regulations of the Wyoming Oil and Gas Conservation Commission which prohibit migration of fluids from one underground zone to another. In general, this is achieved through proper casing, cementing and plugging designs. These rules will apply to all drilling alternatives.

The Leasing Reform Act established a statutory requirement for processing the Surface Use Plan of Operations prior to ground-disturbing activities. This Surface Use Plan of Operations is submitted as part of an Application for Permit to Drill or Notice of Staking and will include the mitigation measures to be applied on a site-specific basis (by individual APO) to protect surface and ground water. Approval of drilling is based on an environmental analysis in accord with NEPA. Site specific mitigation for compliance with state water quality regulations will be fully considered in the NEPA document at the APO stage of development.

Standard lease terms, Section 6, Conduct of Operations, provides in part, "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."

For ALTERNATIVES 1, 2, 3, 4, 6 and 7, all the leasing alternatives, if all the state water quality rules and regulations are met, there will be no any measurable direct effects on
water quality or quantity. Under ALTERNATIVE 5, No New Leasing, there would be no effects to water by new leasing.

Issue 8 - Oil and gas development could affect unique recreation areas such as Rochelle Hills and Upton-Osage area.

ALTERNATIVES 1 and 2 implement Forest Plan Standards and Guidelines for recreation management. Areas identified in scoping as having unique recreation values, such as Rochelle Hills, Upton-Osage, and inventoried semi-primitive areas, would be subject to oil and gas activities. If these areas were developed for oil and gas, the recreation experience offered would change to a more developed experience.

In response to Issue 8, ALTERNATIVES 3, 4 and 7 apply both Controlled Surface Use and No Surface Occupancy stipulations to protect existing recreation values. These stipulations are more restrictive than required by the Forest Plan.

Controlled Surface Use

ALTERNATIVES 3, 4 and 7 apply a CSU stipulation to five reservoirs which have been identified as having the potential to provide a quality fishing experience. This stipulation would limit the noise from oil and gas production facilities to protect the fishing experience.

ALTERNATIVE 4 and 7 apply a CSU stipulation intended to maintain the roded natural character of the Rochelle Hills and Upton-Osage areas (41,245 acres).

No Surface Occupancy

A NSO stipulation is applied to inventoried semi-primitive motorized areas to prevent oil and gas developments from changing the ROS class. ALTERNATIVE 3 protects three areas with a total of 19,950 acres. ALTERNATIVE 4 protects four areas with a total of 27,820 acres. ALTERNATIVE 7 protects three inventoried semi-primitive/biological diversity areas and one biological diversity area for a total of 24,530 acres.

Roads developed for oil and gas improve access for the recreationist, but also cause more disturbance to other visitors and to wildlife. This is analyzed in more detail in the ENVIRONMENTAL CONSEQUENCES section.

Issue 9 - There is a concern about maintaining the economic stability of the area.

In response to this issue, the Forest Service is preparing this Environmental Impact Statement. ALTERNATIVES 1, 2, 3, 4, 6 and 7 consider making the entire Thunder Basin National Grassland available for leasing. In ALTERNATIVE 5, the TBNG would not be available for new leasing.

An economic impact analysis was conducted which considered the effects on the following counties: Campbell, Converse, Crook, Niobrara, and Weston. Economic impacts are reported for total economic activity, personal income and employment supported in the region by oil and gas activity on Forest Service lands in Table 2-4.

Table 2-4 AVERAGE ANNUAL EXPENDITURES1 AND IMPACTS ON FEDERAL SURFACE BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total Economic Activity</th>
<th>Total Personal Income</th>
<th>Total Employment (Full Time Equivalents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>$22,241,924</td>
<td>$3,933,684</td>
<td>140</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
</tbody>
</table>

Compared to ALTERNATIVES 1, 2, 3, 4, 6 and 7, ALTERNATIVE 5 represents a $450,000 decrease in personal income and a decrease of 14 full-time jobs.

The fiscal impact on local governments (counties and towns) resulting from their share of Federal leasing and royalty revenues is estimated as follows:

Table 2-5 AVERAGE ANNUAL REVENUE TO LOCAL GOVERNMENT BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Sales Tax (000$)</th>
<th>Ad Valorem (000$)</th>
<th>Federal Royalties (000$)</th>
<th>Severance Tax (000$)</th>
<th>Total (000$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>77</td>
<td>1,307</td>
<td>334</td>
<td>241</td>
<td>1022,081</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>77</td>
<td>1,307</td>
<td>334</td>
<td>241</td>
<td>1042,063</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>77</td>
<td>1,297</td>
<td>332</td>
<td>239</td>
<td>1012,048</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>77</td>
<td>1,283</td>
<td>328</td>
<td>236</td>
<td>992,023</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>70</td>
<td>1,087</td>
<td>281</td>
<td>200</td>
<td>71,645</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>77</td>
<td>1,307</td>
<td>334</td>
<td>241</td>
<td>1052,064</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>77</td>
<td>1,283</td>
<td>328</td>
<td>237</td>
<td>1002,025</td>
</tr>
</tbody>
</table>

Note: 1 The total economic impacts include direct expenditures by industry in exploration, development and production and the indirect induced expenditures in the economy of the counties involved (Campbell, Converse, Crook, Niobrara, and Weston).

Most of the variation in revenues between alternative results are from the assumption that acres with No Surface Occupancy stipulations would not be leased. This assumption affects leasing patterns and estimated total oil and gas production by alternative. ALTERNATIVE 6 has the largest total revenue followed by ALTERNATIVES 2, 1, 3, 7 and 4. Revenues for ALTERNATIVE 5 are substantially lower due to the lose of revenues with the no leasing alternative.

Issue 10 - Oil and gas development could affect both game and non-game fish and wildlife and their habitat.

ALTERNATIVES 1, 2, 3, 4 and 7 apply supplemental stipulations for the protection of fish and wildlife habitat for both game and non-game species as follows:
Table 2-6 SUMMARY OF WILDLIFE SPECIES PROTECTED BY TYPE OF STIPULATION AND ALTERNATIVE WHERE APPLIED

<table>
<thead>
<tr>
<th>Species</th>
<th>No Surface Occupancy</th>
<th>Controlled Surface Use Stipulation</th>
<th>Timing Limitation Stipulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(ALTERNATIVES)</td>
<td>(ALTERNATIVES)</td>
<td>(ALTERNATIVES)</td>
</tr>
<tr>
<td>Bald eagle</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Peregrine falcon</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Golden eagle</td>
<td>7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Ferruginous hawk</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Swainson’s hawk</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Goshawk</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Prairie falcon</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Osprey</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Sage grouse</td>
<td>1,2,4,6,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Sharp-tailed grouse</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>Deer</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
<tr>
<td>(raptor areas)</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
<td>1,2,3,4,7</td>
</tr>
</tbody>
</table>

Notes
1. Limitations apply to both nest and roost sites.
2. Limitations apply to nest sites only.
3. Limitations apply to breeding grounds (e.g.,
   4. Limitations apply to any rookery (Mountain plover included).
5. Limitations apply to 4,600 acres of isolated rookery area.
6. Limitations apply to raptor areas, prairie dog towns and wetlands.
7. This table only lists No Surface Occupancy for wildlife purposes (4,600 acres). A NSO applied for other
   wildlife purposes will have secondary benefits to wildlife habitat in proportion to the area stipulated.
   ALTERNATIVES 1 and 2, 4,500 acres; ALTERNATIVE 3, 20,170 acres; ALTERNATIVE 4, 28,140 acres; and
   ALTERNATIVE 7, 24,850 acres.

Threatened and endangered species, addressed in a Biological Assessment in informal consultation
with the U.S. Fish and Wildlife Service, include bald eagle, peregrine falcon and
black-footed ferret. Threatened and endangered species will receive the protection of law
under all leasing alternatives. Alternatives differ in that mitigation measures are applied
at various stages of development. ALTERNATIVES 1, 2, 3, 4 and 7 apply protective stipulations
at the leasing stage. ALTERNATIVE 6, to the extent consistent with the rights granted
in the lease, applies the same mitigation measures at the APD stage of development. It is possible under
ALTERNATIVE 6 that impacts to bald eagle nest and roost sites could exceed those allowed by Forest Plan Standards and Guidelines. ALTERNATIVE 6 would prevent impacts to threatened and endangered species by prohibiting new oil and gas
leasing.

The black-footed ferret is not known to exist on the Thunder Basin National Grassland. U.S.
Fish and Wildlife Service methodology was used in annual black-footed ferret searches for the
years 1980 thru 1990. No evidence of ferrets was found. Black-footed ferret habitat, such as
black-tailed prairie dog towns, is managed under the Prairie Dog Management Plan for the
Thunder Basin National Grassland (1981), as amended in 1991. This plan was recognized
in the Biological Opinion, for the Medicine Bow National Forest and Thunder Basin
National Grassland Land Management Plan, that was rendered by the U.S. Fish and Wildlife
Service in 1985 (Final Environmental Impact Statement, Medicine Bow National Forest and
Thunder Basin National Grassland, Appendix G, pages G-1 thru G-4). This Biological
Opinion concurred with the Forest Service determination that the implementation of the
preferred alternative would have no effect on the black-footed ferret. No special stipulations
are applied in any of the alternatives considered in this EIS for prairie dog or black-footed
ferret management.

A Forest Plan amendment is required to preserve crucial deer winter range with the Con­trolled
Surface Use and Timing Limitation stipulations as proposed in ALTERNATIVES 3, 4 and 7 rather than with the No Surface Occupancy Stipulation as proposed in ALTE­RATIVES 1 and 2.

Except for ALTERNATIVE 6, there are no identified adverse environmental impacts from
oil and gas developments in any alternative that would cause the alternative to be inconsis­tent
with the Forest Plan Standards and Guidelines addressing wildlife. It is possible that
under ALTERNATIVE 8, Standard Stipulations Only, impacts to nesting raptors (including
bald eagle), grouse breeding and roosting areas, and mountain plover rookeries could exceed
Forest Plan Standards and Guidelines. Further, ALTERNATIVE 6 may not provide
sufficient control of operations to ensure the area north of Upton, identified as Forest Plan
Management Area SA, could function as crucial winter range. The Forest Plan Management
Prescription would have to be amended to implement ALTERNATIVE 6.

Issue 11 - Availability of federal lands for oil and gas leasing affects industry decisions to lease
and develop intermingled state and private lands.

In response to this issue, the Forest Service is preparing this Environmental Impact State­ment. As described in CHAPTER I, DECISIONS TO BE MADE, the lands administratively
available for leasing (36 CFR 228.102 (d)) and the leasing decisions for specific lands (36
CFR 228.102 (ii)) will be disclosed in a Record of Decision based on this final EIS. ALTE­RATIVES 1, 2, 3, 4 and 7 consider making the entire TBNG available for leasing. In
ALTERNATIVE 5, the TBNG would not be available for new leasing.

When a No Surface Occupancy stipulation is applied to an area, the value of the oil and gas
lease is severely depreciated on both the NSO lands and lands adjacent to the NSO. Areas
which are not leased similarly depreciate the value of leases on adjacent lands. Factors
which contribute to these depreciated values are: 1) technological limitations on deviated or
horizontal drilling (3,000 feet), 2) higher drilling and operating costs on deviated or
horizontal wellbores; 3) reservoir management and secondary recovery is restricted; 4) oil
and gas may be drained by wells on adjacent non-federal lands; 5) the reservoir may
be damaged; and 6) recovery and revenues are reduced. An estimate of the amount of federal,
state and private lands affected by NSO and no leasing by alternative is displayed in Table
2-7.

Table 2-7 ESTIMATED LAND AREA AFFECTED BY NSO AND NO LEASING

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>4,920</td>
<td>2,350</td>
<td>560</td>
<td>2,920</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>4,920</td>
<td>2,350</td>
<td>560</td>
<td>2,920</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>20,170</td>
<td>35,150</td>
<td>3,840</td>
<td>6,880</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>28,140</td>
<td>43,022</td>
<td>3,840</td>
<td>10,000</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>50,700</td>
<td>560,000</td>
<td>95,000</td>
<td>605,000</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>24,850</td>
<td>42,670</td>
<td>4,560</td>
<td>11,590</td>
</tr>
</tbody>
</table>
Issue 12 - Failure to lease federal lands could result in loss of revenue due to subsurface drainage of the federal oil and gas by wells on State and private lands.

Oil and gas will migrate in the underground reservoir from areas of high pressure to areas of lower pressure, such as those created by a producing oil well. When this movement is from one mineral estate to another, it is known as drainage. When this occurs, the losing mineral estate does not receive any compensation for its loss. The only remedy is to develop a well on the losing mineral estate. The Federal Government uses the oil and gas lease to acquire the ability to recover oil and gas and to assign the responsibility for protecting the oil and gas resource from drainage to the lessee. Section 4 of the Standard Lease requires the lessee to prevent unnecessary damage to, loss of, or waste of leased resources. If the federal mineral estate is not leased the existing mineral resource (oil and gas) may be drained and produced from adjacent non-federal mineral estates; thus, without leasing the federal mineral estate, the United States has no way to prevent this drainage of oil and gas resources.

Drainage also affects revenue, in that secondary recovery (injection of water, natural gas or other fluids into the underground oil and gas reservoir) cannot occur unless the entire oil and gas reservoir is leased. This could mean as little as five percent of the oil in the reservoir recovered, whereas, with secondary recovery, up to 40 percent may be recovered.

ALTERNATIVES 1, 2, 3, 4, 6 and 7 each provide fully for protection of the federal oil and gas resources from subsurface drainage. ALTERNATIVE 5, No New Leasing, would cause a decline in the ability of the Federal Government to protect its oil and gas mineral rights. As present leases expire under ALTERNATIVE 5, they would not be renewed, and the Federal Government would no longer have the ability to recover the oil and gas resource. Drainage of the subsurface oil and gas resource could occur with a resultant loss in royalties.

Issue 13 - There is concern about the management of chemicals and wastes, generated and used at oil and gas sites.

Chemicals used in the drilling and production processes or chemicals found in produced waters which may contain high concentrations of salt (particularly sodium and chloride) and heavy metals, may be toxic. Hydrogen sulfide, a common by-product of oil and gas drilling, is highly toxic. Blowouts during drilling or production are unusual, but have the potential for polluting. Oil spills, or spills of contaminated water, may also occur. The potential for chemicals reaching stream channels from such disturbances is low due to the relatively flat terrain, lack of running water, and low precipitation found on the Grassland. Oil field chemicals, wastes and releases are regulated by the Wyoming Department of Environmental Quality (DEQ) and the Wyoming Oil and Gas Conservation Commission. These regulations are applicable to all alternatives. If the state rules and regulations are met, there will be no measurable direct or indirect effects on water quality in any alternative.

The risk of spill and blowout contaminating soil and water is minimized in ALTERNATIVE 5, No New Leasing. The risk of a spill or blowout is approximately equal for ALTERNATIVES 1, 2, 3, 4, 6 and 7; the leasing alternatives. If a spill did occur, soil and water would be contaminated locally. Cleanup is required under State Regulation.

Issue 14 - Oil and gas development could affect important biological community relationships and biological diversity.

On June 4, 1992, the Chief of the Forest Service by letter to the Regional Foresters issued his policy on Ecosystem Management. Because of this new direction and to respond to public comment, a biological diversity assessment was initiated on the TBNG.

Biological diversity is expressed at four scales on the Thunder Basin National Grassland. These are the landscape, community, species and genetic scales. Oil and gas leasing is not expected to affect the genetic scale. Populations of specific species which have been identified as indicator species, threatened or endangered species or are of other interest for management, are expected to be adequately protected under Forest Plan Standards and Guidelines, federal endangered species laws, standard lease terms and special stipulations (both Controlled Surface Use and Timing Limitation).

At the landscape and community scales, several special biological diversity areas were identified. These are mainly specialized communities which form islands or patches in the greater sagebrush-grassland. There are also specialized communities on specific soil types in badlands.

Six areas with special biological diversity values were identified. Generally, these areas are coincident with areas identified as having unique recreation values. These areas are: 1) Upton-Osage, 26,000 acres; 2) Rochelle Hills, 15,245 acres; 3) Cow Creek Buttes, 6,970 acres; 4) Miller Hills, 3,520 acres; 5) Duck Creek, 8,960 acres; and 6) Downs, 5,080 acres.

ALTERNATIVE 5 protects the existing biological diversity through no new leasing. ALTERNATIVE 6 provides species level protection of biological diversity to the extent afforded by law (Endangered Species Act of 1973, as amended) and Standard Lease Terms. In addition to Standard Lease Terms and Law ALTERNATIVES 1, 2, 3, 4 and 7 provide species level protection of biological diversity in the form of both CSU and Timing stipulations for indicator, threatened and endangered species. ALTERNATIVE 3 protects two areas, 10,160 acres, identified for special biological diversity values (Miller Hills and Cow Creek Buttes) with the NSO stipulation for inventoried semi-primitive motorized areas. ALTERNATIVE 4 protects three areas, 18,105 acres, identified for special biological diversity values (Duck Creek, Miller Hills and Cow Creek Buttes) with the NSO stipulation for inventoried semi-primitive motorized areas and two areas, 41,245 acres, with a CSU stipulation (Rochelle Hills and Upton-Osage). ALTERNATIVE 7 protects four areas, 24,530 acres, identified for special biological diversity values (Duck Creek, Miller Hills, Cow Creek Buttes and Downs) with the NSO stipulation for inventoried semi-primitive motorized areas and two areas, 41,245 acres, with a CSU stipulation (Rochelle Hills and Upton-Osage). The boundaries of the individual areas vary slightly between alternatives.
CHAPTER III
AFFECTED ENVIRONMENT

This chapter describes the environment of the Thunder Basin National Grassland that would be affected by implementation of the proposed action or any alternative. A general description of the physical, biological, social and economic environment is provided in Chapter III (page III-1 to III-54) of the Forest Plan EIS. More specific information related to the project follows:

SUMMARY OF CHANGES BETWEEN THE DRAFT AND FINAL EIS

In general, the changes made in response to public comments and new inventory information between the draft EIS and the final EIS include an expansion of the discussions of resources; particularly, vegetation, biological diversity, visual quality, recreation and water.

In the draft EIS, Forest Plan Management Area 5A, the Upton-Osage deer winter range was identified as severe winter relief range. As a result of Wyoming Game and Fish comments on the draft EIS and subsequent consultations this area was reclassified as crucial winter range.

GENERAL

The TBNG is mostly within the southern portion of the northern rolling high plains and drains into the Missouri Basin. The topography is largely a "plains" landform with frequent hills and escarpments. Major positive relief features include the Rochelle Hills, Cow Creek Buttes, Red Hills, Pine Ridge and the Miller Hills. Riparian areas or valley plains, dissect the landscape and several hundred acres of playas and reservoirs exist within the Grassland. Riparian areas (streams, playas and reservoirs) make up less than one percent of the National Grassland area.

The TBNG largely lies within the Northwestern Great Plains Ecoregion of the west-central United States (EPA, 1987, Ecoregions of the West Central United States). Small portions of the Grassland are adjacent to what is classified as the Middle Rockies in the northeastern corner of TBNG. The main plant vegetative series is sagebrush (Artemisia) with various grasses such as wheatgrass (Agropyron) and gram grass (Bouteloua). Other grasses include some bluegrasses, inland saltgrass, green needlegrass, little bluestem and needle-and-thread grass, as well as shrubs such as greasewood and saltbush. Some localized sites with ponderosa pine or limber pine occur mostly on Pine Ridge or the Rochelle Hills. Cottonwood trees commonly grow in association with the wet draws and riparian areas.

The climate of the TBNG is characteristically dry and cold. Average annual precipitation is about 12 inches, including about 40 inches of snowfall. With an increase in elevation, mean annual precipitation generally increases and average air temperatures drop. Mean annual air temperature is about 46 degrees Fahrenheit. Mean daily low temperatures in January is about ten degrees Fahrenheit. Summer temperatures can reach above 100 degrees. The growing season is five to six months and varies with elevation. The sun shines about 70 percent of the time on a yearlong basis. Prevailing winds are from the west.

Thunder Basin National Grassland lies within the Powder River Structural Basin, a 12,000 square mile geological basin bounded by the Bighorn Mountains to the west, the Black Hills to the east and Casper Arch, Laramie Mountains and Hartville uplift to the south. The basin continues into Montana where it is separated from the Williston Basin by the Cedar Ridge uplift.
**GEOLOGY**

Various geologic materials form the Thunder Basin National Grassland study area. The surface geology of the area largely includes: the Wasatch formation (Eocene) which contains arkosic sandstone, carbonaceous shale and many coal beds; the Fort Union Formation (Paleocene) which contains the sandstone, siltstone and shale with coal beds. Pierre Shale, which contains dark marine claystone and shale, with yellow to light gray bentonite, also occurs locally.

Map 3-2 GENERALIZED GEOLOGY MAP OF TBNG

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Below are general map unit descriptions (reference map).

**Kjm:** Inyan Kara Group and Morrison Formation (lower Cretaceous and Upper Jurassic). There are two formations under the Inyan Kara Group: Fall River - gray to brown sandstone with interbedded gray siltstone and gray to black shale. Thickness 95 to 200 feet. Lakota - Irregularly interbedded lenticular sandstone and conglomeratic sandstone, variegated claystone, and gray siltstone; coal beds are present locally at or near the base of the formation. Fusion Shale is not a mappable unit in this area. Thickness 45 to 300 feet. Morrison Formation - greenish gray to variegated claystone containing some discontinuous beds of gray, silty sandstone and nodular impure limestone. Thickness 0 to 155 feet.

**Kl:** Lance Formation (Upper Cretaceous) - somber colored shale and massive, lenticular, concretionary sandstone; many thin coal beds in lower half. Thickness 700 to 2,500 feet, (thickening southwest).

**Km:** Mowry Shale (Upper/Lower Cretaceous) - black, hard siliceous shale; weathers silvery gray. Clay Spur bentonite at top. Thickness 180 to 230 feet.

**Kp:** Pierre Shale (Upper Cretaceous) - dark gray to black, concretionary marine shale. Includes Kara Bentonic Member in upper part. Age of bentonite is 68 to 78 Ma (estimated). Thickness 2,000 to 3,100 feet.

**Ksc:** Skull Creek Shale (Lower Cretaceous) - black, soft fissile shale. Thickness 180 to 270 feet. Newcastle/Muldy sandstones may occur as small inclusions within the polygones.

**Tr:** Lebo Member (Fort Union Formation, Paleocene) - light to dark gray shale and claystone with subordinate light gray sandstone and a few carbonaceous shale and coal beds. Thickness 200 to 250 feet.

**Trf:** Tullock Member (Fort Union Formation) - light gray to yellowish sandstones, gray sandy or silty shale and numerous beds of carbonaceous shale and thin coals. Thickness 0 to 1500 feet.

**Trt:** Tongue River and Lebo Members undivided (Fort Union Formation) - mapped in the southern half of the Fort Union outcrop area. Tongue River (upper part) consists of fine-grained drab to gray sandstone, and contains some siltstone, claystone and shale; thick coal beds near top. Lebo member is gray shale and claystone. Thickness is 0 to 2,500 feet.

**Trb:** Tongue River Member (Fort Union Formation) - light gray to yellowish brown feldspathic sandstone, gray siltstone and sandy shale and carbonaceous shale; numerous coal beds. Thickness approximately 800 to 1,200 feet.

**Tw:** Wasatch Formation (Eocene) - buff arkosic sandstone, drab siltstone, light gray and carbonaceous shale and lenticular conglomerate; many coal beds in lower part. Thickness up to 3,000 feet.

**Sources:**


WATER RESOURCES

Water resources encompass both surface water and groundwater, in and adjacent to, the Grassland. Associated water resources would include floodplains, riparian areas, wetlands and playas. Characteristics used to describe water resources on the Grassland include: Water quantity, water quality, aquatic biota and beneficial (designated) uses of water.

Surface waters

The surface of the Grassland is drained by the Little Powder, Little Missouri, Belle Fourche and Cheyenne Rivers of the Missouri River system. Primary drainages in the area are the Cheyenne River (91 percent) and Little Powder River (7 percent). For planning purposes, the TBNG is divided into ten planning watersheds: Dry Creek, Dry Fork, South Fork Cheyenne River, Antelope Creek, Black Thunder Creek, Lodge Pole Creek, Belle Fourche River, Beaver Creek, Little Powder River and Little Missouri River (see Table 3-1).

Precipitation on the major portion of the Grassland averages 12 inches per year. The northern unit of TBNG averages 16 inches per year of precipitation. Approximately 40 percent of the average annual precipitation occurs as snow, much of which is converted directly to water vapor without melting (sublimated). Summer precipitation occurs as light showers and occasional intense thunderstorms. Average annual runoff per square mile is less than ten acre-feet (0.2 inches) for most of the Grassland.

Plains streams are typically bordered by terraces (past floodplains) and have wide, sandy bottoms. The streams are primarily ephemeral, flowing only during times of high surface runoff, such as in direct response to snowmelt or high-intensity storms. Some streams intercept shallow aquifers or springs that provide perennial flow a short distance downstream. Perennial streams on the Grassland are rare and generally found low in the drainage.

Flooding may occur during rapid spring snow melt or intense summer thunderstorms. High-intensity thunderstorms tend to produce the largest floods. These storm events typically affect only a small portion of a drainage, but the magnitude of the floods can be severe (particularly in small streams).

Map 3-3 MAJOR RIVER DRAINAGE BASINS AFFECTED BY THE THUNDER BASIN NATIONAL GRASSLAND

Note:

Table 3-1 DRAINAGE SIZE AND PERCENT NATIONAL FOREST SYSTEM LANDS WITHIN THESE DRAINAGES FOR THE THUNDER BASIN NATIONAL GRASSLANDS

<table>
<thead>
<tr>
<th>Drainage Name</th>
<th>Forest Service Planning Watersheds1</th>
<th>USGS Gaging Station Name</th>
<th>Drainage Area Above Gage (Acres)2</th>
<th>Total Acres in Planning, Watershed</th>
<th>Total Forest Service Acres</th>
<th>Percent National Forest Lands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheyenne River</td>
<td>Cheyenne River near Edgemont S.D.</td>
<td>4,571.441</td>
<td></td>
<td></td>
<td></td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>Dry Creek</td>
<td>80,095</td>
<td></td>
<td></td>
<td></td>
<td>47.0</td>
</tr>
<tr>
<td></td>
<td>Dry Fork</td>
<td>114,642</td>
<td></td>
<td></td>
<td></td>
<td>44.0</td>
</tr>
<tr>
<td></td>
<td>Antelope Creek</td>
<td>229,057</td>
<td></td>
<td></td>
<td></td>
<td>48.0</td>
</tr>
<tr>
<td></td>
<td>Black Thunder</td>
<td>254,067</td>
<td></td>
<td></td>
<td></td>
<td>47.0</td>
</tr>
<tr>
<td></td>
<td>South Fork</td>
<td>119,629</td>
<td></td>
<td></td>
<td></td>
<td>58.0</td>
</tr>
<tr>
<td></td>
<td>Lodgepole Creek</td>
<td>69,119</td>
<td></td>
<td></td>
<td></td>
<td>53.0</td>
</tr>
<tr>
<td></td>
<td>Beaver Creek</td>
<td>135,962</td>
<td></td>
<td></td>
<td></td>
<td>60.0</td>
</tr>
<tr>
<td></td>
<td><strong>SUBTOTAL</strong></td>
<td><strong>1,002,571</strong></td>
<td><strong>505,490</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Little Missouri River</td>
<td>Little Missouri River near Camp Cook S.D.</td>
<td>1,260.778</td>
<td></td>
<td></td>
<td></td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>Little Missouri River</td>
<td>16,806</td>
<td></td>
<td></td>
<td></td>
<td>35.0</td>
</tr>
<tr>
<td>Belle Fourche</td>
<td>Keyhole Reservoir near Moorcroft, WY</td>
<td>1,279.978</td>
<td></td>
<td></td>
<td></td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>Belle Fourche River</td>
<td>25,354</td>
<td></td>
<td></td>
<td></td>
<td>66.0</td>
</tr>
<tr>
<td>Little Powder</td>
<td>Little Powder River near Broadus, MT</td>
<td>1,263.338</td>
<td></td>
<td></td>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>Little Powder River</td>
<td>74,113</td>
<td></td>
<td></td>
<td></td>
<td>60.0</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>1,094,748</strong></td>
<td><strong>572,224</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1 Forest Service Planning Watersheds are an administrative area within boundaries of Thunder Basin National Grassland and may only reflect a portion of a complete watershed.
2 The area above the closest upstream gaging station which contains all Thunder Basin National Grassland lands was selected because the entire drainage is large.

Stock ponds and small reservoirs provide the majority of fishable water on Thunder Basin. Fifty-eight reservoirs have supported fish populations historically. The majority of these reservoirs are no longer viable due to insufficient depth and water supply.

In 1991. Wyoming Game and Fish and Forest Service biologists examined all the known biological, physical and chemical data for these reservoirs and developed a list of five reservoirs in which future fisheries management work may be conducted. Eight reservoirs were listed in the Draft Environmental Impact Statement, but recent evidence indicates that three of these should not be candidates for future management. Surveys conducted for the TBNG in the summer of 1992 revealed that Roadhill Dam, Upton Centennial No. 1 and Dull Draw Reservoir no longer have potential to support fisheries. Table 3-2 gives the most recent data for the fisheries in these reservoirs. This list is not complete and additional reservoirs may be added later.
Figure 3-1 GENERALIZED EAST-WEST SECTION ACROSS THE POWDER RIVER BASIN

Location of section shown on Map 3-1. Textures from the cross-section correspond to the Stratigraphic Section below.

- Groundwater

Groundwater is available throughout the Thunder Basin National Grassland. Some flowing wells have been developed in the valleys of major streams; however, deeper wells yield larger quantities of water. Paleozoic sandstone and carbonate rocks define the deeper aquifers and are usually considered when large groundwater supplies are needed. For instance, wells developed in the Madison Limestone can yield up to 7000 gallons per minute (see Figure 3-1). The upper and lower cretaceous shale on the east side of the Grassland has the least potential for developing water supplies. Deeper water wells are needed in this area. In most of the area, wells for stockwater are about one mile apart (further on the east side of the TNfG). The groundwater generally flows north through the deeper Madison and Lower Cretaceous aquifers. In the Wyoak-Anderson coal bed, the most extensive shallow aquifer in the area, groundwater movement is to the north along the eastern outcrop, with some discharge in the Gillette area. Recharge to aquifers occurs mainly in the outcrop areas near the Black Hills, Bighorn and Laramie Mountains.

- Water quality

Primary water quality problems on the TNfG stem from sedimentation, metals concentrations, nutrient loading and flow alternations (APPENDIX G). Chemical constituents vary widely due to the vastly fluctuating nature of the stream systems. Natural variation of water quality on the Grassland is large.

The top five sources of water quality impairment on the TNfG, based on the proportion of miles impacted are: rangeland, natural sources, irrigated cropland, pastureland; and highway, road and bridge construction, respectively. These sources are based on statewide river predictions and linear disturbance, not on the severity of impact. Rangeland impacts 105 river miles in the Cheyenne River Basin; 59 miles in the Belle Fourche drainage; and, 736 miles in the Powder River watershed.

Concentrations of suspended sediment in streams vary directly with streamflow. Low concentrations are associated with low flows and high concentrations are found with high flows. Sediment loads transported by the Powder River are larger than those found in the Cheyenne and Belle Fourche Rivers.

The silt-plant loads transported by these drainages increase downstream as erosion from side tributaries concentrates sediment to the main channel. Much of the sediment from the Belle Fourche drainage is trapped in Keyhole Reservoir, located just north of the Grassland. Several small reservoirs trap sediments from the Cheyenne River.

Waters of the Grassland are highly buffered, moderately alkaline and contain high concentrations of sodium, calcium carbonate and chloride. Alkalinity concentrations within the area generally exceed 200 milligrams per liter. Levels of alkalinity on the TNfG are not considered a health hazard in drinking supplies, nor to fish and aquatic life.

Nutrient and organic concentrations are generally indicative of recently received waste loads at the time samples were taken. The wastes can reach the stream either from point discharges or from non-point runoff. Studies on Lodgespole Creek, a tributary of the Cheyenne River, indicate a predominance of green and blue-green algae during portions of the year. Dominance of these algae is generally considered a sign of organic enrichment. The commonness of green and blue-green algae is probably a result of natural conditions and nutrients from livestock and wildlife fecal wastes.

Trace metals and elements (such as iron, zinc, manganese and boron) are generally not found in waters of the TNfG. Concentrations of these trace minerals are generally not a problem but high concentrations of manganese and iron do occur in some waters of the area. Manganese concentrations exceed the 50 μg/L secondary drinking-water standard in a high percentage of the samples obtained at USGS water quality monitoring sites but the water is still suitable for livestock use or irrigation. Iron concentrations exceed the 300μg/L level for secondary drinking-water in a few samples (less than 5 percent) from USGS monitoring sites; however, these waters are still usable for livestock and irrigation. Cadmium, lead and mercury...
concentrations have occurred at levels above national drinking-water standards in a few USGS samples, but occur at such infrequent intervals that a pattern or persistent problem cannot be defined.

The chemical quality of groundwater on the Grassland is controlled by the solubility of minerals in rocks, the temperature and pH of water, and the length of time during which the water is in contact with the rocks. Eighty-four percent of the sampled wells and springs produce water with dissolved-solids concentrations greater than the recommended national secondary drinking-water standard of 500 milligrams per liter. Nearly all sources yield water suitable for livestock. Manganese and iron concentrations in some aquifers are high enough to be objectionable for domestic supplies because of taste and staining problems.

Biological data from streams in the Grassland is spotty. The United States Geological Survey (USGS) has eleven surface water monitoring sites, of which, seven have biological data and four have water quality data available. Additional baseline data on the aquatic biota and abiotic of selected streams on the Thunder Basin was collected by the Water Resource Research Institute during the 1970's, and by the Wyoming Department of Environmental Quality (DEQ) in 1990. Data has also been collected on reservoirs and ponds by the Wyoming DEQ and the University of Wyoming. Biological data is summarized in APPENDIX G of this FES and the Biological Diversity Technical Report for the Thunder Basin National Grassland (located in the project file in the Forest Supervisors Office in Laramie, Wyoming).

Floodplains, riparian areas, wetlands and plays

Riparian, wetland areas and drainage networks for the TBNG have been mapped. Drainage networks, including floodplains, and riparian/wetland areas were mapped on mylar overlays at the scale of 1:24,000 and are available at the Medicine Bow Supervisor’s Office in Laramie, Wyoming.

Floodplains are associated with most streams and rivers flowing through the Grassland. The larger floodplains are mostly developed with agriculture or used for livestock grazing.

Riparian areas and wetlands occur along perennial streams and where the water table is high enough to permit the existence of riparian vegetation. The major vegetation species are: plains cottonwood, peach leaf willow, greasewood, silver sagebrush, sedges, blue grama and several other grasses. Low topographic areas also support riparian or mesic vegetation because of seasonal runoff accumulation in depressions. Riparian areas occupy less than one percent of the total TBNG. These include 2,791 acres of riparian associated with streams, 670 acres associated with reservoirs and 757 acres associated with plays (undrained desert basins that become, at times, a shallow lake).

Riparian areas and wetlands on the Thunder Basin have definable landform characteristics in addition to their specialized vegetation. These include concave plays and areas around artificial impoundments which would be expected to remain flooded. Stream channels form linear riparian areas that divide the landscape and form a connected web of increasing downstream complexity. Because they are a scarce resource on the Grassland, floodplains, riparian areas, wetlands and plays are critical for maintaining biodiversity of the area.

Designated uses

Designated uses of water on the Grassland include: Warmwater fisheries, coldwater fisheries, public water supply, recreation, livestock and wildlife watering, irrigation and industrial development (APPENDIX G). Regional groundwater uses total 53 million gallons per day (mgd). These uses include: Industrial (27 mgd), irrigation (20 mgd), municipal (3 mgd) and rural (3 mgd). Most of the groundwater used for stock and domestic purposes is developed from wells less than 500 feet deep.

Over 90 percent of the total water use (surface and ground) within the Powder River, Belle Fourche and Cheyenne River drainages is for irrigation, usually applied to hayfields along stream channels. Livestock watering ponds are common in small drainages where they catch and hold intermittent runoff.

Six percent of the water is used for industrial purposes and is primarily obtained from groundwater. Water is sometimes injected during oil operations to maintain or increase the pressure in oil bearing formations and improve production. Water injection wells are also used to dispose of saline waste water by pumping it back into the ground.

Water for municipal use and rural supplies makes up approximately two percent of the total available water on the Grassland. Most municipal supplies are obtained from groundwater. Rural water sources are from equal proportions of surface water and groundwater.

The current condition of surface waters and their beneficial uses are described for many drainages on the TBNG (APPENDIX G). Sedimentation, trace metals and flow alterations impact many of the designated uses.

SOILS

The soil types are many and quite diverse. Parent materials (the unconsolidated materials in which soils form) include shale, siltstone, limestone and sandstone (see GEOLOGY). Natural or geologic erosion has played a significant force in the formation of the Grassland topography, evidenced by much of the dissected landscape and some of the "badlands" topography. A detailed description of the soil types, erosion and mass movement potential is contained in Soils Resource report for the Oil and Gas Leasing EIS for the Thunder Basin National Grassland, in the project file at the Forest Supervisors Office in Laramie, Wyoming. Published soil survey reports are available for about two thirds of the TBNG.

The erosion hazard is the inherent potential of the soil to erode if it is not under adequate protection. It does not describe past erosion, only the soil potential for future erosion. The principal features that determine erosion hazard are soil texture, amount of organic matter, soil structure and the ability of the soil to absorb precipitation or runoff and the rainfall intensity. Slope gradient also determines whether a soil has a certain hazard for erosion potential. Numerically, if the annual potential soil loss (or movement) is more than 5 tons per acre per year, then the erosion hazard rating is "severe". Maps (1:24,000 scale) with areas of high erosion hazard potential are in the Project Map Record for the Oil and Gas Leasing EIS, located at the Forest Supervisors Office in Laramie, Wyoming.

Mass wasting is defined as "...dislodgement and downslope transport of soil and rock material under the direct application of gravitational body stresses." Maps with a scale of 1:24,000 showing areas of mass wasting potential are in the Project Map Record. These "potential" areas show where mass soil-movement could be triggered by disaster (or in some cases, natural processes). The triggered event could be relatively slow or fast. These mass wasting areas correspond to slopes with greater than 40 percent gradient and slopes actively eroding that are subject to downslope debris movement. The larger mass wasting potential areas are in the vicinity of Soda Bench Mark of the Spring Creek Unit, Shale Hill near Osage, Little Thunder area off Strie Highway 450, Rochelle Hills, Red Hills, Cow Creek Buttes and Miller Hills.

MINERALS

The Powder River Basin is a major oil, gas and coal-bearing area, the second largest such area in the State of Wyoming. In addition, uranium, bentonite and scoria have all been developed on the Thunder Basin National Grassland.

Coal

There are 18 active coal mines between the southern boundary of the FES study area and the Spring Creek Unit of the Grassland (the northern Grassland Unit). These mines lie along a north south line paralleling Highway 59, from 15 miles north of Bill, Wyoming, to north of Gillette, Wyoming, a distance of about 70 miles. These mines are along the east"n and shallowest edge of the Powder River Basin coal formations.
There are six active coal mines that include National Grassland surface and are all major producers. They are Jacobs Ranch Coal Mine, Black Thunder Coal Mine, North Rochelle Coal Mine, Rochelle Coal Mine, North Antelope Coal Mine and Antelope Coal Mine. Keeline Coal Mine also includes National Grassland Surface, but at this time, is not active. Black Thunder Coal Mine, when measured by production, is the largest surface coal mine in the western hemisphere.

Powder River Basin coal is strip-mined at depths typically less than 250 feet and is frequently 50 to 100 feet thick. Overburden-to-coal ratios are commonly between 1:1 and 2:1. The Powder River Basin coal mines, particularly the mines on the Thunder Basin National Grassland, employ the latest reclamation techniques; frequently, returning a mined area to a more productive state than the native range prior to mining.

The potential for additional coal mine development on the Thunder Basin National Grassland is very high. Thousands of acres of coal deposits, with a high to moderate potential for development, exist. Currently, there are four coal lease by application proposals. Three of these involve National Forest System lands. An expansion of the existing leases is the most likely scenario.
Each Powder River coal mine, whether on or off the Thunder Basin National Grassland, has affected the National Grassland. Power lines, railroads, gravel sources, over-stripping areas and similar uses increased as a result of coal development. Coal mining increased human activity in the area and recreational demands on the National Grassland. Coal mining and the facilities needed to support coal mining, such as roads, powerlines and railroads, are part of the existing character of the Thunder Basin National Grassland.

**Table 3-3 THUNDER BASIN NATIONAL GRASSLAND COAL MINES**

<table>
<thead>
<tr>
<th>Mine Name</th>
<th>Total Lease Acres</th>
<th>National Grassland Acres</th>
<th>Average Annual Production, Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jacobs Ranch</td>
<td>4.950</td>
<td>640</td>
<td>15,000,000</td>
</tr>
<tr>
<td>Black Thunder</td>
<td>2.960</td>
<td>2,880</td>
<td>30,000,000</td>
</tr>
<tr>
<td>North Rochelle</td>
<td>1.960</td>
<td>480</td>
<td>Minimal</td>
</tr>
<tr>
<td>North Antelope</td>
<td>2.280</td>
<td>920</td>
<td>6,000,000</td>
</tr>
<tr>
<td>Rochelle</td>
<td>5.600</td>
<td>2,760</td>
<td>10,000,000</td>
</tr>
<tr>
<td>Antelope</td>
<td>5.406</td>
<td>1,900</td>
<td>4,000,000</td>
</tr>
<tr>
<td>Total</td>
<td>27.556</td>
<td>9,580</td>
<td>65,000,000</td>
</tr>
</tbody>
</table>

**Oil & Gas**

There are 58 developed oil and gas fields on the TBNG. Some statistics for oil and gas actions on the TBNG are listed in Table 3-4. It is important to note that these figures are only for lands with federal surface. As previously discussed, within the FEIS study area the surface ownership is approximately 1/3 federal and 2/3 state and private lands. Extensive oil and gas field development has occurred on state and private land, as well as, the federal land. Well sites in all stages of utilizing the oil and gas resource are common. The character of the entire area is heavily influenced by oil and gas development, such as drill rigs, pumpjacks, storage tanks, treater tanks, pipelines, powerlines and oil field roads and traffic.

**Table 3-4 STATUS OF OIL AND GAS WELLS ON THE THUNDER BASIN NATIONAL GRASSLAND, NATIONAL FOREST SYSTEM LANDS ONLY**

<table>
<thead>
<tr>
<th>Status</th>
<th>Analysis Area, Total Actions</th>
<th>National Grassland, Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producing wells</td>
<td>1,895</td>
<td>376</td>
</tr>
<tr>
<td>Wells reclassified and accepted</td>
<td>1,244</td>
<td>650</td>
</tr>
<tr>
<td>Wells with reclamation in process</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Wells converted to injection wells</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>APD’s processed and cancelled</td>
<td>48</td>
<td>236</td>
</tr>
<tr>
<td>Wells in misc. status</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Total oil and gas actions</td>
<td>3,187</td>
<td>1,365</td>
</tr>
</tbody>
</table>

The conditions of approval on APD’s and lease stipulations designed to protect the natural resources and maintain productivity of the land vary with the date when the authorization was made. Early leases contained few stipulations and wells authorized before 1971 have very few conditions of approval.

As the need for protection of the environment became more apparent, more stringent leasing stipulations and conditions of approval on APD’s were applied. Leases and APD’s authorized after the Forest Plan was approved, November 20, 1985, have stipulations and conditions of approval that make the oil & gas development fully consistent with the Forest Plan Standards and Guidelines. Basic safety and environmental acceptability are common to all of the producing sites; spill prevention measures are required; equipment causing hazards to the public or livestock/wildlife is prohibited and no unapproved changes to existing facilities can occur.

There are 14 known hydrocarbon productive formations on the Thunder Basin National Grassland. Generally, oil in this area is produced from stratigraphic traps, a condition of the rock strata, where the oil bearing formation laterally changes to another rock type, forming a pocket or trap where oil can collect. Depth to oil bearing strata is generally between 4,000 feet and 13,500 feet, but some of the older wells are as shallow as 400 feet. Oil and gas production on the Thunder Basin National Grassland has been very consistent. Some of the older wells in the Newcastle area have been producing since the 1950's. The rate of abandonment of producing wells, both old and new is very low.

Reclaimed sites are common on the Grassland. Standard practice requires the site to be returned to acceptable topographic contours and an acceptable quality and quantity of vegetation established stabilizing the soil. Additionally, an above ground "Dry Hole Marker" is required. Typically, this is a four inch pipe extending at least five feet above the ground with the legal location and well information shown. These Dry Hole Markers have proven to be visually acceptable, are an aid to management by being a location marker and providing looting perches for raptors.

**Geophysical Exploration**

Geophysical exploration to detect oil and gas reserves beneath the Grassland's surface increased sharply beginning in the mid 1970's, in response to the Nation's effort to be independent of foreign sources of petroleum. During the period, 1975 to 1988, approximately 223 line miles of seismic data were permitted on the Grassland with a significantly greater number of line-miles of exploratory work completed on the State of Wyoming and private surfaces within the FEIS study area boundary.

Fiscal year 1981 had the most seismic data acquisition with a total of 512 line-miles completed on National Forest System lands. After 1982, the number of line-miles of seismic data acquired each year began fluctuating, with a sharp decrease in the number of line-miles acquired in 1987. Typically, about 50 percent of the seismic work has been shot hole and 50 percent Vibroseis. The fluctuations and decreases in seismic data acquisition are due to the interactions of a complex set of world wide social, technological, and economic factors which are most difficult, if not impossible, to accurately predict and correlate. Current seismic data acquisition is less than 10 line-miles per year.

**Bentonite**

Bentonite is an absorptive and colloidal clay with a wide variety of uses ranging from oil/gas well drilling, plugging seismograph holes, sealing stock ponds, to an inert ingredient in food stuffs; especially, candy bars. On lands with public domain mineral status, bentonite is a locatable mineral, while on lands with acquired minerals, it is a leaseable mineral.

On the Thunder Basin National Grassland, bentonite is generally found in small pockets at fairly shallow depths, often no more than 10 to 25 feet deep. Generally, the mine sites vary from 10 to 70 acres and average somewhat over 40 acres. Scrapers, dozers and backhoes are the types of equipment commonly found at a bentonite operation. Blasting is seldom necessary and equipment larger than a scraper is not common.

Bentonite production quickly and directly fluctuates with demand. Presently, with the low demand for bentonite from the oil/gas industry, little mining is occurring on National Forest System lands.

There is one bentonite operation, American Colloid, on the National Grassland. The operation is surface mining, and consists of a 150 acre lease, of which only 90 acres will be disturbed within a 680 acre locatable operation.
Thirty-three bentonite mine sites covering a total of 1,040 acres exist on the Thunder Basin National Grassland. Thirty-two of the 33 sites have been reclaimed to productive land. Re-entry is planned on the one unreclaimed site and it was deleted from the reclamation program.

Uranium mining was high priority during the 1950’s when many claims were filed and leases issued adjacent to and on the Thunder Basin National Grassland. After the Three Mile Island nuclear event and insensitive uranium being produced in Canada and Australia, American uranium mining activities have decreased significantly. Only one uranium mine is located on the TBNG and it is in the process of terminating operations. While significant additional uranium reserves exist on the TBNG, no new uranium mining is foreseen in the near future.

### Table 3-5 BEAR CREEK URANIUM MINE

<table>
<thead>
<tr>
<th>Status</th>
<th>Total Lease Acres</th>
<th>National Grassland Acres</th>
<th>Average Annual Production, Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leased</td>
<td>7,400</td>
<td>3,200</td>
<td>503,963</td>
</tr>
<tr>
<td>Mined</td>
<td>2,153</td>
<td>756</td>
<td>Presently, No</td>
</tr>
<tr>
<td>Reclaimed</td>
<td>1,685</td>
<td>756</td>
<td>Production</td>
</tr>
</tbody>
</table>

**Common Variety Minerals**

Common variety minerals are typically sand, gravel, and building stone. According to Forest Service regulations these are saleable minerals. Gravel, in the form of aconite, is the only common variety mineral being utilized in any significant amount on the TBNG. It has been and continues to play a key role in road construction and maintenance: for Forest System roads, oil field roads, county roads, state roads and coal mine road surfacing.

There are five community gravel pits on the TBNG and one exclusive use permit. This permit is associated with a Coal Mine and encumbers 280 acres. The community pits have multiple users and encumber about five acres each.

**Hard Rock Mining - Locatable Minerals 1872 Mining Law**

Currently, there are no prospecting operations occurring. The only 1872 Mining Law authorized activities occurring on the Grassland have been related to bentonite and uranium. Currently, there is an active bentonite claim. No active uranium mining is occurring. During the last ten years, two patents have been issued by virtue of the 1872 Mining Law: one for bentonite and one for uranium. The patents totalled 305 acres.

**VEGETATION**

The Thunder Basin National Grassland contains vegetation typical of the northern Great Plains. Two overall groups of vegetation are found on the TBNG. These groups are upland vegetation and riparian vegetation. Five general categories of vegetation are found within these groups. These can be further divided into forest, woodland, shrubland and grassland (see Table 3-6).

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### Table 3-6 VEGETATION COMMUNITY CLASSIFICATION

<table>
<thead>
<tr>
<th>Community Types†</th>
<th>Forest</th>
<th>Woodland</th>
<th>Shrubland</th>
<th>Grassland</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPLAND WOODLAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ponderosa pine/</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bluebunch wheatgrass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ponderosa pine/Rocky Mountain juniper</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocky Mountain juniper</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UPLAND SHRUBLAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(shrubland)</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>birdfoot sagebrush</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>founwing saltbush</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Douglas rabbitbrush</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Shrub-steppes)</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>skunkbush sumac/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bluebunch wheatgrass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>soapweed yucca/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>needle and thread grass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>big sagebrush/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bluebunch wheatgrass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>big sagebrush/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>blue grama-bluebunch wheatgrass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>big sagebrush/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>green needlegrass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>big sagebrush/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>western wheatgrass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>big sagebrush/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>blue grama-western wheatgrass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UPLAND GRASSLAND</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>little bluebunch</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>blue grama</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>blue grama-threadleaf sedge</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>needle and thread blue grama</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIPARIAN DECIDUOUS FOREST</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>plains cottonwood/ western snowberry</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIPARIAN Shrubland (non-saline)</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>silver sagebrush/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>blue grama</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>silver sagebrush/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>blue grama-prairie sedge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sandreed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>black greasewood/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| western wheatgrass/
| blue grama        |
| RIPARIAN GRASSLAND (non-saline) | ☑️ |          |           |           |
| western wheatgrass |


**Note**

Six large-scale vegetation units, which correspond closely to the geology and precipitation patterns are shown in Map 3-6. Seventeen upland community types from the classification in Table 3-6, are fitted into these-seven zones to form a general vegetation model. The Riparian community types are not presented on the map but they are discussed in the text in this section and also in the section on riparian and wetland vegetation.

The Rochelle Hills, composed of sandstones of the Tongue River member of the Fort Union Formation, are vegetated with ponderosa pine - bluebunch wheatgrass and ponderosa pine - Rocky Mountain juniper upland woodlands (Map 3-6, Area #4). Similar plant communities are found on the Spring Creek Unit, which has the same geologic base (Area #4). Ponderosa pine - Rocky Mountain juniper upland woodlands characterize land east of the Upton-Osage area influenced by the Big Hills uplift. These woodlands are on a different geologic base composed of cretaceous sediments million years older than the Wasatch or Fort Union sediments (Area #7). The patchy nature of the geologic substrate forms a basis for the interspersion of grassland with the upland woodland vegetation for Areas #4 and #7. In general, ponderosa pine and Rocky Mountain juniper grow where bedrock is near the surface and grassland occurs where soils have developed on finer-grained bedrock or alluvium.

The most extensive characteristic landscapes of the Thunder Basin National Grassland consist of upland grassland, upland shrubland or a mosaic of both. Areas #1 and #6 on Map 3-6 are primarily upland grassland, consisting of what has been, historically described, as northern mixed-grass prairie. The principal species are: blue grama, western wheatgrass, needle and thread, green needlegrass and threadleaf sedge. Dryland farming has replaced native vegetation on parts of both areas with smooth bromegrass, alfalfa or crested wheatgrass, especially on private land. Playas, vegetated with nearly pure stands of western wheatgrass, are associated with both Area #1 and Area #6. Playas are classified as non-saline riparian grasslands. They range in size from less than an acre to over 50 acres.

Upland shrublands of Area #2 can be divided into two groups: one group has a grass understory (shrub-steppe), while the other has an understory of smaller shrubs or forbs. A dominant vegetation type is big sagebrush shrub-steppe. Big sagebrush forms a mosaic with western wheatgrass, blue grama, bluebunch wheatgrass, green needlegrass or various combinations of these to create a sagebrush-steppe mosaic. The grasses do not form a true understory. They occur together with big sagebrush in a variety of patch sizes. The big sagebrush shrub-steppe occurs on soils with high clay content.

Upland shrublands and upland grasslands in Area #3 are associated with scoria outcrops and the dissected sideslopes of the Wasatch Formation along creeks tributary to the Cheyenne River. Skunkbrush sumac, little bluestem and bluebunch wheatgrass are found here, interspersed with big sagebrush and communities of other shrubs, such as birdfoot sagebrush, which is restricted to areas with alkali substrates and impeded drainage on uplands. Area #3 is a transition from the slightly dissected uplands near
The top of the Cheyenne River watershed to the Rochelle Hills escarpment. Several coal mines are in this zone.

The area east and southeast of the Rochelle Hills (#5), has patches of upland shrubland on "badlands" within a matrix of big sagebrush steppe and upland grassland. Although this land may seem barren, the collection of plant community types in this area makes it one of the most diverse areas botanically on the Thunder Basin National Grassland. The "badlands" consist of multicolored carbonateose shales, concretionary silt, gravel, and thin beds of coal supporting communities of Douglas-fir, sourfoot sagebrush, fouling saltbush, birdfoot sagebrush and yucca with a variety of small forbs in the understory.

In addition to the playas, major riparian vegetation types include three kinds of riparian shrublands and riparian deciduous forest. Two major non-saline riparian shrublands which are found in lowlands and on stream terraces are dominated by silver sagebrush. These are shrub-steppe communities which have blue grama or blue grama and prairie sandreed understories. A common saline riparian shrubland is greasewood with a western wheatgrass and blue grama understory. All three of these community types have been heavily impacted by livestock grazing and the understories often consist of prickly pear cactus, cheatgrass and other introduced or annual weeds. The larger, perennial streams have terraces which support perennial plants. The larger shrub-sagebrush is an understory dominant where it has not been removed by grazing or browsing. Woody draw, similar to those described for areas in South Dakota and Nebraska, occur in the Spring Creek Unit. Woody draw vegetation may include green ash and boxelder in addition to understory shrubs such as currant, sourberry and chokecherry.

This vegetation classification and geographic description is based on data from plant communities described as reliable to represent stable state vegetation composed of native species. The influences of livestock grazing and fire suppression, the spread of introduced annual and perennial plants and noxious weeds plus the creation of new landscape forms, sols and plant communities during the reclamation process for large areas (coal mining), small patches (oil and gas well reclamation) and intermediate size areas (bentonite mining) must also be considered in classifying and describing the vegetation for an environmental impact evaluation. At this time, the patches influenced by non-native vegetation or recreated landscapes occupy only a small portion of the total area.

Non-woody weed control is accomplished interactively by the Grazing Associations and the Forest Service. Musk thistle and canadita thistle are the primary targets. These plants occur in disturbed areas, mostly along roads or in the bottoms of draws. Approximately 250 acres were treated in 1992. Small populations of leafy spurge have been in the Irion Karlu area for over a decade. Spotted knapweed is beginning to appear in the Spring Creek area. Pest populations of these plants occur in Montana. There is little control of weeds on mine spoil piles or on oil and gas lease pads. Herbicides are used by the State Highway Department to suppress plant growth along road Right-of-Ways.

Successional relationships among upland grassland and upland shrubland communities are only partially understood. Effects of fire and the subsequent path of succession are determined in part by precipitation and the impact of grazing and browsing on shrub establishment and growth. No large-scale studies of patch size and patch position have been conducted to date and any studies done will be done on systems which are already highly altered. It is only possible to study the existing plant communities and to recommend management to attain a desired future condition which meets the criteria for ecosystem management and biodiversity in the Forest Plan.

Long-term study areas, established in the mid-1980s on land presently part of the Thunder Basin National Grassland, are being reemphasized. Analysis of data from a study area located in Area #1, Map 3-6, showed that since the 1980s bunchgrass cover increased by over 290% and mesquite grasses by over 200%. Annual grass cover increased over 500% and cactus by 900%. Blue grama cover more than tripled during the 51 year time span. (Fisher, H.G., Johnson, K.L. and K.S. Moore. 1989. 51 year change in the shortgrass prairie of Eastern Wyoming. Proceedings of the 11th Annual North American Prairie Conference, Lincoln, NE).

There are no federally listed Threatened or Endangered Plant species known in the Thunder Basin National Grassland. Astragalus barni (barren clay hills) which had been classed as Category 2 (C2) was downlisted to Category 3C in 1992. Oryzopsis contracta remains classed as a 3C plant. (3C means that the species is more abundant than previously believed, but that populations should be watched).

BIOLICAL DIVERSITY

Biological diversity is expressed at four scales on the Thunder Basin National Grassland. These are the landscape, community, species and genetic scales. Oil and gas leasing is not expected to affect the genetic scale. Populations of specific species which have been identified as indicator species, threatened or endangered species or are of other interest for management are discussed under WILDLIFE and VEGETATION.

At the landscape and community scales several special biological diversity areas have been identified. These are mainly specialized communities which form islands or patches in the greater sagebrush-grassland. There are also specialized communities on specific soil types in badlands. The mosaic of communities within these islands (patches), interactions among them and with the greater grassland along their edges, provides opportunities for biological interactions which do not occur in any of the individual communities in isolation. This results in greater biological diversity than would be expected in separate communities.

In theory, areas presently exhibiting a high degree of natural condition, multiple biological community relationships and relatively high natural diversity are the most valuable. These areas provide the best chance of meeting multiple species needs and are the best insurance against causing irreversible environmental effects.

Six areas having specific communities whose composition, structure, processes and functions which are unique within the context of the TNBG have been identified (see Map 3-7). Generally these areas are coincident with areas that have special recreation values. These areas are: 1) Upton-Osage, 26,000 acres; 2) Rochelle Hills, 15,245 acres; 3) Cow Creek Buttes, 6,970 acres; 4) Miller Hills, 3,520 acres; 5) Duck Creek, 8,960 acres; and 6) Downs, 5,080 acres.

Rochelle Hills--The Rochelle Hills (15,245 acres) is an isolated, tree covered escarpment in a large grass-shrub area of low topographic relief. In the larger surrounding area, it is unique in terms of vegetation (ponderosa pine forest), community types, relationship within the areas of plant and animal communities, number and relationship of both communities and species. This contributes to higher wildlife and biological diversity values.

Upton-Osage--Upton-Osage (26,000 acres) is in a transition area between grassland and the Black Hills with stringers of ponderosa pine forest interspersed with grassland. The topography in the Upton-Osage area is gently rolling hills. In the larger surrounding area, it is unique in terms of vegetation (ponderosa pine forest), community types, relationship within the areas of plant and animal communities, number and relationship of both communities and species. This contributes to higher wildlife and biological diversity values.

Duck Creek--This area of 8,960 acres, is located on a major transition between the Duck Creek breaks and grassland to the east. It is an area of deep canyon terrain and steep bill slopes.

This area is characterized by plant communities whose structure and composition differ sharply from the surrounding area. The existing biological diversity consists of highly integrated woodland, shrub land and grassland communities with excellent ecological integrity and condition. Some plant communities found...
Downs-- This area of 5,080 acres, is an elevated landform which is highly dissected into canyons and badlands. It is an area containing a complex mosaic of shrublands and woodland communities. It is unusual in that many plant communities occur together in a small area. Many of these communities are uncommon in the TBNG (ie. Birdfoot sagebrush, Douglas rabbitbrush and sand sagebrush sumac). Birdfoot sagebrush, which occupies flat areas and requires a saline shale substrate, is well developed in the Downs area. The condition of plant communities is good.

RANGE/LIVESTOCK

The main plant vegetation series is sagebrush (Artemisia) with various grasses such as wheatgrass and grama grass. Other grasses include some bluegrasses, inland saltgrass, green saltgrass, little bluestem and needle-and-thread grass. Shrubbs include greasewood and saltbush. Some localized sites of ponderosa pine or limber pine occur in the Pine Ridge and Rochelle Hills areas. Cottonwood trees commonly grow in association with the wet draws and riparian areas.

In 1991, there were 183 permittees that grazed livestock on 201 allotments on the Thunder Basin National Grassland. Grazing is permitted to livestock operators through three Grazing Associations. Each Grazing Association is authorized by a grazing agreement with the Forest Service. The agreements identify the roles and responsibilities of each Association and the Forest Service. Typically, the Forest Service is responsible for determining how the land is to be used, while the Association is responsible for carrying out the Forest Service decisions involving livestock use. Typically, the allotments are highly intermingled with several land ownerships. There are approximately 1,100,000 acres of private "end" and 124,300 acres of state lands that are located within grazing allotments that contain National Grassland surface. Approximately 98 percent of the 572,224 acres of Thunder Basin National Grassland are suitable for providing livestock forage.

Over the past 10 years, about 21,000 sheep and 20,000 cattle have been permitted annually to graze on the National Grassland. Seasons of use in allotments vary greatly due to the National Grassland commonly being linked with all segments of year-around ranching operations. Animal Unit Months (AUMs) of forage consumed, by permitted livestock, averages about 148,500 AUMs annually on the National Grassland. Livestock stocking rates average about 4 acres/AUM. Many of the operators are very dependant on the National Grassland in order to have a viable economic ranch operation. Many facilities have been constructed on the National Grassland to enhance livestock and vegetation management. Currently, there are about 830 livestock dams/dugouts, 340 water wells, 80 spring developments, 835 miles of fence and 76 miles of water pipeline on the Grassland. Non-structural rangeland improvements are also common and include many acres which have been seeded, burned, marked with small pits in the soil to improve water infiltration, or treated with chemicals to control sagebrush, cactus, grashoppers, prairie dogs and noxious weeds.

VISUAL RESOURCES

The landscape of the Thunder Basin National Grassland is typified by open grasslands, low rolling hills and views for many miles; (often for 30 to 40 miles). Grazing livestock, roads, railroad tracks and mineral activities are part of the view. Travelers can observe working ranches with fences, windmills and cattle; active coal mines with huge open pits, coal slir's, draglines and trucks; oil and gas fields; with pump-jacks, treater tanks, storage tanks, pipelines and trucks; and a wide variety of wildlife species. On federal lands, most of the past mineral activities, such as, oil and gas drilling, coal strip mining, uranium mining and bentonite mining have been reclaimed. Many active oil and gas wells located on both federal and private lands are visible from the primary travel routes (Highways 59, 450 and 16). Both Jacobs Ranch and Black Thunder coal companies with facilities, reclaimed sites and portions of active coal mining sites can be observed from Highway 450. Some coal silos (Antelope Coal Mine silo located on the Grasslands and several others located on private lands) can be observed from Highway 59. Highway 59 also runs through...
a coal mine north of Gillette. From southeast of Upton on Highway 16, several abandoned bentonite mines located on private lands are visible and east of Gillette on Highway 16. Wyndak power plant and coal mine are visible. The Antelope and North Rochelle coal mines are visible from secondary roads located within the vicinity of the Rochelle Hills area.

Visual Quality

Visually, the Grassland is characterized by limited visual variety and a moderate level of existing human impacts. The rolling topography allows visitors to view wide expanses of grassland, broken occasionally by buttes and wooded stream corridors. Coal silos are typically visible for three to five miles, while lesser developments such as ranches and railroads may be visible for one-fourth to one mile. An oil well pumpjack and storage tank, if painted appropriate colors, will typically blend visually into its surrounding landscape.

There are, however, some notable exceptions, such as, the Rochelle Hills, Red Hills, Upton-Osage area and the portions of the Spring Creek area where the topographic relief and ponderosa pine, pinyon/juniper vegetation offer very pleasant viewing. The importance of these wooded areas for viewing is increased because of the contrast with the surrounding grasslands.

The Medicine Bow National Forest Plan adopted Visual Quality Objectives (VQO) by Management Area. Except for riparian areas, the Forest Plan adopted VQO for the Thunder Basin National Grassland is modification and maximum modification. Riparian areas, Forest Plan Management Area 9A, have a Forest Plan adopted VQO of partial retention. Riparian areas occur along perennial stream channels or where the water table is high enough to permit the existence of riparian vegetation. Riparian areas, playas, floodplains and wetlands were mapped on mylar overlays at the scale of 1:24,000 and are available at the Medicine Bow Supervisor’s Office in Laramie, Wyoming.

During the interval between the DEIS and the FEIS the 1980 VQO inventory was updated to 1992. At the time of the 1980 inventory, Highway 16 from Newcastle to Moorcroft was considered a Sensitivity Level One travel route due to tourists traveling on this road to Devils Tower National Monument. Today, tourists use Interstate Highway 90 to reach Devils Tower. Highway 16 is used mostly by local people to commute to various towns located adjacent to the highway. Because of this change in traffic, Highway 16 is presently classified a Sensitivity Level Two travel route. The significance of this change is that the Highway 16 corridor will be required to meet modification only, rather than retention and partial retention as in the DEIS.

Visual Absorption Capability

The gentle topography and lack of major vegetation result in a low visual absorption capability (VAC), meaning that landscape modifications will have a high impact, which cannot be easily mitigated; however, the communities involved are tolerant of the impacts of all types of intrusions for economic reasons.

RECREATION

The Thunder Basin National Grassland provides numerous recreation opportunities and is an especially important recreation resource for local area residents. Recreation use is measured in Recreation Visitor Days (RVD), which is equivalent to 12 hours of visitor use (for example: 1 RVD equals 12 visitors for 1 hour apiece, or 1 visitor for 12 hours or any combination thereof). Total recreation use in 1990 on the Thunder Basin National Grassland was 43,590 RVD’s entirely in non-facility based recreation pursuits, such as, driving for pleasure, hunting, snowmobiling and hiking.

Big game hunting is the primary recreational use on the Thunder Basin National Grassland. Recreation use attributable to hunting is shown in Table 3-7. Other recreation visitor days are displayed in Table 3-8.

Table 3-7 BIG GAME, SMALL GAME AND UPLAND GAME RECREATION USE ON THE THUNDER BASIN NATIONAL GRASSLAND, 1990

<table>
<thead>
<tr>
<th>Species</th>
<th>Visitor Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antelope</td>
<td>3,544</td>
</tr>
<tr>
<td>Mule Deer</td>
<td>3,502</td>
</tr>
<tr>
<td>Elk (Area 115 is normally closed)</td>
<td>0</td>
</tr>
<tr>
<td>Cottontail Rabbit</td>
<td>2,900</td>
</tr>
<tr>
<td>Sage Grouse</td>
<td>1,700</td>
</tr>
<tr>
<td>Waterfowl</td>
<td>1,500</td>
</tr>
<tr>
<td>Black-Tailed Prairie Dog</td>
<td>1,124</td>
</tr>
<tr>
<td>Total</td>
<td>13,146</td>
</tr>
</tbody>
</table>

Table 3-8 SUMMARY OF RECREATION USE ON THE THUNDER BASIN NATIONAL GRASSLAND, 1990

<table>
<thead>
<tr>
<th>Activity</th>
<th>Visitor Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunting - From Table 3-7 above.</td>
<td>13,146</td>
</tr>
<tr>
<td>Winter Sports - Snowmobiling and Cross-country skiing primarily in the Upton-Osage area.</td>
<td>1,000</td>
</tr>
<tr>
<td>Fishing - Warm water reservoirs provide limited fishing in the Grassland.</td>
<td>3,600</td>
</tr>
<tr>
<td>Sightseeing - State highways and county roads provide good antelope and small upland game viewing.</td>
<td>14,220</td>
</tr>
<tr>
<td>Hiking, Camping, Picnicking - Hiking, camping and picnicking use is dispersed and minimal.</td>
<td>4,600</td>
</tr>
<tr>
<td>Firewood - Gathering of firewood is minimal and limited to the Upton-Osage, Rochelle Hills and Weston areas of the Grassland.</td>
<td>1,124</td>
</tr>
<tr>
<td>Motorcycle and Trailbike Travel - dispersed and minimal</td>
<td>1,800</td>
</tr>
<tr>
<td>Horseback Riding - dispersed and minimal</td>
<td>1,200</td>
</tr>
<tr>
<td>Swimming and Waterplay - dispersed and minimal</td>
<td>1,100</td>
</tr>
<tr>
<td>Miscellaneous - dispersed and minimal</td>
<td>2,000</td>
</tr>
<tr>
<td>Total</td>
<td>43,590</td>
</tr>
</tbody>
</table>
Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) is the framework for integrating recreation values into National Forest Plans, project designs and management decisions. Four classes of ROS were identified in the Thunder Basin National Grassland (ref: Medicine Bow National Forest ROS inventory 1981, updated 1992):

1. Urban - is characterized by high levels of human activity and by concentrated development, including development for recreation opportunities. About 15,712 acres (3%) of the Grasslands is in this class.

2. Rural - the sights and sounds of human activity are readily evident, though less pronounced and less concentrated than in the urban class. About 61,098 acres (10%) of the Grasslands is in this class.

3. Roaded Natural - is characterized by predominately natural appearing settings, with moderate sights and sounds of human activities and structures. About 466,975 acres (82%) of the Grasslands is in this class.

4. Semi-Primitive Motorized - is characterized by predominately natural or natural-appearing landscapes. The size of these areas gives a strong feeling of remoteness from the more heavily used and developed areas. About 28,436 acres (5%) of the Grasslands is in this class.

The Thunder Basin National Grassland is comprised mostly of Roaded Natural and Rural Recreation Opportunity Spectrum (ROS) classes, indicating that the Grassland is in relatively close proximity to the road system serving them. The Upton-Osage, Rochelle Hills, and Miller Hills areas, while roaded natural, do offer some of the attributes of the semi-primitive motorized ROS class. There are no areas designated by the Forest Plan for nonmotorized recreation, so the TBNG and no areas have been designated for management for semi-primitive recreation opportunities. There are 4 areas, totaling 27,820 acres which have been inventoried as having semi-primitive motorized ROS class characteristics. These four areas are: Duck Creek (7,970 acres), Dugout (3,930 acres), Miller Hills (9,280 acres) and Cow Creek Buttes (6,640 acres).

Oil and gas activities on the Grasslands could change ROS classes on small acreages, where the activities occur.

CULTURAL RESOURCES

Cultural resource properties recorded on the Thunder Basin National Grassland (TBNG) reflect approximately 11,000 years of human use of the High Plains Steppe environment. About 36 percent (200,000 acres) of the TBNG has undergone some degree of archaeological surface examination since the mid 1970's. Just over 1,100 prehistoric (1,000) and historic (100) sites have been located and recorded on the Grassland. The variety of individual resources/sites range from Native American encampments, to historic trails and wagon roads, to more recent homesteads and pastoral camps. Although the average site size is under one half acre, some linear features, such as the Bozeman and Texas Trails, extend for many miles across the TBNG. Approximately 150 of the historic and prehistoric sites recorded on the Grassland have been determined eligible to the National Register of Historic Places, but none are currently listed on the National Register. Site densities on the Grassland are high, an average of four sites per square mile. The most common sites encountered consist of small, temporary prehistoric hunting camps and historic pastoral camps.
Prehistoric Resources

Prehistoric peoples are believed to have inhabited the High Plains of northeastern Wyoming, the general location of the Thunder Basin National Grassland, for at least 11,000 years. The general chronology for aboriginal occupation of the TBNG is:

(all dates BP "Before Present")

1. the Paleolindian Period (11,000 - 7,500 BP);
2. the Archaic Period (7,500 - 1800 BP);
3. the Prehistoric Period (1800 - 400 BP);
4. the Protohistoric Period (400 - 200 BP);
5. the Contact Period (200 - 120 BP).

Virtually all of the prehistoric sites located on the (TBNG) date from the last 3,000 years. There have been no sites recorded from Paleolindian or Early Archaic periods, but diagnostic points from these earlier periods have been found on the surface as isolated finds. Sites dating to 11,000 years (Hell Gap, Casper, and Carter-Kier McGee) do exist immediately north and south of the (TBNG) in the Powder River Basin, so the potential for the location of Paleo and Early Archaic sites does exist on the Grassland. Such sites are often hard to identify because they are usually covered by several feet of overlying sediments.

The 1,000 recorded prehistoric sites on the Grassland can be classified into types reflecting their use by prehistoric groups. For the (TBNG), several site types (open campsites, lithic procurement sites, tepee ring sites, kill sites, butchering sites, etc.) have been recorded, the most significant are long term habitation sites. Such sites which contain substantial archaeological data are important for scientific research, interpretation and public education. The Walker Tepee Ring site is a 320 acre long term habitation site.

Historic Resources

The majority of the historic sites on the Grassland are related to early homesteads, ranches, farms and pastoral camps. A few small coal mining sites also exist. The historic record for the Thunder Basin National Grassland begins with the early explorers who traversed the area to explore and establish transportation routes. The Powder River and North Platte River valleys, just to the west and south of the Grassland, were investigated in the early 1800s by Canadian fur companies, from the north and by eastern pioneers. In 1812, Robert Stuart discovered an overland route between St. Louis and Oregon. This route soon became known as the Oregon/Columbia/Mormon Trail, and became the major thoroughfare for thousands of push cart and wagon train pioneers. Explorers made their way into the Grassland by the mid 1800's following the Cheyenne River north to the Black Hills. The Reynolds Expedition came through in 1859 and the James A. Sawyers Wagon Road Construction Crew in 1876.

In 1863, John Bozeman established a trail from Deer Creek Station on the Platte River to the gold fields of Montana. The trail was also utilized as a cattle stock drive. A portion of this trail crosses through the southwest portion of the TBNG in what is now Converse County.

It was not until the early 1900's that people started to homestead the Grassland. The activity was mostly due to the Homestead Act of 1909 and the Stock Raising Homestead Act of 1916, which allowed the homesteaders to file on 320 and 640 acres of public land. Dry farming was attempted, but most farmers had to also rely on livestock (mainly sheep) to get by. Small homesteads continued to spring up on the Grassland until the dust bowl depression of the 20's and 30's. Hard times fell on the settlers, then many of the homesteads reverted back to the Government and many more were sold to the Government. The Soil Conservation Service administered the public land on the TBNG until 1954 when the Medicine Bow National Forest took over management.

Local farmers and ranchers were aware of the abundance of coal on the Grassland. In the early 1900's, small mines were started for private use. Eventually, many expanded their operations to function at a much larger commercial scale.

American Indian Sacred Sites

There are presently no documented American Indian sacred sites on the Thunder Basin National Grassland; however, the grassland is located between the Big Horn Mountains to the west and the Black Hills to the east, both mountain ranges are considered sacred by various Indian cultures. This creates the possibility that locations exist which may have special religious or heritage significance to American Indian groups.

WILDLIFE

The majority of the TBNG consists of sagebrush/grassland habitat types with low topographic and vegetative diversity. The Rochelle Hills, Miller Hills and Red Hills, with their pine clad escarpments and patches of ponderosa pine and Rocky Mountain juniper, grade into sagebrush/grassland. Rolling hills dissected by deep drainages provide excellent vegetative and topographic relief. The Upton, Ogage and Spring Creek areas also provide considerable diversity as a result of rolling, partially timbered valleys. Riparian areas associated with several drainages on the Grassland are also important for habitat diversity. Several of the drainages in the Spring Creek Management Unit are occupied by broad-leafed trees and shrubs, which form a hardwood drain type. Reservoirs also provide habitat for some aquatic species that normally would not occur on the Grassland.

The Forest Plan identifies several areas for management emphasis on wildlife habitat (Forest Plan Management Area Map, Management Area 48) and approximately 4,600 acres of crucial winter range for deer (Forest Plan Management Area 5A). No other crucial winter range for deer has been identified on the TBNG, although, antelope tend to concentrate in the Rosecraen area during severe winters.

Table 3-9 TERRESTRIAL VERTEBRATE SPECIES THAT OCCUR ON THE THUNDER BASIN NATIONAL GRASSLAND

<table>
<thead>
<tr>
<th>Vertebrate Species</th>
<th>Total Species</th>
<th>Game and/or Furbearing Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphibians</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Reptiles</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Birds*</td>
<td>220</td>
<td>26</td>
</tr>
<tr>
<td>Mammals</td>
<td>60</td>
<td>21</td>
</tr>
<tr>
<td>TOTAL</td>
<td>301</td>
<td>47</td>
</tr>
</tbody>
</table>

Note:
\* Includes migratory or incidental species

Big Game

Antelope, mule deer, white-tail deer and Rocky Mountain elk are the only big game species occurring on the Thunder Basin National Grassland.
In the vicinity of the rainy season, prairie dog colonies can grow rapidly. The population of the Thunder Basin National Grassland is estimated to be 15,215,215 per square mile, with a high density in Wyoming. Coyotes appear to be slow to respond to the presence of prairie dogs, but they can be found in the vicinity of colonies.

In the spring, coyotes can be found on the grassland for feeding and possibly breeding and nesting. Some of the reservoirs have been fenced, or partially fenced, to exclude livestock in order to provide residual nesting cover for waterfowl and shorebirds.

Raptors

Several raptors are known to nest on the TBNG. Golden eagles will nest either in trees or on the ground. Because of their status as a species of special interest and as a Forest indicator species, their nesting activity and success has been monitored annually since 1981. Golden eagle nesting activity dropped dramatically after the spring snow storms of 1984, but it is now increasing. In 1991, 60 of 176 known golden eagle nests were active. Tree nesting raptors that nest on the Thunder Basin National Grassland include: Swainson's hawks, red-tailed hawks, American kestrels and great horned owls. Ground nesting raptors that nest on the TBNG include: marsh hawks, ferruginous hawks and short-eared owls. Three prairie falcon nest sites are located in the Rochele Hills. All of the above mentioned species forage over the Grassland. Rough-legged hawks are common winter residents on the Grassland, but migrate out of the area prior to nesting.

Merlins had not been known to nest on the TBNG until 1991. But during golden eagle nest surveys, two active merlin nests were discovered on National Forest System lands. Both nests were in old magpie nests in live ponderosa pines.

Song Birds

The number of non-game bird species is high. Ponderosa pine and deciduous trees provide nesting habitat for a wide variety of mid and upper canopy nesting birds, as well as, habitat for cavity nesting birds. Shortgrass/sagebrush associated bird species, such as; horned larks, lark buntings, brewer's sparrow, vesper sparrow, western meadowlarks and killdeer, are common.

Threatened and Endangered Species

The following list of all listed, proposed, or candidate species known or possibly occurring in the analysis area was developed in consultation with the Fish and Wildlife service.
Table 3-11 THREATENED, ENDANGERED AND CANDIDATE SPECIES KNOWN TO EXIST ON THE THUNDER BASIN NATIONAL GRASSLAND (or Possibly Occurring)

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
</tr>
<tr>
<td>Black-footed Ferret, Mustela nigripes (Unlikely occurrence)</td>
<td>Endangered</td>
</tr>
<tr>
<td>Swift Fox, Vulpes velox</td>
<td>Category 2</td>
</tr>
<tr>
<td>Preble's meadow jumping mouse, Zapus hudsonicus preblei (possible occurrence)</td>
<td>Category 2</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
</tr>
<tr>
<td>Bald Eagle, Haliaeetus leucocephalus</td>
<td>Endangered</td>
</tr>
<tr>
<td>Peregrine Falcon, Falco peregrinus</td>
<td>Endangered</td>
</tr>
<tr>
<td>Mountain Plover, Charadrius montanus</td>
<td>Category 1</td>
</tr>
<tr>
<td>Ferruginous Hawk, Buteo regalis</td>
<td>Category 2</td>
</tr>
<tr>
<td>White-faced Ibis, Plegadis chihi</td>
<td>Category 2</td>
</tr>
<tr>
<td>Long-billed Curlew, Numenius americanus</td>
<td>Category 2</td>
</tr>
<tr>
<td>Black-Tern, Chlidonias niger</td>
<td>Category 2</td>
</tr>
<tr>
<td>Loggerhead Shrike, Lanius ludovicianus</td>
<td>Category 2</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
</tr>
<tr>
<td>Black Hills red-belly snake, Storeria occipitomaculata pahsasaperse</td>
<td>Category 2</td>
</tr>
<tr>
<td><strong>Plants</strong></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Black-footed Ferret - Habitat for black-footed ferrets exists on the TBNG. Black-footed ferrets lived throughout the western states in prairie dog towns and fed, almost exclusively, on prairie dogs. Although the TBNG exists in the historical range of black-footed ferrets, the species was likely exterminated earlier in the century. The Forest Service has done annual searches for the ferret using U.S. Fish and Wildlife Service methodology for the years 1980 thru 1990. No evidence of ferrets was found. It is believed that no ferrets presently exist on the TBNG.

As outlined in the approved Prairie Dog Management Plan, prairie dogs are controlled on the TBNG with zinc phosphide. In the past, before any prairie dog town was treated, black-footed ferret night searches were conducted, using the standard U.S. Fish and Wildlife Service methodology described in the Black-footed Ferret Survey Guidelines. For Compliance With The Endangered Species Act, written by the U.S. Fish and Wildlife Service, dated April 1989. No black-footed ferrets or their sign have been observed since night searches were discontinued in 1981. The prairie dog management plan provides for the restoration of designated prairie dog towns for biodiversity purposes.

Bald Eagles - Approximately 100 bald eagles winter on the Thunder Basin National Grassland, almost exclusively, on carrion. Bald eagle roosts are generally located in timber stands on steep east facing slopes below ridge tops where they are protected from high winds and disturbance. The TBNG provides important winter and early spring feeding areas for bald eagles. This wintering population departs in early spring. Bald eagles have not been known to successfully nest on federal surface within the TBNG. There is no bald eagle critical habitat designated by the Secretary of the Interior anywhere in the State of Wyoming.

Peregrine Falcons - Peregrine falcons may occur on the Thunder Basin National Grassland during their seasonal migrations. They feed almost exclusively on birds associated with riparian areas. They are not known to nest on the TBNG. There is no peregrine falcon critical habitat designated by the Secretary of the Interior anywhere in the State of Wyoming.

Candidate Species

Several candidate species occur on the TBNG. Candidate species are plants and animals which are being reviewed for possible addition to the list of endangered and threatened wildlife (Act of 1973). A brief description of these species and their habitat follows:

The Swift Fox is listed as a category 2 species. Category 2 species are those which require more information before a proposed listing as threatened or endangered would be appropriate. A category 2 species are sometimes found not to warrant candidate listing and are removed from this status. Swift Fox inhabits open, level, sparse vegetation areas where it preys upon small rodents. Prairie dogs are an important food source for the Swift Fox. These foxes are easily trapped, shot or poisoned and many times become the victim of control efforts directed towards rodents and predators.

The Preble's Meadow Jumping Mouse, a category 2 species, usually occupies marshy areas and moist streamsidest vegetation in open prairies. This sub-species has only been found in the eastern foothill marshes of the Laramie Mountain Range. It is not known to occur on the TBNG.

The Fringed Myotis, a category 2 species, generally occurs in grassland, deserts and woodlands. Caves, mine tunnels and buildings are used as roosts. Fringed Myotis are known to migrate. Although hibernation sites are poorly known, the Fringed Myotis is known to hibernate in caves in the Black Hills of South Dakota. The Fringed Myotis is considered rare in Wyoming.

The Mountain Plover is a category 2 species. In October 1991, the Fish and Wildlife Service decided that substantial information exists to support a proposal to list this species as endangered or threatened. Mountain Plover was reported as a category 1 species in the draft EIS, however, the listing has not been completed and has been resubmitted in September 1992. At the publication of this final EIS Mountain plover is category 2 species. Mountain Plovers nest in sagebrush/grassland habitat types and feed strictly on insects. Mountain Plovers are primarily found on the shortgrass prairie and inhabit black-tailed prairie dog towns. They are closely associated with grazed areas where they can access readily available food sources.

The Ferruginous, a category 2 species, are birds of the open prairies and deserts and are quite versatile in their choice of nest sites. They nest in trees and on the ground on vantage points, such as hummocks, buttes and river cutbanks. They feed mainly on rodents, rabbits and occasionally small birds and reptiles. They will also feed on prairie dogs when they have the opportunity.

The White-faced Ibis and Long-billed Curlew, both category 2 species, are associated with aquatic habitats. The White-faced Ibis nests on platforms of reeds in marshy areas. The Long-billed Curlew nests on upland sites near water and feeds in the backwaters of reservoirs.

The Black Tern, a category 2 species, is found on the plains and prairies where it inhabits wet areas, such as marshes, sloughs, ponds and lakes. The Black Tern prefers aquatic habitats with extensive stands of emergent vegetation and large areas of open water. The Black Tern is a summer resident considered common in the State of Wyoming.

The Loggerhead Shrike, a category 2 species, generally prefers very open country with scattered shrubs and small trees. It may be found around cemeteries, farmsteads and hedgerows in plains country. The Loggerhead Shrike is a summer resident considered common in Wyoming.
The Black Hills Red-belly Snake, a category 2 species, occurs around old wood, brush and slash piles in mountain or hill woodlands. These secretive serpents often go unnoticed, as they search for worms and slugs beneath rocks, lumber, leaves, and trash. The Black Hills Red-belly Snake in western South Dakota and eastern Wyoming is considered an isolated population.

**FISH**

A total of 29 fish species presently exist within waters on the TBNG or in waters immediately adjacent to the TBNG, that may be affected through oil and gas leasing. Eleven species have been introduced into waters of the TBNG as of August 1991.

The 29 fish species include eight families: Hiodontidae (gold eye), Salmonidae (trout), Cyprinidae (carp, minnow), Catostomidae (sucker), Ictaluridae (catfish, bullhead), Cyprinodontidae (killifish, topminnow), Centrarchidae (basal, bluegill, crappie) and Percidae (perch). Members of the minnow family predominately date to 10 game fish species have been collected from the TBNG waters: brown trout, rainbow trout, brook trout, channel catfish, black bullhead, stonecat, blue gill, largemouth bass, smallmouth bass, green sunfish, rock bass, black crappie and yellow perch. No fish species is considered as threatened by the U.S. Fish and Wildlife Service, although, the goldeye is considered rare by Wyoming Game and Fish Department. A species list and associated tolerance levels is provided in the Aquatic and Riparian Resources Current Conditions for Oil and Gas Leasing EIS on the Thunder Basin National Grassland and the Biological Diversity Technical Report for the Thunder Basin National Grassland, both located in the project file in the Forest Supervisors Office in Laramie, Wyoming.

**AMPHIBIANS**

Amphibians on the Thunder Basin National Grassland include: salamanders, salamander, true toads, true frogs and tree frogs. The only salamander on the Grassland (Tiger salamander) generally require a moist environment but will inhabit both terrestrial and aquatic habitats during various stages of its life history. The plains spadefoot toad, Great Plains toad and the Woodhouse's toad all inhabit grassland and/or sage brush communities. Breeding typically occurs in temporary water habitats with the exception of the Woodhouse's toad, which is known to utilize perennial ponds associated with floodplains. Both frogs located on the Grassland (the chorus frog and the leopard frog) are found in or near permanent water. All amphibian species found on the Grassland are considered common.

**MACROINVERTEBRATES**

The major invertebrate types occupying any of the streams throughout the Thunder Basin are as follows: snails (Physa, Lymnaea, Gyraulus), mayfly nymphs (Caenis), beetle larvae (Primarily Dubaphila, shrump (Hyallela axiata), clams (Sphaerium and Plsidium), Oligocheetes and damselfly nymphs (primarily similans). This assembly of invertebrates is common forms living in or near mud substrate of ponds, lakes and streams where organic debris is available as food source. These types are tolerant of a wide range of environmental conditions, including such things as high turbidities and temperatures, low dissolved oxygen and poor diversity of aquatic habitats. A species list of macroinvertebrates and associated pollution tolerance levels collected from waters of the TBNG is provided in the Aquatic and Riparian Resources Current Conditions for Oil and Gas Leasing EIS on the Thunder Basin National Grassland and the Biological Diversity Technical Report for the Thunder Basin National Grassland, both located in the project file in the Forest Supervisors Office in Laramie, Wyoming.

Shannon-Weaver diversity values for macro-invertebrate communities in streams on the TBNG range from 1.0 to 2.5, with 1.0 indicating fair stream condition, and 3.0 indicating good stream condition.

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**TRANSPORTATION AND TRAVEL MANAGEMENT**

There are approximately 3,200 miles of road on federal surface on the Thunder Basin National Grassland. These roads are open to the public, without restriction, year-long. These roads are categorized into the following four types:

| Table 3-12 ROAD MILES BY ROAD TYPE ON THE THUNDER BASIN NATIONAL GRASSLAND |
| Road Type | Miles |
| State Highways | 115 |
| County Roads | 552 |
| Improved roads | 400 |
| Two Track Roads | 2,132 |

State Highways and US Highways are double lane paved roads with shoulders. These highways are the main travelways through the Thunder Basin National Grassland to population centers. State highways serving the TBNG include:

| Table 3-13 HIGHWAYS ON THE THUNDER BASIN NATIONAL GRASSLAND |
| Highway Number | Terminus |
| State Highway 59 | Douglas to the Montana State Line |
| State Highway 387 | Wright to Midwest |
| State Highway 420 | Wright to Newcastle |
| State Highway 116 | Highway 450 to Sundance |
| US Highway 16 | Newcastle to Moorcroft |
| US Highway 85 | Newcastle to Lusk |

Counties roads are two-lane gravel roads that provide access to large areas of the Thunder Basin National Grassland. These roads are maintained yearly. These roads provide public access to large areas of the Thunder Basin National Grassland and are used by the public, local ranchers and the oil industry.

Improved roads are usually single lane roads that have been crowned and ditched. If there was a gravel source nearby, these roads may also have a gravel surface. Almost all of these improved roads were two-track roads that were upgraded by an oil company to provide all-weather access to an oil well or other production facility. At the present time, there are 113 Road Use Permits issued to 87 permittees. Of these 87 permittees, 75 are oil companies who use these roads to access their existing facilities. These improved roads are also used by the local ranchers and the public.

Two-track roads are just that, two tracks or ruts going across the country. Sometimes they go to something. They are mostly used by the local ranchers and by the public during hunting season.

Railroads too, serve the Thunder Basin National Grassland. Within the planning area there are:
Table 3-14 RAILROADS ON THE THUNDER BASIN NATIONAL GRASSLAND, BY CATEGORY

<table>
<thead>
<tr>
<th>Category</th>
<th>Forest Service Surface</th>
<th>Private or State Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Line</td>
<td>5.6 miles (141 acres)</td>
<td>15.6 miles (378 acres)</td>
</tr>
<tr>
<td>Spurs to Coal Mines</td>
<td>1.7 miles (57 acres)</td>
<td>13.5 miles (447 acres)</td>
</tr>
<tr>
<td>Coal Line - Orient to Gillette</td>
<td>22.4 miles (779 acres)</td>
<td>18.7 miles (594 acres)</td>
</tr>
<tr>
<td>Total</td>
<td>29.9 miles (997 acres)</td>
<td>47.8 miles (1419 acres)</td>
</tr>
</tbody>
</table>

SOCIAL SETTING

Social Resource Units are used to evaluate social, cultural and economic interactions with physical resources at the regional level. Social Resource Units are defined by natural boundaries, such as, mountain ranges and river basins and by socio-economic factors, such as, settlement patterns and agricultural activities. The Thunder Basin National Grassland lies within Social Resource Unit O as displayed in Figure II-1 on page II-4 of the Forest Plan.

Within the Social Resource Units, smaller Human Resource Units are used to respond to conditions at the Ranger District or Forest levels. Human Resource Units are characterized by patterns of lifestyles, economic conditions, institutional arrangements and topography. They are typically larger than towns, and they often cross political jurisdictions. Three Human Resource Units are included in the Thunder Basin National Grassland's area of influence: Casper-Douglas, Gillette and Newcastle Human Resource Units as displayed in Figure II-2 on page II-5 of the Forest Plan.

The Human Resource Units are described in detail in Chapter III of the Final Environmental Impact Statement for the Forest Plan.

ECONOMIC SETTING

The primary area of economic influence of the Thunder Basin National Grassland is the northeastern quarter of Wyoming. Three Economic Impact Areas are included: Sheridan (2), Rapid City (3) and Casper (6) as displayed in Figure II-3 on page II-6 of the Forest Plan. Although the Economic Impact Areas contain a total of 11 counties, the primary counties affected are Campbell, Converse, Crook, Johnson and Weston, all in Wyoming.

CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

This chapter discloses the environmental consequences of implementing the alternatives. The information found in CHAPTER III, AFFECTED ENVIRONMENT provides the baseline for describing these consequences. A comparison of the alternatives relative to the issues is presented in CHAPTER II.

The impact analysis was conducted by an Interdisciplinary (ID) Team as required by 40 CFR 1502.6, as described in Forest Service Handbook 1990.15, Chapter 12, using existing information.

In this section, the elements of the environment likely to be affected by the alternatives are described. First, the site specific affected environment is described for each element, then the direct, indirect and cumulative environmental consequences disclosed. Only the anticipated effects are reported. If a factor is not addressed, no effect on the factor is expected. These environmental factors include on-site and off-site factors that are of concern to agencies or individuals. The factors were selected in response to issues and concerns raised during scoping and to address environmental consequences the Forest Service must consider in all analyses.

The existing surface and mineral ownership pattern will greatly affect the outcome of any of the alternatives. Generally, because of the intermingled pattern of non-federal ownership and existing leases, development is likely to occur in the FEIS study area regardless of any action that may result from this FEIS. The application of any of the proposed mitigation measures is limited to those lands under federal control. Approximately one-third of the analysis area is under federal control (federal ownership of both surface and minerals). Most of the lands under federal control are already leased, and lessees could not be forced to comply with any new direction that would result from this FEIS until such time as the existing lease terminates. Thus the application of any new direction will first apply to parcels not currently leased and later to other parcels as they become available when existing leases terminate.

For analysis purposes, new oil and gas activities are projected in the Reasonably Foreseeable Development Scenario, APPENDIX C, in accordance with 36 CFR 228.102(c)(3). These projections are for new oil and gas activities on federal surface, lands both presently leased and not leased. Thus environmental consequences projected in this chapter which are based on the RDF projections of between 10 and 20 new wells per year represent a projection of all new oil and gas activity on federal surface, lands presently both leased and not leased. The actual consequences of new leasing activities will be less, approximately proportional to the ratio of new leases to presently existing leases.

The maps in APPENDIX H are an integral part of the analysis for comparison among the alternatives. These maps describe the existing conditions for transportation facilities, surface ownership and the various environmental constraints that are the basis for the examination of environmental effects.

The environmental consequences of activities that would occur under all alternatives have been considered, and no effect is predicted on the following:
CIVIL RIGHTS, MINORITY GROUPS AND WOMEN.

The analysis area contains no:

WILDERNESS, WILD AND SCENIC RIVERS, PRIME FARMLANDS, OR PRIME FORESTLANDS.

SUMMARY OF CHANGES BETWEEN THE DRAFT AND FINAL EIS

In general, the changes between the draft and final EIS include an expansion of the discussions of impacts to resources. Changes and additions were made in response to public comment requesting more information on vegetation, wildlife, recreation, visual and water resources.

PHYSICAL FACTORS

SOIL RESOURCE

The site specific soil resource that would be affected includes the area which would be disturbed by drill pads, access roads, storage tanks, tank pipelines and utility lines.

Standard lease terms—Standard Lease Terms (Sec. 6) require the Lessee to '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.' Further Section 6 provides 'lessee shall be required to be approved of procedures to be followed and modifications or reclamation measures that may be necessary.' Reclamation is further defined in 36 CFR 228.108(g) as follows:

(g) Reclamation. (1) Unless otherwise provided in an approved surface use plan of operations, the operator shall conduct reclamation concurrently with other operations.

(2) Within 1 year of completion of operations on a portion of the area of operation, the operator must reclaim that portion, unless a different period of time is approved in writing by the authorized Forest Officer.

(3) The operator must:

(i) Control soil erosion and landslides;

(ii) Control water runoff;

(iii) Remove, or control, solid wastes, toxic substances, and hazardous substances;

(iv) Reshape and revegetate disturbed areas;

(v) Remove structures, improvements, facilities and equipment, unless otherwise authorized; and

(vi) Take such other reclamation measures as specified in the approved surface use plan of operations.

At the APD stage of development when a site specific proposal is received a Surface Use Plan of Operations (SUPO), including an Erosion Control Plan, will be analyzed in an appropriate environmental analysis. Some mitigation measures that could be applied on a site specific basis at the APD stage of development are listed in APPENDIX E.

In addition to the provisions of standard lease terms and to more fully implement the Forest Plan Standards and Guidelines (KA1 page 83-74,75), ALTERNATIVES 1, 2, 3, 4 and 7 consider applying 2 Controlled Surface Use and one No Surface Occupancy supplemental stipulations to preserve the soil resource (see APPENDIX D).

Areas where No Surface Occupancy stipulations have been applied and areas of no leasing (ALTERNATIVE 5 only) will be protected from surface disturbance. Acreages for these areas are listed in the following table:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Protected by NSO (Acres)</th>
<th>Protected by CSU (Acres)</th>
<th>Protected by No Leasing (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>49201</td>
<td>36,250p</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>4920r</td>
<td>36,250p</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>23,179p</td>
<td>28,639p</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>28,140p</td>
<td>27,350p</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>0</td>
<td>0</td>
<td>520,000p</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>24,850a</td>
<td>25,420a</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes:

1) This includes the Walker Tepee Ring (320 acres) and the Upton-OSage crucial deer winter range (4,600 acres).
2) This includes the Walker Tepee Ring (320 acres) and three inventoried semi-primitive motorized areas: 1) Cow Creek Buttes (6,640 acres); 2) Miller Hills (9,280 acres); and 3) Dugout (3,930 acres).
3) This includes the Walker Tepee Ring (320 acres) and four inventoried semi-primitive motorized areas: 1) Cow Creek Buttes (6,640 acres); 2) Miller Hills (9,280 acres); 3) Dugout (3,930 acres); and 4) Duck Creek (7,970).
4) This includes the Walker Tepee Ring (320 acres) and four areas with higher biological diversity: 1) Cow Creek Buttes (6,970 acres); 2) Miller Hills (3,520 acres); 3) Duck Creek (8,960 acres); and 4) Downs (5,080).
5) This includes an area with a soils Controlled Surface Use stipulation spoil Additional areas are protected with a recreation, wildlife, riparian area or other CSU stipulation but are not shown in this table.
6) This includes an area with federal surface and federal oil and gas minerals. Presently existing leases would not be affected. As leases expire the area would not be available for a new lease.

Productivity—Expected direct effects would be a loss of soil productivity on a direct acreage basis. Clearing and grading of the oil and gas related sites and 'near disturbances would remove that area from vegetative productivity (until reclaimed). Productivity would be temporarily lost in direct proportion to the number of wells drilled. It is estimated that in ALTERNATIVES 1, 2, 3, 4, 5 and 7 between 20' and 50 acres/year would be disturbed for drill pads and roads. Pipelines would
temporarily disturb an additional 17” to 34” acres per year (reclaimed in 1 to 2 years). Under ALTERNATIVE 6, No New Leasing, some areas would continue to be disturbed under existing lease conditions. There would be no impacts from new leases.

Upon reclamation, soil productivity on a site, including drill pad, access roads, pipelines, and utility lines would be restored. Soil productivity (as expressed by the vegetation) may sometimes appear to be greater after reclamation than the pre-disturbance conditions. Historically, 64 percent of the oil and gas wells on the Thunder Basin National Grassland are either reclaimed or in the process of being reclaimed. Applying this percentage to the acres disturbed annually yields an estimated 13 to 35 acres/year reclaimed.

Soil compaction from off highway vehicle travel due to oil and gas activities is also a possibility. This would be minimized by the mitigation measures implemented at the APD stage of development.

Erodibility—Some soil may be moved off-site and deposited downhill. Some sediment could reach a live stream. ALTERNATIVE 6 protects areas with sensitive soils with standard lease terms which allows the agency to move a proposed well location up to 200 meters. In addition to standard stipulations, ALTERNATIVES 1, 2, 3, 4, and 7 apply a controlled surface use stipulation to areas with sensitive soils (see APPENDIX D). For all leasing ALTERNATIVES (1, 2, 3, 4, 6, and 7) a Surface Use Plan of Operations (SUPO), including an erosion control plan, is required at the APD stage of development (36 CFR 228.106). Site specific environmental analysis will be conducted on the SUPO and documented in an appropriate NEPA document. This site specific analysis will ensure that all soil erosion concerns as well as laws, regulations and policies are addressed. Under ALTERNATIVE 5, No New Leasing, there would be no impacts from new leases on Federal surface. Some wells would be displaced to existing leases and to non-federal surface. Where non-federal surface is involved the control of operations could be less and the impacts greater than for operations on federal lands. No significant soil erosion is expected under any of the alternatives.

Mass wasting—The potential of soil mass wasting exists on some slopes greater than approximately 34 percent. ALTERNATIVE 6 protects areas with potential of mass wasting with standard lease terms. The agency may move a proposed well location up to 200 meters. A Surface Use Plan of Operations (SUPO), including a detailed mitigation plan to prevent mass wasting, is required at the APD stage of development (36 CFR 228.106). Site specific environmental analysis will be conducted on the SUPO and documented. Soil mass wasting concerns as well as laws, regulations and policies must be addressed satisfactorily or the SUPO will not be approved. In addition to standard stipulations, ALTERNATIVES 1, 2, 3, 4, and 7 apply a controlled surface use stipulation to areas with sensitive soils (see APPENDIX D). The difference between these leasing alternatives and ALTERNATIVE 6 is that the specific requirements to prevent mass wasting are disclosed at the leasing stage rather than the APD stage of development. Under ALTERNATIVE 5, No New Leasing, there would be no impacts from new leases on Federal surface. Some wells would be displaced to existing leases and to non-federal surface. Where non-federal surface is involved the control of operations could be less and the impacts potentially greater than for operations on federal lands. No significant soil mass wasting is expected under any of the alternatives.

Notes
1. Calculated using experienced figures for wells constructed from 1966 to 1991 as follows:
   - 1.7 acres per well (average pipeline disturbance)
   - 1.7 acres X 10 wells/year (minimum from the RDF, APPENDIX C) = 17 acres
2. Calculated using experienced figures for wells constructed from 1966 to 1991 as follows:
   - 1.7 acres per well (average pipeline disturbance)
   - 1.7 acres X 20 wells/year (maximum from the RDF, APPENDIX C) = 34 acres

Table 4-2 CUMULATIVE SOIL DISTURBANCE IMPACTS ON THE THUNDER BASIN NATIONAL GRASSLAND

<table>
<thead>
<tr>
<th>Impact</th>
<th>Area (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Impacts</td>
<td></td>
</tr>
<tr>
<td>Livestock grazing, the entire TBNG is in range allotments</td>
<td>572,224</td>
</tr>
<tr>
<td>Within the National Grassland there are about 2,263 miles of Federal, county, and private roads</td>
<td>3,447</td>
</tr>
<tr>
<td>Within the National Grassland there are about 29.9 miles of Railroads</td>
<td>997</td>
</tr>
<tr>
<td>Currently producing well sites and associated roads</td>
<td>750</td>
</tr>
<tr>
<td>Active coal mining</td>
<td>4,980</td>
</tr>
<tr>
<td>Reclaimed coal mine</td>
<td>6,073</td>
</tr>
<tr>
<td>Reclaimed uranium mine (presently no production)</td>
<td>756</td>
</tr>
<tr>
<td>Reclaimed uranium mine sites (23)</td>
<td>3,200</td>
</tr>
<tr>
<td>Reclaimed bentonite mine sites (33)</td>
<td>1,040</td>
</tr>
<tr>
<td>Leased area which could be mined for coal</td>
<td>90</td>
</tr>
<tr>
<td>Total permitted area for gravel mines</td>
<td>500</td>
</tr>
<tr>
<td>Natural gas pipelines (226.7 miles), presently reclaimed</td>
<td>750</td>
</tr>
<tr>
<td>Crude oil pipelines (153.2 miles), presently reclaimed</td>
<td>484</td>
</tr>
<tr>
<td>Telephone lines (149.7 miles), presently reclaimed</td>
<td>233</td>
</tr>
<tr>
<td>Transmission power lines (57.6 miles) carry a voltage of 35 KV or more</td>
<td>580</td>
</tr>
<tr>
<td>Distribution power lines (224.2 miles) carry a voltage less than 35 KV. Presently, all distribution power lines are regraveled</td>
<td>769</td>
</tr>
</tbody>
</table>

Impacts of New Oil and Gas Leasing
From the RDF it is estimated that 10 to 20 wells/year will be drilled. Using the higher figure, in a 15 year planning period, 300 wells would be drilled. The average drill pad and road disturbance is 2.5 acres.

Approximately 2/3 as many wells are plugged and reclaimed each year as are drilled. Reclamation for the 15 year period would be on 200 wells.

Temporary Impacts of New Oil and Gas Leasing
Pipelines will disturb an additional 1.7 acres per well, normally reclaimed to pre-disturbance condition in 1 or 2 years. In a 15 year planning period, at 20 wells per year, disturbance will be temporary

Note 1 National Forest System lands are managed under the Multiple-Use Concept as defined in the Multiple-Use Sustained-Yield Act of 1960. A specific area of land may have more than one use for example: a reclaimed area (mine, pipeline or road) may be grazed; or an area leased for coal may also be leased for oil or gravel; therefore, the reader is cautioned that the areas listed in this table are not additive, a total is not listed for the reason.
Cumulative effects, soil resource—Soil disturbance impacts are summarized in Table 4-2. For a more detailed analysis, see the Soils Report for the Thunder Basin National Grassland on file in the Forest Supervisor’s Office, Laramie, Wyoming.

In the year 15 planning period, for all leasing ALTERNATIVES (1, 2, 3, 4, 6 and 7) it is estimated from the RDF that 1,290 acres of land will be disturbed by new oil and gas activities (0.22 percent of the TBNG federal surface). Reclamation would occur on an estimated 1,010 acres (0.18 percent of the TBNG federal surface). Over a 15 year time period, the net new disturbance due to oil and gas activities would be 250 acres (0.04 percent of the TBNG federal surface acreage). With this small area disturbed, and with the application of all the mitigation measures required by standard lease terms, supplemental stipulations, required Surface Use Plan of Operations (36 CFR 228.106) and associated erosion control plans, no measurable contribution of oil and gas activities to cumulative soil erosion is expected.

The cumulative impacts of ALTERNATIVE 5 are the same as for the leasing alternatives above, except that 1/2 to 2/3 as many wells would be drilled and they would be displaced to non-federal surface and existing leases held by production.

The following discussion has been added for the benefit of commenters on the DEIS, who suggested that the cumulative impacts of allotment management together with oil and gas activities needed clarification. The entire TBNG is in range allotments (572,224 acres). Grazing practices within these allotments are expected to be Forest Plan Standards & Guidelines (ref. p. 88-37, Range Resource Management). Livestock grazing may contribute to non-point source pollution on TBNG. The amount of impact is difficult to determine. Under the Rocky Mountain Region Action Plan for Management of Riparian Areas (memo to Forest Supervisors, dated 4/19/90) approximately 10 Allotment Management Plans on the Grasslands will be reviewed or written annually. The goal is to have all range plans in compliance with Forest Plan Standards and Guidelines. It is expected that range, and in particular, riparian condition will continue to change toward the desired future condition. Non-point sedimentation resulting from range condition is expected to be reduced or at the 15 year planning period for oil and gas leasing.

MINERALS AND ENERGY RESOURCES

The site specific minerals and energy resources that would be affected includes the locatable, leaseable and non-locatable minerals on the Thunder Basin National Grassland. Mineral resources are located in specific geologic areas where host formations are found (see CHAPTER R, III, MINERALS).


Oil and Gas resources—From the Reasonably foreseeable Development Scenario, APPENDIX C, production from fields partially or entirely within the planning area boundary is 4.4 million (MM) barrels of oil per year and 25.3 billion cubic feet of gas (BCF) per year (1989 figures). New fields will probably be discovered but overall production is expected to decline at about the state-wide average of four percent per year. Several small or moderate size discoveries, 0. one or two large discoveries, could temporarily reverse this trend.

Oil and gas production can vary substantially by fields and individual wells. The average annual production used in this analysis was based on historical production volume and the number of producing wells within the Thunder basin National Grassland (federal surface). Average annual production across alternatives is displayed in Table 4-3.

Table 4-3 AVERAGE ANNUAL OIL AND GAS PRODUCTION BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Oil (Barrel)</th>
<th>Gas (Thousand Cubic Feet)</th>
<th>Barrel of Oil Equivalents</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>957,374</td>
<td>4,978,014</td>
<td>1,787,043</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>957,374</td>
<td>4,978,014</td>
<td>1,787,043</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>947,966</td>
<td>4,978,014</td>
<td>1,777,625</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>932,966</td>
<td>4,978,014</td>
<td>1,762,035</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>765,777</td>
<td>4,443,324</td>
<td>1,506,331</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>957,501</td>
<td>4,978,014</td>
<td>1,787,170</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>933,954</td>
<td>4,978,014</td>
<td>1,762,733</td>
</tr>
</tbody>
</table>

Note: This is an updated version of the report and the graphs, tables, and data have been revised. The figures are based on the most recent data available at the time of publication.
that the threshold where a well can be operated economically is higher; this results in many thousands of barrels of oil per well left in the ground as compared to a vertical well.

When federal lands are not leased (ALTERNATIVE 5), or when NSO stipulations are applied to large areas (ALTERNATIVES 3, 4 and 7), the oil resource under federal lands may be drained by wells on adjacent non-federal leases resulting in loss of resource, revenues and damage to the underground oil reservoir. In addition, secondary recovery can be restricted resulting in significant loss of oil and gas. For the NSO areas proposed, the federal land is largely owned the adjacent oil and gas minerals. Some adjacent private and state lands are affected (see Table 4-4).

Also, when federal lands are not leased (ALTERNATIVE 5), or when NSO stipulations are applied to large areas (ALTERNATIVES 3, 4 and 7), adjacent federal, state and private oil and gas leases can be deprecated. During the leasing phase of oil and gas development, the exact extent of the underground reservoir is not known. Because of the very speculative nature of drilling a wildcat well, and because of the high costs of drilling, it is desirable to have the entire reservoir under lease. This improves the chance of receiving a positive economic return and thus increases the chance that a new prospect will be drilled.

Because of the effects NSO and no leasing have on reservoir development, drainage and the economics of reservoir development, and because of the limitations of technology, oil and gas reservoir development is affected on a much larger area than the area to which the drilling restrictions apply. Based on the size of reservoir common in the surrounding area and other assumptions, Table 4-4 estimates the area by ownership affected by NSO and no leasing in each alternative.

Table 4-4 ESTIMATED LAND AREA AFFECTED BY NSO AND NO LEASING

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>4920</td>
<td>2,350</td>
<td>560</td>
<td>2,020</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>4920</td>
<td>2,350</td>
<td>560</td>
<td>2,920</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>20,170</td>
<td>35,150</td>
<td>3,840</td>
<td>8,880</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>28,140</td>
<td>43,022</td>
<td>3,840</td>
<td>10,000</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>520,000</td>
<td>580,000</td>
<td>95,000</td>
<td>605,000</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>24,850</td>
<td>42,670</td>
<td>4,560</td>
<td>11,590</td>
</tr>
</tbody>
</table>

Other Mineral Resources—An Oil & Gas Leasing restrictions may influence decisions about other minerals by drawing attention to the issues that caused establishment of the restriction, but the fact of an oil and gas restriction is not basis for applying a similar restriction to other mineral resources.

Each decision relative to the exploration, development and mining of a mineral resource is an independent action subject to NEPA. The site specific impacts and merits of the individual situation must be considered in an environmental analysis and documented in an appropriate NEPA document.

Mineral law recognizes three general categories of minerals, common variety, leaseable, and locatable. "Common variety" minerals such as building stone and gravel may be sold subject to full, site specific NEPA compliance. "Leasable" minerals such as coal and oil may be leased subject to full, site specific NEPA compliance. "Locatable" minerals, such as gold and silver, may be claimed under the 1872 Mining Law. Locatable minerals are developed under an Plan of Operations which is subject to full, site specific NEPA compliance. To exclude the exploration and development of locatable minerals would require a "Mineral Withdrawal" subject to full, site specific NEPA compliance.

Another impact of oil and gas leasing, ALTERNATIVES 1, 2, 3, 4, 6 and 7, is the possibility of conflicting lease rights. For example, an oil and gas lease may be issued for a parcel where the rights to the coal are held by another party. It is within jurisdiction of the BLM to address these conflicting rights. The Forest Service role is to consent or not to consent to a specific leasing proposal based on the surface management requirements in the Forest Plan, ALTERNATIVE 5. No New Leasing, does not commit additional oil and gas mineral resources and, therefore, does not create the possibility of such conflicts. Therefore, other than 1) possible conflicting lease rights; and 2) disclosure of issues which could lead to restrictions, it is not anticipated that oil leasing will affect other mineral development.

Cumulative effects, mineral and energy resources.The projection for future drilling activity contained in the RPU is 10 to 20 wells per year, perhaps fewer. Seismic data acquisition activity is currently about rate one well per year and is projected at that rate into the future. This is a fairly low level of activity. Based on this level of oil and gas exploration and development and projecting the decline in production on existing wells of four percent per year, oil and gas will decline on the Thunder Basin National Grassland over the planning period. This decline will occur with full leasing and will occur at a faster rate under no new leasing (for a detailed analysis see the Economic Impact and Cost Efficiency Analysis to Support the Oil and Gas Leasing EIS for the Thunder Basin National Grassland, in the project file at the Forest Supervisor's Office in Laramie, Wyoming). Several factors, such as an increase in the price of oil or a large field discovery, could reverse these trends. These factors can not be predicted accurately.

**VISUAL RESOURCES**

The site specific visual resources that would be affected include the proposed oil and gas sites with associated roads as viewed from within the Thunder Basin National Grassland leasing analysis area, primary and secondary travel routes, recreation use areas and water bodies.

**Standard lease terms**—Standard Lease Terms, Section 6, provides for protection of visual resources, as well as, reclamation (see CHAPTER IV, SOILS RESOURCE).

**Visual Quality Objective—**Except for riparian areas, the Forest Plan adopted Visual Quality Objective (VQO) for the Thunder Basin National Grassland is modification. Riparian areas, Forest Plan Management Area 9A, must meet a Forest Plan adopted VQO of partial retention. Forest plan visual quality objectives will be will be maintained in all alternatives except ALTERNATIVE 6.

Direct visual effects would occur when oil and gas wells sites with associated roads are viewed from within the lease analysis area, primary and secondary travel routes, recreation use areas and water bodies. Direct visual effects would also occur when oil and gas developments are located in riparian areas, piavas, floodplains and wetlands. Indirect visual effects could occur if improved access leads to or increases Grassland visitors to drive off roads and impact undisturbed vegetation (not anticipated in the foreseeable future).

The discussion below references various inventoried semi-primitive motorized areas, special values areas and riparian areas. Special value areas have both recreation and biological diversity values and may have certain other special values defined elsewhere in this document. For clarity Table 4-5 specifies the acreage by alternative and describes which inventoried semi-primitive and special value areas apply to each alternative.
For ALTERNATIVE 1, the landscape will continue to be affected by oil and gas development. Forest Plan visual quality objectives will be maintained.

For ALTERNATIVE 2, the landscape will continue to be affected by oil and gas development similar to ALTERNATIVE 1. The difference between ALTERNATIVE 1 and 2 is that special stipulations for the protection of the visual resource in riparian areas is disclosed earlier with the Record of Decision on this EIS rather than in the decision documents for the individual lease parcels.

For ALTERNATIVE 3, the visual impacts are the same as for ALTERNATIVE 2 except there will be no visual alteration of three inventoried semi-primitive motorized areas (see Table 4-6). Grassland visitors will continue to enjoy viewing these three landscapes undisturbed by oil and gas developments.

For ALTERNATIVE 4, the visual impacts are the same as for ALTERNATIVE 2 except:

1. There will be no visual alteration of the four inventoried semi-primitive motorized areas (see Table 4-5). Grassland visitors will continue to enjoy viewing the unique and scenic landscapes located in inventoried semi-primitive motorized areas.

2. A Controlled Surface Use stipulation is applied to the Upton-Osage and to the Rochelle Hills areas.

For ALTERNATIVE 5, the visual changes would occur only on currently leased lands. As leases expire, the lands would be removed from further oil and gas leasing. On lands where the existing leases expire, and on currently nonleased lands, the characteristic landscape will be maintained.

For ALTERNATIVE 6, the landscape will continue to be affected by oil and gas development the same as for ALTERNATIVE 2 except that with standard stipulations only; visual quality in riparian areas may not meet the Forest Plan Standards and Guidelines of partial retention. In most cases, standard lease terms, would be sufficient to meet the partial retention VOQ, but in some limited cases they may not.

For ALTERNATIVE 7, the visual impacts are the same as for ALTERNATIVE 4 except applied to different areas as summarized in Table 4-5.

### Table 4-5 AREA WHERE VISUAL QUALITY IS PROTECTED TO A HIGHER STANDARD THAN REQUIRED BY THE FOREST PLAN, BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Protected By NSO (Acres)</th>
<th>Protected By CSU (Acres)</th>
<th>Protected By No Leasing (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>4,920'</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>4,920'</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>20,170'</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>28,140'</td>
<td>41,245'</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>0</td>
<td>0</td>
<td>520,000'</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>24,850'</td>
<td>41,245'</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes:

1. Except for riparian areas, the Forest Plan adopted Visual Quality Objective for the Thunder Basin National Grassland is modified. Riparian areas, Forest Plan Management Area 9A, must meet a VOQ of partial retention. Forest Plan VOQ's are maintained or exceeded in all alternatives in all locations except in ALTERNATIVE 6. In ALTERNATIVE 6, visual quality in riparian areas may not meet the Forest Plan Standards and Guidelines of partial retention.

2. Includes the Walker Tepee Ring (320 acres) and the Upton-OSage crucial deer winter range (4,600 acres).

3. Includes the Walker Tepee Ring (320 acres) and three inventoried semi-primitive motorized areas: 1) Cow Creek Buttes (6,640 acres); 2) Miller Hills (9,280 acres); and 3) Duck Creek (3,920 acres).

4. Includes the Walker Tepee Ring (320 acres) and four inventoried semi-primitive motorized areas: 1) Cow Creek Buttes (6,640 acres); 2) Miller Hills (9,280 acres); 3) Duck Creek (3,920 acres); and 4) Cow Creek (7,970 acres).

5. Includes the Walker Tepee Ring (320 acres) and four areas with higher biological diversity: 1) Cow Creek Buttes (6,970 acres); 2) Miller Hills (9,320 acres); 3) Duck Creek (3,960 acres); and 4) Downe (5,080 acres).

6. Includes land with Controlled Surface Use stipulation for special values only: 1) Rochelle Hills (15,245 acres); and 2) Upton-OSage. Areas protected with CSU stipulations for riparian, soils or other reasons may have secondary benefits to visual quality, but are not listed in this table.

7. All areas with federal surface and federal oil and gas minerals. Presently existing leases would not be affected. As leasing leases expire, the area would not be available for a new lease.

Cumulative effects, visual resources—Oil and gas well sites with associated roads will introduce visual impacts but will not overwhelm the landscape due to the vast expanse of the rolling plains. Many of the oil rigs, tanks and other facilities located on the federal lands in the Grasslands complement the landscape and convey information about our energy resources to the public. These man-made features will be painted a natural color to appear visually compatible with the surrounding characteristic landscape. Mitigation measures will be applied to minimize visual impacts and to ensure that the Forest Plan visual quality objectives are met.

CULTURAL RESOURCES.

The site specific resource that would be affected includes those cultural resources within the area which would be disturbed by drill pads, access roads, storage tanks and tank batteries, pipelines and utility lines.

Cultural resource law and regulations—Oil and gas exploration and operations are considered undertakings (per 36 CFR part 600) which have the potential to impact significant historic and prehistoric resources. Protection of cultural resources on National Forest System lands is provided...
by Section 106 of the National Historic Preservation Act, Advisory Council regulations 36 CFR 800 and standard lease terms. In the case where other management activities (including oil and gas activities) conflict with cultural resources, Section 106 provides for mitigation of the impacts.

**Standard lease terms**—In addition to law, Standard Lease Terms, Section 6, provides for protection cultural resources (see CHAPTER IV, SOILS RESOURCE). In addition Section 6 provides "Areas to be disturbed may require inventories or special studies..." and "If in the conduct of operations, ... objects of historic or scientific interest ... are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects."

**Potential impacts**—By application of applicable laws and regulations there are no anticipated adverse impacts to cultural resources under any of the alternatives.

In **ALTERNATIVE 1, 2, 3, 4 and 7** one significant cultural resource, the Walker Tapee Ring site (220 acres) is protected with a No Surface Occupancy stipulation. Since cultural resources are protected by law, regulation and standard lease terms, the NSO stipulation provides additional contractual protection and serves as advance notice to prospective lessees that a significant cultural resource exists.

<table>
<thead>
<tr>
<th>Table 4-4 AREA PROTECTED FROM SURFACE DISTURBANCE BY ALTERNATIVE (CULTURAL RESOURCES WOULD ALSO BE PROTECTED FROM DISTURBANCE)*</th>
<th>Alternative</th>
<th>Protected By NSO (Acres)</th>
<th>Protected By No Leasing (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>4,920</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>4,920</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>23,170</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>28,140</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>0</td>
<td>520,000</td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>24,850</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
* For additional specific on areas stipulated by alternative see the footnotes to Table 4-1.

Cumulative effects, cultural resources—On National Forest System lands, a cultural resource inventory will be required before surface disturbing activities would be allowed. Under all leasing ALTERNATIVES (1, 2, 3, 4, 6 and 7), development of oil and gas in the study area may contribute to the inventory of cultural resources. This will benefit the cultural resource program by increasing the inventory of sites and acreage as prescribed in Section 110 of the National Historic Preservation Act and may improve our overall understanding of the prehistory and history of the area. An estimated 4 to 5 new sites may be added to the Forest inventory. Under ALTERNATIVE 6, No New Leasing, no new sites would be discovered, and no new area would be added to the inventory.

**Notes:**
* Based on an average site density for the Thunder Basin National Grassland of 4 sites/square mile and an estimated 750 acres of ground disturbing oil and gas activities in the next 15 years.

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**RECREATION RESOURCES**

The site specific recreation resources that would be affected include the area within the FEIS study area boundary and the recreation oriented business in the cities of Douglas, Gillette, and Newcastle, Wyoming.

**Standard lease terms**—Standards Lease Terms, Section 6, provides for protection of other resources and other users of the land (see CHAPTER IV, SOILS RESOURCE).

Potential Impacts to ROS class—Oil and gas development would change the Recreation Opportunity Spectrum (ROS) class toward the more developed end of the spectrum. This effect would be most pronounced in inventoried semi-primitive motorized areas. The roads required for oil and gas development would, at a minimum, move these areas up one class to roaded natural. Extensive field development could change the ROS class even more. In areas presently in the roaded natural or rural ROS classes, which is the majority of the TBNG, modest or even extensive oil and gas development would move the recreation experience toward the developed end of the scale, but normally not enough to change the ROS class. The effect of a change in the ROS class toward the more developed end of the spectrum would be better access for the visitor, greater chance of encounters with other visitors, the evidence of human activity would be more pronounced, and opportunities for activities requiring more primitive settings would be lost.

| Table 4-7 INVENTORIED SEMI-PRIMITIVE MOTORIZED (ROS CLASS) AREAS PROTECTED BY ALTERNATIVE |
|---------------------------------------------------------------|-------------|--------------------------|
| Alternative | Protected By NSO (Acres) | Protected By No Leasing (Acres) |
| ALTERNATIVE 1 | 0 | 0 |
| ALTERNATIVE 2 | 0 | 0 |
| ALTERNATIVE 3 | 19,850* | 0 |
| ALTERNATIVE 4 | 27,820* | 0 |
| ALTERNATIVE 5 | 0 | 27,820* |
| ALTERNATIVE 6 | 0 | 0 |
| ALTERNATIVE 7 | 18,130* | 0 |

**Notes:**
* This includes those inventoried semi-primitive motorized areas: 1) Cow Creek Buttes (6,640 acres), 2) Miller Hills (9,280 acres), and 3) Duckout (3,930 acres).
* This includes four inventoried semi-primitive motorized areas: 1) Cow Creek Buttes (6,640 acres), 2) Miller Hills (9,280 acres), 3) Duckout (3,930 acres), and 4) Duck Creek (7,970).
* This includes three inventoried semi-primitive motorized areas (or portions) also identified as having higher biological diversity values than the surrounding grassland area: 1) Cow Creek Buttes (6,640 acres), 2) Miller Hills (3,920 acres), and 3) Duck Creek (7,970 acres).

Development of the facilities to extract oil and gas is relatively well financed. Restoration to primitive condition is not as well financed and has other complications as well.

Oil and gas activities occupy the land as long as the underground reservoir continues to economically produce. The average life of an expected field discovery is estimated at 7 to 15 years (see APPENDIX D). Some fields on the TBNG have been producing for 40 years. Over the life of the field, Grassland users, including recreation users, become accustomed to the access provided by the oil field roads. Use patterns develop, which resist restoration to primitive condition. The result
is that primitive recreation opportunities become fewer, while more developed opportunities increase.

Although the oil and gas operator can be required to restore the contour of the surface and revegetate the disturbed area, abandonment of the site, differences in vegetation, soil color and texture may be apparent for many years. These evidences of man's activities also contribute to a more developed ROS classification. In some instances, these effects may persist long after oil and gas facilities have been removed.

Since movement of ROS classes toward development is relatively easy and restoration toward the primitive end of the scale relatively more difficult, perhaps requiring long periods of time, a movement toward development should be considered an irreversible and irretrievable commitment of the recreation resource (loss of primitive opportunities).

ALTERNATIVES 1, 2, and 6, in accordance with present Forest Plan Standards and Guidelines, allow oil and gas activities in inventoried semi-primitive motorized areas. If that occurred, the ROS class would be changed as a minimum to (primarily) natural. Semi-primitive motorized recreation opportunity would be maintained. ALTERNATIVE 4 applies a No Surface Occupancy stipulation to all four inventoried semi-primitive motorized areas on the TBNG. The three areas protected are in the low to moderate mineral development potential areas as projected in the RFD. In these areas, semi-primitive motorized opportunities would be maintained. ALTERNATIVE 4 applies a No Surface Occupancy stipulation to three of the four inventoried semi-primitive motorized areas on the TBNG. The three areas protected are in the low to moderate mineral development potential areas as projected in the RFD. In these areas, semi-primitive motorized opportunities would be maintained. ALTERNATIVE 7 applies a No Surface Occupancy stipulation to four areas with special values (including both recreational and biological diversity values). In three of the four inventoried semi-primitive motorized areas, semi-primitive motorized opportunities would be maintained. In one area, Dugout, semi-primitive motorized opportunities could be changed to a more developed opportunity. ALTERNATIVE 5, No New Leasing would cause no impacts to ROS classes or recreation opportunities.

Potential Impacts to fishing experience—Recreation at fishing reservoirs could also be affected by oil and gas development. Water and fishing are very limited resources on the TBNG. Five reservoirs have been identified for future fisheries management work (see CHAPTER III, RESERVOIRS). The noise of equipment, particularly that of gas operated pumpsjacks, could reduce the quality of fishing experience. Visual quality could also affect fishermen using the reservoirs. Drilling equipment would be a temporary impact on the fishing visitors experience, but production facilities would occupy the area from 7 to in excess of 40 years.

ALTERNATIVES 3, 4 and 7 each apply a Controlled Surface Use stipulation to five fishing reservoirs to protect the fishing experience from noise associated with production facilities. In the future, other reservoirs may be developed and protected under this stipulation. ALTERNATIVES 1, 2 and 6 would apply standard lease terms to protect fishing experience (200 meter stipulation). Noise could detract from the fishing experience at the five designated reservoirs. ALTERNATIVE 5, No New Leasing would cause no impacts to recreation fishing experience.

WATER RESOURCES

The site specific water resources encompass both surface water and groundwater in, and adjacent to the Grassland, as defined by affected beneficial uses. Other resources associated with water would include floodplains, riparian areas, wetlands and playas. Characteristics used to describe the water resource include: water quality, water quantity, aquatic biota and beneficial (designated) uses of the water.

Water law and regulations—Several federal and state laws and regulations direct the protection of water and its associated resources in Wyoming. Specific laws and regulations are covered in CHAPTER 2 (Water Laws and Regulations; Riparian, Wetlands and Floodplains sections). Compliance with laws and regulations is mandatory for all oil and gas activities and apply to each alternative under consideration.

Standard lease terms—In addition to law, Standard Lease Terms, Section 6, provides for protection of water resources, as well as, reclamation (see CHAPTER IV, SOILS RESOURCE).

Potential Impacts—Impacts to the water resources, due to oil and gas operations, can result from activities associated with drill pads, access roads, storage tanks, tank batteries, pipelines and utility lines. The water and associated resources which could be affected by oil and gas activities on the Grassland include: Water quality, water quantity, floodplains riparian areas, wetlands, playas and beneficial (designated) uses.

There will be no impact to any water resources in areas where the No Surface Occupancy stipulation has been applied (ALTERNATIVES 1, 2, 3, 4 and 7) and areas of No New Leasing (ALTERNATIVE 5, only). These areas will be protected from oil and gas activities (see Table 4-1).

However, under these alternatives, some wells could be displaced to existing leases and/or non-federal surfaces. Control of operations on non-federal surfaces could be less, possibly resulting in greater impacts, than for activities occurring on federal property.

Water quality—Water quality on the TBNG could be impacted from drilling fluids, chemical spills, produced salt water, soluble hydrogen sulfide and other chemicals entering a water source. Chemicals used in the drilling and production processes, or constituents found in produced waters, which may contain high concentrations of salt (particularly sodium and chloride) and heavy metals, can be toxic. Chemicals or hydrocarbons from blowouts, may impact the aquatic resource. However, the potential for these constituents to reach stream channels is low, due to the relatively flat terrain, lack of running water, and low precipitation on the Grassland.

Hydrogen sulfide (H₂S), a gas commonly encountered in oil and gas drilling, is rare on most of the TBNG. The Spring Creek Unit is the only area on the TBNG where H₂S has reached significant levels. Hydrogen sulfide is highly toxic and soluble. If introduced into the ground or surface waters, H₂S could result in severe damage to riparian and aquatic ecosystems. The Environmental Protection Agency has established a standard of two micrograms/liter (maximum) of H₂S for the protection of aquatic life. Concentrations of some in the Spring Creek Unit have exceeded 100 micrograms/liter.

Wyoming water quality standards must be maintained under each of the alternatives. Prior to any ground disturbing activity, a Surface Use Plan of Operations (SUPO) is required as part of the Application for Permit to Drill (APD) and will detail, along with appropriate NEPA documentation, the water quality standard measurements to be included with applicable water quality regulations. ALTERNATIVE 6, offers protection of water quality through standard lease terms. In addition to standard lease terms, ALTERNATIVES 1, 2, 3, 4 and 7 apply a Controlled Surface Use (CSU) stipulation for riparian areas, which would provide additional protection to sensitive areas adjacent to streams and water. The difference between these leasing alternatives and ALTERNATIVE 6 is that the requirements to protect riparian areas are disclosed at the leasing stage rather than the APD stage of development. In ALTERNATIVE 5, No New Leasing no impacts to water quality will occur from new oil and gas development if all the State water quality rules and regulations are met, there will not be any measurable effects on water quality, due to oil and gas activities, under any of the alternatives. A discussion of state water quality standards and the types of monitoring required is provided in the Surface Water Quality Monitoring Plan (APPENDIX G).
Groundwater can be impacted from drilling operations, retaining pit leakage or improper abandonment of wells. Drilling can affect both shallow and deep aquifers and thus impact the quality of water in springs, seeps, local streamflows or water wells. In accordance with federal (43 CFR and Culechore Order No. 11) and state (Rules and Regulations of Wyoming Oil and Gas Conservation Commission, Section 315) requirements, all wells must be constructed to preclude the migration of fluids from one zone to another. In general, this is achieved through proper well casing and cementing. The Oil and Gas Conservation Commission also regulates retainer pit design for locations where the ground water content is high. Lined retainer pits and the installation of a monitoring system may be required in areas where fresh water can be affected. Abandonment procedures are also directed by the Oil and Gas Conservation Commission. Proper plugging of wells will ensure that migration of fluids does not occur. These practices should prevent changes in the quality and quantity of groundwater. Due to federal and state regulations, impacts to the groundwater resource from drilling, retaining pits or abandonment, under ALTERNATIVES 1, 2, 3, 4, 6 and 7, are not expected to occur. Under ALTERNATIVE 8, No New Leasing, there would be no impacts on water from new leases on the Grassland. However, increased impacts on non-federal lands may occur if higher activity results from displacement of wells from federal land. State regulations will apply to oil and gas operations on non-federal surfaces.

Water quantity—Water quantity on the Grassland can be affected by land disturbing activities and development of groundwater sources. Where soils are compacted, such as on roads and drill pads, infiltration rates would be lower, thus decreasing groundwater recharge, and increasing overland flow. Rectification of disturbed areas on the Grassland frequently results in more vigorous vegetation than the native range. In such cases, increased transpiration utilizes more water and results in less overland flow. Where sediment basins are constructed, infiltration and groundwater recharge would increase.

Land and Resource Management Plan guidelines on water yield increases would not be exceeded under ALTERNATIVES 1, 2, 3, 4, 6 and 7. Over a 15-year period, the increase in water yield is less than 1 percent of the annual water yield. ALTERNATIVES 1, 2, 3, 4, 6 and 7 would amount to less than one percent of the current annual water yield on the Grassland (see SOILS RESOURCES section). With such a small percentage treated, it would be impossible to detect any changes in water quantity. Under ALTERNATIVE 8, No New Leasing, there would be no possible impacts on water quantity from new leases on the Grassland. Due to the large increases in water quantity, channel stability would not be altered as a result of oil and gas activities on the TBNG. No measurable effects to water quantity, flow characteristics or subsequent channel stability are expected under any of the alternatives.

Floodplains—The impacts associated with development in floodplains can be broken down into two components. First, is the threat to human safety and property where facilities are located in flood-prone areas. Second, soil stock piles, drilling fluids and other materials in the floodplains could be washed downstream and affect water quality, channel integrity and aquatic life. Facilities located in the floodplain would also be constantly at risk of flooding. Human safety, property, water quality and aquatic life would be affected if migration occurs in a floodplain without the application of carefully considered mitigative measures. Samples of mitigation measures can be found in APPENDIX G.

ALTERNATIVE 6 protects floodplains with standard lease terms which permit the agency to move a proposed facility 200 meters. Floodplains wider than 400 meters could be impacted under ALTERNATIVE 6. At the APD stage of development, when a site specific proposal is received, a Surface Use Plan of Operations (SUPO) will be analyzed in an appropriate environmental analysis. Monitoring plans will be developed in cooperation with state and federal agencies who have regulatory responsibility over ground and surface waters and wetlands. Development in floodplains will be minimized. If avoidance is not possible, an interdisciplinary team will determine the potential impacts of the proposed action. In this situation, BMPS and special mitigation measures (see APPENDIX G) will be required to protect human interests and the special values associated with floodplains. If these impacts cannot be adequately mitigated to assure compliance with the Executive Orders, state and federal laws, the action will not be approved. To the extent consistent with the rights conveyed by the lease, the SUPO must also be consistent with the Forest Plan (36 CFR 228.107(2)).

In addition to standard lease terms, ALTERNATIVES 1, 2, 3, 4 and 7 apply a CSU stipulation which prohibits surface occupancy in floodplains, except when: 1) No other reasonable alternatives exist, and, 2) it is determined to the satisfaction of the developer that the use of floodplains would be consistent with the Forest Plan (36 CFR 228.107(2)).
Range allotments cover the entire TBNG. Livestock grazing may contribute to nonpoint (diffuse) source pollution; however, the amount of impact has not been determined. Due to the implementation of the Regional Riparian Action Plan, nonpoint source sedimentation from grazing is expected to decrease over the 15-year planning period for oil and gas leasing.

Active coal mines currently constitute less than one percent of the TBNG surface. Coal mining is conducted under a Mining and Reclamation Plan which is approved by the Wyoming Oil and Gas Surface Mining with Forest Service consent. The Permit to Mine is issued by the Wyoming Department of Environment, Land Quality Division. Compliance with all State laws and regulations (including Wyoming Water Quality Standards) is required. A Monitoring Plan designed to detect water quality impacts is part of the Mining and Reclamation Plan. Because of the small acreage affected and the requirement to meet State Water Quality Standards, anticipated impacts to water resources should be within acceptable limits.

Compliance with the Clean Water Act and Wyoming DEQ regulations, during oil and gas operations, can be achieved through the application of BMPs, special mitigative measures (if needed) and detailed specific monitoring. Mitigative measures will be developed that address the Phase II Study (APD) stage of development. For all leasing alternatives (ALTERNATIVES 1, 2, 3, 4, 6, and 7) a Surface Use Plan of Operations (SUP) is required at the APD stage of development. A site specific environmental analysis will be conducted on the SUP and documented in an appropriate environmental document. This site specific analysis will ensure that all water and associated resource concerns (including laws, regulations and policies) are addressed. Under ALTERNATIVE 5, No New Leasing, there would be no additional impacts, since new leases on federal surfaces will not be allowed. Some wells would be displaced to existing leases and others to non-federal surfaces. Where a non-federal surface is involved, the control of operations could be less, resulting in potentially greater impacts than for operations on federal lands. However, state regulations would still apply to activities on non-federal surfaces. Overall, cumulative impacts to water resources from oil and gas activities on the Grassland should be minimal.

**AIR QUALITY**

The site specific air resource that would be affected includes the air which could be polluted by dust and exhaust emissions from equipment constructing drill pads, access roads, storage tanks and tank batteries, pipelines and utility lines. A potential for gaseous emissions from wells affecting the air also exists.

Air law and regulation—Comprehensive requirements for potential pollutants affecting the TBNG from oil and gas development are contained in the Wyoming Air Quality Standards and Regulations (1989). Effects on air quality will be limited by the State regulations.

Standard lease terms—In addition to law, Standard Lease Terms, Section 6, provides for protection of air resources (see CHAPTER IV, SOILS RESOURCE).

Potential impacts—The effects on air quality are due to the particulate matter and gaseous emissions from engines, vehicles and machinery, airborne particulates (dust) from the linear and area disturbances. Generally, the direct effects will tend to be localized. The impacts from wells would be largely confined to the area adjacent to the wells.

Total Suspended Particulates (TSP) samples are monitored in numerous locations on the TBNG, by coal mines and other authorities. There are many air monitoring stations throughout the Powder River Basin. The data collected from the air monitoring stations are available to the public for viewing at the State of Wyoming, Department of Environmental Quality (DEQ). Air Quality Division in Cheyenne, Wyoming. A review of the 1988 and 1989 data shows that most sites fall within the DEQ...
requirements on a regular basis. Occasionally state standards have been exceeded and are then rectified by the Air Quality Division. For example, during 1988, one (co-located) site within TBNG showed a maximum reading of 273 ug/m³ TSP. Typically, coal operations disturb much greater volumes of soil and overburden than oil and gas operations. The TSPs from the oil and gas disturbances are not predicted to exceed State DEQ regulations.

Smoke from debris burning is likewise regulated by the State. A model (Simple Approach Smoke Estimation Model, SASEM) is used to predict the effects of burning operations and to ensure compliance with Wyoming Air Quality Standards and Regulations; therefore, debris burning associated with oil and gas activities are not expected to violate the ambient air quality standards.

Concentrations of hydrogen sulfide (H₂S), or sour gas, from the wells is expected to be of minor consequence because of the windy conditions of the TBNG and because H₂S is regulated by the Wyoming Air Quality Standards and Regulations. Sour gas sources are not thought to exist in significant quantities within TBNG. Some minor sour gas has been encountered within the Spring Creek Unit of the TBNG (sec. 3, T.54 N., R.70W.). The H₂S levels at the site are monitored monthly and show intratrend and low to non-detectable levels. The H₂S gas has not been detected for several years but could possibly recur at some time. It was originally found in small quantities in the producing salt water at the drill site. The site has warning signs and safety equipment installed in any eventuality. Due to the State regulations and the small amount of sour gas discovery within TBNG, no adverse impacts to human, plant or animal health from H₂S emissions are predicted within the TBNG.

Acid rain is addressed in Title IV of the Clean Air Act Amendments (ref. Pyttle 1990). Acid rain threatens "...natural resources, ecosystems...visibility...[and] public health; the principal sources of acid rain are the emissions of sulfur dioxide (SO₂) and nitrogen oxides (NOₓ) from the combustion of fossil fuels..." in the Federal Register (Vol. 56, no. 242). It says "the acidic deposition resulting from SO₂ and NOₓ emissions and their by-products damage both ecosystems and man-made materials."

The total overall contribution of TBNG oil/gas activities to regional acid rain deposition from a cumulative, direct or indirect effect is not known. Because of the requirements for air quality monitoring under DEQ Air Quality regulations and because of the predicted amount of pollutant release from oil and gas developments, no exceedance of any air quality standard is expected from oil and gas developments. All oil and gas activities within the TBNG are expected to meet the State ambient air quality standards and are not expected to contribute measurably to acid rain.

The Hampshire Energy project (a construction permit application submitted to Wyoming Department of Environmental Quality, Air Quality Division in January 1982) monitored several air quality parameters. The monitoring site was located about 13 miles southeast of Gillette, Wyoming, during a very active time for oil and gas exploration and development. The monitoring values shown approximate current conditions, and in every case are less than the Ambient Air Quality Standards (AAQS). The following table presents some of the summarized data from that monitoring:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Annual Value</th>
<th>WY AAQS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate Matter (ug/m³)</td>
<td>Max 24 'hour concentration</td>
<td>53.8</td>
</tr>
<tr>
<td></td>
<td>Arithmetic Mean</td>
<td>24.3</td>
</tr>
<tr>
<td>Sulfur Dioxide (ppm)</td>
<td>Average concentration</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>3 hr Max concentration</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>24 hr Max concentration</td>
<td>0.011</td>
</tr>
<tr>
<td>Ozone (ppm)</td>
<td>Max 1 hr concentration</td>
<td>0.063</td>
</tr>
<tr>
<td>Nitrogen Oxides (ppm)</td>
<td>Average concentration</td>
<td>0.029</td>
</tr>
<tr>
<td>Nitrogen Dioxide (ppm)</td>
<td>Average concentration</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Note:
The above table is presented for background information only. It is taken from The Hampshire Energy Air Quality Monitoring Data (1982) and presented for the reader's information. (WY AAQS = Ambient Air Quality Standards - Contact WY DEQ AQD for further information).

ALTERNATIVE 5. No New Leasing would not cause impacts to air quality. Some wells would be displaced to existing leases and to non-federal surface. ALTERNATIVES 1, 2, 3, 4, 6 and 7 would have roughly the same effects, as it is expected that leasing disturbance would be somewhat similar. No long-term noticeable changes are expected in the visibility from or through TBNG under any of the alternatives. The air visibility is expected to remain much the same as current conditions.

Contributions to Global Warming Trends

"Anticipated changes in the physical and chemical nature of the earth's climate are likely to have impacts on the Nation's forests and related ecosystems. The extent and magnitude of these changes are uncertain at this time. There is a lack of sufficient information to predict and detect changes in forest health and productivity due to climatic change. The Department of Agriculture and the Forest Service have increased efforts to research the effects of climate changes of forest ecosystems to carbon dioxide and greenhouse gas cycling. The agency accepts and endorses the concept that atmospheric and climate effects that could possibly result from national programs be considered in national planning. Such analysis has been incorporated as part of the Resources Planning Act (RPA) Assessment and recognized as an issue in the RPA Program; however, until such research yields meaningful results, the National Environmental Policy Act (NEPA) disclosure documents at the forest or project levels are not the appropriate means for addressing global climate change issues. Analysis of global climate changes that might result from specific projects would be speculative, masked by regional and global influences, and rarely provide meaningful information for the decision-maker. Evaluation of possible global climate changes, attributable to long-term regional programs, may be appropriate in the future when more research information is available." (statement of the Chief, USDA FS, 1990)
Effective March 15, 1993, the Environmental Protection Agency, by request of the state of Wyoming, is redesignating two additional particulate matter attainment areas within the Powder River Basin. Under this redesignation, the state’s minor source baseline date would not be triggered until 1996 or until a submittal of a PSD permit application for a major stationary source (whichever is first).

EPA has approved Wyoming’s request to redesignate the Powder River Basin as a section 107 (CAA) particulate matter attainment area. Minor source emissions, currently in place, would become part of the background emissions. When the minor source baseline date is triggered, all additional growth from minor sources would begin consuming the increment. An ambient air quality impact greater than or equal to 1 ug/m³ would be considered to be a significant impact (Source: FEDERAL REGISTER Vol. 58, No. 9, Thursday, Jan. 14, 1993. 4348-4356).

Cumulative effects, air resource—The expected developments, combined with existing developments, could contribute to exceedance(s) of incremental regulations. Coal mines infrequently exceed the standards for particulate matter 10 micrometers or less in size. Any exceedance is rectified by the Wyoming Department of Environmental Quality, Air Quality Division. Future well sites that could conceivably impact Class I areas outside the TBNG area are restricted by the State. The existing air quality in the area is generally very good. There could be short-term air quality impacts until the gaseous output of new wells is tested and mitigation measures implemented.

Lauenroth et al., discuss the effects of SO₂ on grasslands. This source predicts that long term exposure of northern mixed prairies to SO₂ from energy development will likely have measurable negative impacts under existing permit requirements (Wyoming Department of Environmental Quality, Prevention of Significant Deterioration permit required at the APD stage of development).

All oil and gas activities within the TBNG are expected to meet the State ambient air quality standards and are not expected to contribute measurably to acid rain (see Air Resource Management report in support of the Thunder Basin National Grassland Oil and Gas Leasing EIS in the project file in the Forest Supervisor’s Office, Laramie, Wyoming).

NOISE

The site specific environment that would be affected includes the area within normal hearing distance of drilling and production operations.

Equipment used during road and drill pad construction, drilling operations, production operations (pump-jacks), and vehicles traveling on the roads would increase noise levels. In the relatively gentle terrain and grassland environment of the TBNG, gas powered pump-jacks may be heard for up to a mile.

In ALTERNATIVES 3, 4 and 7 a Controlled Surface Use stipulation has been approved that protects the fishing experience at five selected fisheries from the impact of excessive noise from production facilities. ALTERNATIVE 5, No New Leasing would cause no noise. Noise from operations on existing leases would continue. ALTERNATIVES 1, 2 and 4 provide no protection from the noise of oil and gas developments or production. The fishing experience at inventoried fisheries (presently five) could be impacted by noise of production facilities.

NOTE


TRANSPORTATION

Roads-The site specific affected area includes the State Highways and County Roads serving the TBNG from Douglas, Gillette, and Newcastle. In addition, there are 400 miles of improved Forest Service roads and 2,132 miles of two track roads on Federal surface on the TBNG.

The primary effects of new oil and gas leasing on the transportation system would be the reconstruction of existing two track roads, the construction of new roads and the reclamation of roads to dry wells. Using experienced averages, it is estimated 0.36 miles of road are constructed or reconstructed to each well drilled, between 3.6 and 7.2 miles per year for the 10 to 20 wells projected in the RFD (see SOIL RESOURCE, Productivity). Further, from experienced averages, 64 percent of the miles constructed would be reclaimed. This amounts to between 2.3 and 4.6 miles of reclamation annually for a net of between 1.3 to 2.6 miles of new road annually.

Forest Plan Standards and Guidelines by management area would be applied to road construction in all alternatives. In ALTERNATIVE 5, No New Leasing, no roads would be constructed for oil and gas activities on new leases (road activities on existing leases would continue). Areas where the No Surface Occupancy stipulation is applied in ALTERNATIVES 1, 2, 3, 4, 7 and 7 would not be affected by new road construction or reconstruction. Generally, since roads could not be placed within the NSO, some roads would be placed outside of the NSO, either on federal or non-federal surface. Some reduction in overall oil and gas activities could also be expected. This reduction in activity can be roughly estimated on the basis of the area affected by NSO (from one to five percent of the TBNG federal surface depending on the alternative). Using the RFD projection of 10 to 20 wells per year, it would be expected that the NSO areas would reduce the number of wells projected in the RFD by less than one well per year (0.36 miles of road). The Controlled Surface Use stipulations (primarily the soils CSU stipulations) applied in ALTERNATIVES 1, 2, 3, 4, and 7 would in some cases require roads to be relocated to more stable areas and in other cases require higher construction standards. The affect on the transportation system of ALTERNATIVE 6, where only standard lease terms are applied, would be similar to those described for CSU stipulations on ALTERNATIVES 1, 2, 3, 4, and 7, except that the information disclosed in the CSU stipulations would not be available until the APD stage of development.

Traffic from oil and gas activities on the existing road system is expected to gradually decline under all alternatives. That is because the projected increased production from new wells is less than the decline in production from existing wells. Of course, several moderate size or a few large discoveries in the area could change this scenario. ALTERNATIVE 5 would have the fastest and greatest decline in traffic. No detectable difference is expected in the amount of traffic for any of the leasing alternatives.

BIOLOGICAL FACTORS

VEGETATION

The site specific vegetation that would be affected includes the vegetation disturbed by drill pads, access roads, storage tanks and tank batteries, pipelines and utility lines.

Standard lease terms—Standard Lease Terms, Section 6, provides for protection of biological resources, as well as, reclamation (see CHAPTER IV, SOILS RESOURCE).
Projected Impacts—Vegetation must be removed in the construction of access roads, drill pads, pipelines and storage tanks and tank batteries. When vegetation is removed, primary succession ensues. Generally, annual grasses and forbs recolonize disturbed areas. Eventually these are replaced as community dominants by perennial grasses and shrubs. This process is accelerated by planting perennial grasses, shrubs and forbs in reclaimed areas.

Disturbed areas are potential sites for the spread of exotic species and noxious weeds. Noxious weeds known to occur on TBNG include Russian thistle, kochia, leafy spurge and spotted knapweed. Mechanical or herbicidal weed control occurs in active drill sites, and reclamation with perennial grasses, forbs and shrubs is required in non-producing sites. To date, noxious weed or exotic species invasions have not been a serious problem due to oil and gas leasing activities, and they are not expected to be a problem in the future.

Vegetation removal in the sagebrush/grassland areas can be satisfactorily reclaimed in a reasonable time period without adverse impacts to local sites or to biological diversity. In shrublands located on badlands, reclamation is difficult to impossible and biological diversity will be simplified because replacement of the shrub components in kind, is not expected to be feasible or possible. In woodland areas, removal of ponderosa pines, junipers and shrub species other than sagebrush, will result in a loss of this vegetation for an unknown length of time, since these species reproduce sporadically and are in an environment which imposes strong limitations on their populations. Reclamation of woody perennial vegetation has not been shown to be feasible or possible on the Thunder Basin National Grassland.

The number of acres displaced by the wells is constant for all leasing alternatives. The amount of additional disturbed area in ALTERNATIVES 1, 2, 3, 4, 6 and 7 would be 20 to 50 acres per year (see SOIL RESOURCE, Productivity) or a maximum of 0.01 percent of the total area. With only 0.01 percent of the area disturbed there would not be any measurable direct effects on vegetation. The impacts for gas, removal would be reduced by reclamation which historically amounts to 94 percent of the area disturbed or between 13 and 35 acres/year. ALTERNATIVE 5, No New Leasing, would not impact vegetation on Forest Service administered lands. If, as anticipated, ALTERNATIVE 5 causes an increase in oil and gas activities on intermingled non-Federal ownership, less stringent controls and revegetation requirements on those lands could result in a greater permanent impact.

In addition to the vegetation disturbed by well pads and roads, an average of 1.7 acres per well is disturbed for pipelines (approximately 34 acres per year). This area is normally reclaimed within one or two years.

ALTERNATIVE 5, No New Leasing, would cause no impact on vegetation by oil and gas activities on Federal lands, possibly increasing those disturbances on non-Federal lands. ALTERNATIVES 1, 2, 3, 4 and 7 apply No Surface Occupancy and Controlled Surface Use stipulations prohibiting or limiting road construction in various areas. The effect of these restrictions would be to move the disturbances to other areas. Except for location of potential impacts, the overall effect of applying these stipulations on vegetation is not expected to be different than ALTERNATIVE 5 where only standard lease stipulations are applied.

Threatened or endangered plants—Through consultation with the U.S. Fish and Wildlife Service plant specialist, it has been determined no threatened, endangered, or sensitive vegetation species are known to exist within the boundaries of TBNG; therefore, no impact will occur under any of the alternatives.

WILDLIFE

Wildlife law and regulation—The Migratory Bird Treaty Act prohibits killing of any migratory bird including all raptors. The Bald Eagle Protection Act also protects golden eagles from being killed. The Rural Electrification Administration has power line construction specifications which they enforce to prevent raptor electrocution. The Endangered Species Act of 1973, as amended, governs the management of threatened and endangered species. This document evaluated the following endangered wildlife species: black-footed ferret, bald eagle, and peregrine falcon.

Standard lease terms—in addition to the requirements of law. Standard Lease Terms, Section 6, provides for protection of biological resources, as well as, reclamation (see CHAPTER IV, SOILS RESOURCE).

Habitat and populations—The site specific wildlife resource that would be affected includes animals and habitat disturbed by drill pads, access roads, storage tanks and tank batteries, pipelines and utility lines. For the purpose of addressing effects, wildlife species will be grouped in the following manner: Big Game and Trophy Animals, Raptors, Upland Game Birds, Waterfowl, Non-Game Birds, Small Mammals, Predators, Reptiles, Amphibians, Threatened or Endangered Species and Threatened or Endangered Candidate Species.

Big Game and Trophy Animals

This category includes pronghorn antelope, mule deer, whitetail deer, and elk (all classified as "Big Game animals in Wyoming). Black bear and mountain lion are classified as "Trophy Game" in Wyoming. For the sake of this analysis, mule deer and whitetail deer will be grouped together and referred to as deer. Black bear and mountain lion are only occasional inhabitants found on the TBNG.

The effect of oil and gas development activities on big game and trophy animals are: displacement and stress due to noise and human activity, potential increase in harvest (both legal and illegal), potential reduction of preferred habitat, and incidental mortalities due to road kills, antelope, deer, and elk populations are generally above the Wyoming Game and Fish Department objectives within TBNG (see Terrestrial Wildlife Specialist's Report and Biological Evaluation for the Thunder Basin National Grassland Oil and Gas Leasing EIS in the project file in the Forest Supervisor's Office, Laramie, Wyoming). Based on the oil and gas activity projected in the RDF (APPENDIX C), and the fact that these animals have large home ranges, the projected, site specific oil and gas activities will not significantly affect big game or trophy game animals with the following exception:

Displacement due to oil and gas activities during abnormally severe winters and other times of severe stress could cause significant mortality. Approximately 4,600 acres of crucial winter range for deer (Upton-Usage deer winter range) have been identified on the Grassland and classified as Forest Plan Management Area 5. Emphasis on big game winter range. This range is critical to maintaining deer populations at or above objective 8 out of 10 years. The impacts by alternative are displayed in the table below. No significant impact is expected under any alternative. ALTERNATIVE 3, 4, 6 and 7 allow for the possibility of oil and gas impacts to the surface of the area, but the development potential for the area is low.
Table 4-9: MITIGATION BY ALTERNATIVE ON THE UPTON-CSAGE DEER WINTER RANGE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Mitigated By NSO</th>
<th>Mitigated By CSU and Timing Limitation</th>
<th>Mitigated By No Leasing</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVES 1</td>
<td>4.600 acres*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVES 2</td>
<td>4.680 acres*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVES 3</td>
<td>4.600 acres*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVES 4</td>
<td>4.680 acres*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVES 5</td>
<td>4.600 acres*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVES 6</td>
<td>4.600 acres*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVES 7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. The Upton-Csage deer winter range is in Forest Plan Management Area 5A. Emphasis on big game winter range.
2. To meet the Forest Plan Standards ALTERNATIVES 1 and 2 require a No Surface Occupancy stipulation to this area ensuring that there will be no surface disturbance of big game winter range.
3. ALTERNATIVES 3, 4 and 7 apply both Controlled Surface Use and Timing Limitation stipulations to allow oil and gas activities under strictly controlled conditions to protect crucial deer winter range.
4. If ALTERNATIVES 5 No New Leasing, the area would be managed in accordance with the Forest Plan and the effects would be the same as in ALTERNATIVES 1 and 2.
5. Under ALTERNATIVES 6, Standard Stipulations Only, the Upton-Csage deer winter range would only receive the protection of standard lease terms (60 days or 200 meters); however, because the area is in low development potential area for oil and gas activities, the protection is expected to be no or minimal impact.

Standard lease terms provide that proposed oil and gas operations may be moved 200 meters; or new surface disturbing operations may be prohibited up to 60 days. In addition to standard lease terms, ALTERNATIVES 1, 2, 3, 4 and 7 apply supplemental lease stipulations to protect crucial winter range for deer. With the mitigation available through these standard and supplemental lease terms, no significant effect is expected on big and trophy game animals, with one possible exception. Impacts to crucial winter range for deer could be greater than allowed by Forest Plan Standards and Guidelines if ALTERNATIVE 6 were implemented; however, no significant impact on crucial winter range is expected even in ALTERNATIVE 6 because of the mitigation measures available in standard lease terms and because the area has a low potential for oil and gas mineral development. ALTERNATIVE 5, No New Leasing would cause no impacts to big and trophy game animals and habitat.

Elk

Because of concern identified in scoping, elk require further discussion. The Rochelle Hills-HA Divide area provides important elk habitat and is in Forest Plan Management Area 48, Emphasis on big game wildlife. A total of 1,200 acres is within one-quarter mile of the proposed site. Elk habitat and human activities may result in disturbance to elk and possible changes to elk behavior. Special attention should be paid to elk during oil and gas development.

Standard lease terms provide that proposed oil and gas operations may be moved 200 meters; or new surface disturbing operations may be prohibited up to 60 days. In addition to standard lease terms, ALTERNATIVES 3 and 4 include a No Surface Occupancy stipulation to protect inventoried semi-primitive motorized areas, a small portion (approximately 1,200 acres) of the Rochelle Hills elk range. A Controlled Surface Use stipulation is applied in ALTERNATIVE 4 and 7 to the Rochelle Hills area for recreation purposes. These stipulations would have a secondary benefit of lessening human intrusion into the Rochelle Hills elk habitat. ALTERNATIVE 6, No New Leasing would cause no impacts to elk habitat.

Raptors

This category includes: golden eagle, ferruginous hawk, Swainson’s hawk, goshawk, osprey, prairie falcon, merlin, red-tailed hawk, great-horned owl and short-eared owl. The environmental consequences to threatened, endangered and candidate species of raptors are discussed under Threatened and Endangered Species.

The effects of oil and gas activities on raptors have the following potential: electrocution, nesting disturbance, destruction of nests, drowning or poisoning in production pits, poisoning by hydrogen sulfide gas, or bird mortality caused by roosting on flared stacks. Raptors may be indirectly affected by oil and gas leasing through loss of nesting habitat or reduction of prey resulting from a reduction of prey habitat. Since raptors are wide-ranging, and often have alternate nest sites, small, local, site specific impacts such as those associated with oil and gas activities are not expected to be significant.

The adverse effects of reserve pits are a concern. A reserve pit is usually an excavated pit that may be lined with plastic, that holds drip cuttings and waste mud. A production pit, similarly, is an excavated pit that may be lined, that holds water separated from the oil being produced by the well. For this analysis we have referred to both types as production pits. Some wildlife species, particularly birds and small mammals, potentially can be killed in these pits when covered with discharged oil as a result of equipment failure. Raptors and many other birds are protected under the Migratory Bird Treaty Act. The U.S. Fish and Wildlife Service has begun documenting mortalities and taking legal action against pit operators, who fail to take precautionary measures. The prevention of this impact can be handled at the APD stage of development by requiring pits to be covered with netting or by requiring covered tanks.

The Migratory Bird Treaty Act prohibits killing of any migratory bird including all raptors. The Bald Eagle Protection Act also protects golden eagles from being killed. The Rural Electrification Administration has power line construction specifications which they enforce to prevent raptor electrocution. Standard lease terms provide that proposed oil and gas operations may be moved 200 meters or new surface disturbing operations may be prohibited up to 60 days. Covering of production pits and screening vent stacks are standard procedures addressed at the APD stage of development in the Surface Use Plan of Operations (36 CFR 228.106). Although in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, nesting raptors could be impacted resulting in nesting failure or abandonment. ALTERNATIVES 1, 2, 3, 4 and 7, in accordance with Forest Plan Standards and Guidelines, apply both Controlled Surface Use and Timing Limitation stipulations which will protect raptor nests. These stipulations will: 1) allow no activities within one-quarter mile of an active golden eagle nest from February 1 to July 31 if they would cause nesting failure or abandonment; 2) allow no activities within one-half mile of an active golden eagle nest at any time if they would cause disturbance of the adult birds on the nest; 3) allow no activity within one-quarter mile of an active ferruginous hawk, Swainson’s hawk, goshawk, osprey or prairie falcon nest from March 1 to July 31 if they would cause nesting failure or abandonment, and 4) allow no activity within 300 feet of any ferruginous hawk, Swainson’s hawk, goshawk, osprey or prairie falcon nest at any time if they would cause nest abandonment, unless specific practices are successfully implemented to

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feet (the same as the Forest Plan provides to other raptors). ALTERNATIVE 5, No New Leasing, would cause no impacts to any raptors.

Upland Game Birds

Three species of upland game birds occur in the analysis area: sage grouse, sharp-tailed grouse and Merriam’s turkey. There are 49 known sage grouse breeding grounds on TBNG, with 25 of them occurring on NFS surface. Only six sharp-tailed breeding grounds have been documented within the boundaries of TBNG. All of them are either on state or private surface.

Merriam’s turkey occurs in the Rochelle Hill, the Upton/Osage area, Spring Creek and along the Cheyenne River. Merriam’s turkeys have a high tolerance for human disturbance, often thriving near ranches and private dwellings where the human inhabitants feed them. Oil and gas developments could cause a minor reduction of feeding, roosting, or nesting areas. These effects would be mitigated on a case-by-case basis at the APD stage of development.

The effects of oil and gas leasing on upland game birds are: disturbance of breeding/nesting birds, temporary displacement of breeding grounds, accidental death due to increased traffic (road kill) or produced water pits, increased hunting pressure due to better access, and increased potential for poaching.

Standard lease terms provide that proposed oil and gas operations may be moved 200 meters; or new surface disturbing operations may be prohibited up to 60 days. Although in most cases standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, impacts to sage grouse and sharp-tailed grouse breeding grounds could be greater than allowed by Forest Plan Standards and Guidelines. ALTERNATIVES 1, 2, 3, 4 and 7 apply supplemental lease stipulations in accordance with Forest Plan Standards and Guidelines which protect sage grouse and sharp-tailed grouse breeding grounds. ALTERNATIVE 5, No New Leasing, would cause no impacts to upland game birds.

Waterfowl

The major species expected to use the reservoirs for breeding, nesting and feeding habitat is the mallard duck. Canada geese occasionally nest in the northeastern portions of the Thunder Basin National Grassland, but their use is limited because of lack of feeding areas (cultivated grains). A variety of other dabbling ducks such as blue-winged teal, northern pintail and American widgeon can also be expected to use the reservoirs for feeding and possibly breeding and nesting.

The effects of oil and gas activities on waterfowl are expected to be: disturbance of breeding/nesting birds, possible modification of habitat, accidental death due to production pits, increased hunting pressure due to better access, and increased potential for poaching. Any changes to riparian or wetland areas can also have effects on waterfowl.

Potential benefits to waterfowl may be derived through the discovery of artemis wells and the construction of long term reservoirs which may be converted to wetlands for waterfowl.

For all leasing ALTERNATIVES (1, 2, 3, 4, 6 and 7), standard lease terms provide that proposed oil and gas operations may be moved 200 meters, or new surface disturbing operations may be prohibited up to 60 days. Although in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, impacts to waterfowl habitat (riparian areas and wetlands) could be greater than allowed by Forest Plan Standards and Guidelines. ALTERNATIVES 1, 2, 3, 4 and 7 apply supplemental lease stipulations in accordance with Forest Plan Standards and Guidelines which protect waterfowl habitat (riparian areas) unless: 1) no other reasonable alternative exist; and 2) it is established to the authorized officer’s satisfaction, that the development will meet Forest Plan Standards and Guidelines regarding riparian, playas, floodplains and wetland areas. ALTERNATIVE 5, No New Leasing, would cause no impacts to waterfowl.

Non-Game Birds

The number of non-game bird species (including Passerine birds) is high on the TBNG (approximately 228 species). The timber stands provide nesting habitat for a wide variety of mid and upper canopy nesting birds as well as habitat for cavity nesting birds. Typical shortgrass/sagebrush associated bird species such as horned larks, sharp tailed sparrows, western meadowlarks, willow flycatcher, house wren and kirtleder are common on TBNG. Some bird groups which have neotropical migrants known on Thunder Basin National Grassland include hummingbirds, flycatchers, vireos, warblers and buntings. Habitat for non-game birds is further enriched on TBNG by the presence of riparian areas, woody draws, woodland patches, shrublands associated with badlands and riparian forests, shrublands and grasslands.

Because of their high reproductive rate and wide distribution, non-game birds are capable of rapid recovery and are not adversely affected by local disturbances such as those associated with oil and gas activities. Non-game birds may be temporarily displaced from an area due to the exploration, development or production of oil and gas resources. Construction of drill pads and roads will result in some habitat modification which will be partially offset by reclamation on other areas. Non-game birds may be trapped in produced water pits. Normal mitigation measures (see Raptors above) implemented at the APD stage of development, minimize this hazard.

Small Mammals

This category includes moles, shrews, bats, rabbits and rodents. The effects of oil and gas activities on small mammals are: drowning or poisoning in production pits, increased sport shooting, trapping, or hunting due to improved access, and habitat created or modified for these species. Site specific modification of vegetation and/or topographic habitat for the construction of oil and gas facilities or pipelines may be offset by artificial habitat created by the same facilities. Many small mammals quickly invade and occupy stockpiled materials, unoccupied facilities (including oil and gas facilities), and disturbed and reclaimed areas. Based on this information and the fact that most of these species have high reproductive rates and wide distributions, no significant effects are expected on these species’ habitats in any of the alternatives.

Prairie Dogs

Although prairie dogs are small mammals, they require more discussion since there is considerable interest in them and they are a highly managed species under the Prairie Dog Management Plan for the Thunder Basin National Grasslands (approved in 1981, and revised in 1991). Prairie dog towns have more than doubled in acreage during the past 10 years, concurrently with increased oil and gas activity. Prairie dogs prefer disturbed soils and may, in fact, tend to invade areas such as new oil well pads and pipelines, which, because of their disturbed soil, are easy to excavate. Oil and gas activity will not adversely impact prairie dog habitat or population and may improve habitat.

The effects of oil and gas activity on prairie dogs are: potential increase in prairie dog habitat, prairie dog town sizes, and improved access for potential increase in sport shooting. While improved habitat may be helpful to the prairie dog population, it may be detrimental to range management programs. Sport shooting of prairie dogs could potentially reduce prairie dog populations. At the present time; however, sport shooting does not appear to be threatening prairie dog populations. Presently, prairie dogs are controlled or prairie dog towns are retained under the Prairie Dog Management Plan to maintain or reduce the size of prairie dog towns and improve
forage production. Any contribution of oil and gas activities to prairie dog population increase or decrease is not expected to be significant for any of the alternatives.

**Predators**

The effects of oil and gas activities on predators are: disruption of dens, displacement of prey species (at least meadowlarks), potential increased trapping, hunting, and road mortalities. Since the effect of oil and gas activities on predator populations is local and temporary (see Small Mammals, Prairie Dogs and Non-Game Birds above) and these animals tend to be wide-spread, the effect on predator populations is not expected to be significant. Improved access from oil and gas could increase hunting, trapping, predation control and traffic mortalities. Trapping, sport shooting of predators, and predator controls on TBNG are legal activities. Proposed Oil and Gas activities are not expected to cause any significant effects to predator habitat or populations.

**Reptiles**

The effects of oil and gas leasing are not expected to be significant. These animals are wide-spread and since oil and gas activities will only impact small portions of these species habitat, it is not expected to be significant.

**Amphibians**

The effects of oil and gas activities on amphibians are primarily associated with modification of habitat (riparian areas and wetlands).

Standard lease terms provide that proposed oil and gas operations may be moved 200 meters or new surface disturbing operations may be prohibited up to 60 days. Although in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, impacts to amphibians (riparian areas and wetlands) could be greater than allowed by Forest Plan Standards and Guidelines. ALTERNATIVE 1, 2, 3, 4, 5, and 7 apply supplemental lease stipulations in accordance with Forest Plan Standards and Guidelines which protect riparian areas and wetlands unless: 1) no other reasonable alternative exists, and 2) it is established to the authorized officer's satisfaction, that the development will meet Forest Plan Standards and Guidelines about riparian, playa, floodplains and wetland areas. ALTERNATIVE 5. No New Leasing would cause no impacts to amphibians.

**Threatened and Endangered Species**

In accordance with the Endangered Species Act of 1973, as amended, interagency cooperation (Section 7 of the Act) has been accomplished. A Biological Assessment was prepared in accordance with 50 CFR 402.12, and submitted on May 29, 1992, to the U.S. Fish and Wildlife Service (FWS), Wyoming State Office, for review and concurrence as part of informal consultation (50 CFR 402.13). This document evaluated three species: black-footed ferret, bald eagle, and peregrine falcon. The conclusion of this document is that none of the proposed alternatives are likely to adversely affect any of these three species. On September 23, 1992, the FWS concurred with conditions on implementing conservation measures on black-footed ferret habitat (see APPENDIX A, COMMENT 92). The correspondence and Biological Assessment are a part of the record for this EIS on file in the Forest Supervisor's Office in Laramie, Wyoming.

Black-footed ferrets

Black-footed ferret habitat is managed on the TBNG under the Forest Plan and incorporated by reference. Prairie Dog Management Plan (1981, revised 1991). Habitat sufficient to support a viable population of ferrets is provided under guidance of these documents. The Forest Service has performed 10 years of night searches (U.S. Fish and Wildlife Service methodology) for ferrets on the TBNG. No ferrets or evidence of ferrets has been found. They are not believed to exist on the TBNG. The Secretary of the Interior has not designated critical habitat for the ferret anywhere in the State of Wyoming. None of the six alternatives are likely to adversely affect prairie dog habitat, which the ferret is closely associated with and likely dependent upon. Consequently, no effects to this endangered species are predicted.

**Bald Eagle**

The Migratory Bird Treaty Act, The Bald Eagle Protection Act and the Endangered Species Act of 1973, as amended, protect bald eagles from being killed. The Rural Electrification Administration has power line construction specifications which they enforce to prevent raptor electrocution. In addition to the protection afforded by law, standard lease terms provide that proposed oil and gas operations may be moved 200 meters; or new surface disturbing operations may be prohibited up to 60 days. Although, in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, impacts to bald eagle nests and roosts could be greater than allowed by Forest Plan Standards and Guidelines. ALTERNATIVE 1, 2, 3, 4 and 7, in accordance with Forest Plan Standards and Guidelines, apply with Controlled Surface Use and Timing Limitation stipulations which will: 1) allow no activities within one mile of an active bald eagle nest from February 1 to July 31, if they would cause nesting failure or abandonment, 2) allow no activity within one-half mile of an active bald eagle nest at any time if they would cause disturbance of the adult birds on the nest, and 3) allow no activity within one mile of an active bald eagle winter roost site from November 1 to April 1 if they would cause reduction of use of the roost. ALTERNATIVE 5. No New Leasing would cause no impacts to any raptors.

**Peregrine falcon**

Because no nesting sites or critical habitat (as designated by the Secretary of the Interior) for peregrine falcons has been identified, oil and gas exploration or development should have no impacts on the species for any of the alternatives. In the event that a peregrine falcon nest site is discovered, there are Standards and Guidelines in the Forest Plan that will afford them adequate protection. Migrant and trappable peregrine falcons are evaluated in the Biological Assessment (in the project record on file in the Forest Supervisor's Office in Laramie, Wyoming). Oil and gas activities are not likely to adversely affect these occasional users of the TBNG.

**Threatened and Endangered Candidate Species**

**Mountain plover**

The possible adverse effects of oil and gas leasing on mountain plovers on TBNG are: disturbance of breeding and nesting birds, drowning or poisoning in production pits, disturbance by road and drill pad construction, improved access and increased human activity, and reclamation to other than native short-grass prairie. Mountain Plovers may also be affected from access roads and development sites where vegetation is sparse, short (ankle height or less), or non-existent, which provide better conditions for birds searching for insects. Further, since mountain plovers are associated with prairie dog towns, oil and gas activities that expand prairie dog towns would also benefit the mountain plover.

Standard lease terms provide that proposed oil and gas operations may be moved 200 meters or new surface disturbing operations may be prohibited up to 60 days. Covering of produced water pits and reclamation with native short-grass are addressed at the APD stage of development in the
Surface Use Plan of Operations (36 CFR 228.106). Although, in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, impacts to mountain plover rockeries could be greater than allowed by Forest Plan Standards and Guidelines. ALTERNATIVES 1, 2, 3, 4 and 7 apply supplemental lease stipulations in accordance with Forest Plan Standards and Guidelines which prohibits activities within one-quarter mile of any rockery (breeding and nesting area) from March 1 to July 31, if they would cause nesting failure or abandonment. ALTERNATIVE 6, No New Leasing would cause no impacts to mountain plover habitat.

Preble’s meadow-jumping mouse

The Preble's meadow-jumping mouse does not occur within the TBNG (see the Terrestrial Wildlife Specialist Report in the project record on file in the Forest Supervisor's Office in Laramie, Wyoming). This species occupies wetlands and riparian areas in the Laramie Range. If the mouse would be found on TBNG there would still be few expected impacts because of the mitigation applied to wetlands and riparian areas.

Fringed myotis (bat)

The fringed myotis roosts in caves, tunnels, and buildings, feeds primarily on beetles and is considered rare in Wyoming. The only expected hazard to this species from oil and gas activities is mortality caused by flare stacks, dehydrators, vents, and reserve pits. Since these impacts can be mitigated through screening stacks and vents and by covering production pits, all standard measures applied at the APD stage of development, no significant impacts to the myotis population is expected under any alternative. New buildings constructed in association with oil and gas production may provide more habitat for these animals.

Swift fox

The possible effects of oil and gas activities on swift fox are: disruption of dens, displacement of prey species (at least temporarily) and potential increased trapping, hunting, and road mortalities. Since the effect of oil and gas activities on prey populations is local and temporary (see Small Mammals, Prairie Dogs and Non-Game Birds above) and these animals tend to be wide-spread, the effect on swift fox populations is not expected to be significant. Improved access from oil and gas could possibly increase hunting, trapping and traffic mortalities. Proposed Oil and Gas activities are not expected to cause any significant effects to swift fox habitat or population.

Ferruginous hawk

The possible effects of oil and gas activities on ferruginous hawks are: potential electrocution, nesting disturbance, destruction of nests, drowning or poisoning in production pits, poisoning by hydrogen sulfide gas, or bird mortality caused by roosting on flare stacks. The ferruginous hawk may be indirectly affected by oil and gas leasing through modification of nesting habitat or reduction of prey through modification of prey habitat.

The Migatory Bird Treaty Act prohibits killing of any migratory bird including ferruginous hawks. The Rural Electrification Administration has powerline construction specifications which they enforce to prevent raptor electrocution. In addition, standard lease terms provide that proposed oil and gas operations may be moved 200 meters; or new surface disturbing operations may be prohibited up to sixty days. In most cases breeding and nesting disturbances can be avoided through application of the standard lease terms. Covering production pits and screening vent stacks are standard procedures addressed at the APD stage of development in the Surface Use Plan of Operations (36 CFR 228.106). Although, in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, impacts to ferruginous hawk nests could be greater than allowed by Forest Plan Standards and Guidelines. ALTERNATIVES 1, 2, 3, 4 and 7 apply supplemental lease stipulations in accordance with Forest Plan Standards and Guidelines which protect active ferruginous hawk nests from activities which would cause nesting failure or abandonment. ALTERNATIVE 6, No New Leasing would cause no impacts to raptors.

Black tern

The effect of oil and gas leasing on the black tern are: drowning or poisoning in production pits and modification of habitat (riparian and wetland areas).

Standard lease terms provide that proposed oil and gas operations may be moved 200 meters or new surface disturbing operations may be prohibited up to 60 days. Covering production pits and screening vent stacks are standard procedures addressed at the APD stage of development in the Surface Use Plan of Operations (36 CFR 228.106). Although, in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, impacts to black tern habitat could be greater than allowed by Forest Plan Standards and Guidelines. ALTERNATIVES 1, 2, 3, 4 and 7 apply supplemental lease stipulations in accordance with Forest Plan Standards and Guidelines which protect riparian areas unless: 1) No other reasonable alternative exists, and 2) it is established to the authorized officer's satisfaction, that the development will meet Forest Plan Standards and Guidelines regarding riparian, playa, floodplains and wetland areas. ALTERNATIVE 6, No New Leasing would cause no impacts to black terns.

Loggerhead shrike

The effects of oil and gas activities on loggerhead shrikes are: drowning or poisoning in production pits, and disturbance of prey species (small mammals). Since loggerhead shrikes hunt over large areas, and most oil and gas activities are localized, the impact on the loggerhead shrike is not expected to be significant. Loggerhead shrikes feed on small mammals such as mice and are known to use the barbs on barbed wire fences to catch and hold prey during consumption. Construction or barbed wire fences around facilities (a requirement handled at the APD stage based on other factors), and the potential for increased small mammals around facilities may benefit loggerhead shrikes.

Covering produced water pits and screening vent stacks are standard procedures addressed at the APD stage of development in the Surface Use Plan of Operations (36 CFR 228.106). ALTERNATIVE 5, No New Leasing, would cause no impacts to loggerhead shrikes. With the available mitigation measures, no significant effect is expected on loggerhead shrikes in any alternative.

Long-billed curlew and White-faced ibis

The long-billed curlew and white-faced ibis are uncommon residents of Wyoming including the TBNG. The potential for leasing to affect the curlew and ibis is low. The potential effect of oil and gas activities on these birds are: nesting disturbances, habitat (riparian and wetlands) modification, and drowning or poisoning in production pits.

Standard lease terms provide that proposed oil and gas operations may be moved 200 meters or new surface disturbing operations may be prohibited up to 60 days. Covering production pits and screening vent stacks are standard procedures addressed at the APD stage of development in the Surface Use Plan of Operations (36 CFR 228.106). Although, in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, impacts to long-billed curlew and white-faced ibis nesting and habitat could be greater than allowed by Forest Plan Standards and Guidelines. ALTERNATIVES 1, 2, 3, 4 and 7 apply
supplemental lease stipulations in accordance with Forest Plan Standards and Guidelines which protect riparian areas unless: 1) no other reasonable alternative exists; and 2) it is established to the authorized officer's satisfaction that the development will meet Forest Plan Standards and Guidelines regarding riparian, plays, floodplains and wetland areas. ALTERNATIVE 6. No New Leasing would cause no impacts to the long-billed curlew and white-faced ibis.

Black Hills red-belly snake
The possible effects of oil and gas activities on the Black Hills red-belly snake are: direct mortality due to increased human activity, disturbance of dens, and disruption or destruction of its habitat (rock piles, old wood piles, etc.). Snakes tend to be unpopular wildlife and are often killed without consideration of species or threat to humans. Black Hills red-belly snakes are also not easily seen, since they are associated with rocks, trash, and piled lumber and may be killed accidentally by equipment. Dens may also be disturbed during earth moving processes or during the removal or relocation of rocks, debris piles, or old buildings. Oil and gas related construction activities are widely dispersed and should only be minor occurrences when spaced throughout the snakes' range of habitat. These activities are not expected to have significant effects on the Black Hills red-belly snake population or habitat in any alternative.

Cumulative effects, all wildlife species
The cumulative effects on wildlife and wildlife habitat of new oil and gas leasing in conjunction with existing and anticipated new land use activities (see CHAPTER IV, SOILS RESOURCE) is not expected to have any unacceptable impacts in any alternative except ALTERNATIVE 6.

Although, in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, impacts to nesting raptors (including bald eagles), breeding and nesting areas, and mountain plover rookeries could exceed Forest Plan Standards and Guidelines. Further, ALTERNATIVE 6 may not provide sufficient control of operations to ensure the area north of Upton, identified as Forest Plan Management Area 5A, could function as crucial winter range.

FISH
The site specific fish resource that would be affected includes the habitat in streams, stock ponds, reservoirs and associated riparian and wetlands on the Thunder Basin National Grassland.

Fish law and regulations—The primary laws affecting the fish resources are the various federal and state laws and regulations which protect water resources. Specific laws and regulations are covered in CHAPTER 2 (Water Laws and Regulations; Riparian, Wetlands and Floodplaine sections). Compliance with laws and regulations is mandatory for all oil and gas activities and apply to each alternative under consideration.

Standard lease terms—In addition to law, Standard Lease Terms, Section 6, provides for protection of water and biological resources (see CHAPTER IV, SOILS RESOURCE).

Habitat and Populations—Clearing for drilling pads, production and development facilities, and roads can result in the exposure of soil to erosion by wind and water. A portion of this eroded material may be delivered to streams as sediment and deposited in the channels or recharged downstream. Excessive sediment can adversely affect aquatic life by blocking sunlight which plants need for photosynthesis, altering fish feeding behavior, clogging gills, and thus reducing growth rates, size at maturity, and reduced reproductive success. Sediment can also smother invertebrates and can fill pools in streams making them unsuitable for aquatic life. Excessive sediment can also reduce the life expectancy of downstream reservoirs. The potential for sediment reaching stream channels from such disturbances is low, due to the relatively flat terrain, lack of running water, and low precipitation that occurs on the Grasslands.

Chemicals used in the drilling and production processes or chemicals found in produced waters, which may contain high concentrations of salt (particularly sodium and chloride) and heavy metals, may be toxic. Hydrogen sulfide, encountered in drilling in some areas, is highly toxic to aquatic life. Blowouts during drilling or production are unusual, but have the potential for polluting surface waters. Oil spills or spills of contaminated water may also occur. When these chemicals are transported into nearby streams and still water bodies, aquatic life may be affected. Disposal and, in the event of spill, cleanup of these hazardous materials is governed by the Wyoming Department of Environmental Quality (DEQ), Water Quality Regulations and is applicable to all alternatives.

For all alternatives, the State of Wyoming Water Quality Rules and Regulations apply providing significant protection to all aquatic resources including fish. ALTERNATIVE 6. No New Leasing would cause no impacts to fish habitat and populations on federal lands. Some wells will be displaced to existing leases and to non-federal surface. Where non-federal surface is involved, the control of operations could be less and the impacts potentially greater than for operations on Federal lands. In ALTERNATIVE 6, standard lease terms require the lessee to minimize adverse impacts to water and biological resources. The applicable standards and guidelines and monitoring for raptors, floodplains and wetland areas would be applied at the APD stage of development. In addition to standard stipulations, ALTERNATIVES 1, 2, 3, 4 and 7 apply a Controlled Surface Use stipulation which subjects surface occupancy to the following constraints: 1) no other reasonable alternative exists, and 2) it is established to the authorized officer's satisfaction, that the development will meet Forest Plan Standards and Guidelines about riparian, plays, floodplains and wetland areas. It should be noted that no significant impact is expected under any alternative.

NO threatened, endangered, or state-listed sensitive aquatic dependent species are known to exist within the boundaries of TBNG; therefore, no impact will occur under any of the alternatives.

BIOLGICAL DIVERSITY

Biological diversity direction—On June 4, 1992, Chief of the Forest Service, F. Dale Robertson, announced a new management philosophy for the National Forests and Grasslands termed ecosystem management (see CHAPTER 1, ECOSYSTEM MANAGEMENT). In order to fully implement the new ecosystem management philosophy, a biological diversity assessment was prepared (see Biological Diversity Technical Report for the Thunder Basin National Grassland located in the project file in the Forest Supervisors Office in Laramie, Wyoming).

Standard lease terms—Standard Lease Terms, Section 6, provides for protection of biological resources as well as reclamation (see CHAPTER IV, SOILS RESOURCE).

Projected impacts—The environmental consequences of oil and gas activities are considered for four scales of biological diversity defined as:

- Genetic. The structure and composition of the gene pool, and the presence and variation of configurations of DNA for a species, is the focus of biological diversity at the genetic scale. This is concerned with the variation among individuals within a species population.
- Species. At the species level, biological diversity is described using species richness (kinds of species) or species evenness (distribution, abundance or importance of different species). Species richness or evenness can be evaluated in the context of community or landscape scale.
The impacts of oil and gas leasing on the biological diversity of patches of shrublands and woodlands within the greater sagebrush grassland may be more disruptive to ecological composition, structure, processes and functions than the impacts to the greater sagebrush grassland. These patches are composed of long-lived woody perennial species and shrubs. If parts of these communities are removed, replacement by reclamation and succession would take between (10 to 50 years).

Certain shrubland communities generally occur on shale, clay, scoria or soft sandstones. Birdfoot sagebrush communities form small patches on flat or gently sloping surfaces in the badlands of the Fort Union Formation. Birdfoot sagebrush is an uncommon plant community highly specialized to its soil requirements. These types of areas, because of limited extent and specialized communities, are more likely to be adversely impacted than the larger sagebrush and grassland types. To date, reclamation of birdfoot sagebrush has not been demonstrated. Further, the extent of this community is not fully known. Because of these factors, the impact of oil and gas on this type could be severe. This is a particular concern in the Downs area where birdfoot sagebrush is particularly well represented.

Woodland communities in the Rochelle Hills, Miller Hills, Cow Creek Buttes and Duck Creek areas form even smaller patches than the shrublands discussed above, and occur as isolated islands. Ponderosa pine and Rocky Mountain juniper in these areas are at species limits and may reproduce in significant numbers only a few times each century. The shrub and herbaceous communities associated with these woodlands, create a tight system of specialized habitats. The limited size of these areas may make them especially sensitive to disruption by roads, drill pads and subsequent human activities. Not enough is known about the biological interactions in these areas to predict consequences with any degree of certainty.

Woodland and shrublands on steep slopes will not be affected by oil and gas leasing because soil conservation requirements will prevent roads and drill pads from occurring in those vegetation communities.

In general, riparian areas, including playas, stream corridors and the riparian deciduous forest, are not expected to be directly impacted by oil and gas activities (see CHAPTER IV, Riparian areas, Wetlands, and Playas).

During the period between the draft and the final EIS, a biologic diversity assessment was conducted. Six areas of unusual biological diversity or areas with higher biological diversity than in the larger surrounding area (grassel and sagebrush grassland) were identified. Five of the six areas, with minor variations in boundaries, were also identified as having higher recreation values (see CHAPTER IV, RECREATION). A description of these six areas of unusual biological diversity may be found in CHAPTER III, BIOLOGICAL DIVERSITY. Each alternative provides varying degrees of protection to these six areas as summarized below:

### Table 4-10 AREAS WITH SPECIAL BIOLOGICAL DIVERSITY VALUES PROTECTED BY ALTERNATIVE AND TYPE OF STIPULATION

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Protected by NSO (Acres)</th>
<th>Protected by CSU (Acres)</th>
<th>Protected by No Leasing (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>4600^</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>4600^</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>10,160^</td>
<td>4,600^</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>18,120^</td>
<td>41,245^</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>0</td>
<td>0</td>
<td>65,775^</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>24,300^</td>
<td>41,245^</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes:

^This includes the Upton-Deage crucial deer winter range (4,600 acres).

^This includes portions of two areas identified with special biological diversity values: 1) Cow Creek Buttes (8,940 acres); and 2) Miller Hills (3,520 acres).

^This includes portions of three areas identified with special biological diversity values: 1) Cow Creek Buttes (8,940 acres); 2) Miller Hills (3,520 acres); and 3) Duck Creek (7,970 acres).

^This includes portions of the area (total acreage of each) identified with special biological diversity values: 1) Cow Creek Buttes (8,970 acres); 2) Miller Hills (3,520 acres); 3) Duck Creek (9,960 acres); and 4) Downs (5,080 acres).

^This includes areas with a Controlled Surface Use stipulation for special values: 1) Rochelle Hills (15,245 acres); and 2) Upton-Deage (26,000 acres). The Upton-Deage crucial deer winter range (4,600 acres) is an inclusion within the Upton-Deage area with special values. Areas protected with CSU stipulations for riparian, soils or other reasons may have secondary benefits to biological diversity but are not listed in this table.

^This includes areas identified under footnotes 1, 2, 3, 4 and 5 above.

^This table does not include area covered by Controlled Surface Use or Timing Limitation stipulations for featured species, ecological indicator species, threatened or endangered species, except for the NSD applied to the Upton-Deage crucial deer winter range (ALTERNATIVES 1 and 2) which happens to be totally included within the Upton-Deage biological diversity area. Additional biological diversity protection would be afforded by these stipulations.

For the reader's convenience a brief description of the area and the special biological diversity values involved follows:

**Rochelle Hills**-- (15,245 acres) is an isolated, ponderosa pine covered escarpment. Within this area, the vegetation, community types, plant and animal community relationships, and number of both communities and species contributes to higher biological diversity values.

**Upton-Deage**-- (26,000 acres) is in a transition area between grassland and the Black Hills with stringers of ponderosa pine forest interspersed with grassland. This area includes the Upton-Deage crucial deer winter range, 4,600 acres. Within this area, the vegetation, community types, plant and animal community relationships, and number of both communities and species contributes to higher biological diversity values.

**Duck Creek**-- (8,960 acres) is located on a transition between the Duck Creek breaks and grassland. The existing biological diversity consists of highly integrated woodland, shrub land and grassland communities with excellent ecological integrity and condition. Some plant communities found here are believed to be the only such communities on the TBBG.
ie, woody draws and big bluestem. Other plant communities found here occur sparingly elsewhere on the TBNG; ie, aspen groves and little bluestem.

Miller Hills-- (3.520 acres) is an isolated scoria and sandstone butte. The shrub land communities on the six slopes and toe-slopes function together with the wooded areas toward the top of the escarpments to create an integrated landscape unit. The area is in good biological condition.

Cow Creek Buttes-- (8,560 acres) is a prominent landscape feature on scoria and shale substrates and sandstone cap. The diversity of substrate material (scoria, sandstone, siltstone, claystone and shale) contributes to a high diversity of woodland and shrub land communities in this area.

Downs-- (5,080 acres) is an elevated landform which is highly dissected into canyons and badlands. It is unusual in that many plant communities occur together in this area. One of these communities birdfoot sagebrush is uncommon on the TBNG. The condition of plant communities is good.

Standard lease terms provide that proposed oil and gas operations may be moved 200 meters; or new surface disturbing operations may be prohibited up to 60 days. At the landscape scale, if ALTERNATIVE 6 were implemented, fragmentation of ecosystems consisting of multiple plant communities in areas identified with higher biological diversity values could occur. The interaction between, and within, communities could be disrupted by oil and gas drill pads, roads and pipelines. Although, in most cases, standard lease terms would provide adequate protection, it is possible that under ALTERNATIVE 6, Standard Stipulations Only, woody draws, big bluestem, little bluestem, aspen groves, and birdfoot sagebrush communities could be impacted with oil and gas activities. At the landscape scale, both the interactions within the community and the interactions of the community with adjacent communities is a concern. In ALTERNATIVE 6, impacts to crucial winter range for deer could be greater than allowed by Forest Plan Standards and Guidelines; however, no significant impact on crucial winter range is expected because of the mitigation measures available in standard lease terms and because the area has a low potential for oil and gas mineral development. The impacts on landscape scale biological diversity for ALTERNATIVES 1 and 2 are the same as those for ALTERNATIVE 6 except that the Upland-Uspsage crucial winter range will be protected by an No Surface Occupancy stipulation. Use of supplemental stipulations in ALTERNATIVES 3, 4 and 7 provide for maintaining the integrity of landscape scale biological diversity values in the area, some identified as having higher biological diversity values in the Downs and birdfoot sagebrush communities could be impacted. ALTERNATIVE 7 provides for all identified biological diversity concerns (see Table 4-10). ALTERNATIVE 6, No New Leasing would cause no impacts to biological diversity on federal lands. No significant effects to biological diversity is expected in any alternative except in ALTERNATIVE 6, where impacts to crucial winter range could exceed Forest Plan Standards and Guidelines.

Cumulative effects, biological diversity--Cumulative effects on biological diversity, from oil and gas activities result from the incremental increase of man caused disturbances such as domestic animals, hunting, animal damage control, fire suppression, water diversion and water development, coal, uranium and bentonite mining, use of herbicides, roads, off-road vehicles, and oil and gas leasing. These effects cause changes at many different scales.

Impacts of coal, uranium, bentonite and scoria mining are restricted to very specific mineral locations. Plant and animal communities in the mined areas may be completely removed. Replacement is generally with smaller systems, which are basically grasslands with minor shrub and forb components. Although the land is being returned to productive use, the manmade ecosystems do not replace the former biological diversity. Birdfoot sagebrush (in flat areas), Douglas rabbitbrush and skunkbrush sumac (both on steep sideslopes) are three community types, which occur in small patches on specialized substrates and which are being decreased in both size and extent due to mining (primarily coal).

In contrast, oil and gas leasing, while not affecting as many actual acres as mining, affects the whole landscape because the roads, drill sites and pipelines accumulate as many small sites and corridors over the entire area. Thus, the impacts to landscape, community species and genetic biological diversity have different spatial patterns than other mining activities.

As stated in CHAPTER IV, SOILS RESOURCE, on a cumulative basis between 20 and 50 acres of oil-plant (biological) resource would be disturbed by drilling activities. Disturbed sites will not be successively different than undisturbed areas. Sagebrush sites will progress faster to an undisturbed condition than will coniferous sites. Reclamation generally results in simplification of biological diversity. Reclamation with introduced grass species does not prevent natural recolonization of native species.

Livestock grazing affects landscape, community and species biological diversity by direct, differential impacts on plant and animal species. Fire suppression, use of herbicides, hunting and animal damage control all affect biological diversity. Oil and gas leasing is not expected to significantly change the patterns already in place due to these other influences.

Perhaps the most important cumulative effect of oil and gas leasing on biological diversity is the increase in roads and drill pad sites which fragment communities and landscapes. While these activities are not expected to cause serious disruption at the species level, especially with the application of the proposed stipulations to protect wildlife species, they do physically fragment communities and landscapes. The effects of this fragmentation are not fully understood.

The effects on biological diversity of oil and gas activities in conjunction with other existing and foreseeable activities on the TBNG for ALTERNATIVES 1, 2, and 3 may impact the biological diversity on the TBNG for ALTERNATIVES 5, 6, and 7. Where supplemental lease stipulations are applied to protect biological diversity, as are those for ALTERNATIVE 6 except that the Upland-Uspsage crucial winter range will be protected by an No Surface Occupancy stipulation. Use of supplemental stipulations in ALTERNATIVES 3, 4 and 7 provide for maintaining the integrity of landscape scale biological diversity values in the area, some identified as having higher biological diversity values in the Downs area and the birdfoot sagebrush community could be impacted. ALTERNATIVE 7 provides for all identified biological diversity concerns (see Table 4-10). ALTERNATIVE 6, No New Leasing would cause no impacts to biological diversity on federal lands. No significant effects to biological diversity is expected in any alternative except in ALTERNATIVE 6, where impacts to crucial winter range could exceed Forest Plan Standards and Guidelines.

ECONOMIC FACTORS

ECONOMIC BASE

The site specific affected area for purposes of the economic impact analysis is defined as the five Wyoming counties encompassing the TBNG. This would include the counties of Campbell, Converse, Crook, Niobrara and Weston. Economic impacts are reported for total economic activity, personal income and employment supported in the region by oil and gas activity on Forest Service lands (see Economic Impact and Cost Efficiency Analysis to Support the Oil and Gas Leasing EIS).
for the Thunder Basin National Grassland, in the project file at the Forest Supervisor’s Office in Laramie, Wyoming.

Table 4-11 AVERAGE ANNUAL EXPENDITURES* AND IMPACTS ON FEDERAL SURFACE BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total Economic Activity</th>
<th>Total Personal Income</th>
<th>Total Employment (Full Time Equivalents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>$22,241,924</td>
<td>$3,933,684</td>
<td>140</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>$24,177,294</td>
<td>$4,384,369</td>
<td>154</td>
</tr>
</tbody>
</table>

Note: * The total economic impacts include direct expenditures by industry in exploration, development and production and the indirect induced expenditures in the economy of the counties involved (Campbell, Converse, Crook, Niobrara and Weston).

REVENUE BASE

The site specific affected area for purposes of the economic impact analysis is defined as the five Wyoming counties encompassing the Thunder Basin National Grassland. This would include the counties of Campbell, Converse, Crook, Niobrara and Weston.

Local government revenues—The fiscal impact on local governments (counties and towns) resulting from their share of Federal leasing and royalty revenues is estimated as follows (see Economic Impact and Cost Efficiency Analysis to Support the Oil and Gas Leasing EIS for the Thunder Basin National Grassland, in the project file at the Forest Supervisor’s Office in Laramie, Wyoming).

Table 4-12 AVERAGE ANNUAL REVENUE TO LOCAL GOVERNMENT BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Sales Tax (000$)</th>
<th>Ad Valorem Royalties (000$)</th>
<th>Federal Royalties (000$)</th>
<th>Severance Tax (000$)</th>
<th>Leasing (000$)</th>
<th>Total (000$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>77</td>
<td>1,307</td>
<td>334</td>
<td>241</td>
<td>102</td>
<td>2,061</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>77</td>
<td>1,307</td>
<td>334</td>
<td>241</td>
<td>104</td>
<td>2,063</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>77</td>
<td>1,297</td>
<td>332</td>
<td>239</td>
<td>101</td>
<td>2,046</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>77</td>
<td>1,283</td>
<td>328</td>
<td>236</td>
<td>99</td>
<td>2,023</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>70</td>
<td>1,087</td>
<td>281</td>
<td>200</td>
<td>7</td>
<td>1,645</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>77</td>
<td>1,307</td>
<td>334</td>
<td>241</td>
<td>105</td>
<td>2,064</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>77</td>
<td>1,293</td>
<td>328</td>
<td>237</td>
<td>100</td>
<td>2,025</td>
</tr>
</tbody>
</table>

Most of the variation in revenues between alternative results are from the assumption that acres with No Surface Occupancy stipulations would not be leased. This assumption affects leasing patterns and estimated total oil and gas production by alternative. As shown in Table 4-12, ALTERNATIVE 6 has the largest total revenue because all acres are assumed to be leased which maximizes the revenues from oil and gas production. Revenues for ALTERNATIVES 1 and 2 are somewhat lower, due to small amounts of No Surface Occupancy acres, which reduces oil and gas production. Revenues for ALTERNATIVES 3, 4 and 7 are the lowest due to larger amounts of No Surface Occupancy acres and lower levels of oil and gas production. Revenues for ALTERNATIVE 5 are substantially lower due to the lose of revenues with the no leasing alternative.

INCOME

Revenues accruing to the Federal Treasury that are considered to be directly affected by oil and gas activity on the Thunder Basin National Grassland include: lease bonus bids, annual lease rentals and royalties based on annual production (see Economic Impact and Cost Efficiency Analysis to Support the Oil and Gas Leasing EIS for the Thunder Basin National Grassland, in the project file at the Forest Supervisor’s Office in Laramie, Wyoming). For the purpose of this study, total revenues were calculated on the average rates received in the Thunder Basin National Grassland analysis area. When estimating forgone revenues associated with No Surface Occupancy, average site specific rates were provided by the Bureau of Land Management. These estimates were based on historical data and the estimated potential of the affected area.

Lease Bonus Bids—Lease bonus bids are one-time premiums paid to the Federal Government for the right to explore and develop a particular tract of land. The premium is established by competitive bid. The bonus bid typically reflects the industry’s appraisal of the mineral potential of the lease parcel and the outlook for future energy prices. The greater the parcel’s mineral potential and the higher the price of oil, the higher the bid price. As a result, bonus bids can vary substantially within a geographic area such as the TBNG.

Annual Rentals—Annual rentals are the yearly payments to the Federal Government for active leases. Oil and gas leases obtained by competitive bid have a primary term of five years with a current annual rental rate of $1.50 per acre. Non-competitive leases have a primary term of ten years with a current annual rental rate of $1.50 for the first four years and $2.00 for the last six years. For the TBNG, it is assumed that 50 percent of the leases are competitive and 50 percent are non-competitive. A lease can be held indefinitely as long as production is occurring and no rent is paid if the royalties exceed the rental rate. Currently, approximately 25 percent of the leases on the TBNG are held by production.

Royalties—Royalties are a function of the royalty rate, the amount of production and the value of production from the producing wells. The current royalty rate for federal oil and gas leases is 12.5 percent. This rate is maintained over the entire analysis period.

In recent years, energy prices have been unstable making projection of future prices difficult. The values used in this analysis represent the statewide average wellhead prices for 1989. The values used were $16.64 per barrel of crude oil and $1.64 per thousand cubic feet of natural gas. Because energy prices were near historic lows during 1989, the results derived using these prices are probably conservative.

Oil and gas production can vary substantially by fields and individual wells. The average annual production used in this analysis was based on historical production volume and the number of producing wells within the Thunder basin National Grassland (federal surface). Average annual production across alternatives is displayed in CHAPTER IV. MINERALS AND ENERGY RESOURCES.

Distribution of Revenues—Half the bonus, rental and royalty revenues from public domain minerals on the TBNG is returned to the State of Wyoming. On acquired minerals, one-fourth of the revenues is returned to the counties based on their proportion of the TBNG. No money goes to...
the State from the revenues on acquired minerals. For purposes of this analysis, it is assumed that all oil and gas activity involves public domain minerals.

Only federal revenues are considered for this analysis. The benefits of the 'revenue-sharing' disbursements at the local level are considered as a fiscal impact on local government in the ECONOMIC BASE section above.

Table 4-13 summarizes the average annual revenues for the seven alternatives over the 15-year planning period.

Table 4-13 AVERAGE ANNUAL REVENUES BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Leasing (000$)</th>
<th>Royalties (000$)</th>
<th>Total Revenues (000$)</th>
<th>Payments To States (000$)</th>
<th>Federal Revenues (000$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>919</td>
<td>3,010</td>
<td>3,929</td>
<td>1,965</td>
<td>1,965</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>934</td>
<td>3,010</td>
<td>3,944</td>
<td>1,972</td>
<td>1,972</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>857</td>
<td>2,821</td>
<td>3,678</td>
<td>1,839</td>
<td>1,839</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>769</td>
<td>2,556</td>
<td>3,325</td>
<td>1,663</td>
<td>1,663</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>61</td>
<td>2,504</td>
<td>2,565</td>
<td>1,283</td>
<td>1,283</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>942</td>
<td>3,012</td>
<td>3,954</td>
<td>1,977</td>
<td>1,977</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>773</td>
<td>2,571</td>
<td>3,344</td>
<td>1,672</td>
<td>1,672</td>
</tr>
</tbody>
</table>

Since it was assumed that No Surface Occupancy acres will not be leased, most of the variation in revenues between alternatives is due to differences in leasing patterns that also affect royalty revenues. Table 4-13 shows that total revenues for ALTERNATIVE 6 are the largest because all acres are assumed leased which maximizes revenues from oil and gas production. Revenues for ALTERNATIVES 1 and 2 are slightly lower, due to small amounts of No Surface Occupancy acres. Revenues for ALTERNATIVES 3, 4 and 7 are lower reflecting larger amounts of No Surface Occupancy acres and the loss of royalty receipts due to lower oil and gas production. Revenues for ALTERNATIVE 5 are substantially lower due to the loss of leasing and royalty receipts. Under this alternative, it is assumed that production and royalties from new wells would decline proportionally to the decline in the number of acres available for leasing. Some rental and royalty receipts would still be collected from existing leases and production. All existing leases not held by production will have expired in approximately eight years.

COSTS TO THE GOVERNMENT

Three categories of costs are addressed in the cost efficiency analysis: operation and maintenance, general administration and capital investments. As with revenues, the emphasis is on costs that are directly associated with the oil and gas leasing program.

Operation and Maintenance by the Forest Service—Operation and maintenance (O&M) costs are the recurring labor and non-labor costs required to implement and administer the program on-site and at the local district level. These costs represent the District office time and related costs directly associated with the industry’s exploration, development, production and reclamation activities. For this analysis, the projected O&M costs reflect recent Forest Service staff and budgets for oil and gas leasing programs in the study area.

The major component of O&M costs are payroll and staff-related expenses such as benefits and motor vehicles. As opposed to revenues, O&M costs are more sensitive to the administrative requirements for leasing, exploration, development, and reclamation rather than the number of producing wells. In addition, because the Forest Service’s budget is established by Congress, increasing staffing does not necessarily result from increased demand. For this analysis, it is assumed that funding for additional staff will be available depending on the needs under each alternative. Additional staff expenses would include payroll, benefits and motor vehicle costs.

General Administration—General administration (GA) costs also include recurring labor and non-labor costs associated with the administration of the program; however, GA costs are associated with the administration of the overall program at the Forest, Regional and National levels. Among the costs considered as GA, are administrative reporting and record keeping, coordination of leasing programs and outputs among the Forests, and budgeting for the various District operations. These costs are not easily distributed to specific activities and programs on a particular District. For this analysis, they are assumed to be equal to 27 percent of the O&M costs.

Capital Investments—Capital investments are expenditures associated with improvements or items which have an expected life of more than one year. Examples of such expenditures include construction costs for new roads, new equipment, or additional data processing capacity. For this analysis, it is assumed that no major additional capital investments from federal sources result from oil and gas leasing on the TBNG.

Loss of Grazing Fee Revenues—The major opportunity costs from other outputs on the National Forest as a result of oil and gas activity in the TBNG is the loss of grazing fee revenues. Based on past activity, over the last 15 years, oil and gas activity disturbance has directly affected 750 acres of range livestock grazing in the TBNG. Of this total, 500 acres have been reclaimed for a net loss of 250 acres. Assuming that these rates continue, with 10 acres per animal unit month, and an average rental rate for grazing of $2.00 per animal unit month, the net loss is estimated to be negligible to the revenue-cost analysis.

Table 4-14 summarizes the total average annual federal cost for the seven alternatives over the 15 year planning period.

Table 4-14 AVERAGE ANNUAL TOTAL FEDERAL COSTS BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Operation &amp; Maintenance (000$)</th>
<th>General Administration (000$)</th>
<th>Total Federal Costs (000$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>264</td>
<td>85</td>
<td>349</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>124</td>
<td>34</td>
<td>158</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>124</td>
<td>34</td>
<td>158</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>124</td>
<td>34</td>
<td>158</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>87</td>
<td>24</td>
<td>111</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>149</td>
<td>40</td>
<td>189</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>124</td>
<td>34</td>
<td>158</td>
</tr>
</tbody>
</table>

Total costs are the same for ALTERNATIVES 2, 3, 4 and 7. Costs for ALTERNATIVE 1 are substantially higher due to the requirement of site specific environmental analysis. Costs for ALTERNATIVE 5 are somewhat lower due to the lack of leasing activity. However, some costs would still be incurred under this alternative in order to administer existing leases. Costs for ALTERNATIVE 6 are somewhat higher reflecting the probable need for increased negotiations with lease-holders to protect resources with standard stipulations.

Forgone Revenues—Table 4-15 summarizes the Average Annual forgone Revenues due to No Surface Occupancy stipulations. It is assumed that No Surface Occupancy acres would not be leased resulting in lost revenues in terms of leasing, bonus and royalty revenues. Estimations of
forgone revenues are based on past activity and oil and gas development potential in a specific area.

No Surface Occupancy area will result in forgone revenues for ALTERNATIVES 1, 2, 3, 4, and 7. ALTERNATIVES 5 and 6 realize no forgone revenues because no acres are protected by No Surface Occupancy stipulations.

Even though the forgone revenues reported in Table 4-15 are based on only federal surface, there could be additional forgone revenues on adjacent state and private parcels.

Table 4-15 AVERAGE ANNUAL FORGONE REVENUES DUE TO NSO BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Leasing &amp; Bonus Revenues ($)</th>
<th>Royalty Revenues ($)</th>
<th>Total Revenues ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1</td>
<td>1,347</td>
<td>2,525</td>
<td>3,872</td>
</tr>
<tr>
<td>ALTERNATIVE 2</td>
<td>1,347</td>
<td>2,525</td>
<td>3,872</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>84,722</td>
<td>190,699</td>
<td>275,421</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>172,502</td>
<td>455,899</td>
<td>628,401</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>168,758</td>
<td>440,966</td>
<td>609,724</td>
</tr>
</tbody>
</table>

Net Present Value and Revenue Cost Estimates—A summary of the assumptions for each alternative is in the Economic Impact and Cost Efficiency Analysis to Support the Oil and Gas Leasing ES for the Thunder Basin National Grassland, in the project file at the Forest Supervisor’s Office in Laramie, Wyoming. The revenue stream would typically include periodic receipts of bonus bids received from initial leasing, annual rental income based on acres leased and cumulative increases in royalty payments as new wells come into production. The revenue stream would also include royalty payments from production on existing wells; however, this production is assumed to be declining over a 15-year period. The net result is that annual revenues decline during the period for all alternatives because increased production from new wells is less than the decline in production from existing wells. Of course, several moderate-size or a few large discoveries in the area could change this scenario.

Compared to revenues, management costs are more stable because they are associated with the protection of a fixed amount of resources. As a result, management costs are relatively stable and tend to adjust to changes in oil and gas activity in a more discrete fashion.

The discounted value of the annual revenue and cost streams is derived using a four percent discount rate and a 15-year time period. The discounted revenue and cost streams represent the equivalent lump-sum value of future receipts and expenses today. Because of the time-value of money, amounts to be received or spent in the future have lower value than the same amount received or spent today, thus, the further in the future an amount is to be received or spent the less it’s current value.

Table 4-16 combines discounted revenues and costs to measure the overall cost efficiency of each alternative. Two measures of efficiency are presented: 1) the net present value or the difference between discounted revenues and costs; and 2) the revenue-cost ratio or discounted revenues divided by discounted costs.

SOCIAL FACTORS

Society as a Whole—if the oil and gas mineral resources within the TBNG are not developed, society as a whole would be denied the benefit of these resources and would need to obtain the benefit from other sources. Revenue from lease premiums, rental rates and royalties would be denied the government. ALTERNATIVE 5 would deny society the benefits of the TBNG oil and gas resources except to the extent they are already leased. The remaining alternatives all provide for the development of TBNG oil and gas resources.

The Region—The affected Region, which includes Economic Impact Areas 2, 3 and 6, as displayed in Figure II-3 on page II-6 of the Forest Plan, and Cultural and Social Resource Unit Q, as displayed in Figure II-1 on page II-4 of the Forest Plan, would receive the jobs and income from the oil and gas leasing described in ECONOMIC FACTORS above for any of the leasing alternatives. ALTERNATIVE 5 would deny the region the benefit of those same jobs and income.

The Locals—The locals, which includes the Casper-Douglas, Gillette and Newcastle Human Resource Units, as displayed in Figure II-2 on page II-5 of the Forest Plan, would experience little change in lifestyle, attributes, beliefs, values or land use for any of the alternatives. ALTERNATIVE 5, with the loss of 14 full time equivalent jobs, could contribute to a population decline in the area.

Consumers—Any alternative could affect consumers if oil and gas prices are kept lower or higher due to increased or decreased supplies of these items. ALTERNATIVE 5 would remove all National Forest System lands from future leasing. The resulting loss of revenues could affect consumers during the planning period.

Table 4-16 ANNUALIZED NET PRESENT VALUES & REVENUE-COST RATIOS BY ALTERNATIVE

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Discounted Revenues (000$)</th>
<th>Discounted Costs (000$)</th>
<th>Net Present Value (000$)</th>
<th>Revenue-Cost Ratio</th>
<th>Ranking of Net Present Value</th>
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<tr>
<td>ALTERNATIVE 1</td>
<td>1,467</td>
<td>273</td>
<td>1,194</td>
<td>5.37</td>
<td>6</td>
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<tr>
<td>ALTERNATIVE 2</td>
<td>1,474</td>
<td>130</td>
<td>1,344</td>
<td>11.34</td>
<td>1</td>
</tr>
<tr>
<td>ALTERNATIVE 3</td>
<td>1,434</td>
<td>130</td>
<td>1,304</td>
<td>11.03</td>
<td>3</td>
</tr>
<tr>
<td>ALTERNATIVE 4</td>
<td>1,396</td>
<td>130</td>
<td>1,256</td>
<td>10.73</td>
<td>5</td>
</tr>
<tr>
<td>ALTERNATIVE 5</td>
<td>981</td>
<td>98</td>
<td>983</td>
<td>10.40</td>
<td>7</td>
</tr>
<tr>
<td>ALTERNATIVE 6</td>
<td>1,478</td>
<td>153</td>
<td>1,325</td>
<td>9.63</td>
<td>2</td>
</tr>
<tr>
<td>ALTERNATIVE 7</td>
<td>1,401</td>
<td>130</td>
<td>1,271</td>
<td>10.77</td>
<td>4</td>
</tr>
</tbody>
</table>

All alternatives yield positive net present values and revenue-cost ratios greater than 1.0, thus, any of the alternatives are justifiable from a cost-efficiency perspective. ALTERNATIVE 2 yields the greatest federal revenue from oil and gas leasing. The ranking of alternatives in the right hand column is based on the highest net return to the U.S. Treasury (1) to lowest (7).
NATURAL AND DEPLETABLE RESOURCE REQUIREMENTS

Relationship Between Short-Term Uses and Long-Term Productivity

All leasing alternatives would result in levels of revenue above current conditions for the federal treasury. Consumption of the federal minerals would provide short-term revenues and reduce the amount of federal reserves that would be available for long-term development, beyond the 15-year planning period under the reasonably foreseeable development scenario.

Federal minerals not leased during the planning period cannot be developed. The Federal Government could lose the value of federal minerals drained by development of non-federal minerals.

Irreversible and Irretrievable Commitment of Resources

The oil and gas produced as a result of any of the leasing alternatives would be an irreversible and irretrievable commitment of mineral reserves.

All leasing alternatives cause a relatively minor irreversible loss of forage production on areas disturbed for oil and gas facilities. Reclamation of dry holes, pipelines, roads and well sites would ensure there would be no irreversible loss of forage production.

In the event leasing in inventoried semi-primitive motorized areas resulted in oil and gas development, the result would be an irreversible and irretrievable commitment of the semi-primitive recreation resource. A NSO stipulation is applied in ALTERNATIVE 3 to 19,850 acres, in ALTERNATIVE 4 to 27,820 acres and ALTERNATIVE 7 to 18,130 acres. ALTERNATIVE 5, No New Leasing would cause no impacts to inventoried semi-primitive motorized areas.

ALTERNATIVES 1, 2 and 6 allow leasing consistent with the Forest Plan Standards and Guidelines with no special stipulations to mitigate impacts on areas with special values (recreation and biological values).

There is always the potential for a spill of oil or wastes such as salt water and drilling fluids, associated with oil and gas development. Mitigation measures are designed to reduce the possibility of spills. Although most spills could be cleaned up and the environment completely recover, some impacts could be long-term, irreversible or irretrievable. ALTERNATIVES 1, 2, 3, 4, 5 and 7, the leasing alternatives, have approximately equal potential for impacts to soil, water, vegetation and wildlife. ALTERNATIVE 6 has the least potential (from existing oil and gas leasing activities, none from new leasing).

For ALTERNATIVE 5, No New Leasing, drainage and the resulting loss of revenue is an irreversible and irretrievable commitment of the oil and gas resource.

Adverse Environmental Effects Which Cannot Be Avoided

The production of oil and gas under any of the leasing alternatives would reduce oil and gas reserves, an unavoidable impact to the mineral resource.

Drainage, or the movement of federal oil and gas to adjacent non-federal mineral estates, is an unavoidable loss of the federal mineral resource and revenues for ALTERNATIVE 5, No New Leasing.

Because secondary recovery cannot proceed unless there is control of the entire underground oil and gas reservoir, ALTERNATIVE 5, No New Leasing, in some cases would result in less efficient recovery and could affect the development of adjacent non-federal oil and gas.

For all the leasing alternatives, well and road construction would result in disturbance of the soil and vegetation. The No Surface Occupancy stipulation limits the area subject to these impacts. The acreage by alternative to which NSO is applied, is displayed in Table 4-1.

Even with management stipulations in place, some riparian, sagebrush and grassland habitat would be changed as a result of the leasing alternatives.

MONITORING AND EVALUATION

Monitoring and evaluation will occur at several stages.

At the lease proposal stage, the leasing analysis decisions made on the basis of this EIS will be monitored to: 1) verify the adequacy of compliance with the NEPA, 2) determine that the parcel can be occupied, and 3) identify stipulations in the lease.

At the APD and Surface Use Plan of Operations stage, when the actual location of ground disturbing activities is known: 1) consistency with lease stipulations, 2) site specific monitoring requirements, and 3) site specific mitigation measures will be determined along with full NEPA compliance.

At the field development stage, when the extent of ground disturbing activities is known for the field, 1) consistency with lease stipulations, 2) site specific monitoring requirements, and 3) site specific mitigation measures will be determined along with full NEPA compliance.

Specific post-lease monitoring activities are conducted by several federal and state agencies, including the U.S. Forest Service, the Bureau of Land Management, the Wyoming Department of Environmental Quality (land, air and water quality divisions), and the Wyoming Oil and Gas Commission. Monitoring occurs at several stages during the operational life of an oil and gas lease:

1) On-site inspections as part of the application for permit to drill.

2) Well production reports.

3) Action on any permit application (i.e., salt water injection permit).

4) Operational monitoring conducted by the legally authorized government agency (i.e., air and water quality monitoring has conducted by the Wyoming Department of Environmental Quality).

5) Approval of the process for abandonment and closure of wells and roads.

The Forest Plan, Chapter IV, pages IV-1 thru IV-67, has monitoring requirements and these requirements are incorporated by reference into this EIS. Monitoring is required for the lands leased and the activities to explore and develop oil and gas. A schedule for monitoring is displayed in Table 4-17.
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Subject</th>
<th>Activity or Effect to be Measured</th>
<th>Data Source</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Visual Resources</td>
<td>Compliance with Forest Plan Adopted Visual Quality Objective</td>
<td>Field Observations of Completed Projects</td>
<td>Upon Completion of the Project</td>
</tr>
<tr>
<td>11,12</td>
<td>Cultural Resources</td>
<td>Compliance with Cultural Resource Regulations</td>
<td>Project NEPA at APD stage</td>
<td>100 percent for APD’s received</td>
</tr>
<tr>
<td>18</td>
<td>Wildlife</td>
<td>Winter Runge Carrying Capacity, Wildlife habitat changes associated with road construction and oil and gas activities: Deer, Elk and Antelope.</td>
<td>WY Q&amp;F Annual report, APD’s, other projects, habitat surveys</td>
<td>Annual</td>
</tr>
<tr>
<td>20</td>
<td>Threatened and Endangered Species, Acres by habitat for T&amp;E species: Bald Eagle, Peregrine Falcon and Black-footed Ferret</td>
<td>Project NEPA, Range Analysis and Riparian Score-card, review of completed projects in riparian areas</td>
<td>Field Review of Project Activities, Recovery Plans, Progress Reports, other surveys</td>
<td>Upon Completion of Project, Annual Summation</td>
</tr>
<tr>
<td>23</td>
<td>Riparian Condition Rating, ensure the riparian uniqueness as an ecosystem is being maintained and that Forest Plan Standards and Guidelines are being followed</td>
<td>Project NEPA, Range Analysis and Riparian Score-card, review of completed projects in riparian areas</td>
<td>Annual</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Grazing</td>
<td>Forage Utilization, the percentage of forage grazed by both wild and domestic animals</td>
<td>One of three range utilization methods found in the Range Environmental Analysis Handbook (FSH 2209.21)</td>
<td>20 percent of the Allotments Annually</td>
</tr>
</tbody>
</table>

**Note:** The Item Number corresponds to the Forest Plan monitoring requirement, pages M-1 thru M-67.

---

**Table 4-17 MONITORING SCHEDULE**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Subject</th>
<th>Activity or Effect to be Measured</th>
<th>Data Source</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td></td>
<td>Range Condition and Trend, measurements taken over a period of time to determine trends in range condition are improving, declining or remaining static</td>
<td>Field Review of Project Activities, Water Samples</td>
<td>Prior to, during and after ground disturbing activities as determined at the APD stage.</td>
</tr>
<tr>
<td>36</td>
<td>Water</td>
<td>Water Quality, ensure that ground disturbing activities do not cause violations of state and federal water quality laws. Physical, chemical and biological components will be monitored.</td>
<td>Field Review of Major Ground Disturbing Activities (includes oil and gas activities)</td>
<td>Once per Project</td>
</tr>
<tr>
<td>39</td>
<td>Soil</td>
<td>Soil Erosion, evaluate whether or not the techniques used are effective in preventing erosion; 3 types of soil monitoring are identified by FSH 2508.18, Implementation, Effectiveness and Validation Monitoring; soil monitoring is documented on the SOIL MONITORING WORK-SHEET</td>
<td>Field Review of Major Ground Disturbing Activities (includes oil and gas activities)</td>
<td>Once per Project</td>
</tr>
<tr>
<td>41</td>
<td>Facilities</td>
<td>Forest Road Development, tabulate the miles of road constructed, reconstructed and closed</td>
<td>Variable as Stated in the Forest Plan</td>
<td>Annual</td>
</tr>
<tr>
<td>48</td>
<td></td>
<td>Compliance with Terms of Land Use Authorization and Consistency with Forest Plan</td>
<td>Land Use Authorization File and NEPA documentation</td>
<td>During and variable immediately following construction, FSM 2710</td>
</tr>
<tr>
<td>49</td>
<td>Minerals</td>
<td>Compliance with Terms of Minerals Operating Plans and Consistency with the Forest Plan</td>
<td>Surface Use Plan of Operations and NEPA documentation</td>
<td>During and variable immediately following project activity, FSM 2710</td>
</tr>
</tbody>
</table>
CHAPTER V
LIST OF PREPARERS AND REVIEWERS

This EIS was prepared by an Interdisciplinary Team of individuals with varied specialties and backgrounds. Throughout the planning process, an interdisciplinary approach was used to conduct the analysis and to develop the alternatives. The following are those who helped in the analysis and in the preparation of this EIS.

Medicine Bow National Forest and Thunder Basin National Grassland, Laramie, Wyoming

Interdisciplinary (ID) Team

TIM BYER
Wildlife Biologist. B.S. Degree in Wildlife Management from the University of Wyoming. Ten years Forest Service experience at the District level in wildlife.

TERRY DILTS
Oil and Gas Specialist. ID Team Leader. B.S. Degree in Forest Management from Colorado State University. Twenty-four years experience with the Forest Service in recreation, landownership, timber management and minerals.

JOE REDDICK
Forester with emphasis in Lands and Minerals Management. B.S. Degree in Forestry from Oklahoma State University. Nineteen years of Forest Service experience in lands, recreation, minerals, fire, engineering, timber and range. The last ten years of experience have been focused on lands and minerals.

Consulting Specialists

TOM CARTWRIGHT
Forest Wildlife Biologist. B.S. Degree in Forest Management from Colorado State University and M.S. Degree in Wildlife Management from the University of Wyoming. Twenty-four years experience with the Forest Service.

MALCOLM EDWARDS
Forest Soil and Air Scientist. B.S. Degree in Soils from Cal State Polytechnic University. Seventeen years experience with the Forest Service at the Ranger District, Supervisor's Office and Regional Office Levels in several regions.

DAVID GEER
Currently Minerals Specialist, was Recreation Forester at time of input to this document. B.S. Degree in Forestry from the University of Idaho. Fifteen years experience with the Forest Service in forestry and recreation.

JIM HEID
Forest Archeologist. B.A. Degree in Anthropology from San Francisco State University and a M.A. Degree from the University of Nevada at Las Vegas. Sixteen years of Federal experience in archeology and cultural resource management, with both the Bureau of Land Management and the Forest Service.

Douglas District Ranger. B.S. Degree in Forest Management from the University of Montana. Twenty-seven years of Forest Service experience at the District level, primarily in timber, with some recreation, range and planning. Six years of Forest Service experience at the Supervisor's Office level, in timber.

Biological and Cartographic Technician. B.S. Degree in Hydrology from Colorado State University, presently working on M.S. in Water Resources at the University of Wyoming. Five years experience on Water Law Study for Casper-Alcova Irrigation District; six years of Federal experience in hydrology and biology, with both the Bureau of Land Management and the Forest Service.

Forest Recreation Planner. B.S. Degree in Parks and Recreation Administration and Masters in Planning and Outdoor Recreation Planning from the University of Wyoming. Three years experience with municipal recreation, two years experience in State recreation planning and one year experience with the Forest Service.

Wildlife Biologist. B.S. Degree in Wildlife Management and Biology from the University of Wisconsin - Stevens Point and an M.S. Degree in Biology from South Dakota State University. Sixteen years experience with the Forest Service.

Forest Planning and Public Affairs Staff Officer. B.S. Degree in Forest and Resource Management from the University of Minnesota. Thirty years of Forest Service experience in recreation, special use administration, minerals, planning and public affairs at the District, Supervisor's Office and Regional Office levels.

Primary Staff Officer for the Resource Group, includes Timber, Rangeland, Pest Management, Soils, Water, Wildlife, Fisheries, Landscape Architecture and Cultural Resources. B.S. Degree in Forest Management and graduate studies in ecology, hydrology and economics. Thirty-one years experience with the Forest Service.

Forest Fisheries Biologist. B.S. Degree in Zoology and an M.S. Degree in aquatic ecology and fisheries. Seven years experience with state wildlife departments and five years experience with the Forest Service.

Hydrologist. B.S. Degree in Microbiology and an M.S. Degree in Environmental Science (Water Quality). Five years experience in water quality and hydrology. One and one-half years experience with the Forest Service.

Forester. B.S. Degree in Forestry from Michigan State University. Eight years Forest Service experience at the District and Supervisor's Office levels in timber and data base management.
JEFF TUPALA
Forest Landscape Architect, B.S. Degree in Forestry and Master of Landscape Architecture. Three months experience with the National Park Service and five years experience with the Forest Service.

MARLA WERTZ
Cartographer. Twenty-one years experience in architectural, civil and geologic drafting.

GEORGE WIGGINS
Range Conservationist. B.S. Degree in Forest and Range Management from Utah State University. Twenty-four years of Forest Service experience at the District level in Range Conservation.

MARC WILCOX
Forest Hydrologist. B.S. Degree in Resource Economics and M.S. Degree in Hydrology. Fourteen years experience with the Forest Service.

MIKE WINTERS
Oil & Gas and Land Use Specialist. B.S. Degree in Forestry from Northern Arizona University. Twenty-one years of Forest Service experience at the District level. 15 years in timber and six years in oil and gas and related facilities.

JUDY Von AHLEFELDT
Ecologist. B.S. Degree in Biology, M.S. Degree in Entomology and a Ph.D. in Plant Ecology. Fifteen years experience as a teacher and as a citizen advocate in County Planning and three years Forest Service experience at the District level in ecology.

Rocky Mountain Regional Office (Region 2). USDA Forest Service, Lakewood, Colorado

JOHN DERSCH
Regional Geologist, Watershed, Soils & Minerals Area Management. Responsible for Mining Law Administration and Geological Services, including the determination of mineral potential for locatable, leasable, and salable minerals. B.S. Degree in Geology from Colorado State University. Sixteen years Forest Service minerals experience at District, Supervisor’s and Regional Office levels. A member of the American Association of Petroleum Geologists and Society of Mining Engineers.

MILT ROBINSON
Energy and Leasable Minerals Specialist. Responsible for Regional Minerals programs, including oil and gas leasing and operations. B.S. Degree in Forest Management from Louisiana State University. M.S. Degree in Forest Watershed Management from North Carolina State University. Thirty-one years Forest Service experience in watershed, soils and minerals.

Casper District Office of the Bureau of Land Management, USDI, Casper, Wyoming

FRED CROCKETT
Geologist. B.S. Degree in Geology from the University of Maine and M.S. Degree in Geology from the University of Utah. Fourteen years experience with both private industry and the Bureau of Land Management, including experience as a uranium geologist, Registered Professional Geologist (PG. 408), Certified Petroleum Geologist (No. 4126).

GLEN NEBEKER
Botanist. B.S. Degree in Botany from Weber State College and M.S. Degree in Botany from Brigham Young University. Twelve years experience in environmental planning and coordination.

University of Wyoming, Agricultural Economics

BUDDY BORDEN
Research Associate. B.S. Degree in Marketing and Masters in Agricultural Economics from the University of Wyoming. One year experience with the University of Wyoming.

BOB FLETCHER
Professor. B.S. and M.S. Degrees in Agricultural Economics from the University of Wyoming, and a Ph.D. in Agricultural Economics from Oklahoma State University. Four years experience with the USDA Economics Research, and 23 years experience with the University of Wyoming in administration, and as Extension Specialist in Agricultural Economics.

TEX TAYLOR
Associate Professor. B.S. and M.S. Degrees in Agricultural Economics from Montana State University, and a Ph.D. in Agricultural and Natural Resource Economics from Colorado State University. Sixteen total years experience with the University of Wyoming, three years as an extension agent in Jackson, Wyoming, and 13 years as an extension economist.
CHAPTER VI
PERSONS OR AGENCIES CONSULTED AND/OR RECEIVING COPIES OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT

Scoping was performed as part of the analysis process to inform interested agencies, groups and individuals of the proposal to lease oil and gas on the Thunder Basin National Grassland. This was done to enable the projects to be designed to respond to any issues that were identified. A Scoping Statement was distributed to interested parties and comments were received by the Forest Service. The following list of agencies, groups or individuals includes people who were contacted during the scoping process, people who received a copy of the draft EIS and will receive a copy of the final EIS, people who responded to the Scoping Statement and draft EIS and others who requested a copy of the final EIS. Those who received copies of the final EIS are noted by the number of copies sent in the right hand column below. All others received notification that the final EIS is available and may be requested.

**Federal Agencies receiving notification of, or a copy of, the FEIS**

<table>
<thead>
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<th>Name and Address</th>
<th>Copies</th>
<th>Name and Address</th>
<th>Copies</th>
</tr>
</thead>
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<td>Bureau of Land Management</td>
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<td>Bureau of Land Management</td>
<td>01</td>
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<tr>
<td>Richard Zancler</td>
<td>189 N Cedar</td>
<td>Buffalo, WY 82834</td>
<td></td>
</tr>
<tr>
<td>Bighorn National Forest</td>
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<td>Bureau of Land Management</td>
<td>01</td>
</tr>
<tr>
<td>1969 Sheridan Avenue</td>
<td></td>
<td>Casper District Office, Fred Crockett</td>
<td>1701 E. Street</td>
</tr>
<tr>
<td>Sheridan, WY 82801</td>
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<td>U.S. Fish &amp; Wildlife Service Mr. Art Anderson 2617 E. Lincolnway, Suite A Cheyenne, WY 82001</td>
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<td>Box 214</td>
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<td>Lora Nachman</td>
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<td>Nerc Co. Coal Corporation</td>
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<td>c/o Dennis McNamamen</td>
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<td>Dennis Skog</td>
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<tr>
<td>Box 486</td>
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<td>P. O. Box 68689</td>
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<td>Winnebucca, NV 89445</td>
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<td>St. Louis, MO 63166</td>
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<td>Nessai Energy, Inc</td>
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<td>Peabody Development Company</td>
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<td>Jerry Klassen</td>
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<td>Victor E Garber</td>
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<tr>
<td>1615 California Street, Suite 702</td>
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<td>Denver, CO 80202</td>
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<td>News Letter Journal</td>
<td>None</td>
<td>Peterson Brothers</td>
<td>Box 185</td>
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<tr>
<td>14 W. Main Street</td>
<td></td>
<td>Upton, WY 82730</td>
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PraneIa Corp.
Elmer Parson
P. O. 80K 2514
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Poulson. Odell & P9I9ISOrl
1 n5 Sha<man St,98I
Suite 1400
Denver. CO 80203

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Pope & Talbolt
cia J!m Hex!
P.O. Box 370

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Quarter Circle D Ranch Inc.
3918 House A~
Cheyenne. WY 82001

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Powder Rive, Coal Company
Don T ruabIood
Caller Box 3034
Gllt9lte. WY 82716

Nona

R. L Hammer L.urnber & T1mbar
P. O. 80K 126
Encampment. WY 82325

Nona

Powder River Eagle Studies
WoIdIiIe ConsuMing
P.O. 80K 2411
Gilt9lte. WY 82716

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Route 2. 884 Steinle Road
Douglas. WY 82633

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Rural Electric Co

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Reynolds Ranches Inc

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01
Richard Stinson
ESlartlrook Lodge
DougI9s. WY 82633

01

Samadan 011 Corporation
John Long
1660 lincoln SIre9I. Suite 3000
Denver. CO 80264

Nona

Ritthaler Callie Company
cia R _ Ritthaler
80K t60
Upton. WY 82730

Nona

Sane< Lake Lodge. Inc.
Ms. Vlckl C-..m. Secretary

Nona

,.,., IW1ch88 Inc.

a.-...:. .......
P. O. b537

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Caepar. WY 82602· 11 88

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<td>C/O Michael H. Sarvee</td>
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<td>922 S. Center</td>
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<td>Snake River Press</td>
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APPENDIX A

COMMENTS RECEIVED FROM THE PUBLIC ON THE DRAFT EIS
AND FOREST SERVICE RESPONSE TO COMMENTS

The Forest Service received a total of 92 letters with comments on the Draft Environmental Impact Statement (DEIS). There were 83 letters received by the close of the comment period, August 18, 1992. Nine letters were received after the close of the comment period, the latest of which was received September 25, 1992. All comments were considered during preparation of this Final Environmental Impact Statement (FEIS).

Many of those who responded to the DEIS expressed a preference for an alternative or lease stipulation. Tables A-1 and A-2 summarizes the statements of preference.

Table A-1 - COMMENTORS PREFERENCE, BY ALTERNATIVE

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Notes:

1. These respondents expressed a preference for a specific alternative.
2. These respondents expressed opposition to any additional leasing but did not specifically identify Alternative 5 as preferred. Alternative 5 is the only alternative fitting the description as expressed by the respondent.
3. These respondents favor oil and gas leasing, oppose NSO, but did not specifically identify Alternative 2 as preferred. Alternative 2 is the only alternative fitting the description as expressed by the respondent.

Of the total 92 responses received, 53 specifically expressed opposition to the proposed NSO stipulation on inventoried semi-primitive motorized areas.

Twelve individuals expressed opposition to leasing (but not all leasing), and desired greater protection of other resources. Included within this 12 was one comment specifically supporting NSO on inventoried semi-primitive motorized areas and nine supporting protection of areas with high recreation values (with a more general statement).

In the draft EIS, Forest Plan Management Area 5A, the Upton-Osage deer winter range (4,600 acres), was identified as severe winter relief range. As a result of Wyoming Game and Fish comments on the draft EIS (see COMMENT 39) and subsequent consultations (see COMMENT 91) this area was reclassified as crucial winter range. This point requires clarification here because the public comments in this appendix are on the draft EIS, the commentator will refer to the Upton-Osage sever winter relief range for deer. In some cases the Forest Service Response to Comment will refer to the Upton-Osage crucial deer winter range. Both refer to the same area and stipulations.
Table A-2 - COMMENTORS PREFERENCE FOR CRUCIAL WINTER RANGE STIPULATION

<table>
<thead>
<tr>
<th>Controlled Surface Use</th>
<th>No Surface Occupancy</th>
<th>Timing</th>
</tr>
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<tbody>
<tr>
<td>33</td>
<td>7</td>
<td>1</td>
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</tbody>
</table>

Note: *Those listed in this table expressed an opinion specifically on deer winter range.*

Each letter received by the Forest Service with a comment on the DEIS is reproduced in the last part of this APPENDIX. Letters and comments from the public are numbered in the order in which they were received by the Forest Service. Forest Service staff have read each letter and identified the comments that require a Forest Service response. Each comment is numbered in the margin of the letter. The Forest Service response to the comments is listed in the first part of APPENDIX A.

To aid in locating an individual comment or response Table A-3, contains an alphabetical listing of the respondents, the page where the respondents comments are located and the page where the Forest Service response is located.

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**FOREST SERVICE RESPONSE TO COMMENTS**

**COMMENT 1A**—The Department of the Army, Corps of Engineers has been involved in the development of this EIS from the beginning of the process. As documented in the DEIS, on July 8, 1991, the Corps requested to be a cooperating agency. On July 30, 1991, Terry Ditla, the ID Team Leader for this EIS, phoned Gerard Mick of the Corps of Engineers to discuss the manner in which the Corps would be involved in the EIS. Mr. Mick stated that formal designation as a cooperating agency was not necessary and that he would prefer to be involved by allowing the Corps to review the draft EIS at the time of the formal review prior to publication and released for public comment. A preliminary copy of the DEIS was sent to the Corps on March 16, 1992.

Galen Rasmussen of the Army Corps of Engineers, responded to the preliminary DEIS by telephone on April 9, 1992. The telephone comments received were incorporated into the DEIS released for public review. The Corps documented the telephone conversation in a letter, dated April 9, 1992, received by the Forest Service April 13, 1992. This letter is displayed in this FES to show the complete line of documentation, and because the Corps response to the DEIS (COMMENT 1B) references this letter.

**COMMENT 1B**—USDI Bureau of Land Management OFFER TO LEASE AND LEASE FOR OIL AND GAS, Form 3100-11, subjects all lease rights to applicable laws, terms, conditions and attached stipulations of the lease, the Secretary of Interior’s regulations and formal orders in effect as of lease issuance and to regulations and formal orders hereafter promulgated. At the APO stage of development, when a specific proposal involving waters of the United States, including wetlands, is received, a 404 permit would be obtained prior to approval of the Surface Use Plan of Operations. For a complete discussion of the anticipated impacts to riparian and wetland areas, the mitigation afforded by Standard Lease Terms (200 meter stipulation) and Supplemental Stipulations by alternative see CHAPTER IV, WATER RESOURCES.

**COMMENT 1C**—We agree that springs and seeps are important for both wildlife and livestock and should be avoided. Standard Lease Terms (Sec. 6) require the Lessee to conduct operations in a manner that minimizes adverse impacts to the land, air, and water; to cultural, biological, visual, and other resources. Any impacts to springs and seeps will be considered in an appropriate environmental analysis and satisfactory mitigation measures developed, prior to approval of the Surface Use Plan of Operations at the APO stage of development. For a complete discussion of...
COMMENT 1D—At the APD stage of development, when a site specific proposal is received, a Surface Use Plan of Operations (SUPO) will be analyzed in an appropriate environmental analysis. Slant or directional drilling may be one of the mitigation measures analyzed in the SUPO.

COMMENT 1E—Standard Lease Terms (Sec. 6) require the Lessee to conduct operations in a manner that minimizes adverse impacts to the land, air, and water; to cultural, biological, visual, and other resources. At the APD stage of development, when a site specific proposal is received, a Surface Use Plan of Operations (SUPO) will be analyzed in an appropriate environmental analysis. The need for water monitoring, the parameters to monitor, the design of reserve and waste water pits are determined during the analysis of the SUPO. Lining of reserve pits is standard practice. Compliance with all federal, state and local laws and regulations is a primary consideration and requirement for approval of the SUPO.

COMMENT 1F—Standard Lease Terms (Sec. 6) require the Lessee to conduct operations in a manner that minimizes adverse impacts to the land, air, and water; to cultural, biological, visual, and other resources. At the APD stage of development, when a site specific proposal is received, a Surface Use Plan of Operations (SUPO) will be analyzed in an appropriate environmental analysis. Surface drainage is one of the considerations analyzed in the SUPO.

COMMENT 1G—Thank you for this information. Operators will be required to obtain all necessary permits prior to operations being approved. This office has worked with Matt Blodeau for many years on many projects where Corps of Engineers jurisdiction is involved and we look forward to continuing this productive relationship.

COMMENT 2A—On August 3, 1992, Terry Ditts, Oil and Gas Team Leader, telephoned Myron Eckberg of the U.S. Department of Housing and Urban Development (HUD) to determine what information HUD needed to respond to the DEIS. When the employment figures contained in Table 4-4 on page IV-25 of the DEIS were explained and Mr. Eckberg understood that the difference in employment between No Leasing and any of the Leasing Alternatives was 14 full time equivalents spread over a five county area, Mr. Eckberg determined this impact to be insignificant and not affecting HUD programs.

COMMENT 3A—Thank you for your comment. This comment does not require a Forest Service response.

COMMENT 4A—Thank you for your comment. This comment does not require a Forest Service response.

COMMENT 5A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.112.

COMMENT 5B—The NSC stipulation referred to is designed to protect five areas on the TBNG with inventoried semi-primitive motorized characteristics as defined by the Recreation Opportunity Spectrum (see GLOBAL RAY). As explained in CHAPTER 4, ENVIRONMENTAL CONSEQUENCES, RECREATION RESOURCES, oil and gas developments in these inventoried semi-primitive motorized areas would, at a minimum, move the recreation experience in these areas up one class to roaded natural. This represents a loss of the most primitive recreation experience available on the TBNG, a concern to some segments of the public; and is disclosed in this EIS as an impact.

COMMENT 5C—The reclamation listed in Table 4-2 has been accepted by the Forest Service. The intent of Table 4-2 is to thoroughly display cumulative impacts to the soil resource on the TBNG. The conclusion is that the contribution of oil and gas activities to cumulative soil erosion is not expected to be measurable (CHAPTER 4, SOIL RESOURCE, Cumulative effects).

COMMENT 5D—Thank you for your assessment of the environmental impacts of oil and gas leasing. Your support of ALTERNATIVE 2 is recognized in Table A-1. Your support of CSU stipulation on wildlife winter relief range is recognized in Table A-2. Your opinions are further recognized by including your comments and this response in APPENDIX A.

COMMENT 6A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 6B—Executive Orders 11988 and 11990 provide protection of riparian, wetland and floodplains at all times. However, this does not preclude development. Rather, it means that if development is to occur, extraordinary (perhaps costly) mitigation may be required. The CSU stipulation for floodplain, wetland, playa or riparian conditions surface occupancy as follows: 1) no other reasonable alternative exists; and 2) it is clearly established that the development will meet Forest Plan Standards and Guidelines. Your comments are addressed in APPENDIX D.

At the APD stage of development additional site specific environmental analysis will be conducted. Monitoring plans will be developed in cooperation with state and federal agencies who have regulatory responsibility over ground and surface waters and wetlands. Whenever possible riparian, playas, floodplains and wetlands will be avoided. If avoidance is not possible, an interdisciplinary team will determine the potential impacts of the proposed action. If these impacts cannot be adequately mitigated to assure compliance with executive orders, state and federal laws, the action will not be approved. To the extent consistent with the rights conveyed by the lease, the SUPO must also be consistent with the Forest Plan (36 CFR 228.107(2)).

Language has been added in several locations in the main body text of this EIS to clarify that the Forest Service intends to preserve riparian, wetlands, playas and floodplains to the extent provided by Executive Order and the Forest Plan.

Your preference for making riparian areas and wetlands off limits is recognized by including your comment and this response in APPENDIX A.

COMMENT 6C—As stated in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, SOIL RESOURCE, Standard Lease Terms (Sec. 6) require the Lessee to conduct operations in a manner that minimizes adverse impacts to the land, air, and water; to cultural, biological, visual, and other resources. At the APD stage of development, when a site specific proposal is received, a Surface Use Plan of Operations (SUPO), including an Erosion Control Plan, will be analyzed in an appropriate environmental analysis. Some mitigation measures that could be applied on a site specific basis at the APD stage of development are listed in APPENDIX E.
In addition to the provisions of Standard Lease terms and to more fully implement the Forest Plan Standards and Guidelines (KAT page III 74 75 ALTERNATIVES 1 2 3 4 7 and 7 consider applying three supplemental soil stipulations see APPENDIX D). The Forest Supervisor's decision on the stipulations to be applied will be contained in a Record of Decision based on this ES.

COMMENT 9D-As described in the CHAPTER IV ENVIRONMENTAL CONSEQUENCES RECREATION RESOURCES oil and gas development would change the Recreation Opportunity Spectrum (ROS) class toward the more developed end of the spectrum. In areas presently in the roaded natural ROS class (both Rochelle Hills and Upton-Usage), even extensive oil and gas development, such as full field development, would move the recreation experience toward the developed end of the scale, but normally not enough to change the ROS class. The effect of such a change would be better access for the visitor, greater chance of encounter with other visitors, the evidence of human activity would be more pronounced and opportunities for activities requiring more primitive settings would be lost.

ALTERNATIVES 3 4 and 7 consider a range of actions to preserve recreation values in excess of Forest Plan Standards and Guidelines. Further, in response to the comments on the DEIS additional wording has been added in several locations to clarify the justification for the Supplemental stipulations included in APPENDIX D.

COMMENT 9E-To implement Forest Plan Standards and Guidelines, pages III 29 to III 32, both Timing Limitation and Controlled Surface stipluations have been applied to protect grouse and raptors (see APPENDIX D). Experience has demonstrated that production operations do not significantly affect raptors or grouse. These birds seem to adjust easily to this phase of oil and gas leasing (see CHAPTER 4 WILDLIFE).

COMMENT 9F-An Environmental Impact Statement is not a decision document. It is a document disclosing the environmental consequences of implementing the proposed action and alternatives to that action. The Forest Supervisor will make three related decisions in a Record of Decision based on this FEIS (CHAPTER 1 PURPOSE AND NEED DECISIONS TO BE MADE).

Leasing Reform Act implementing regulations (36 CFR 228.100 et seq) institute a staged decision making process. The regulatory framework provides the following decision points. (1) The determination of whether lands are eligible for leasing (36 CFR 228.102 (d)); (2) The leasing specific in the applicable Forest Plan (36 CFR 228.102 (a)); (3) Application for Permit to Drill (APD); and (4) Amendment of the permit to drill if field development occurs. Each decision is based on environmental analysis and disclosure of the probable effects in accord with the National Environmental Policy Act (see CHAPTER 1 PURPOSE AND NEED OIL AND GAS LEASING). The first two of these decision will be made based on this FEIS (see CHAPTER 1 PURPOSE AND NEED DECISIONS TO BE MADE). Additional environmental analysis will be required at the APD and field development stages.

This FEIS constitutes a leasing analysis as required by 36 CFR 228.102 (c). The analysis identifies the areas open to development, subject to the terms and conditions of the standard oil and gas lease form; the areas open to development, subject to constraints that require the use of lease stipulations; and the areas that are closed to leasing (see APPENDIX H). Lease Stipulations are identified in APPENDIX D.

Based on the leasing analysis, as required by 36 CFR 228.102 (d), the lands which are administratively available for leasing have been identified as "The entire TBNG for all alternatives except ALTERNATIVE 5. In order to consider a full range of alternatives, ALTERNATIVE 5 would make all Forest Service administered lands unavailable for leasing. As documented in CHAPTER II, ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY, the ID Team tried to develop an alternative whereby less than the entire TBNG was available for leasing. Four reasons are documented for not including such an alternative.

The specific lands decision required by 36 CFR 228.102 (e), is not implemented until the Forest Service has reviewed the land parcel being considered for lease and validated the decision to authorize the BLM to offer the lease tracts. A specific lease parcel is not actually offered and issued until it has been determined that the information disclosed in this FEIS is accurate for a proposed parcel. However, the required stipulations are applied. Further, no ground disturbance is authorized until an APD is approved by both the Forest Supervisor and the authorized office of the BLM. A separate NEPA analysis and document is required before an APD is approved.

COMMENT 9G-Standard Leases terms provide for considerable protection of various resources (see Sec 6 OFFER TO LEASE AND LEASE FOR OIL AND GAS APPENDIX D). To further mitigate impacts to surface resources, Supplemental stipulations have been identified in APPENDIX D. Law, regulations, policy and Forest Plan Standards and Guidelines provide the basis for determining the adequacy of the mitigation measures applied. The Forest Supervisor's selected alternative will be identified in an Record of Decision based on this FEIS and will include a finding of consistency with the applicable Forest Plan and laws.

COMMENT 9H-The Forest Service constantly reviews its programs for consistency with laws, regulations and policies (see CHAPTER I NATURE AND PURPOSE OF ACTION). The Multiple Use Sustained Yield Act of 1960 states:

Sec. 1 In the policy of the Congress that the national forests are established and shall be administered for outdoor recreation range timber watershed wildlife and fish purposes. The purposes of this Act are declared to be supplemental to but not in derogation of the purposes for which the national forests were established as set forth in the Act of June 4 1905 (16 U.S.C. 460). Nothing herein shall be construed as affecting the jurisdiction or responsibilities of the several states with respect to wildlife and fish on the national forests. Nothing herein shall be construed so as to affect the use or administration of the mineral resources of national forest lands or to affect the use or administration of federal lands not within national forests (16 U.S.C. 475).

It is clear that Congress intended the use of mineral resources to be consistent with multiple-use on national forest system lands. Further, the Forest Service agrees that an additional resource has a higher value for a section of the Grassland then oil and gas leasing should be permitted only if it can be done in a compatible manner. This FEIS was prepared to assess the environmental consequences of alternative uses of mineral resources on the Grassland. Alternative No New Leasing. The Forest Supervisor's decision on the lands to be made available for leasing will be made in a Record of Decision based on this FEIS.

COMMENT 9I-Thank you for your opinion. The Forest Service agrees that the Thunder Basin National Grassland is special and deserves of careful consideration.

COMMENT 7A-The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6B.

COMMENT 7B-The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6C. Your preference for making highly erosive areas (badlands) and steep areas off limits is recognized by including your comment and this response in APPENDIX A.

COMMENT 7C-This ES considers a range of alternatives for oil and gas leasing on the Thunder Basin National Grassland. Two alternatives (ALTERNATIVES 1 and 2) apply Forest Plan Standards and Guidelines for recreation on the Grassland. ALTERNATIVES 3 4 and 7 consider...
a range of actions to protect recreation values in excess of Forest Plan Standards and Guidelines (including a CSU on the Rochelle Hills, and Upton-Osage areas (ALTERNATIVES 4 and 7). ALTERNATIVE 6, considers No New Leasing on the entire TBNG, effectively considering NSO for the Rochelle Hills, Upton-Osage and Weston areas. Further, wording has been added in several locations to clarify the justification for the proposed stipulations contained in APPENDIX D.

Your preference for making the Rochelle Hills off-limits is recognized by including your comment and this response in APPENDIX A.

COMMENT 7D—To implement Forest Plan Standards and Guidelines, pages III-143 to III-159, ALTERNATIVES 1 and 2 apply a No Surface Occupancy stipulation to crucial deer winter range (see APPENDIX D). Rather than the No Surface Occupancy stipulation, ALTERNATIVES 3, 4, and 7 consider applying both Timing Limitation and Controlled Surface Use stipulations to crucial deer winter range (see APPENDIX D). This would require a Forest Plan amendment (see CHAPTER II, ALTERNATIVES).

COMMENT 7E—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6E.

COMMENT 8A—Decisions to allow an activity, whether oil and gas leasing or powerline construction, must be accompanied by an environmental analysis and appropriate NEPA documentation. Restrictions (lease stipulations) applicable to oil and gas leasing and the reason the restriction is necessary are contained in APPENDIX D of this EIS. The Forest Supervisor’s decision on the stipulations to be applied will be contained in a Record of Decision based on this EIS.

The decision to lease for oil and gas includes the recognition that the ancillary facilities are needed to develop the resource. Therefore, the impacts of facilities such as roads, powerlines, and pipelines are discussed in this EIS. While oil and gas ancillary facilities are considered during lease analysis, the authorization of related facilities is a separate and independent process requiring public involvement and NEPA compliance. While the same issues and concerns will exist, i.e., impacts of the ancillary facilities may significantly differ from that of the oil and gas leasing and must be considered on a site specific basis.

COMMENT 8B—Since third party authorizations are a separate, distinct process, including public involvement and NEPA compliance, as noted in FOREST SERVICE RESPONSE, to COMMENT 8A, and beyond the scope of this analysis, additional wording is not necessary.

COMMENT 9A—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6E.

COMMENT 9B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6E.

COMMENT 9C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 7D.

COMMENT 9D—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 7D.

COMMENT 9E—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6B.

COMMENT 9F—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 7C.

COMMENT 9G—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 10A—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 7A thru 7G.

COMMENT 11A—Thank you for your opinion. Your comment is recognized by including your comment and this response in APPENDIX A. For a discussion of the compatibility of mineral activities in the multiple-use framework see FOREST SERVICE RESPONSE to COMMENT 6H.

COMMENT 12A—Thank you for your opinion. Your comment is recognized by including your comment and this response in APPENDIX A. Your opposition to the imposition of undue oil and gas lease restrictions, such as NSO, are recorded in Table A-1.

COMMENT 12B—This EIS considers a range of alternatives from NO New Leasing, ALTERNATIVE 5, to Leasing with Standard Stipulations Only, ALTERNATIVE 6. Various levels of leasing stipulations, including NSO stipulations on approximately 4% of the federal surface area within the FEIS study area boundary, are considered in ALTERNATIVES 3, 4, and 7 (see CHAPTER II, ALTERNATIVES).

We agree that no new leasing or who spread application of NSO stipulations would, for the most part, preclude future exploration in the TBNG (see CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, specifically the consequences of ALTERNATIVE 5).

COMMENT 13A—Thank you for your comment; and support of the oil and gas leasing analysis process.

COMMENT 13B—Thank you for your comment. You preference for a Controlled Surface Use stipulation on the Upton-Osage deer severe winter relief range is recognized in Table A-2.

COMMENT 13C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6B.

COMMENT 13D—Leasing Reform Act implementing Regulations (36 CFR 238.102 (c)), requires a discussion as to why the constraints are necessary and justifiable. Wording has been added to CHAPTER IV, ENVIRONMENTAL CONSEQUENCES and APPENDIX D to clarify the justification for each of the proposed stipulations.

COMMENT 13E—There is no doubt that the last several decades of oil and gas activities on the TBNG have demonstrated that these activities have a high degree of comp, visibility with many other uses on the Grassland. As pointed out in COMMENT 13D, much of the non-motorized recreation opportunity available on the Grassland has been the result of oil and gas activities. However, there is no doubt that this increase in motorized recreation opportunities has been at the expense of the more primitive recreation experiences as demonstrated by the fact that there are presently no primitive, or semi-primitive non-motorized areas on the TBNG (see GLOSSARY).

This loss of semi-primitive recreation opportunities is a concern of some segments of the public, and was identified as an issue in the initial scoping efforts for the DEIS. The semi-primitive
motorized recreation experience was the most primitive recreation experience available on the TBNG with which to respond to public concern (ALTERNATIVE 3, 4 and 7). The environmental consequences of oil and gas developments on recreation opportunities (ROS classes) are described in CHAPTER IV, RECREATION RESOURCES. Also please refer to FOREST SERVICE RESPONSE to COMMENT 8B.

Wording has been added to the environmental consequences section to clarify the long term effect of oil and gas developments on establishing traffic and use patterns, soils, and vegetation each of which can impact the ROS class long after oil and gas has abandoned the area. In addition, projections of the times oil and gas activities are expected to occupy an area are clarified.

COMMENT 13F—Data for the economic impact analysis for the Thunder Basin National Grassland EIS was obtained from interviews of industry representatives in Casper, Wyoming and in Denver, Colorado. In response to direct inquiry, industry was unable to quantify any differences in economic impacts for different levels of leasing stipulations or for individual stipulations except that NSO would most often equate to no leasing. Using this data, foregone revenues were projected for areas to which the NSO stipulation was applied by alternative. These projections are reflected in the economic impact analysis summarized in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, ECONOMIC FACTORS.

On September 14, 1981, Jan Roberts of AMOCO was contacted by Buddy Borden of the University of Wyoming, in reference to her comments to the economic impact study prepared for the Thunder Basin National Grassland EIS. Her concern centered around the static economic results as more stipulations are introduced. Ms. Roberts was told that industry representatives were contacted regarding changes in activity across alternatives and no additional information was provided. We also offered to consider any specific information which she could provide. However, she indicated that if industry was previously contacted, additional analysis is not needed.

COMMENT 13G—Cumulative impact is defined in 40 CFR 1508.7 as 'the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.' The intent of Table 4-2 is to thoroughly display cumulative impacts to the soil resource on the TBNG. The conclusion is that the contribution of oil and gas activities to cumulative soil erosion is not expected to be measurable (CHAPTER IV, SOIL RESOURCE, Cumulative Effects).

For further information please refer to FOREST SERVICE RESPONSE to COMMENT 8C.

COMMENT 13H—Experience on the TBNG has not demonstrated that a well site shrinks once a well goes into production.

COMMENT 13I—As defined in CHAPTER I, SCOPING, issue 13 is "There is concern about management of chemicals and hazardous wastes, generated and used at oil and gas sites." Clearly, issue 13 has to do with management of chemicals, not air or water pollution. Both public and internal concern was expressed over management of chemicals used and produced by oil and gas activities.

HJS has been noted within TBNG (see CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, AIR QUALITY). "NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made." (40 CFR 1500.1(b)). Therefore, we have disclosed the possibility and potential consequences.

COMMENT 13J—The Forest Service agrees with this comment and the wording has been changed in this FEIS.

COMMENT 13K—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 14A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 14B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 129.

COMMENT 14C—Your preference for a CSU stipulation on severe winter relief range is recognized in Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 14D—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 15A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 15B—Your preference for a CSU stipulation on severe winter relief range is recognized in Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 15C—The 1987 Leasing Reform Act authorized the Secretary of Agriculture to identify the lands for which leases can be sold and to determine the appropriate stipulations to apply to the lease to protect the surface resources (36 CFR 228.100 et. seq., 55 FR 10423). This EIS has been prepared to consider alternative methods of complying with the requirements of the Leasing Reform Act to protect surface resources (see CHAPTER I, PURPOSE AND NEED). The impacts to leasing of alternative methods of stipulating oil and gas leases, are disclosed in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES.

For a discussion of the Multiple-Use Sustained-Yield act in relation to oil and gas leasing see FOREST SERVICE RESPONSE to COMMENT 8H.

COMMENT 15D—Your opposition to the use of NSO stipulations in the inventoried semi-primitive motorized areas and your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 15A—The Forest Service thanks you for expressing your concern on this important issue. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 16B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 8E.

COMMENT 16C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 8E.
COMMENT 16D—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 7D.

COMMENT 16E—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6C.

COMMENT 16F—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6B.

COMMENT 16G—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6C.

COMMENT 16H—Your opposition to leasing (but not all leasing) is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 17A—The Forest Service thanks you for expressing your concerns on this important issue. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 17B—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-3 and by including your comment and this response in APPENDIX A.

COMMENT 17C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 5B.

COMMENT 17D—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 5B.

COMMENT 18A—Your opposition to ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 18B—Your opposition to NSO stipulations is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 18C—For a description of the Congressional Mandate to manage the National Forest System under the Multiple-Use Sustained-Yield Act of 1960 see FOREST SERVICE RESPONSE to COMMENT 6H.

COMMENT 18D—As stated in CHAPTER I, PURPOSE AND NEED, the purpose of this FES is to disclose the effects of alternative decisions the Forest Service may make regarding availability of and authorization for the Bureau of Land Management to lease lands on the Thunder Basin National Grassland. As required by the National Environmental Policy Act regulations (40 CFR 1502.14), a range of reasonable alternatives (seven) are described in CHAPTER II, ALTERNATIVES and the impacts discussed in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES.

COMMENT 19A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 19B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6E.

COMMENT 19C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 7D.

COMMENT 19D—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6E.

COMMENT 19E—Two historic trails have been identified on the TIBNG (see CHAPTER III, AFFECTED ENVIRONMENT, CULTURAL RESOURCES). At the APE stage of development, when a site specific proposal is received, a Surface Use Plan of Operations (SUPO) will be analyzed in an appropriate environmental analysis. All historic trails, as well as other cultural resources, will be evaluated in accordance with Section 106 of the National Historic Preservation Act of 1966. Whenever possible, these areas will be avoided. If avoidance is not possible, an interdisciplinary team will determine the potential impacts of the proposed action. If these impacts cannot be adequately mitigated to assure compliance with state and federal laws the action will not be approved. To the extent consistent with the rights conveyed by the lease, the SUPO must also be consistent with the Forest Plan (36 CFR 228.107(2)).

COMMENT 19F—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6C.

COMMENT 20A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102. Your opposition to further restrictions on the oil industry is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 20B—For a description of the Congressional Mandate to manage the National Forest System under the Multiple-Use Sustained-Yield Act of 1960 see FOREST SERVICE RESPONSE to COMMENT 6H.

COMMENT 21A—Thank you for your compliment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 21B—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102. Your opposition to further restrictions on the oil industry is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 21C—Your opposition to NSO stipulations is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 21D—Your opposition to NSO stipulations is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 21E—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 21F—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 21G—Thank you for your appreciation. Your comment is recognized by including your comment and this response in APPENDIX A.
COMMENT 22A—Thank you for your comment. Your opposition to leasing is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 22B—Your objection to the Upton-Osage deer severe winter relief range is recognized in Table A-2.

COMMENT 22C—Your preference for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 22D—Thank you for your comment. Your objection to leasing is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 22E—Your preference for a Controlled Surface Use stipulation on the Upton-Osage deer severe winter relief range is recognized in Table A-2.

COMMENT 22F—Your preference for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 22G—Thank you for your comment. Your objection to leasing is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 22H—Thank you for your comment. Your objection to leasing is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 22I—Your preference for a Controlled Surface Use stipulation on the Upton-Osage deer severe winter relief range is recognized in Table A-2.

COMMENT 22J—Your preference for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.
COMMENT 29A—Thank you for your comment. The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6E.

COMMENT 29B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6E.

COMMENT 29C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 7D.

COMMENT 29D—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6C.

COMMENT 29E—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 49.

COMMENT 29F—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 7C.

COMMENT 29G—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 30A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 30B—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 30C—Thank you for your comment. Your preference for a Controlled Surface Use stipulation on the Upton-Grange deer searves winter relief range is recognized in Table A-2.

COMMENT 30D—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 30E—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 31A—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENTS 8A and 8B.

COMMENT 32A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 32B—Your opposition to NSO stipulations is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 32C—Your preference for a Controlled Surface Use stipulation on the Upton-Grange deer searves winter relief range is recognized in Table A-2.

COMMENT 33A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 33B—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 34A—Thank you for your comment. Your opinion that a CSU stipulation should be adequate to protect wildlife is recognized in Table A-2. Your opposition to NSO stipulations is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 35A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 35B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 128.

COMMENT 36A—In 1987, Congress passed the Federal Onshore Oil and Gas Leasing Reform Act and implementing regulations became effective April 20, 1990. Under the Leasing Reform Act, the Secretary of Agriculture was authorized to identify the lands for which leases can be sold and to determine the appropriate stipulations, to apply to the lease, to protect the surface resources. In order to redeem these new responsibilities the Forest Service has prepared this EIS (see CHAPTER I, PURPOSE AND NEED).

Standard Lease terms provide for considerable protection of various resources (see Sec. 6, OFFER TO LEASE AND LEASE FOR OIL AND GAS, APPENDIX D). To further mitigate impacts to surface resources, Supplemental Stipulations have been identified in APPENDIX D. Law, regulations, policy and Forest Plan Standards and Guidelines provide the basis for determining the adequacy of the mitigation measures applied. The Forest Supervisor's selected alternative will be identified in an Record of Decision based on this EIS and will include a finding of consistency with the applicable Forest Plan and laws.

COMMENT 36B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENTS 6A and 7D.

COMMENT 36C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6B.

COMMENT 36D—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 7C.

COMMENT 36E—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6C.

COMMENT 36F—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 37A—Thank you for the Wyoming Geologic Survey Oil and Gas Map, 1991, and the copy of Oil and Gas Statistics for 1990. Both of these basic resources were used in the development of the DEIS.
COMMENT 38A—Thank you for your comment. On September 6, 1992, Larry Pate of the Wyoming Game and Fish (WG&F) and members of the Forest Service staff met in Douglas, Wyoming, to exchange information and to discuss Forest Service responses to individual WG&F comments. Each of the WG&F comments was responded to by the Forest Service individually (see FOREST SERVICE RESPONSE to COMMENTS 39A thru 39Q). Further, in response to your comment that the State of Wyoming does not endorse blanket NSO on areas identified as crucial big game winter range, both CSU and Timing Limitation stipulations were developed in cooperation with WG&F for crucial winter range (see COMMENT 91A). These stipulations are included in APPENDIX D.

COMMENT 38B—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Title A-1 and by including your comment and the response in APPENDIX A.

COMMENT 38A—Thank you for your comment. On September 9, 1992, Larry Pate of the Wyoming Game and Fish (WG&F) and members of the Forest Service staff met in Douglas, Wyoming, to exchange information and to discuss Forest Service responses to individual WG&F comments. In this discussion, it was determined that there is crucial deer winter range in the Upton-Osage area rather than severe winter range as previously identified. ALTERNATIVES 3, 4, and 7 consider applying both a CSU and a Timing Limitation stipulation (see APPENDIX D) to protect this area. Further, it was determined that no stipulation was needed for severe winter relief areas on TNB.

COMMENT 38B—The requested meeting between the Wyoming Game And Fish Department and the Medicine Bow National Forest was held on September 9, 1992, at the Douglas Ranger District Office in Douglas, Wyoming.

COMMENT 38C—Wyoming State Governor, Mike Sullivan, in COMMENT 38A, expressed the opinion that the State of Wyoming does not endorse blanket NSO on areas identified as crucial big game winter range. The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENTS 38A, and 38A. For the position of the Wyoming Game and Fish District Supervisor, see COMMENT 91A.

COMMENT 39D—Standard Lease Terms (Sec. 6), Appendix D, require the Lessee to conduct operations in a manner that minimizes adverse impacts to the land, air, and water; to cultural, biological, visual, and other resources. At the APD stage of development, when a site specific proposal is received, a Surface Use Plan of Operations (SUP0) will be analyzed in an appropriate environmental analysis. Any site specific impacts to breeding and nesting birds will be analyzed by an interdisciplinary team at the APD stage of development. If these impacts cannot be adequately mitigated to assure compliance with executive orders, state and federal laws, the action will not be approved. To the extent consistent with the rights conveyed by the lease, the SUP0 must also be consistent with the Forest Plan (36 CFR 228.107(2)). In addition to the provisions of Standard Lease terms and to more fully implement the Forest Plan Standards and Guidelines for nesting and breeding areas (COI page III-29 thru 34), ALTERNATIVES 1, 2, 3, 4 thru 7 consider applying both Timing Limitation and Controlled Surface Use stipulations (see APPENDIX D). The Forest Supervisor's decision on the stipulations to be applied will be contained in a Record of Decision based on this EIS.

COMMENT 39E—In accordance with the Endangered Species Act of 1973, as amended, interagency cooperation (Section 7 of the Act) requires the Forest Service, as the agency propos-
COMMENT 39J—Wording has been added to the FES to include moles, shrews and bats.

COMMENT 39K—Thank you for your comment. The definition has been corrected in the FES.

COMMENT 39L—Thank you for your comment. The wording has been corrected in the FES.

COMMENT 39M—To implement Forest Plan Standards and Guidelines, pages III-29 to III-32, ALTERNATIVES 1, 2, 3, 4 and 7 apply both Timing Limitation and Controlled Surface Use stipulations to raptors and grouse (see CHAPTER II, ALTERNATIVES).

COMMENT 39N—Thank you for your comment. Bald eagles, golden eagles, and peregrine falcons have been added to the Controlled Surface Use stipulation for Indicator Species (see APPENDIX D).

COMMENT 39O—Thank you for your comment. The Townships have been corrected in this FES.

COMMENT 39P—As stated in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, WATER RESOURCES, water quality standards in Chapter 1, Water Quality Standards and Regulations, Wyoming Department of Environmental Quality are required to be maintained in all alternatives. Wording has been added to CHAPTER II, ALTERNATIVES in order to clarify that Water Quality Rules and Regulations apply to all alternatives. The Forest Service states that the quality of both surface and groundwater will be adequately protected under all alternatives.

COMMENT 39Q—We agree that water quality is an important concern. Standard Lease Terms (Sec. 8) require the Lessee to conduct operations in a manner that minimizes adverse impacts to the land, air, and water, cultural, biological, visual, and other resources. Any impacts to water quality will be considered in an appropriate environmental analysis and satisfactory mitigation measures developed, prior to approval of the Surface Use Plan of Operations at the APD stage of development. For a complete discussion of the anticipated impacts to water quality, and the mitigation afforded by Standard Lease Terms (200 meter stipulation), Onshore Orders (43 CFR 3190), the Clean Water Act, and Wyoming Department of Environmental Quality Water Quality Rules and Regulations by alternative see CHAPTER IV, WATER RESOURCES.

Protecting the fishing experience at known fisheries from excessive noise is a requirement above that is normally anticipated in Standard Lease Terms; therefore, a Supplemental Stipulation was considered in ALTERNATIVES 3, 4 and 7 of this EIS (see APPENDIX D). The Forest Supervisor’s decision on the stipulations to be applied will be contained in a Record of Decision based on this EIS. If additional fisheries are discovered or developed, they will be added to the inventory and the Supplemental Stipulation applied to leases issued after the update of the inventory.

COMMENT 40A—Thank you for your comment. Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 40B—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 41A—Your preference for ALTERNATIVE 6 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 41B—Thank you for your comment. The Forest Service authority and responsibility for managing recreation as one of multiple-uses is defined in the Multiple-Use Sustained-Yield Act of 1960, which states:

Sec. 1. It is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, wildlife and fish purposes. The purposes of this Act are declared to be supplemental to, but not in derogation of, the purposes for which the national forests were established as set forth in the Act of June 1, 1897 (16 U.S.C. 475). Nothing herein shall be construed as affecting the jurisdiction or responsibilities of the several states with respect to wildlife and fish on the national forests. Nothing herein shall be construed so as to affect the use or administration of the mineral resources of national forest lands or to affect the use or administration of federal lands not within national forests (16 U.S.C.475). It is clear that Congress intended the national forests to be administered for multiple-uses including outdoor recreation. Further, the use of mineral resources is consistent with multiple-use on national forest system lands. This FES was prepared to assess the environmental consequences of alternative schemes of making lands available for oil and gas leasing (see CHAPTER I, PURPOSE AND NEED). The Recreation Opportunity Spectrum (ROS) is a system of classifying an area by the recreation opportunities and experiences it can provide, and is defined in U.S. Department of Agriculture, Forest Service, ROS User’s Guide, 1981 (see GLOSSARY). One of the impacts of oil and gas leasing is to inventoried semi-primitive motorized recreation opportunities as described in this FES (see CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, RECREATION). The Forest Supervisor’s decision on the lands to be made available for leasing will be contained in a Record of Decision based on this FES.

COMMENT 42A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 43A—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENTS 8A and 8B. Your opposition to the NSO stipulation in inventoried semi-primitive motorized areas is recognized in Table A-1.

COMMENT 44A—Thank you for your comment. Your support of oil and gas leasing and support of multiple-use is recognized by including your comment and this response in APPENDIX A.

COMMENT 44B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 5B.

COMMENT 44C—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 45A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102. Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 45B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 12B.
new leasing that the number of new wells drilled would decline in proportion to the number of acres not available for leasing (see CHAPTER IV, ECONOMIC FACTORS).

COMMENT 48D—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 50A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 50B—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 50C—Thank you for your comment. The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 128. Your preference for a Controlled Surface Use stipulation on the Upton-Osage deer severe winter relief range is recognized in Table A-2.

COMMENT 51A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 51B—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 51C—Oil and gas leasing and royalty revenues for the entire TBNG are summarized in Table 4-13. AVERAGE ANNUAL REVENUES BY ALTERNATIVE of the DEIS. As stated in the discussion of Table 4-13, for purposes of the economic analysis, it is assumed No Surface Occupancy tracts would not be leased. These differences are reflected in five of the six columns in Table 4-13, including Total Revenues.

In response to the concern that the economic analysis should vary across alternative, additional analysis was conducted. An estimate of forgone revenues due to NSO is displayed in Table 4-19. AVERAGE ANNUAL FORGONE REVENUES DUE TO NSO BY ALTERNATIVE in the FES. These projections are reflected in the economic impact analysis summarized in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, ECONOMIC FACTORS.

COMMENT 51D—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 52A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 52B—Your preference for a Controlled Surface Use stipulation on the Upton-Osage deer severe winter relief range is recognized in Table A-2.

COMMENT 52C—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 53A—Your opposition to leasing is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

For economic analysis purposes it is assumed that NSO areas would not be leased, primarily because the cost of a deviated wellbore or horizontal drilling would not be economical, and for no

COMMENT 45C—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 46A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102. The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 128.

COMMENT 46B—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 46C—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 47A—As stated in the introduction to CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, only the anticipated effects are reported. If a factor is not addressed, no effect on the factor is expected. There are no anticipated cumulative effects on other mineral resources.

Wording has been added to clarify the referenced statement in the DEIS, page IV-27, "It is assumed that production and royalty revenue is not affected by the No Surface Occupancy stipulations," is specific to the economic analysis. The effects on mineral and energy resources are discussed in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, MINERAL AND ENERGY RESOURCES.

COMMENT 47B—The Forest Service agrees with this comment. Wording has been added to CHAPTER IV, MINERAL AND ENERGY RESOURCES to clarify the impact of oil and gas leasing restrictions on development of other minerals.

COMMENT 48A—Thank you for your comment. Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 48B—Your preference for a Controlled Surface Use stipulation on the Upton- Osage deer severe winter relief range is recognized in Table A-2. Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 48C—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 49A—Thank you for your comment. Your preference for a Controlled Surface Use stipulation on the Upton- Osage deer severe winter relief range is recognized in Table A-2.

COMMENT 49B—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 49C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 128.
COMMENT 53B—A survey of recreation opportunities was conducted on the entire TBNG. The most primitive experience identified was inventoried semi-primitive motorized (see CHAPTER III, AFFECTED ENVIRONMENT).

ALTERNATIVE 3 considers applying NSO to three inventoried semi-primitive motorized areas; ALTERNATIVE 4 considers applying NSO to four of these areas; and, ALTERNATIVE 7 considers applying NSO to the WYOMING OIL LANDS (WOL). As explained in CHAPTER IV, RECREATION RESOURCES, oil and gas developments in these inventoried semi-primitive motorized areas would, at a minimum, move the recreation experience in these areas up one class to roaded natural. This represents a loss of the most primitive recreation experience available on the TBNG, a concern to some segments of the public, and is disclosed in this EIS as an impact. The Forest Supervisor’s decision on the stipulations to be applied will be contained in a Record of Decision based on this EIS.

COMMENT 53C—Thank you for your comment. The National Grasslands are managed for multiple use as provided for under 36 CFR 213. The inventoried semi-primitive motorized areas, the most primitive recreation experience available on the TBNG, have been reviewed against the 1964 Wilderness Act and the inventory of potential wilderness in FSM 1909.12, CHAPTER 7. No areas suitable for placement on the inventory of potential wilderness were identified. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 54A—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1. Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 54B—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 54C—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 54D—Thank you for your comment. Your preference for a Controlled Surface Use stipulation on the Upton-Disage deaver winter relief range is recognized in Table A-2.

COMMENT 55A—Five resources are listed in CHAPTER II (see description of ALTERNATIVE 6) which could conceivably be impacted in excess of Forest Plan Standards and Guidelines under standard lease terms. In some cases wording has been added to CHAPTER IV, ENVIRONMENTAL CONSEQUENCES to clarify that the impacts are unacceptable under standard lease terms. Additionally, the impact of oil and gas leasing to inventoried semi-primitive motorized recreation is discussed in CHAPTER IV, RECREATION RESOURCES. Oil and gas development in one of the inventoried semi-primitive motorized areas would be an irreversible and irretrievable commitment of the recreation resource.

COMMENT 55B—As described in the introduction to CHAPTER II, ALTERNATIVES, the National Environmental Policy Act (NEPA) regulations (40 CFR 1502.14), require rigorous exploration and objective evaluation of all reasonable alternatives, including those not within the jurisdiction of the agency. Seven alternatives were developed in response to the issues and to present a broad range of alternatives for analysis, as required under NEPA (see CHAPTER 2, ALTERNATIVES).

The Forest Service believes the range of alternatives considered, which includes only alternative applying standard stipulations only, reasonably represents all interests.

COMMENT 55C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 5B.

COMMENT 55D—The statement that “tracts with a No Surface Occupancy (NSO) stipulation would not be leased” is an assumption used in the economic analysis CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, ECONOMICS. For a more complete discussion of how this assumption is used see FOREST SERVICE RESPONSE to COMMENT 51C.

The regulations direct the Forest Service to identify areas “open to development” subject to constraints that will require the use of lease stipulations, such as those prohibiting surface use on areas larger than 40 acres.” (36 CFR 228.102(f)(1)(b)). Therefore, the use of NSO stipulations is appropriate in making the Area or Forest-wide leasing decision (36 CFR 228.102(d)).

COMMENT 55E—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 55F—The Forest Service agrees, except that discoveries may be along productive trends, instead of randomly distributed and impacts concentrated. Application of the mitigation stipulations in APPENDIX D, and site specific environmental analysis of the SUPO at the APD stage of development will insure impacts are minimized.

COMMENT 55G—All the inventoried semi-primitive motorized areas in Converse county are east of the outcrop of major coal seams. Although thin coal seams are probably present in the subsurface it is unlikely that any can be economically mined in the foreseeable future.

Oil and gas production facilities are temporary but wells and production facilities are often used 20 years or more. The Wyoming Oil and Gas Conservation Commission Statistics book lists many fields discovered over 25 years ago that are still producing.

COMMENT 55H—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 55I—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 5B.

COMMENT 55J—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 55K—Revenues from oil and gas leasing activities (rentals, bonus bids, and royalties) on the Thunder Basin National Grassland are deposited in the general fund of the United States Treasury. On public domain minerals, one half of the revenues are returned to the State of Wyoming. For minerals on acquired lands, one quarter of the revenues are returned to the counties (see CHAPTER IV, ECONOMIC FACTORS). Receipts in the General Fund are available for allocation by the Congress of the United States.

COMMENT 55L—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.
COMMENT 55M—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 59. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 55N—Your preference for ALTERNATIVE 6 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 58A—Your preference for ALTERNATIVE 6 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 58—As stated in CHAPTER I, PURPOSE AND NEED the purpose of this EIS is to disclose the effects of alternative decisions the Forest Service may make regarding availability of and authorization for the leasing lands of the Thunder Basin National Grassland for oil and gas exploration and development. The Forest Service decisions will apply to lands with surface (TBNG) and with federal oil and gas mineral (520,000 acres). The Forest Service has no authority to make decisions on other ownerships. Experienced averages for oil and gas development activities on federal lands were used to predict reasonably foreseeable development activities. Since the past oil and gas developments of the TBNG were in the context of the greater development occurring in the larger Powder River Basin, they yield a good estimate of expected future impacts to federal lands (see APPENDIX C).

COMMENT 57B—Thank you for your comment. The mapping errors noted have been corrected in this EIS.

COMMENT 57C—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 57D—Horizontal drilling in the Powder River Basin and on the TBNG is, at present, a promising technology with unproven results. The RFD recognizes this possibility but specific numbers of horizontal wells are not estimated because of insufficient data. The RFD estimates 20 wells per year on federal surface within the FEIS study area boundary. Even if a horizontal drilling play develops, drilling activity is not expected to exceed that predicted in the RFD. However, the cost of drilling would increase and is reflected in the Economic Analysis.

COMMENT 57E—The Muddy Formation (Newcastle Formation) outcrops are of such minor extent in this portion of the FEIS study area that they are not discernable at the scale of Map 3-2. Generally, they are included within the Skull Creek shale. For those who need more detailed information the sources of Map 3-2 are identified.

COMMENT 57F—Thank you for your comment. Map 3-2 has been modified to show the Mowery Shale (map unit Lm).

COMMENT 57G—Thank you for your comment. Map 3-2 has been modified to show the Fox Hill Sandstone (map unit KH).

COMMENT 57H—At the scale we have presented the "Generalized Geology Map," it is within accepted cartographic standards not to show very small (or very narrow) map units. The map was for the general information of interested readers. More detailed maps are referenced for those interested in seeing the smaller inclusions that we could not show at the scale used. Please refer to the referenced 1:250,000 scale maps for more detailed geology.
provided the Forest Service with both industry contacts and a meeting room. In response to direct inquiry, industry was unable to quantify any differences in economic impacts for different levels of leasing stipulations or for individual stipulation except that NSO would most often equate to no leasing. Using this data, foregone revenues were projected for areas to which the NSO stipulation was applied by alternative. These projections are reflected in the economic impact analysis summarized in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, ECONOMIC FACTORS.

In response to the concern that the economic analysis should vary across alternative, additional analysis was conducted. An estimate of forgone revenues due to NSO is displayed in Table 4-10, AVERAGE ANNUAL FORGONE REVENUES DUE TO NSO BY ALTERNATIVE in the FEIS. These projections are reflected in the economic impact analysis summarized in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, ECONOMIC FACTORS.

COMMENT 59G—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 13G.

COMMENT 59H—Experience on the TBNG has not demonstrated that a well site shrinks once a well goes into production.

COMMENT 59I—Thank you for your comment. The wording on issue 13 has been modified in this FEIS (see CHAPTER I, PURPOSE AND NEED).

COMMENT 59J—The Forest Service agrees with this comment. Wording in this FEIS has been changed.

COMMENT 59K—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 13J.

COMMENT 59L—Thank you for your comment. The suggested wording has been substituted in this FEIS.

COMMENT 59M—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 60A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 61A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 61B—The economic consequences are displayed by alternative in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, ECONOMIC FACTORS.

COMMENT 61C—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 12B.

COMMENT 61D—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 61E—Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 61F—Your preference for a Controlled Surface Use stipulation on the Upton-Osage deer severe winter relief range is recognized in Table A-2.

COMMENT 61G—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 62A—Thank you for your comment. Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 62B—The effect of the proposed No Surface Occupancy stipulations on adjacent ownerships, both surface and mineral, are disclosed in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 63A—Thank you for your comment. Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 63B—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 64A—Your opposition to NSO stipulations and your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 65A—Your opposition to NSO stipulations is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 65B—ALTERNATIVES 1, 2, 3, 4 and 7 apply a No Surface Occupancy (NSO) stipulation to the Walker Tapee Ring cultural resource site. ALTERNATIVES 1 and 2 apply a NSO stipulation to deer winter range. ALTERNATIVE 3 applies the No Surface Occupancy stipulation to four inventoried semi-primitive motorized areas. ALTERNATIVE 4 applies the NSO stipulation to four areas with special values, which include both biological diversity and recreation values (see CHAPTER II, ALTERNATIVES).

COMMENT 65C—In 1987, Congress passed the Federal Onshore Oil and Gas Leasing reform Act which authorized the Secretary of Agriculture to identify the lands available for leasing and determine the appropriate stipulations to apply to the lease to protect the surface resources (see CHAPTER I, PURPOSE AND NEED). This EIS had been prepared to comply with the requirement of the Leasing Reform Act and the implementing regulations (36 CFR Part 228, 100 st. seq., 55 FR 10423).

COMMENT 65D—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.
COMMENT 85E—The effects of NSO on oil and gas activities are documented in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES. The justification for each stipulation is detailed in APPENDIX D. The Forest Supervisor’s decision on the stipulations to be applied will be contained in a Record of Decision based on this EIS.

COMMENT 85F—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 85A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 85B—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 88.

COMMENT 85C—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 86D—Thank you for your comments. Your preferences for ALTERNATIVE 2 is recognized in Table A-1, and by including your comment and this response in APPENDIX A.

COMMENT 71A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 71B—Thank you for your opinion. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 71C—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 72A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 72B—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 73A—Thank you for your comment. It is important to note that the maintenance of the inventoried semi-primitive motorized areas, by applying a NSO stipulation, is a requirement in excess of Forest Plan Standards and Guidelines (see CHAPTER II, ALTERNATIVES). It is a consideration of ALTERNATIVES 3, 4 and 7 developed in response to public concern. These alternatives retain some of the existing inventoried semi-primitive motorized areas in their current status, so the option of a special emphasis Management Area on the TSNG can be considered during revision of the Forest Plan. The Forest Supervisor’s decision on the stipulations to be applied will be contained in a Record of Decision based on this EIS.

COMMENT 73B—Alternatives are formulated to provide for a range of reasonable management scenarios (40 CFR 1502.14 (a)), for oil and gas leasing on the TSNG. Constraints, such as those prohibiting surface, use must have a discussion as to why the constraints are necessary and justifiable (36 CFR 228.102 (c)(8)). Justification requires more than an arbitrary division on acreage or percentage of the area.

COMMENT 70C—Your opposition to ALTERNATIVE 4 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 70D—The impact of oil and gas leasing to inventoried semi-primitive motorized recreation is discussed in CHAPTER IV, RECREATION RESOURCES. As explained there, wording has been added to clarify that oil and gas development in a semi-primitive motorized areas would change the recreation opportunity class to roaded natural, an irreversible and irrevocable commitment of the recreation resource.

For additional discussion on inventoried semi-primitive motorized areas see the FOREST SERVICE RESPONSE to COMMENT 88.

COMMENT 70E—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 89.

COMMENT 70F—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 90.

COMMENT 70G—Your preference for ALTERNATIVE 6 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 71A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 71B—Thank you for your opinion. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 71C—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 72A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 72B—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 73A—Thank you for your comment. It is important to note that the maintenance of the inventoried semi-primitive motorized areas, by applying a NSO stipulation, is a requirement in excess of Forest Plan Standards and Guidelines (see CHAPTER II, ALTERNATIVES). It is a consideration of ALTERNATIVES 3, 4 and 7 developed in response to public concern. These alternatives retain some of the existing inventoried semi-primitive motorized areas in their current status, so the option of a special emphasis Management Area on the TSNG can be considered during revision of the Forest Plan. The Forest Supervisor’s decision on the stipulations to be applied will be contained in a Record of Decision based on this EIS.

COMMENT 73B—Alternatives are formulated to provide for a range of reasonable management scenarios (40 CFR 1502.14 (a)), for oil and gas leasing on the TSNG. Constraints, such as those prohibiting surface, use must have a discussion as to why the constraints are necessary and justifiable (36 CFR 228.102 (c)(8)). Justification requires more than an arbitrary division on acreage or percentage of the area.
The Forest Service believes the range of alternatives presented in this FEIS is a reasonable range of alternatives to display and articulate the potential environmental consequences for oil and gas leasing on the TBNG.

COMMENT 73C—As stated in CHAPTER II, ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY, the interdisciplinary team tried to develop an alternative whereby less than the entire TBNG was available for leasing. Four reasons are listed for eliminating this alternative from detailed study.

COMMENT 73D—Thank you for your comment. For the Upton-Osage deer crucial winter range, ALTERNATIVES 1 and 2 consider a NSO and ALTERNATIVES 3, 4, and 7 consider both a Timing Limitation and a CBU stipulations. wording has been added to Table 4-1 to clarify the areas (see the FOREST SERVICE RESPONSE to COMMENTS 38, 39, and 91).

COMMENT 73E—It is accurate that seismic exploration could occur in a NSO area. It could also occur in lease areas. The NSO stipulation would apply only to activities conducted under lease rights. Rarely is seismic exploration conducted under lease rights. Typically, it is conducted under an authorization known as a Prospecting Permit. Site specific NEPA analysis is required whether the seismic exploration was requested under lease rights or Prospecting Permit. Constraints and mitigation measures, necessary to protect any areas of concern identified during the NEPA analysis, would be applied to the project. No road construction, cross country travel with no tree cutting and no resulting visible ruts are examples of constraints which could be applied.

Reallocating Forest Plan Management Areas is beyond the scope of this EIS (see CHAPTER I, PURPOSE AND NEEDS). ALTERNATIVES 3, 4, and 7 consider applying a NSO stipulation to areas with special values, including inventoried semi-primitive motorized areas. The purpose of a NSO stipulation is to perpetuate identified special values, including recreation (see CHAPTER II, ALTERNATIVES). During Forest Plan revision allocation of Management Areas, including allocation of semi-primitive motorized areas, will be considered in the context of the mix of goods and services to be offered by the entire Medicine Bow National Forest and the Thunder Basin National Grassland (see FOREST SERVICE RESPONSE to COMMENT 73G).

COMMENT 73F—In the FEIS study area, with the mixed land ownership pattern described in CHAPTER I, LANDS INVOLVED, it is not necessarily true that no leasing would result in no loss of resources. As described in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, when federal lands are not leased or when NSO stipulations are applied, the oil resource under federal lands may be drained by wells on private lands resulting in loss of resources, revenues and damage to the underground oil reservoir. In addition secondary recovery can be restricted resulting in significant loss of resource.

Neither directional drilling nor horizontal drilling are new technologies. Both have higher drilling costs and higher operating costs than a vertical well. Because of higher costs they have higher limits what they can be operated economically. This results in many thousands of barrels per well left in the ground as compared to a vertical well. In some situations these technologies can minimize surface disturbance.

COMMENT 73G—A biological diversity assessment was developed, in part, to respond to the short-grass prairie concern. Although there are small patches of short grass prairie on the TBNG, it is not a type requiring special protection. The Biological Diversity Technical Report for the Thunder Basin National Grassland is located in the project file in the Forest Supervisors' Office in Laramie, Wyoming. For a discussion on Recreation Opportunity Spectrum (ROS) classes, such as semi-primitive non-motorized, see the FOREST SERVICE RESPONSE to COMMENT 73H.

Providing management areas emphasizing semi-primitive non-motorized recreation is a Forest Plan level decision (see Forest Plan, Management Area 3A, Emphasis on semi-primitive non-motorized recreation, page 11-13). The present Forest Plan provides for Management Area 3A; however, not on the TBNG (see CHAPTER I, RELATIONSHIP TO OTHER PLANS AND DOCUMENTS, for a listing of the five Management Areas currently identified by the Forest Plan on the TBNG). Further, there is no area on the TBNG in the semi-primitive non-motorized Recreation Opportunity Spectrum (ROS) class (see CHAPTER III, AFFECTED ENVIRONMENT, RECREATION OPPORTUNITY SPECTRUM).

ALTERNATIVES 3, 4, and 7 consider applying a NSO stipulation to inventoried semi-primitive motorized areas in order to protect their existing character. Whether to classify these areas in a Management Prescription to maintain their semi-primitive motorized character would be considered during the Forest Plan revision (estimate 1995). The question of changing these areas Management Prescription is appropriate during Forest Plan revision when it can be considered in the context of the forest wide mix of goods and services to be provided.

COMMENT 73H—As described in the FOREST SERVICE RESPONSE to COMMENTS 73A and in CHAPTER II, ALTERNATIVES inventoried semi-primitive motorized areas have no official status. There are no requirements of law, regulation, policy or the Forest Plan to protect them. There are no areas with semi-primitive non-motorized character on the TBNG (see CHAPTER III, AFFECTED ENVIRONMENT).

The Forest Service agrees that it is the condition on the ground that counts. In response to the comments on the DEIS, additional analysis was conducted to check thoroughly the inventory. Some adjustments are reflected in this FEIS (see APPENDIX H).

COMMENT 73I—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 39E.

COMMENT 73J—Forest Plan Standards and Guidelines provided the basis for the wildlife stipulations contained in APPENDIX D of this FEIS. Both a Timing Limitation and a Controlled Use Surface Use stipulation have been considered for indicator and for threatened and endangered species. Also, please see the FOREST SERVICE RESPONSE to COMMENTS 86 and 39E.

COMMENT 73K—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 39E.

COMMENT 73L—Cumulative impacts are discussed in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES under each factor listed. As discussed in the introduction of CHAPTER IV, only anticipated effects are reported. If a factor is not addressed, no effect on the factor is expected.

COMMENT 74A—Thank you for your comment. Your concern is recognized by including your comment and this response in APPENDIX A.

COMMENT 74B—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 75A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.
COMMENT 75A—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 58.

COMMENT 75c—Thank you for your comment. Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 75d—Your preferences for ALTERNATIVE 2 and for CSU on severance winter relief range are recognized in Table A-1. Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 75e—Thank you for your comment. Your concern is recognized by including your comment and this response in APPENDIX A.

COMMENT 75f—Thank you for your comment. Wording has been added in CHAPTER IV, MINERALS AND ENERGY RESOURCES, to clarify the impact of NSO stipulations in the inventoried semi-primitive motorized areas on mineral exploration and development. Also, please refer to the FOREST SERVICE RESPONSE to COMMENT 128.

COMMENT 75g—Wording has been added to clarify the impacts of NSO on drainage of the federal mineral resource in CHAPTER IV, MINERALS AND ENERGY RESOURCES.

COMMENT 75h—The Forest Service agrees with this comment (see APPENDIX C). Further, your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 75i—The Forest Service agrees with this comment (see CHAPTER IV, MINERALS AND ENERGY RESOURCES).

COMMENT 75j—The CSU stipulation on reservoirs pertains to maintaining a 70 decibel noise output from production facilities (see APPENDIX D). The noise restriction is easily met with electric pump motors or, on gas pumps, with adequate mufflers. Because drilling is a temporary impact (usually less than three weeks), this noise restriction was not applied to drilling. When this was explained to Terry Dills, Oil and Gas Team Leader, to Leslie Theiss, Senior Geologist, BLM Casper District Office, she had no objections to this stipulation as written.

COMMENT 75k—Additional wording has been added to clarify that cement plugs are required to protect groundwater zones (see CHAPTER I, OIL AND GAS DEVELOPMENT OVERVIEW, Abandonment).

COMMENT 75l—The Forest Service agrees with this comment. Wording has been added to CHAPTER IV, ENVIRONMENTAL CONSEQUENCES to clarify that Federal Regulations and Onshore Orders govern drilling.

COMMENT 75m—Thank you for your comment. The term "grouting" has been replaced with "cementing" in this EIS.

COMMENT 75n—Wording has been changed to reflect that when drainage occurs, the losing mineral owner does not receive any compensation for the loss.

COMMENT 76a—Thank you for your comment. Wording has been changed in this FEIS.

COMMENT 76b—It is true that the Onshore Order allows for a buried plate. However, as stated in CHAPTER III, MINERALS, the Forest Service has found the above ground marker very helpful as location markers, as raptor perches and has opted for above ground markers. In black-footed ferret recovery areas, a buried plate may be required to reduce raptor predation on ferrets (see CHAPTER II, FEATURES COMMON AMONG ALL ALTERNATIVES).

COMMENT 76c—No, the areas with NSO stipulations are not off limits to grazing. Limiting livestock grazing is beyond the scope of this EIS (see CHAPTER I, PURPOSE AND NEED). ALTERNATIVES 3, 4 and 7 consider applying a NSO stipulation to areas with special values, including inventoried semi-primitive characteristics. The purpose of NSO stipulation is to perpetuate identified special values, including the recreation experience (see CHAPTER II, ALTERNATIVES). During Forest Plan revision allocation of Management Areas, including allocation of semi-primitive motorized areas, will be considered in the context of the mix of goods and services to be offered by the entire Medicine Bow National Forest and the Thunder Basin National Grassland (see FOREST SERVICE RESPONSE to COMMENT 730).

Presently there are no semi-primitive motorized management areas on the Grassland. If, during Forest Plan revision, it was decided to apply a semi-primitive motorized management prescription to areas on the Grassland, then other resources, including livestock grazing, would be managed in accordance with emphasis on semi-primitive motorized recreation (see Forest Plan, pages III-99 to III-104). The following restrictions to livestock grazing would apply: 1) Manage livestock distribution and stocking rates to be compatible with recreation use; and 2) Locate structural improvements to meet visual quality objectives. (Forest Plan, page III-101, General Direction (0158)).

If, during Forest Plan revision, it was decided not to apply a management prescription protecting inventoried semi-primitive motorized areas on the Grassland, a decision could be made to eliminate the NSO stipulation in these areas.

COMMENT 76e—Traffic counts, hunting, and fishing license sales, kill ratios, recreation surveys, various recreation permits, personal observations and counts are some of data sources used to develop the recreation use figures used in CHAPTER III, AFFECTED ENVIRONMENT, RECREATION. The Recreation Opportunity Spectrum (ROS) is the framework for integrating recreation values into National Forest Plans, project designs and management decisions.

Public comment in response to the initial scoping effort on the DEIS revealed concern over the loss of primitive recreation experiences on the TBN. Review of the 1981 ROS inventory for the TBN revealed semi-primitive motorized recreation to be the most primitive experience available on the TBN (this means that primitive and semi-primitive non-motorized (ROS classes are not present). An update of the 1981 ROS survey (to 1991) was conducted which showed the area inventoried semi-primitive motorized to be reduced in size since 1981, due mostly to road development for oil and gas.

As explained in CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, RECREATION RESOURCES, oil and gas developments in these inventoried semi-primitive motorized areas would, at a minimum, move the recreation experience; i.e., these areas up one class to roaded natural. This represents a change in the most primitive recreation experience available on the TBN, a concern to some segments of the public, and is disclosed in this EIS as an impact.

ALTERNATIVES 3, 4 and 7 in this EIS consider a range of actions to protect special values, including recreation, in excess of Forest Plan Standards and Guidelines. Further, in response to
the comments on the DEIS, additional wording has been added in several locations to clarify the justification for the Supplemental Stipulations included in APPENDIX D.

COMMENT 76C—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 79A—Your opposition to NSO stipulations is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 79B—Your preferences for ALTERNATIVE 2 and for GSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 80A—Ecosystem management is a new operating philosophy for achieving environmentally sensitive, socially responsive, economically feasible and scientifically sound multiple-use management of the National Forest System. As a management philosophy, it is incorporated into each alternative considered in detail in this FEIS. For a discussion on how ecosystem management is incorporated see CHAPTER I, ECOSYSTEM MANAGEMENT.

COMMENT 80B—We agree, ecosystem management is applicable to National Grasslands as well as to National Forests. For more information on how ecosystem management is incorporated into this FEIS see CHAPTER I, ECOSYSTEM MANAGEMENT.

COMMENT 81A—Thank you for your support of the Forest Service effort to comply with 36 CFR 228.102.

COMMENT 81B—Your preference for a Controlled Surface Use stipulation on the Upton-Osage deer severe winter relief range is recognized in Table A-2.

COMMENT 81C—ALTERNATIVES 3, 4 and 7 consider a range of actions to protect special values, including recreation values in excess of Forest Plan Standards and Guidelines. As explained in CHAPTER 4, ENVIRONMENTAL CONSEQUENCES, RECREATION RESOURCES, oil and gas developments in inventoried semi-primitive motorized areas would, at a minimum, move the recreation experience in these areas up one class to roaded natural. This represents a loss of the most primitive recreation experience available on the TNBO, a concern to some segments of the public, and is disclosed in this EIS as an impact. Further, in response to the comments on the DEIS, additional wording has been added in several locations to clarify the justification for the Supplemental Stipulations included in APPENDIX D.

COMMENT 81D—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 82A—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 82B—Forest Plan Standards and Guidelines provided the basis for the wildlife stipulations contained in APPENDIX D of this FEIS. With the exception of additional protection for the golden eagle, considered in ALTERNATIVE 7, these are the same requirements that have applied to oil and gas leases since November 1985. Also, please see the FOREST SERVICE RESPONSE to COMMENTS 6E, 7D and 39E.

COMMENT 82C—On September 14, 1991, Elmer Parson of Prenatal Corporation was contact-
However, because of the great amount of information available, much data is incorporated by reference.

COMMENT 84C—Leasing Reform Act implementing regulations (36 CFR 228.100 et seq.) institute a staged decision making process. The regulatory framework provides the following decision points: (1) The determination of lands available for leasing; (2) The leasing specific lands decision; (3) Application for Permit to Drill (APD); and (4) Amendment of the permit to drill if field development occurs. Each decision is based on environmental analysis and disclosure of the probable effects in accordance with the National Environmental Policy Act (see CHAPTER 1, OIL AND GAS LEASING). The first two of these decisions will be made in a Record of Decision based on this FEIS (see CHAPTER 1, PURPOSE AND NEED, DECISIONS TO BE MADE). Additional environmental analysis will be required at the APD and field development stages.

Standard Lease Terms (Sec. 6) require the Lessee to conduct operations in a manner that minimizes adverse impacts to the land, air, and water; to cultural, biological, visual, and other resources. At the APD stage of development, when a site-specific proposal is received, a Surface Use Plan of Operations (SUP0) will be analyzed in an appropriate environmental analysis. The need for water monitoring, the parameter to be monitored, the design of water monitoring, and the water pits are determined during the analysis of the SUPO. Compliance with all federal, state and local laws and regulations is a primary consideration and requirement for approval of the SUP0. Site specific information needed to develop an effective monitoring plan is available only at the APD stage, not at the leasing stage.

Water quality data already exists for many areas of the Grassland. In addition, standard lease stipulations require the following: 1) Prior to disturbing the surface of leased lands, lessee shall contact lessor to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary; 2) Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources; and 3) Lessee may be required to complete minor inventories or short-term special studies under guidelines provided by lessor. Standard lease stipulations do not require the lessee to conduct long-term water quality monitoring from non-point sources of pollution. Where existing information is not available, the lessee may be required to conduct a minor inventory or short-term study. It may not be feasible, nor reasonable, to require the lessee to provide an inventory on the entire leased area. However, site-specific water resource information may be needed for riparian areas, floodplains, playas and wetlands within the leased area that may be affected by oil and gas operations. Affected areas will be identified in the Surface Use Plan of Operations (SUP0) at the APD stage of development. In some cases, an inventory may be required to describe the existing water resource that may be impacted. At the APD stage an Interdisciplinary Team will determine the type of data needed for impact analysis and develop a monitoring plan. At this point, the lessee may be required to collect specific data to meet the obligations of a minor inventory or short-term study. Additional data may be collected through Forest plan monitoring requirements (Forest Plan IV-12). The need for additional monitoring will be determined by the Interdisciplinary Team.

COMMENT 84D—The response to COMMENTS 84C thru 84AA represent the outcome of discussions and agreement with EPA on specific changes and or additions needed.

COMMENT 84E—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6B.

COMMENT 84F—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6B.
COMMENT 840—Areas open to development but subject to constraints (stipulations) larger than 40 acres must be mapped for the leasing analysis required under 36 CFR 228.102. The riparian mapping is to an approximate onearc resolution (see CHAPTER II, FEATURES COMMON AMONG ALTERNATIVES), sufficient for the leasing decisions to be made. At the APD stage of development a site specific verification will be conducted by the authorized representative to assure that the Surface Use Plan of Operations will not adversely affect riparian areas, floodplains, wetlands or playas (36 CFR 228.108).

COMMENT 841—The Forest Service agrees with this comment and wording in the EIS has been added in CHAPTER II, FEATURES COMMON AMONG ALTERNATIVES, to clarify that a 404 permit will be required from the Army Corp of Engineers for dredge and fill operations in accordance with the Clean Water Act.

COMMENT 842—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 68.

COMMENT 841J—for a discussion of riparian mapping resolution, please see FOREST SERVICE RESPONSE to COMMENT 840.

At the APD stage of development additional site specific environmental analysis will be conducted. Vernal pools and transitory (non-perennial) wetlands, which were too small or did not appear in the infra-red photos, will be identified at this site specific analysis stage. Whenever possible these areas and riparian, playas, floodplains and wetlands will be avoided. If avoidance is not possible, an interdisciplinary team will determine the potential impacts of the proposed action. If these impacts cannot be adequately mitigated to assure compliance with executive orders, state and federal laws, the action will not be approved. To the extent consistent with the rights conveyed by the lease, the SUPO must also be consistent with the Forest Plan (36 CFR 228.107(2)).

COMMENT 844—The Forest Service agrees with this comment and has clarified the wording in CHAPTER II, Controlled Surface Use Stipulation, Riparian Areas and Wetlands to better define these areas.

COMMENT 84L—Intermittent streams are included in the broader term "floodplains." The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 68.

COMMENT 84M—A literature search was conducted through the Wyoming Water Research Institute to obtain information on water resources within the FEIS study area. Additionally, water quality data collected between 1970 through 1992 was obtained from the following three sources: 1) U.S. Environmental Protection Agencies Water Quality Information System called STORET; 2) WRDS, Wyoming’s Water Resource Data System, and 3) through a search of water quality data available on the Medicine Bow National Forest. This information is summarized in APPENDIX G and will be used, as needed, for site specific analysis at the APD stage of oil and gas development.

For those U.S. Geological Survey gauging stations where sufficient period of record exists, ranges for discharge, pH, temperature, hardness, specific conductance, dissolved solids, alkalinity, phosphorus, ammonia, nitrates, nitrites, potassium and chloride are tabulated in APPENDIX G. Water quality data from reservoirs surveyed within the last two years are also included in APPENDIX G.

COMMENT 84N—In response to this comment wording has been added to CHAPTER III, WATER USES and to CHAPTER IV, WATER RESOURCES to clarify the inclusion of offsite (downstream) uses and impacts.

COMMENT 84Q—Wording has been added to CHAPTER IV, ENVIRONMENTAL CONSEQUENCES, SOIL RESOURCE, Cumulative Effects, to clarify the effect on suspended solids of anticipated oil and gas activities added to other past, present, and reasonably foreseeable future actions. The conclusion is the same as in the DEIS. No measurable contribution of oil and gas activities to cumulative nonpoint source pollution is expected.

Further wording has been added to CHAPTER III, WATER QUALITY to clarify the existing impacts of rangelands on suspended solids.

Standard and special stipulations (APPENDIX D), are included largely in order to minimize soil erosion and maintain productivity. Therefore, nonpoint source water pollution due to sedimentation would also be minimized. Measurable increases in nonpoint source pollution, due to the cumulative effects of livestock grazing and oil/gas activities, are not predicted.

COMMENT 84P—Wording has been added to the Cumulative effects, water resources section of CHAPTER IV, ENVIRONMENTAL CONSEQUENCES.

COMMENT 84Q—The Forest Service agrees that design considerations should be employed which minimize risk to water resources. As required by the Leasing Reform Act implementing regulations 36 CFR 228.102 et seq., site specific environmental analysis will be conducted prior to approval of the APD and SUPO. An interdisciplinary team will determine the potential impacts of the proposed action. If these impacts cannot be adequately mitigated to assure compliance with executive orders, state and federal laws, the action will not be approved. To the extent consistent with the rights conveyed by the lease, the SUPO must also be consistent with the Forest Plan (36 CFR 228.107(2)). Mitigation measures may include design and engineering of proposed facilities, including barriers and interception pits. Some mitigation measures that could be applied at the APD stage of development are listed in APPENDIX E for information.

COMMENT 84R—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 6C.

COMMENT 84S—EPA’s comment refers to a letter from the Fisheries Management Office of the Wyoming Game and Fish Department in Buffalo, Wyoming, to the Bureau of Land Management Office in Buffalo and dated December 5, 1990. The referenced letter was attached for information to the Wyoming Game and Fish Department comments to the Preliminary Scoping Statement for this EIS, dated August 13, 1991, and published in the DEIS for information purposes.

In the DEIS the Forest Service responded to the August 13, 1991, letter and did not respond to individual comments in the December 5, 1990, letter because:

1. It was attached for information purposes.
2. It was addressed to the Bureau of Land Management.
3. The site specific considerations listed were not on the TBNG.

Concerns of the Wyoming Game and Fish Department, concerning aquatic resources have been addressed in FOREST SERVICE RESPONSE to COMMENTS 38P and 38Q.

COMMENT 84T—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.
Instead of the broad baseline monitoring, the Forest Service uses a site specific system of concurrent samples, taken at the same time, above and below the monitored activity. Such a system provides a good indicator of pollution. Once potential pollution is detected, further investigations are required to determine the source.

The monitoring required in Table 4-13 is consistent with that required in the Forest Plan, pages IV-3 thru IV-11, and is sufficient for the decisions under consideration in this EIS (see CHAPTER I, DECISIONS TO BE MADE).

At the APD stage of development, additional site specific environmental analysis will be conducted. Site specific monitoring plans will be developed in cooperation with state and federal agencies which have regulatory responsibility over ground and surface waters and wetlands. Both chemical and biological factors appropriate to the site specific situation, will be monitored. An interdisciplinary team will determine the potential impacts of the proposed action. If these impacts cannot be adequately mitigated to assure compliance with the executive orders, and state and federal laws, the action will not be approved. To the extent consistent with the rights conveyed by the lease, the SUPO must also be consistent with the Forest Plan (36 CFR 228.1072). Some mitigation measures that could be applied at the APD stage of development are listed in APPENDIX E for information.

COMMENT 85A—Your preferences for ALTERNATIVE 2 and for CSU on severe winter relief range are recognized in Table A-1, Table A-2 and by including your comment and this response in APPENDIX A.

COMMENT 86A—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENTS 8A and 8B.

COMMENT 86B—Authorization of utility and pipeline facilities are a separate, distinct process, including public involvement and NEPA compliance, as noted in FOREST SERVICE RESPONSE to COMMENT 8A, and beyond the scope of this analysis.

COMMENT 86C—Land exchange, easements, right-of-way grants and acquisitions are beyond the scope of this analysis. However, these are all very important considerations in any land transaction and will be fully considered in the environmental analysis for those decisions.

COMMENT 86D—The Forest Service will not assume cost for other than their direct actions. Processes used to authorize new utility services provide for coordination with existing facilities and resolution of any relocation cost. Relocation costs are normally passed on to the developer of the mineral resource.

COMMENT 86E—Thank you for your comment. Timber operations and utility corridors are beyond the scope of this analysis. However, direction and processes exist to accomplish the items identified in the comment.

COMMENT 87A—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 87B—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.
COMMENT 87C—Your preference for ALTERNATIVE 2 is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 88A—Thank you for your comment. Your comment is recognized by including your comment and this response in APPENDIX A.

COMMENT 88B—Your opposition to NSO stipulations on inventoried semi-primitive motorized areas is recognized in Table A-1 and by including your comment and this response in APPENDIX A.

COMMENT 88A—The referenced attachment was the letter from William H. Mortimer, BLM, Casper District Office, reproduced in this appendix (APPENDIX A) COMMENT 76 with accompanying FOREST SERVICE RESPONSE to COMMENTS 76A thru 76R.

COMMENT 90A—The referenced attachments were the letters from Governor Mike Sullivan and the State agencies reproduced in this appendix (APPENDIX A) COMMENTS 38 thru 43 with accompanying FOREST SERVICE RESPONSE to COMMENTS 38A thru 43A.

COMMENT 91A—The response to this comment is the same as the FOREST SERVICE RESPONSE to COMMENT 39C.

COMMENT 91B—Thank you for this information. This office agrees that coordination with the various offices of the Wyoming Game and Fish Department is essential to alleviating conflicts and we look forward to continuing this productive relationship.

COMMENT 92A—Based on agreements reached as documented in your letter, the suggested wording on black-footed ferret conservation measures is included in CHAPTER II, FEATURES COMMON AMONG ALL ALTERNATIVES.

COMMENT 92B—Thank you for your "concurrence with conditions" on the Biological Assessment on the proposed oil and gas leasing on the Thunder Basin National Grassland.

COMMENT 92C—Thank you for the invitation to attend the annual black-footed ferret Interstate Coordinating Committee meeting. The Forest Service also has a keen interest in preservation of endangered species such as the black-footed ferret. Scoping for the Forest Plan revision will include coordination with the Fish and Wildlife Service on all issues, including the issue of the Prairie Dog Management Plan.

COMMENT 92D—Thank you for your comment. This office has worked with Jane Roybal on many projects where Fish and Wildlife Service jurisdiction is involved and we look forward to continuing this productive relationship.

WRITTEN COMMENTS RECEIVED IN RESPONSE TO THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Scoping for the TBNG Oil and Gas Leasing EIS began September 10, 1990, with a meeting of concerned groups and agencies in Douglas, Wyoming. On June 14, 1991, a Notice of Intent to Prepare an Environmental Impact Statement on the TBNG Oil and Gas Leasing was published in the Federal Register, Vol. 56, No. 115, pages 27494 and 27495. On June 18, 1991, a news release announcing the preparation of the TBNG Oil and Gas Leasing EIS was sent to 56 newspapers, 21 radio and eight television stations in Wyoming and Northern Colorado. On June 19, 1991, a Preliminary Scoping Statement was sent to 1,313 individuals, groups, organizations and agencies. An additional 12 Preliminary Scoping Statements were sent, after the initial mailing, to individuals requesting one and to Native American organizations identified by the interdisciplinary team. There were 31 responses with comments on the Preliminary Scoping Statement and Notice of Intent. Each comment received from the initial scoping effort was published in the Draft Environmental Impact Statement with Forest Service Response to the Comment.

The Draft Environmental Impact Statement was made available for public review on June 4, 1992. Copies of the DEIS were originally sent to 136 individuals, organizations and agencies. An additional 1065 individuals were notified by letter that the DEIS was available. Subsequent to the initial mailing another 45 individuals and groups received copies of the DEIS. The DEIS was distributed to a total of 181 individuals, organizations and agencies. On June 8, 1992, a news release announcing availability of the DEIS and a public meeting to be held June 30, 1992, was sent to 26 newspapers (plus Associated Press), 15 radio and seven television stations in Wyoming and Northern Colorado. On June 18, 1992, a second news release announcing the June 30, 1992, public meeting was sent to 13 newspapers. A Notice of Availability on the DEIS was published in the Federal Register June 19, 1992, Vol. 57, No. 119, page 27450. On June 30, 1992, nine individuals attended the public involvement meeting in Douglas, Wyoming. On July 27, 1992, a news release announcing the extension of the comment period to August 18, 1992, was sent to the same mailing list as the June 8, 1992, news release.

There were 92 responses with comments on the DEIS. Each comment received is duplicated on the following pages. The comments are listed in the order received by the Forest Service. To facilitate finding an individual comment, Table A-3 lists those who commented alphabetically along with the page numbers for the comments and the page numbers for the FOREST SERVICE RESPONSE to COMMENTS.
Mr. Terry B. Dilts  
Medicine Bow National Forest  
2448 Jackson Street  
Laramie, Wyoming  82070-6535  

Dear Mr. Dilts:

This letter references the internal review of the Draft EIS for the OIL AND GAS LEASING ANALYSIS FOR THE THUNDER BASIN NATIONAL GRASSLAND. Our comments as requested are as follows:

a. Department of the Army Section 404 permits would be required for road crossing of waters of the United States including wetlands. These crossings are normally authorized under the nationwide permit §14. If at all possible, wetland crossings should be avoided. Under the nationwide permit, road crossings which include the filling of less than 100 linear feet of wetlands on either side of the bridge are authorized. If more than 100 feet of wetland or no creek, etc. is present, an individual permit would be required. The above should be taken into account when road crossings are designed.

b. In the dryer parts of Wyoming and other states natural springs and seeps may occur in or near proposed drilling sites. Drilling and associated work should avoid these important areas at all costs as they are extremely important watering areas for wildlife and livestock and could easily be subject to contamination and/or possible disruption of their hydrology. By staying clear from them, there is less chance of damaging these valued resources.

c. Slant drilling or avoidance are options which could be used to avoid damage to natural resources such as wetlands, riparian areas, fisheries and springs and seeps. This would also reduce the disturbance to the wildlife which depend on these areas.

d. In view of the concerns surrounding these valuable resources, should drilling occur within two hundred yards of a spring or seep or riparian area, the Forest Service should implement procedures to monitor the effects of that drilling and possible leakage from reuse pits/waste oil pits. Reuse/waste oil pits should be constructed with synthetic liners and leak detection systems. Monitoring should involve both the spring/seeps and the water bearing formation feeding the springs/seeps. Parameters monitored should include sulfates, chlorides and organics. This monitoring should be fairly inexpensive and any monitoring efforts should be coordinated with the Corps Regulatory office, the Wyoming Department of Environmental Quality, and the Wyoming Game and Fish Department.

e. Should drilling activities be located above a riparian or wetland area, precautions should be implemented to prohibit surface drainage of pollutants into that riparian or wetland area.

f. If exploration activities could impact any waters of the United States, the Forest Service should provide the Corps Regulatory Field Office with topographic maps for the Thunder Basin National Grasslands marked with the exact prospecting locations in order that we may determine precisely what waters would be affected and the appropriate permits that would be needed. These crossings can then be included in the permits that would be issued. The address to which these marked topographic maps should be sent is:

Mr. Matthew Bilodeau  
U.S. Army Corps of Engineers  
Cheyenne Regulatory Office  
504 West 17th Street, Suite 280  
Cheyenne, Wyoming  82001-4348  
(307) 772-2300

We appreciate the opportunity to be included in the internal review for this preliminary Draft EIS.

Sincerely,

Richard D. Gorton  
Chief, Environmental Analysis Branch  
Planning Division
Mr. Terry B. Dilts  
Project Coordinator  
Medicine Bow National Forest  
2468 Jackson  
Laramie, Wyoming 82070  

Dear Mr. Dilts:

This is in response to your request for comments on the Draft Environmental Impact Statement (DEIS) for the Thunder Basin National Grassland, Campbell, Converse, Crook, Niobrara and Weston Counties, Wyoming.

Your DEIS has been reviewed with consideration of the areas of responsibility assigned to the Department of Housing and Urban Development (HUD). This review considered the impact of the project and the alternatives on housing and community development in the Casper-Douglas, Gillette and Newcastle urban areas. The DEIS lacked sufficient data to enable HUD to determine the impacts on these urban areas or to determine if acceptable mitigation procedures had been developed.

We would appreciate receiving this information so that we can properly respond to your DEIS.

If we may be of further assistance, please contact me at (303) 844-3102.

Very sincerely yours,

Howard S. Kutser  
Regional Environmental Officer  
Office of Operational Support

Sincerely yours,

RODNEY D. VAUGHN, P.E.  
Division Administrator

Mr. Robert Jacobson, Environmental Planner, HPP-08
Mr. Terry B. Dilts,
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

Thank you for the opportunity to review the draft environmental impact statement for the proposal to lease oil and gas on the Thunder Basin National Grassland, Wyoming. We have no comments.

Sincerely,

Eugene L. Lehr, Chief
Environmental Division

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Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

RE: Thunder Basin National Grassland Draft EIS for Oil and Gas Leasing.

Dear Mr. Dilts:

We strongly support the Forest Service efforts to comply with 36CFR228.102 so that oil and gas leasing will resume on the Grasslands. However, we are disappointed the Forest Service chose Alternative 4 which apparently assumes that oil and gas exploration is incompatible with motorized recreation.

It is also disturbing to see that mitigation by reclamation and revegetation of disturbed sites is no longer effective in the eyes of the Forest Service (Table 4-2). This is typical of a trend within the agency to maximize the long term impacts and to take no risks, with very little supporting scientific evidence.

The predicted impacts of oil and gas leasing on the Thunder Basin National Grasslands appear to be so small and immeasurable that the environmental effects are insignificant and do not justify the increased restrictions proposed in the Preferred Alternative. We support Alternative 2 with the winter range modification (Controlled Surface Use stipulation) outlined in Alternative 4.

Sincerely,

Anthony D. Colter
Senior Resource Manager
LOUISIANA-PACIFIC CORP.

cc: Cheryl Feraud
July 8, 1992
Gerald G. Beath
Forest Supervisor
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Beath,

The following are comments of the Sierra Club and the Wilderness Society regarding the oil and gas leasing EIS for the Thunder Basin National Grassland (NG). Before getting into specifics we wanted to provide some general observations about the plan. We view the plan as grossly inadequate in protecting the environment and very accommodating to the oil and gas industry at the expense of other resources. Major changes in the final plan need to occur if a balance is to be achieved.

Controlled surface use (CSU) stipulations for wetland and riparian areas in the Grassland are completely insufficient to protect these areas because drilling is absolutely incompatible with maintaining quality wetlands and riparian areas. Riparian and wetland areas comprise only a small percentage of the land in the Thunder Basin NG and should be off limits to development. The oil and gas leasing plan for the Cimarron and Comanche NGs provides No Surface Occupancy (NSO) stipulations for wetlands and riparian areas. The Forest Service has made a commitment in recent years to improve and enhance riparian and wetland areas. Allowing oil and gas development in these important wildlife areas is in contrary to this commitment.

The Thunder Basin NG plan inadequately addresses steep slope and fragile soil areas. The plan provides only a CSU stipulation for these areas, which would allow oil companies to actually locate and develop wells on these unstable areas. The Little Missouri NG oil and gas plan requires NSO stipulations for these areas. Steep slopes and fragile soil areas should not be open to development. Problems with erosion are inevitable and reclamation will be extremely difficult if not impossible. The Forest Service needs to tighten restrictions in these areas or not allow leasing at all.

Although we are pleased to see a recognition of the importance of various recreation areas in the plan, we feel that restrictions in

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these areas are inadequate. The recreational attributes of the Rochelle Hills and Upton-Usage areas will not be protected by a CSU stipulation. Full field development could still occur in these areas destroying their recreational value. We support stronger protection for these areas. Since this EIS will amend the Medicine Bow forest plan, we support an amendment which recognizes and provides the recreational importance of these lands and provides management prescriptions that would protect and enhance the recreational opportunities these areas offer.

The protection for raptors and grouse is also inadequate. The Little Missouri NG plan provides NSO stipulations around both raptor nests and grouse strutting grounds. Why are these same species subject to less protection in the Thunder Basin NG? Since timing stipulations are only applicable for oil exploration and not development, the restrictions provided by the plan are virtually meaningless. The Forest Service needs to provide sufficient protection for these species.

Although the Forest Service is claiming in this document that it is making both the availability decision under 36 CFR 228.102 (d) and the leasing decision for specific lands under 36 CFR 228.102 (e), the plan fails to reach the level of specificity needed to make the decision required under subsection (e). Much greater detail and on-the-ground study needs to occur in order to make this second decision. The Forest Service has not fully complied with subsection (d) by not taking its responsibilities seriously in making the decision regarding lands available for leasing. By finding 100% of the Thunder Basin NG available for leasing, the Forest Service is clearly implying that the Thunder Basin NG has no other resources as important as oil and gas reserves. Wildlife, riparian areas, wetlands, soil stability, water quality, and recreation are all subordinate to oil and gas exploration and development in this draft plan.

Major changes need to occur in this plan to properly protect wildlife, recreational opportunities, soils and water quality from the adverse impacts of oil and gas development. The Thunder Basin NG plan is a long way off to just be brought up to par with other national grassland oil and gas leasing plans, and we maintain that these plans have serious flaws in their levels of protection for other resources.

The Forest Service needs to closely examine its multiple use mandate, particularly in regards to oil and gas development. If every single acre of the Thunder Basin NG is open to oil and gas leasing, than oil and gas has become a resource above all others. Oil and gas must be properly integrated into multiple use management. If other resources such as wildlife, recreation, or
soil and water protection are higher priorities for a section of the grassland than oil and gas leasing should not be permitted.

The Thunder Basin NG is a very special place. It may not have the awe-inspiring mountains that the rest of the Medicine Bow National Forest has, but it does have beauty all its own. The rugged escarpments, isolated pine forests in the midst of prairie, and the unobstructed vistas of the wide-open range make the Thunder Basin NG an exceptional area. We hope that the final plan will recognize these values and not treat the Thunder Basin NG as the unwanted stepchild of the Medicine Bow National Forest.

We appreciate this opportunity to comment.

Sincerely yours,

Kirk Koepel
Associate Representative
Sierra Club

Sandy MacIntyre
Regional Associate
The Wilderness Society

Forest Supervisor
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

July 10, 1992

Dear Sir:

I am writing to you concerning the draft plan for oil and gas leasing in the Thunder Basin National Grasslands.

In the interest of sound and responsible land management I urge you to have the following areas off-limits to leasing in the Grasslands:

1) all riparian areas and wetlands
2) all highly scenic areas (buttes) and step areas
3) important landscape features (Rockie Hills) and crucial wildlife ranges
4) a one mile buffer zone around raptor nests, roosts and gliding strutting grounds

I appreciate this opportunity to comment.

Sincerely,

Chuck Neal
1526 AG proofs
Chey, Wyoming 82414
July 15, 1992

Mr. Terry Dills
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Subject: Comments on Oil and Gas Leasing - Thunder Basin N.G.

Dear Mr. Dills:

Pacific Power & Light Company appreciates the opportunity to share its comments and concerns about the Draft EIS. Generally, the document appears to be well written and well defined. It also appears NEPA compliance and current regulations for oil and gas leasing considerations [36 CFR 228.102 (c)] have been properly met.

We do however have some concern regarding construction, operation and maintenance of power lines (existing and future) required to serve oil and gas lease areas. The USFS's preferred action (Alternative 4), should take into consideration the secondary needs of others. It should also not arbitrarily restrict construction of other proposals in areas specifically restricted from oil and gas production.

For example, the No Surface Occupancy (NSO) stipulation for reasons of recreation, cultural resources, severe winter relief range, or visual quality objectives (VQO) may be prudent management objectives for oil and gas leasing, but it may not be reasonable when compared to a power line across the same area. Power lines readily avoid such problems.

Another example is the Forest Plan's Controlled Surface Use (CSU) area of retention along Highway 16. The CSU stipulation may maintain the existing VQO of retention, but Highway 16 also provides a valuable corridor in which to build pipe lines or power lines. The corridor concept is part of the larger management objective of "multiple use on public lands".

Pacific realizes that waivers and special stipulations, in accordance with the Forest Plan, are usually left up to the District Ranger or authorized officer. This process has worked well in the past and should not be changed, but we feel the proposed DEIS should include a statement to prevent confusion of the leasing regulations, when granting waivers to a third party authorized under 36 CFR FLPM4A different regulations.

Sincerely,

[Signature]

Land Agent - Wyoming Region

[Note: The note on the page is not legible.]

July 17, 1992

Encampment
Wyoming 82325

Dear Mr. Heath,

I am concerned about the oil and gas leasing in the Thunder Basin. I believe that certain regions should be off-limits to leasing. A 1-mile buffer zone should be designated around raptor nests and roosting sites. Other areas that should be off-limits to oil and gas leasing are:

1) Grouse nesting grounds
2) Crucial antelope + deer winter range
3) Areas with steep slopes + fragile soils
4) Riparian areas
5) Wetland areas
6) Important recreation areas, such as the Rochelle Hills, Upton Osage pine forest, the Weston pine forest.

You need to remember that Wyoming's recreational value is as important as its potential as an energy-producing state.

Sincerely, Shelley Ellis
July 7, 1992

Mr. Terry B. Dilts
Medicine Bow National Forest
2468 Jackson Street
Laramie, WY 82070-6532

Dear Mr. Dilts:

This letter references the review of the Draft EIS for the OIL AND GAS LEASING ANALYSIS FOR THE THUNDER BASIN NATIONAL GRASSLAND.

Our comments of 3 April, 1992, for the initial review of the above document remain applicable.

Sincerely,

Richard D. Gorton
Chief, Environmental Analysis Branch
Planning Division

July 14, 1992

Gerald G. Heath
Forest Supervisor
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Dear Gerald:

I was really disappointed in the draft plan for oil and gas leasing in Thunder Basin National Grassland. Opening for leasing the entire area, and inadequately protecting winter range for big game, nesting sites for raptors, leks for grouse, and the important riparian and recreation areas hardly does justice to the multiple use concept. I hope that we can come up with a better plan than this.

Sincerely,

[Signature]
July 17, 1992

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

RE: Draft Environmental Impact Statement
Thunder Basin National Grassland

Dear Mr. Dilts:

I am writing to express my opposition to the imposition of undue oil and gas lease restrictions—such as NSO stipulation—in the area embraced by the TBNG. Oil and gas operations have historically been accepted as compatible with recreation activities in this area and no need can be demonstrated to restrict future activity. There are more than 50 developed oil and gas fields in the TBNG and future operation could hardly involve more than a couple percent of the area.

Failure to issue future leases or to issue new leases with NSO restrictions would, in effect, halt further exploration in the TBNG area. No operator in his right mind would conduct expensive exploratory drilling on private or state lands without access to leases on nearby Public lands to develop in the event of a discovery. A severe economic loss would inure to federal, state and county entities—and with no discernible offsetting environmental benefit. Certainly, a Controlled Surface Use provision makes more sense.

Sincerely,

Harry Ptasynski
gas

Amoco Production Company, a subsidiary of Amoco Corporation, is incorporated for the purpose of exploring for and developing oil and gas resources. Amoco has conducted operations in northeastern Wyoming and still has leases and joint ownership in existing wells in the area. Therefore, management policies outlined in this draft EIS could have an effect on Amoco's interests in the area.

The Thunder Basin National Grassland (TBNG) is an important area for oil and gas exploration and development, and Amoco supports the Forest Service's efforts to comply with 36 CFR 228.102 so that oil and gas leasing will resume. We also appreciate the Forest Service's accomplishment in getting the draft EIS out to the public in less than a year from the initial public scoping notice.

We strongly support the proposal to replace the No Surface Occupancy (NSO) stipulation in the Upton-Osage deer winter range with a Controlled Surface Use (CSU) stipulation. Information in the DEIS regarding this area indicates that NSO is too restrictive. For example, on page IV-15 of the DEIS the Forest Service states "In abnormally severe winters, occurring approximately once every 10 years, [the Upton-Osage deer winter range] becomes critical." It is further stated that "Displacement due to oil and gas activities during abnormally severe winters and other times of severe stress could cause significant mortality." However, it is common wisdom that an elevated big game mortality rate would be expected during an abnormally severe winter, regardless of what level and type of activity is occurring. The Forest Service also states on page IV-14 of the DEIS that "Antelope,
deer and elk populations are generally above the Wyoming Game and Fish Department objectives within TBNG. Therefore, the potential threat to the deer population is much lower than if big game populations were in a degenerative state. We believe that other viable means of mitigation which do not totally preclude access to this area on a permanent basis should be used.

We do not support the high degree of emphasis placed on motorized recreation opportunities in the Forest Service's Preferred Alternative 4. Motorized recreation is a use which has historically been deemed fully compatible with energy activities, and this alternative emphasizes this use at the expense of future oil and gas exploration and development in five areas with a total of 23,240 acres. We believe that many motorized recreation opportunities on the TBNG are due to oil and gas access roads.

The Forest Service has not demonstrated in the draft document that the projected impacts from oil and gas activities justify the proposed access restrictions to areas identified for semi-primitive motorized recreation. The data contained in Chapter 3 does not support the premise that recreation activities are of such a magnitude on the TBNG that exceptional management consideration should be given to motorized recreation.

The DEIS states "Grazing livestock, roads, railroad tracks and mineral activities are part of the view. Travelers can observe working ranches with fences, windmills and cattle; active coal mines with huge open pits, coal silos, draglines and trucks; oil and gas fields with pump-jacks, treaters, tanks, storage tanks, pipelines and trucks; and a wide variety of wildlife species. " It is, therefore, reasonably safe to assume that when members of the public venture out to the TBNG in their cars, they do not expect a "wilderness" experience. In fact, on page III-19 the DEIS indicates that the communities involved are tolerant of the impacts of all types of intrusions for economic reasons. It is therefore ironic that the Forest Service proposes to restrict the very areas which make motorized recreation possible in the first place.

We disagree with the statement on page IV-25, "Since movement of Recreation Opportunity Spectrum (ROS) classes toward development is relatively easy and restoration toward the pristine end of the scale is difficult and expensive, a movement toward development should be considered an irreversible and irretrievable commitment of the recreation resource." Oil and gas development requires a relatively small area for a limited time after which it is returned to its natural condition. To declare that oil and gas development will result in an irretrievable loss of recreation opportunities is an overstatement and does not recognize that oil and gas activities are short-term and fully compatible with other uses on the TBNG, as demonstrated by activity which has occurred over the last several decades.

The Forest Service has not accurately identified and analyzed the impacts each alternative could have on opportunities for future exploration and development. Additionally, the Reasonably Foreseeable Development (RFD) is misapplied in the Reasonably Foreseeable Development Impacts on the TBNG, that reclaimed or revegetated sites can be judged "Existing Impacts". The Forest Service establishes the reclamation standards which must be met, and it must sign off on all reclamation projects before the reclamation bond is released to the company responsible for the disturbance. Table 4-2 actually displays historical uses of the TBNG, not cumulative soil disturbance impacts.

While the Forest Service attempts to display reasonably foreseeable impacts from future oil and gas activities, it has failed to consider the fact that once a well goes into production, the well site shrinks in size. Therefore, long-term effects associated with development are less than the 250 acres discussed in the DEIS.

We recommend that the reference to hydrogen sulfide be deleted as issue 13 for: "Oil field chemicals, wastes and releases are regulated by the Wyoming Department of Environmental Quality (DEQ) and the Wyoming Oil and Gas Conservation Commission (OGCC) and are applicable to all alternatives. If the State rules and regulations are met, there will be no measurable direct effects on water quality in any alternative".

In conclusion, the effects anticipated from the maximum reasonable foreseeable development scenario indicate that a very small percentage of the TBNG would be impacted over the 15-year planning period. Such minimal impacts do not justify the increased restrictions proposed in the Preferred Alternative. Amoco believes the concerns expressed here can be addressed in the Final Environmental Impact Statement. We encourage the Forest Service to adopt Alternative 2 as its
Preferred Alternative with the winter range modification outlined in Alternative 4.

Thank you for considering our comments.

Jan Roberts
Sr. Environmental Specialist

cc: G.L. Austin
J.A. Deschamp - Salt Creek
R.D. Howard - AB 5149

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Dear Mr. Dilts:  

As a resident of the State of Wyoming, I am writing to register my comments concerning the Draft Environmental Impact Statement I have referenced above. I support the Forest Service's efforts to comply with 36 CFR 228.102 in order to resume oil and gas leasing on the Thunder Basin National Grassland. However, the level of lease restrictions imposed will have a considerable affect on whether or not an oil and gas lease is ever purchased or drilled. It cannot be assumed that if no new leasing takes place, wells will be drilled on private or state lands. If that were the case, companies certainly would not be awaiting the completion of this leasing document. Prospects have not been drilled because those companies seeking to explore the prospects have been unable to establish a sufficient land base to cover a potential reservoir.

I strongly support the Forest Service's proposal to replace the no-surface occupancy stipulation in the Upton-Orange deer winter range with a controlled surface use stipulation. The facts support that move, and I think it is a prudent one for the Forest Service to take.

I would encourage the Forest Service to adopt Alternative 2 as the Preferred Alternative, with the addition of the winter range modification which has been outlined in Alternative 4 as I mentioned above.

Finally, I oppose the application of no-surface occupancy stipulation in the semi-primitive motorized recreation areas where oil and gas exploration and production has historically been accepted as compatible with recreation opportunities. The Draft Environmental Impact Statement does not demonstrate the need to impose a no-surface occupancy stipulation to protect the areas of motorized recreation. Rather, the Draft Environmental Impact Statement reports that communities are accepting "all impacts of all types of intrusions for economic reasons."

Thank you for the opportunity to submit my comments.

Very truly yours,

[Signature]

John J. Blumstrom
Attorney at Law
P. O. Drawer 1560
892 West River Cross Road
Casper, Wyoming 82002
(307) 266-0313

July 20, 1992

Mr. Terri B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Re: Forest Service Draft Environmental Impact Statement for Oil and Gas leasing on the Thunder Basin National Grassland
July 21, 1992

Mr. Terry Dilla
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Re: DEIS
Thunder Basin National Grassland

Dear Mr. Dilla:

I represent Mr. W. A. Moncrief, Jr., oil and gas operator throughout the Powder River Basin and all of Wyoming. The following comments apply to your DEIS covering the TBNG.

We support your efforts to comply with 36CPR228.102 for resumption of oil and gas leasing on the TBNG.

We support your proposal to replace the NSO stip in the Upton-Ogallala winter range with a CSU stip.

Any lease restrictions imposed by the FS has a negative effect on whether or not to lease. No leasing means no drilling. From my experience of 37 years in the PNB, oil and gas activities are fully compatible with other uses on the TBNG and elsewhere. Therefore, multiple use must continue.

We seriously oppose any NSO stip in the five semi-primitive motorized recreation areas. Recognizing that the FS and BLM have been dictated by recent congressional moves to emphasize wildlife and recreation in their administration of multiple use does not call for NSO stip for oil and gas to limit areas in the TBNG to motorized recreational vehicles only. Both use should be allowed as multiple use.

We encourage your adoption of Alternative 2 as the preferred alternative.

Very truly yours,

W. A. MONCRIEF, JR.

By:

G. L. Edgeman
Joint Operations Manager

cc: W. A. Moncrief, Jr.
Mr. Terry B. Diltz, Project Coordinator
Medicine Bow National Forest
2668 Jackson
Laramie, WY 82070

RE: OIL & GAS LEASING ON THE THUNDER BASIN NATIONAL GRASSLAND
Environmental Impact Statement

July 22, 1992

Gentlemen:

Being a Wyoming resident for twelve years I am familiar with the subject Grasslands area and its importance to the economic well-being of the State of Wyoming. I appreciate the opportunity to make the following comments regarding the proposed "Environmental Impact Statement (EIS)" covering the Thunder Basin National Grasslands (TBNG).

1.) To reduce the availability, or further restrict the leasing of Federal lands on the TBNG will cause a continued exodus of oil and gas exploration and development dollars from our state and region. Additional regulation of the oil and gas industry in this area is not warranted considering their positive history as good operators that have shown an understanding of their effect on the environment.

2.) I strongly support the Forest Service's recommendation to continue leasing on the TBNG. However, I do request your acceptance of Alternative 2 with the proviso to replace the NMO stipulation in the Upton-Gease deer winter range with a 'Controlled Surface Use'. To restrict this area with a NMO when the severe winter weather is applicable in only one out of ten years is simply unreasonable.

3.) It is difficult to understand the Forest Service putting such a strong emphasis on motorized recreation, while in the same area restricting oil and gas activities. Motorized recreationists often take advantage of the oil and gas industries' access roads.

It is appropriate that the Forest Service recommend continued leasing of the Federal government's oil and gas minerals. I do strongly urge you, however, to realize that the additional restrictions as proposed in Alternative 4 could be further causes for the oil and gas industry to withdraw from the state. Please support Alternative 1. The oil and gas industry has already proven itself as good operators under current regulations.

Sincerely,

David W. Ellyn

A-70
July 21, 1992

Best Copy Available

Medicine Bow National Forest
Attn: Mr. Gerald G. Heath,
Forest Supervisor
2468 Jackson
Laramie, WY 82070

Dear Mr. Heath:

I was appalled to learn that the U.S. Forest Service is considering leasing the entire Thunder Basin National Grassland for oil and gas development.

It would seem to me that greed (for the almighty dollar) is again, playing a massive role in your absurd, proposed action to lease 100% of all available lands, or 535,000 acres of Thunder Basin National Grassland! This is not the Forest Management Planning that I would consider to be in the best interest of Forest Protection with its many important wildlife habitats and recreational areas in emergency. The question arises as to whether Environmental Impact Studies have taken place over the entire proposed area; many areas...are vastly different in eco-structure and should not be generalized.

'Forest Service' is quickly becoming an oxymoron. You must turn your goals and fore-sight to the future of the Forest to preserve and protect the wildlife - plant and animal alike.

Please reconsider your current leasing proposal and implement change to protect all critical wildlife habitats including grouse strutting grounds, crucial winter range for deer and antelope, and the nest and roosting sites of the protected birds of prey (eagles, hawks, falcons and ospreys). Also, you must enforce protection of all National Scenic, Historical and Recreational Trails with a substantial buffer zone as well as the steep slope and fragile soil areas.

Sincerely,

Karen Hitchings
P.O. Box 1228
Thermopolis, WY 82443

July 20, 1992

Chaparral Resources, Inc.

621 17th Street, Suite 1301 / Denver, Colorado 80203 / Telephone (303) 293-2340

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Re: Restrictive Use
Thunder Basin National Grass Lands

Dear Mr. Dilts:

Our company has become aware of the upcoming hearings regarding additional restrictions and stipulations relative to land use in the Thunder Basin National Grass Lands. We are adamantly opposed to any further restrictions placed on the oil industry in their efforts to develop and explore potential reserves of hydrocarbons in this general area. We strongly recommend that the Forest Service's efforts relative to 36 CFR 228-102 be supported and approved. We believe that the restrictive use of motorized vehicles already in place is more than sufficient for any future oil and gas operations. Additionally, inasmuch as there is a great amount of private and state lands involved within this general overall area, it makes no reasonable sense to restrict the federal lands within same.

We strongly urge the Forest Service to adopt a reasonable and multiple use view for the Thunder Basin National Grass Lands and we further encourage a continued policy that will allow both motorized recreation and oil and gas exploration.

Sincerely yours,

Paul V. Mooiver
President
U. S. Forest Service
July 21, 1992
Page 2

Insofar as the Upton-Osage Deer Winter Range is concerned, it is respectfully suggested that a Controlled Surface Use ("CSU") be used in lieu of an NSUS. As the base information for the EIS indicates, the NSUS is too restrictive since this area only becomes a winter relief habitat about once every ten years. CSU stipulations should sufficiently protect the area without totally foreclosing other surface opportunities.

As the Forest Service appreciates, it is important to protect the environment; however, this goal must be appropriately balanced within our society so that the government will not waste valuable resources and harm the environment by excluding man from playing his or her part in the natural ecosystem. As Congress has indicated, the BLM and the Forest Service are wise to continue utilizing the "multiple-use" concept so that areas like the Thunder Basin areas are preserved and utilized as efficiently as possible. In this instance, it is important to the National Energy Policy and the State of Wyoming that reasonable and prudent oil and gas exploration and production operations be permitted in the Thunder Basin. Thus, the Forest Service is encouraged to adopt Alternative 2 as the preferred alternative, along with the recommended change concerning the Upton-Osage Deer Winter Range modification to a CSU stipulation area.

In closing, I would like to urge the Forest Service to do whatever is possible to ensure that environmental reviews (EA and EIS) are reasonable and not taken to extreme so that tax dollars and other valuable resources are preserved for other needs of dire importance to this country.

Please be assured that this citizen appreciates not only the effort that was expended in preparing the EIS, but also the opportunity to participate in the public comment process.

Very truly yours,

KIRBY J. ILER

Kirby J. Ilcr
121 Sarah Lane
Cody, Wyoming 82414

July 21, 1992

U. S. Forest Service
Attn: Mr. Terry R. Dilts
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Re: Draft Environmental Impact Statement
Thunder Basin National Grassland

Dear Mr. Dilts:

This letter is written concerning the U. S. Forest Service's Draft Environmental Impact Statement ("EIS") for oil and gas leasing on the Thunder Basin National Grassland ("Thunder Basin"). At the outset, I would like to compliment the Forest Service on its work and initiative in preparing the EIS.

According to the draft EIS, it appears the Forest Service would be justified in resuming oil and gas leasing for the Thunder Basin in accordance with 36 C. F. R., §228.102 (1990), especially considering that reasonably foreseeable development activity would be less than one percent of the surface area within the Thunder Basin over the 15-year planning period.

In addition, according to the information in the EIS, no surface occupancy stipulations ("NSUS") are unwarranted for the five semi-primitive motorized recreation areas. Oil and gas activities have been compatible with such recreational opportunities over the years. As the EIS indicates, communities and areas surrounding the recreation areas have accepted various types of uses including oil and gas operations which provide substantial economic and tax benefits. It is suggested that the Forest Service and others promote topographic relief, such as planting Ponderosa Pines and other vegetation, to screen the two uses if visual aesthetics are a concern.
July 21, 1992

Gerald G. Heath
Forest Supervisor
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Heath,

I hope that the gas and oil development will stay away from:

- Sage and sharptail grouse strutting grounds.
- Crucial winter range for deer and antelope.
- Steep slope and fragile soil areas.
- Riparian and wetlands
- Recreation areas as Rochele Hills, Upton-Osage pine forest and the Weston pine forest
- And will leave a 1 mile buffer zone around raptor nests and roosting sites

Margaret Krake
Graybull, WY 82426

July 20, 1992

Jim Morehouse
156 Crane St. #175
Laramie, Wyoming 82070

Gerald D. Heath
Forest Supervisor
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Dear Mr. Heath,

I am writing to voice my opposition to gas and oil exploration in the Thunder Basin National Grassland. I understand that the Forest Service plan for the Thunder Basin National Grassland (TBNG) calls for leasing all 520,000 acres for oil and gas development. To put gas and oil above all other resources, including recreation, wildlife, soils, GRASS, and water, is against the best interests of the public as well as the ecosystem that the National Grasslands was intended to reestablish. If halting the development is not something you think you can accomplish, then these are minimal guidelines that I think should be off-limits in the Forest Service plan for TBNG:

A. a 1 mile buffer zone around raptor nests and roosting sites.
B. sage and sharptail grouse strutting grounds.
C. crucial winter range for deer and antelope.
D. steep slope and fragile soil areas.
E. riparian areas and wetlands.
F. important recreation areas, including the Rochelle Hills, Upton-Osage pine forest, and the Weston pine forest.

Thank you for your consideration.

Sincerely,

Jim Morehouse
Mr. T. R. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

The proposal for NSO in the TANG would be considered preposterous. It was not made in the present regulatory climate. We are seeing the greatest contrivance of a critical industry which could be imagined and then the government is considering more regulations to further the destruction of the only basic industry which keeps this part of Wyoing somewhat solvent. We are importing over half of one of our most important basic commodities and the government does all it can to discourage production.

I grew up from birth in the Osage oilfield and with my father, have run a successful company in the Mosh Creek-Clareton area for the past 30 years. I recently sold everything because I could foresee the coming problems with trying to operate a small oil company in today's negative business climate. We made a business of buying and producing properties when other companies could not do so. We averaged 500 to 600 bbl of production from over 100 wells during this time and conducted several water flood operations. We employed up to 25 people and paid many millions of dollars in state and local taxes along with royalties to the federal gov't. I do not speak as an outsider, but as a person with some experience in the subject.

During this time I have seen the oilfield progress from abuse of the land to the present state of complete restoration. I can point out numerous places where activities have taken place which have been returned to original conditions. I have had operations in the middle of deer habitat and can assure anyone that they were not affected. I have watched antelope graze unconcerned a hundred yards from operating rigs. The animals soon learn that they are not being menaced by oil activity any more than by ranching or by automobiles on the highway.

The only recreation activity which takes place in this area is hunting in the fall. It is possible that oil activity improves hunting success because the animals become accustomed to people. There are very few people who want to see their vacations wandering around the prairie. If there are people out there who are offended by an oil well, they better be walking or riding a horse. Otherwise they are the consummate hypocrit.

If the NSO stipulation were implemented it would essentially remove this area from leasing activity. Oil is where you find it and the prospectors cannot confine himself to only certain areas if he is to find oil.

Robert S. Young, Jr., M.D.

Mr. Gerald G. Heath
Forest Supervisor
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Dear Mr. Heath:

I am writing to express my concern over the recent Forest Service draft plan calling all 520,000 acres of the Thunder Basin National Grassland to be available for oil and gas leasing. I implore you to reconsider this plan on land that belongs to all of the people of this country and not solely to the oil and gas industry. Recreation, wetlands, wildlife, fragile soil areas, steep slopes, wildlife habitat, riparian areas and water tables are all part of this environment and each is just as important as any single oil or gas lease. It is your specific responsibility as steward of this land to see that all resources are protected equally and not just those that are politically expedient.

Thank you for your time.

Robert S. Young, Jr., M.D.
July 24, 1993

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

re: Draft Environmental Impact Statement/Thunder Basin National Grassland

Dear Mr. Dilts:

This letter is being written to express my concerns about the above referenced matter. I do support the Forest Service efforts to comply with 36 CFR 228.102 in order to resume oil and gas leasing on the Thunder Basin National Grassland (TBNG).

I oppose the application of No Surface Occupancy (NSO) stipulations in the five primitive motorized recreation areas where oil and gas has historically been accepted as compatible with recreation opportunities. The Draft Environmental Impact Statement (DEIS) does not demonstrate the need to impose NSO to protect the area's motorized recreation. Rather, it reports that communities are accepting "all impacts of all types of intrusions for economic reasons." Topographic relief, ponderosa pine and pinon/juniper vegetation "which offer pleasant Viewing" in these semi-primitive motorized recreation areas, should be considered a means to enhance screening of operations rather than a basis for restricting oil and gas opportunities. As demonstrated over the last several years, oil and gas activities are fully compatible with other uses on the TBNG.

The level of lease restrictions imposed will have a considerable affect on whether or not a lease is ever bought and/or drilled. The Forest Service must not assume that if no new leasing were to take place, the wells would be drilled on private or state lands. If that were the case, companies would not be anxiously awaiting the completion of the leasing document. Many companies are unable to drill their prospects because they have been unable to establish a sufficient land base to cover a potential reservoir.

I strongly support the Forest Service's proposal to replace the NSO stipulation in the Upton-Osage deer winter range with a Controlled Surface Use (CSU) stipulation. All information in the DEIS indicates that NSO is too restrictive since, "this area becomes severe winter relief habitat about one out of every 10 years when severe weather concentrates both mule and white-tailed deer in the area."

I encourage the Forest Service to adopt Alternative 2 as the Preferred Alternative with the addition of winter range modification as outlined in Alternative 4 (as described above).

I hope that my comments will have a positive influence on the important issues you are addressing. If I can be of further assistance, please contact me at the above address.

Sincerely,

Robert L. Bailey
July 24, 1992

Mr. Gerald G. Haett
Forest Supervisor
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Heath:

It has recently come to my attention that the Forest Service plan for oil and gas leasing in the Thunder Basin National Grassland will allow leasing of all 520,000 acres of the Grassland, while providing little protection for the wildlife and soils in the area. This is deeply troubling to me, as it seems to indicate that the Forest Service values oil and gas development above other natural resources. Until now, I had always believed that one of the first priorities of the Forest Service was to protect the natural, pristine beauty of our country's designated preserves. It is becoming clearer every day that we must carefully consider the environmental consequences of our actions if we want future generations to be able to enjoy our country's national treasures.

In order to protect the steep slope and fragile soil areas, recreational sites, wildlife habitats, and wetlands in the Thunder Basin National Grassland, provisions similar to those included in other oil and gas leasing plans on national grasslands must be made. These include, but are not limited to, the following:

1) Create a one mile buffer zone around raptor nests and roosting sites.
2) Make sage and sharptail grouse strutting grounds off-limits for oil and gas development.
3) Make the crucial winter range for deer and antelope off-limits.
4) Make the steep slope and fragile soil areas, riparian areas, and wetlands off-limits.
5) Do not allow oil and gas development on important recreation areas, including the Rochelle Hills, Upton- Osage pine forest, and the Weston pine forest.

I consider this issue to be of the utmost importance, not only for the state of Wyoming, but for our nation as well. Please do not allow intense oil and gas development to mar one of our state's prized treasures. With proper protection for wildlife, their habitat, and recreational areas, it should be possible for sensible development to take place without disturbing the natural beauty of this area.

Sincerely,

Kathleen M. Barnett

A-83

July 23, 1992

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts,

I recently received a copy of the draft Environmental Impact Statement on the Thunder Basin National Grassland (TBNG). I do appreciate the opportunity to be involved in the decisions on our Federal properties. It is my recommendation that the Forest Service change their preferred alternative to Alternative 2 and add winter range modification as outlined in Alternative 4.

The TBNG does not contain wilderness, wild and scenic rivers, prime farmlands, prime forest lands, or "roadless" areas. I see no reason for the Forest Service to prefer the restrictive Alternative 4. As stated in the draft EIS, "Grazing livestock, roads, railroad tracks, and mineral activities are part of the view." Since oil production is rapidly declining in Wyoming and the United States, the Forest Service must continue to mitigate issues rather than propose stipulations such as No Surface Occupancy (NSO). As an employee of Marathon Oil Company, my experience has been that NSO stipulations only tend to prevent the development of minerals on Federal properties. Other alternatives are available to address the concerns of impact by our industry on other activities.

Rather than NSO stipulations, I recommend Controlled Surface Use (CSU) to address any winter ranges and allow the industry to work with your agents to blend in their activities with the surrounding environments. CSU stipulations in other areas have been quite satisfactory for supporting winter ranges. One only has to look at one of your neighboring National Forests (Wasatch-Cache) to see that these oil and gas activities provide an outstanding example of our compatibility with the environment. These stipulations and the standard stipulations should adequately mitigate any concerns.

Because of my past experience in field projects in the oil industry, I am quite confident that our industry can explore and develop properties with minimal impact. I urge you to change your preferred action to Alternative 2 with the addition of the winter range modification.

Please keep me informed as to any future actions on this proposal.

Sincerely,

Pet Childress
26 Spino Dr.
Cody, WY 82414

A-84
July 23, 1992

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Re: Comments for DEIS
Thunder Basin National Grassland
Powder River Basin

Dear Mr. Dilts:

Upon review of a portion of the above referenced DEIS, I would like to have the following comments included in the records.

1. I support the Forest Service efforts to comply with 36 CFR 228.102 in order to resume oil and gas leasing on the TBNG.

2. I oppose the application of No Surface Occupancy Stipulations in the five semi-primitive motorized recreation areas where oil and gas has historically been accepted as compatible with recreation opportunities.

3. I strongly support the Forest Service’s proposal to replace the NSO Stipulation in the Upton-Osage deer winter range with a Controlled Surface Use Stipulation. It appears that NSO is to restrictive in this area since this area only becomes winter relief approximately one out of every ten years when severe weather concentrates deer herds in the area.

4. I encourage the Forest Service to adopt Alternative 2 as the Preferred Alternative with the addition of winter range modification as outlined in Alternative 4 (as described in item 3 above).

Thank you for this opportunity to comment on the Draft Environmental Impact Statement for oil and gas leasing on the Thunder Basin National Grassland. It is a pleasure to be part of this decision making process.

Sincerely,

William Dyson
Karin Kohl

Concerned Citizens of Wyoming
July 22, 1992

Mr. Terry Dilts
Medicine Bow National Forest
3466 Jacksorn
Laramie, Wyoming 82070

Subject: Comments on Oil and Gas Leasing - Thunder Basin N.G.

Pacific Power appreciates the opportunity to share its comments about the Draft EIS. Generally, the document appears to be well written and well defined. It also appears NEPA compliance and current regulations for oil and gas leasing considerations (36 CFR 228.102 (e)) have been properly met.

We do however have some concern regarding construction, operation and maintenance of power lines (existing and future) required to serve oil and gas leases. The USFS's preferred action (Alternative 4), should address the secondary needs of others, so as not to restrict proposals by others for projects in specific areas restricted from oil and gas production.

For example, the no surface occupancy (NSO) stipulation for recreation, cultural resources, severe winter relief range, or visual quality objectives (VQO) may all be prudent management objectives for oil and gas leasing, but NSO may not be reasonable when it comes to building a power line required to serve oil and gas leases which are outside the restricted area. The DEIS needs to be flexible enough to allow for such variations.

Another example is the Forest Plan's Controlled Surface Use (CSU) "area of visual retention" along Highway 16. The CSU stipulation may maintain the existing VQO of retention, but Highway 16 also provides a valuable corridor to build pipe lines and power lines. The corridor concept is part of the larger management objective of "multiple use on public lands" and overall greatly lessens the impacts of development on public lands. Likewise, to bury a high voltage power line for visual retention may be economically unreasonable and may cause greater environmental damage to the soil from erosion, the drying effect of heat dissipation and continual maintenance of the power line and oil filled cooling/pump stations.

We realize waivers and special stipulations for right-of-ways, in accordance with the Forest Plan and current regulations, are allowable and left to the discretion of the District Ranger. This process works well and should not be changed. However, we feel the proposed DEIS should make a direct statement giving the authority to allow waivers to third parties, and each proposal reviewed on a case-by-case basis. This properly spells out the situation and prevents unilateral decisions or individual interpretations of regulations at a later time. It also allows for better development of resources according to the Forest Plan.

Sincerely,

[Signature]

Ted Bass
Land Agent - Wyoming Region

THje
July 22, 1992

Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

ATTN: Mr. Terry B. Dilts

Re: Thunder Basin National Grassland

Dear Mr. Dilts,

This is to support the Forest Service’s efforts to comply with 36 CFR 228.102 in order to resume oil & gas leasing in the Thunder Basin National Grassland (TBNG). Operating oil & gas fields, currently in the TBNG, have demonstrated the compatibility of oil & gas operations with recreation activities.

The United States must continue to encourage oil & gas exploration by minimizing leasing restrictions. Non-Surface Occupancy in the TBNG should not be considered as this would restrict prudent utilization of all resources. A Controlled Surface Use designation of the Upton-Osage deer winter range would be a more appropriate designation.

Thank you for reviewing this critical issue.

Very truly yours,

Jacob Mitchell, Director
Regulatory - Compliance

JPM/mg

July 22, 1992

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Dear Mr. Dilts:

I am writing to you concerning the Draft Environmental Impact Statement for oil and gas leasing on the Thunder Basin National Grassland.

I strongly support the Forest Service efforts to comply with 36 CFR 228.102 in order to resume oil and gas leasing on the TBNG. I also strongly oppose the application of NSO stipulations in the five semi-primitive motorized recreations areas where oil and gas has historically been accepted as compatible with recreation opportunities. The DEIS does not demonstrate the need to impose NSO to protect the area’s motorized recreation.

I am expressing these comments as a concerned citizen and also as an employee of Marathon Oil Company.

Sincerely,

L.M. Mueller
3815 Cooper Lane
Cody, Wyoming 82414

LMM/cas
July 23, 1992

Mr. Terry D. Dilts
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Dear Mr. Dilts:

Please note my strong opposition to the proposed "No Surface Occupancy" stipulations under consideration for the Thunder Basin National Grasslands. Based on experience in the Big Piny area with critical winter range for both deer and elk, a controlled surface use stipulation should be very adequate to protect wildlife. The NSO stipulation is inconsistent with multiple use and is not justified simply because some recreational user might prefer not to see an oil or gas well.

Yours truly,

C. C. Parsons

CC: CHAP

cc: Cheryl Feraud - PAW

July 23, 1992

Mr. Terry Dilts
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Re: Draft EIS
Thunder Basin National Grassland

Dear Mr. Dilts:

Axem Resources wishes to support efforts of the Forest Service on their latest review of the Thunder Basin National Grassland.

Based on our work over the past twenty years in the Grasslands, we have found compatible cohabitation of the oil and gas business with all the other uses of the Grassland. Oil wells and their associated traffic have historically been accepted with recreation such as hunting and motorized recreation.

Please do not restrict leasing in an area based on the assumption that we will still explore the area on private or state lands. That does not work for us. We need to have an entire prospect leased before a wildcat prospect can be undertaken. The risk is too great unless the potential reward is large enough. This high reward is only possible if the entire prospect is leased.

Thank you for considering our needs in your plans for the Grassland.

Yours very truly,

AXEM RESOURCES INCORPORATED

Brook J. Milfer
Vice President - Production

BJP:J11
Dear Mr. Heath:

I'm writing to you today about oil and gas leasing in the Thunder Basin National Grasslands. The Wyoming Chapter of the Sierra Club is very disturbed that the recently-released draft plan for oil and gas leasing in the Thunder Basin calls for leasing the entire area. We are adamantly opposed to allowing oil and gas exploration and development with no protection for wildlife habitat, wetlands, recreational areas or areas with potentially unstable soils. We believe that, in proposing to lease the entire Thunder Basin, the Forest Service is totally ignoring these other legitimate and valuable aspects of the area.

In the final oil and gas leasing plan, we urge the Forest Service to protect areas that are essential to wildlife populations by not allowing leasing in those areas. Crucial winter range for deer and antelope should be recognized and placed off-limits to leasing. Grouse, both sage and sharp-tail, are very sensitive to human disturbance while breeding and while rearing chicks. Leks and brood-rearing areas, which are often in or adjacent to riparian areas and wetlands, must be exempt from leasing. Raptors are also disturbed by human activity, and areas where raptors nest and roost should be protected with at least a one mile buffer zone.

Riparian areas and wetlands provide crucial habitat for terrestrial and aquatic wildlife. Stable, healthy riparian areas and wetlands enhance water quality by trapping sediments and other water pollutants, raise and maintain water tables, recharge underground aquifers, provide natural flood control, and provide unique recreational opportunities. Unfortunately, riparian areas and wetlands are extremely susceptible to human mismanagement. This can be seen all over Wyoming in downcut streams with little or no riparian vegetation, increased frequency and intensity of flood events, decimating water tables, changed streamflows from perennial to ephemeral, etc. These changes damage wildlife habitat, fisheries, recreational opportunities, water quality and quantity, and ultimately are detrimental to all values and uses of riparian and wetland areas. These important areas must be protected from the disturbance that would accompany oil and gas exploration and development. Leasing should not be allowed in or near riparian areas or wetlands.

Other important recreational areas should also be off-limits to leasing. Oil and gas drilling is not compatible with high quality recreational experiences, which are a legitimate use of public lands. Areas of special recreational value, such as the Rochelle Hills, the Weston pine forest and the Upton-Duage pine forest, should be protected from oil and gas leasing.

Finally, areas of potentially unstable soils should be identified, and in places where drilling activity (including road construction) may lead to soil erosion, leasing should be prohibited.

We are not opposed to reasonable energy development. But we are adamantly opposed to widespread oil and gas leasing without adequate protection for wildlife habitat, wetlands, recreational areas, and fragile soil areas. We urge you to revise the draft plan to include protection for these important other uses and values of our public lands. Thank you.

Sincerely,

Connie Wilbert
Chapter Chair
Mr. Terry B. Dilts  
Project Coordinator  
Medicine Bow National Forest  
2468 Jackson  
Laramie WY 82070  

Dear Mr. Dilts:  

I understand that the Forest Service is considering an Environmental Impact Statement for the Thunder Basin National Grassland that could contain a stipulation of no surface occupancy for at least a portion of the area. I have attached a copy of the Wyoming Geologic Survey Oil and Gas Map 1991 for your information. With a quick glance at the map it is very apparent that there are numerous fields in the area that are already developed. There is also a tremendous potential for additional development.

I am also attaching a copy of our oil and gas statistics for 1990 that will give you the production by field and also the cumulative. It will become obvious that this area is a very important Oil and Gas province in the State and therefore a N.S.O. stipulation would be devastating.

Please take these comments into consideration and feel free to contact me if you wish.

Yours very truly,  
Donald B. Basko  
State Oil & Gas Supervisor

DBR:mbd

---

Mr. Terry B. Dilts, Project Coordinator  
Medicine Bow National Forest  
2468 Jackson  
Laramie, WY 82070

Dear Mr. Dilts:

Agencies of the State of Wyoming have reviewed the Draft Environmental Impact Statement (DEIS) for Oil and Gas Leasing on the Thunder Basin National Grasslands. Enclosed for your consideration and use are comments resulting from that review.

I would direct your attention to the Wyoming Game and Fish Department (WGFD) comment letter and ask that the DEIS be corrected in those areas where deficiencies or inaccuracies in wildlife related data have been identified. I also would state that the second complete paragraph on page 2 of the WGFD comment letter should not be read to imply that the State of Wyoming endorses blanket No Surface Occupancy (NSO) stipulations on areas identified as crucial big game winter ranges.

Furthermore, I disagree with the preferred Alternative No. 4 requirement that 22,240 acres inventoried as "semi-primitive motorized" be leased with NSO stipulations. The mere fact that this area has been so inventoried is not sufficient justification for a stipulation as extreme as NSO.

Thank you for this opportunity to provide comments on the DEIS. Please keep this office informed as this issue progresses.

With best regards, I am  

Very truly yours,

Mike Sullivan

WS/cms  
Enclosures  
cc: State Review Agencies  
Wyoming Congressional Delegation
EIS 6502
U.S. Department of Agriculture
Forest Service
Medicine Bow National Forest and
Thunder Basin National Grassland
Draft Environmental Impact
Statement
Oil and Gas Leasing on the
Thunder Basin National Grassland
SDN: 91-082
Campbell, Converse, Crook,
Niobrara, and Weston Counties

Rod Miller
State Planning Coordinator's Office
Herschler Building, 4th Floor East
Cheyenne, WY 82002

Dear Mr. Miller:

The staff of the Wyoming Game and Fish Department has reviewed the
draft environmental impact statement (DEIS) for oil and gas leasing on the
Thunder Basin National Grasslands (TBNG). We offer the following comments
for your consideration.

Terrestrial Considerations:

The following big game herd units occupy surface controlled by the USFS
within TBNG: antelope (South Black Hills, HA 4,5), (Thunder Basin, HA 7 ),
and (Lance Creek, HA 6,8, 21,29); mule deer (Black Hills, HA 5,6), (Thunder
Basin, HA 7-11,21), and (Lance Creek, HA 14,167); white-tailed deer (Black
Hills, HA 5,6), and (Thunder Basin, HA 7-11,14,167). There is no big game
habitats north of Osga in the DEIS as deer severe winter

relief range, has been mapped as winter yearlong for both the Black Hills
mule and white-tailed deer herd units. Crucial winter range, not severe
winter relief, is immediately east of this area, but off TBNG surface.

However, there is severe winter relief range in the Woody Creek drainages of
antelope HA 27. In our Umbrella Memorandum of Understanding on oil and gas
leasing with the BLM (Appendix 5-G), timing limitation stipulations for big
game seasonal ranges are only placed on those habitats identified as crucial
by this Department. We suggest that the USFS remove any mention of, and the
restrictions placed on the 4,600 acres of habitat incorrectly mapped as

...
Three grounds within the Weston area are not indicated on the maps nor addressed within the document. These grounds are:

- **Head Dancing Ground:** SE NW Sec. 4, T54N, R69W
- **Prairie Dancing Ground:** NW NE Sec. 8, T54N, R69W
- **Gleason Dancing Ground:** SE NW Sec. 15, T54N, R70W

Section IV, Wildlife - The document states that production pits can adversely affect raptors, upland game birds, waterfowl, non-game birds, small mammals, mountain plover, fringed myotis, ferruginous hawks, black terns, loggerhead shrike, and long-billed curlews. We assume that, except for big or trophy game, it was an oversight to leave this impact out of the discussion of other species. Since these production pits have a known, usually fatal, impact on wildlife, we suggest that a range of options be developed to mitigate this impact and that these options be included in a new stipulation in this EIS. In this way, operators will know what special stipulations will be in place before they bid on a lease. If mitigation of these impacts is left to the APD stage of development, which is often characterized by short turn-around times, these measures could be overlooked.

Page IV-18, Small Mammals - We suggest elimination of the first sentence in this section since small mammals include moles, shrews, and bats in addition to rabbits and rodents.

Page Glossary-17 - The definition given on this page is for a threatened species, not threatened and endangered.

Page D-9, Application Methodology - In the second sentence of the third paragraph of this section, we recommend the words "and bird rookeries" be added after sharp-tailed grouse.

Page D-16 - Since the timing limitations for indicator species are specifically designed to protect active nests during the breeding season, do the controlled surface use stipulations protecting raptor nests and grousleks apply during the rest of the year? If so, why are these stipulations only applied in Alternatives 1 and 2?

Page D-16, Item 1 - Why weren't bald and golden eagles and peregrine falcons included in this item?

Pages D-19 and 21 - In the locations for the fishing reservoirs, the document lists Ranges as Townships.

The efforts to which Forest Service personnel have gone in keeping us informed and considering our concerns for wildlife habitat are sincerely appreciated. We also appreciate the opportunity to comment on this plan from its inception through the several steps.
July 24, 1992

Mr. Terry B. Dilts, Project Coordinator
United States Forest Service
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Dear Mr. Dilts:

RE: Draft EIS - Oil and Gas Leasing
Thunder Basin National Grassland

Our review and discussion of the subject document has generated some concern regarding the proposed NSO stipulations on certain oil and gas leasing areas. More specifically, our concern is with such a stipulation on those lands under Alternatives 3 and 4. This stipulation does not appear to be based on concerns for mass wasting, unstable soils or steeply sloped conditions, especially in Township 39, Ranges 68 and 69.

The proposed NSO stipulation on the Semi-Primitive Motorized Areas apparently is not required by the current Forest Plan. And, such a stipulation will likely chill oil and gas leasing activity in the areas affected, result in congestion with a goal of leasing Forest Service lands for oil and gas. Taking areas considered as viable prospects out of the leasing picture with a No Surface Occupancy stipulation will surely have an enormous dollar impact to both the state of Wyoming and the federal government in terms of taxes and royalties.

We respectfully ask that the Forest Service drop the No Surface Occupancy stipulations affecting Alternatives 3 and 4 under the subject EIS as being so done in the public interest.

Thank you for your consideration in this matter.

Sincerely,

H. D. Kemp, Assistant Director
Mineral Leasing and Royalty Compliance

July 13, 1992

-- MEMORANDUM --

TO: Rod Miller, Wyoming State Clearing House
FROM: Gary B. Glass, State Geologist

SUBJECT: DEIS on Oil and Gas Leasing in the Thunder Basin National Grasslands

The preferred Alternative No. 4 will place a “no surface occupancy” stipulation on an additional 22,240 acres. We prefer Alternative No. 6, Alternative No. 1 or No. 2, in that order. These three alternatives all provide adequate safeguards for other uses of the Forest and require compliance with the existing or a slightly modified version of the present Forest Plan.

Of all the alternatives, Alternative Nos. 1, 2, and 6 are the least discouraging to oil and gas leasing and exploration. The temporary nature and projected extent of oil and gas exploration and drilling should not have a significant impact on recreation in the Thunder Basin National Grasslands.

What is the origin of the defined terms, “semi-primitive non-motorized” and “semi-primitive motorized” given on page 13 of the Glossary? Are the management practices for these recreation opportunities mandated by Congress?

GBG:3b
MEMORANDUM

TO: MR. ROD MILLER
FEDERAL LANDS COORDINATOR
STATE PLANNING COORDINATOR'S OFFICE

FROM: JON F. JACQUOT
CHIEF ENGINEER
PUBLIC SERVICE COMMISSION

DATE: JUNE 19, 1992

RE: MEDICINE BOW NATIONAL FOREST DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR OIL AND GAS LEASING ON THE THUNDER BASIN NATIONAL GRASSLAND

Thank you for the opportunity to comment on the referenced matter. The Commission requests that no unreasonable restrictions be placed on the provision of utility service or on the construction of utility and pipeline facilities as a result of the referenced leasing action.

The Commission requests that, in cases involving oil and gas leasing, the Forest Service not restrict the construction of utility and pipeline facilities necessary for the exploration and production of oil and gas.

If you should have any questions regarding this matter, please let me know.

mj
BERCO RESOURCES, INC.

July 29, 1992

Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

RE: Draft Environmental Impact Statement
Oil and Gas leasing on the
Thunder Basin National Grasland

We appreciate the opportunity to comment on the Draft Environmental Impact Statement prepared by your office to address oil and gas leasing within the Thunder Basin National Grasland. Our company supports oil and gas leasing on lands within the grassland and strongly recommends the multiple use of these lands.

Your Preferred Alternative 4 has designated five (5) "semi-primitive motorized recreational areas" consisting of 22,240 acres. It is our understanding that any Federal oil and gas leases to be issued within these five areas would have No Surface Occupancy stipulations attached. This places a high priority on motorised recreation at the expense of the oil and gas exploration and development in these areas. We believe such restrictive stipulations in areas of significant petroleum resource development potential are unjustified. A controlled surface use stipulation for these areas would provide the opportunity for the Forest Service and the Oil and Gas Industry to jointly, and cooperatively, address situations as they arise under the controlling multiple use mandate.

We encourage you to adopt Alternative 2 as your Preferred Alternative, subject to the Winter Range modification for the area north of Osage as outlined in your Alternative 4. Thank you for your consideration in this matter.

Very truly yours,
BERCO RESOURCES, INC.

[Signature]
William S. Bergner, President

July 27, 1992

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

I am writing in support of Forest Service efforts to comply with 36 CFR 228.102 in order to resume oil and gas leasing on the TBNG, and to oppose the application of NSO stipulations in the five semi-primitive motorized recreation areas. Oil and gas has historically been accepted as compatible with recreation opportunities, and the DEIS reports that communities are accepting "all impacts of all types of intrusions for economic reasons."

As demonstrated over the last several years, oil and gas activities are fully compatible with other uses on the TBNG.

The level of lease restrictions imposed will have a considerable effect on whether or not a lease is bought or drilled. It cannot be assumed that if no new leasing were to take place, the wells would be drilled on private or state lands. Many companies are unable to drill their prospects because they have been unable to establish a sufficient land base to cover a potential reservoir.

I strongly support the Forest Service's proposal to replace the NSO stipulation in the Upton-Osage deer winter range with a CSU stipulation, and encourage the Forest Service to adopt Alternative 2 as the preferred alternative with the addition of winter range modification as described.

Sincerely,

[Signature]
J. E. Halsey

[Date]
July 28, 1992

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

I am writing to express my support to the Forest Service efforts to comply with 36 CFR 228.102 to resume oil and gas leasing on the Thunder Basin National Grassland. As you are aware, the level of lease restrictions imposed will have a considerable affect on whether or not a lease is ever bought and/or drilled. The Forest Service must not assume that if no new leasing were to take place, the wells would be drilled on private or state lands. If that were the case, companies would not be anxiously awaiting the completion of this leasing document. Many companies are unable to drill their prospects because they have been unable to establish a sufficient land base to cover a potential reservoir.

I oppose the application of NSO stipulations in the five semi-primitive motorized recreation areas where oil and gas has historically been accepted as compatible with recreation opportunities. The DEIS does not demonstrate the need to impose NSO to protect the area's motorized recreation. Rather, it reports that communities are accepting "all impacts of all types of intrusions for economic reasons".

Please consider these comments carefully. If Wyoming's economy is to rebound and prosper again, it's imperative the oil and gas industry has an opportunity to conduct their business in the TBNG. Be assured it will be conducted in a safe and environmentally sound manner.

Sincerely,

[Signature]
C. F. Lyman
C.F. Lyman
5 Blackbeard Court
Cody, Wyoming 82414

CFL/Gas
(3137-24)

July 29, 1992

Terry B. Dilts
U.S. Forest Service
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Dear Mr. Dilts:

Subject: Review of Draft Environmental Impact Statement for Oil and Gas Leasing on the Thunder Basin National Grassland

As requested by the Forest Supervisor, Gerald G. Heath, personnel of the U.S. Bureau of Mines, Intermountain Field Operations Center, reviewed the subject Draft Environmental Impact Statement (DEIS) with a proposal such as this, the Bureau is primarily concerned that all mineral resources are adequately considered.

On page IV-5, cumulative effects, mineral and energy resources -- addresses impacts on oil and gas exploration and seismic activity; no other mineral resource impacts are addressed. On page IV-27, a statement is made that because restrictions on surface occupancy would affect less than 6 percent of the total leasable acres under the preferred alternative, "it is assumed that production and royalty revenue is not affected by the No Surface Occupancy stipulations." This statement probably should indicate there would be "little" effect on production and royalty revenues. Although, as the document states on page IV-27, under the No Surface Occupancy stipulation it may be possible to develop oil and gas resources from an alternative site, that would be an impact on mineral resource development. Therefore, the statement that production and royalty revenue would not be affected by the No Surface Occupancy stipulation should be revised to indicate some production might be affected.

Although impacts of the proposed leasing plan on mineral resources other that oil and gas are not addressed in the document, we do not anticipate significant direct impact. However, restrictions on the surface occupancy for oil and gas exploration and development could indirectly contribute to future decisions to place similar

[46A]

[46B]

[46C]

[47A]

[47B]
management restrictions on development of other mineral resources and, if that would be the case, significant impacts could result. Subsequent documents related to this leasing proposal should include some statement concerning possible long-term indirect impacts of the No Surface Occupancy stipulation on mineral resources other than oil and gas. If the Forest Service believes there would be no impacts, a statement to that effect should be included so reviewers will know that possibility was considered.

Our comments are drawn from available information, are provided on a technical assistance basis only, and may not reflect the position of the Department of the Interior. If you have questions regarding this review, please contact Eileen K. Peterson at (303) 236-0451.

Sincerely,

Bradford B. Williams, Acting Chief
Intermountain Field Operations Center

exp/rr

I would like to state my opposition to the application of 485 stipulation 2 to the contiguous mineral resource area of the
7BN3. I do support the Forest Service's proposal to replace the 485 stipulation on the Upper Range with another range with a 450 stipulation and the Forest Service efforts to comply with 450-540.

Oil and Gas production is the primary source of revenue for the State of Wyoming. The fact that Wyoming has been a major Petroleum producer for almost 100 years and be still considered a recreation potential prove that Oil and Gas production and recreation are compatible.

The recent State budget crisis is a direct result of low price and declining oil and gas production. The budget crisis has a direct impact on social service funding. I have personally had to reduce our $10,000 of prints services to private copies with a ceiling for a preschool serving developmentally disabled children. I find it impossible to justify "pleasant charity" at the expense of adequate funding for my disabled child's education.

John O. Cope
Wyo Oil Co.
Dear Mr. Dilts:

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Because leases of all types exist in this area, it is not likely that drilling will take place on non-Forest Service lands if NSO stipulations are imposed on Forest Service lands. You must have a complete lease package to initiate oil and gas exploration. I ask that you replace the NSO with a controlled surface use stipulation in the Upton-Osage deer winter range.

Sincerely,

Gene R. George
Registered Professional Geologist

Gene R. George
Geologist

July 30, 1992

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2488 Jackson
Laramie, Wyoming 82070

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Medicine Bow National Forest
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2488 Jackson
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Sincerely,

Gene R. George
Registered Professional Geologist

Gene R. George
Geologist
Medicine Bow National Forest
July 31, 1992

Ladies and Gentlemen:

We represent a number of oil and gas producers, both large and small, which operate in the Powder River Basin, including lands within the Thunder Basin National Grassland, and we submit these comments on the Draft Environmental Impact Statement on oil and gas leasing in the Thunder Basin National Grassland on their behalf.

We oppose your selection on the preferred alternative (leasing with standard and special stipulations with greater recreation emphasis) for management of oil and gas leasing in the Thunder Basin National Grassland. As the DEIS recognizes, the Thunder Basin National Grassland is within the Powder River Basin, an area of significant past production and an important area for future development for oil and gas purposes. Moreover, it is an area in which the federal mineral estate is significantly intermixed with state and fee lands. The restrictions you propose to impose on oil and gas leasing and on operations on existing leases are unreasonable given the value of the mineral estate in the area and the fact that development will proceed, notwithstanding your plan, on the intermingled fee and state lands. This will lead to drainage of the federal resource with consequent loss to the Treasury and to the State of Wyoming.

We object in particular to your plan to impose no surface occupancy stipulations on five inventoried "semi-primitive motorized areas." It is ludicrous to prohibit oil and gas operations in an area where motorized vehicles are permitted. This is especially so when one considers that part of the intrinsic culture of the Thunder Basin National Grassland includes significant oil and gas and coal production in the area. In other words, people participating in semi-primitive motorized recreation in the Powder River Basin will not be shocked by the sight of a drilling rig.

The projections on Page IV-27 of revenues under the various alternatives proceeds on the assumption that leases containing NSO stip will produce the same revenues as would leases without such stipulations. We find no basis in the document for this conclusion. There is no analysis of the location of the NSO tracts in relationship to fee, state and unutilized tracts from which development could occur. The conclusion that revenues will be the same under alternative 4 is premised on faulty assumptions.

We do commend you for forthrightly stating in the "Purpose and Need" portion of the DEIS that the record of decision will include both the (d) and (e) decisions required under 36 C.F.R. §228.102. However, we prefer that that decision be made based on alternative 2 of the DEIS.

Thank you for your consideration of these comments.

Very truly yours,

Laura Lindley

[Signature]

LL:bjm
Dear Sir:

I have had the opportunity to review the DEIS for the Thunder Basin Natural Grassland. I find nothing in the DEIS that should prohibit the resumption of oil and gas leasing on the TBNG. Furthermore, I urge you not to indiscriminately impose No Surface Occupancy (NSO) stipulations in this area. We are not talking about the pristine mountainous areas of the state. The area in question has prospered throughout the years with multiple use of this public land. The industry has learned to use the large size vegetation to screen their activities from public view. Both domestic stock and wildlife learn to live very comfortably with the joint occupancy.

If certain lands seem to have an unusually high value for winter range, the Controlled Surface Use (CSU) stipulations, instead of NSO stipps, would offer more flexibility of management and, at the same time, provide adequate protection of the resource.

In summary, I urge you to adopt Alternative 2 as the preferred Alternative with the addition of the winter range modification, as set forth in Alternative 4.

I appreciate the opportunity to comment on your DEIS.

Respectfully,

MKM Oil Company

[Signature]

Warren A. Morton

---

*NOTE: Because Mr. Swanson’s letter does not photocopy well, it is transcribed below.*

John R. Swanson
3400 Edmund Blvd.
Minneapolis, MN 55406

July 27, 1992

Medicine Bow National Forest
2468 Jackson Street
Laramie, Wyoming 82070-5135

Dear Sirs:

Please accept my following comments concerning the Oil and Gas Leasing On The Thunder Basin National Grassland Draft Environmental Impact Statement.

I wish to advise that as a consequence of the leasing on the Thunder Basin National Grassland, such activity will destroy this Grassland's soil and water resources, as well as decimate its wildlife, vegetation and recreation attributes.

May I suggest that a roadless features survey be completed so that this area's roadless areas may be evaluated and to secure a roadless areas preservation program for the Thunder Basin National Grassland, with a wildlife habitat restoration and conservation plan initiated, so as to secure a successful wildlife management program for this grassland and to consider this National Grassland as a possible National Wildlife Roadless Preserve, so as to preserve this area's unique natural values.

Sincerely,

JOHN R. SWANSON
Dear Mr. Dilts:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement for oil and gas leasing on the Thunder Basin National Grasslands.

We strongly support alternative 2 as the preferred alternative with the addition of winter range modification as outlined in alternative 4.

We also support the Forest Service’s efforts to resume oil and gas leasing on the Thunder Basin National Grasslands and to comply with JFCCFR228.102.

In the past, oil and gas operations have been compatible with recreation opportunities; and we see no reason to apply “no surface occupation stipulations” in the five semi-primitive motorized recreation areas.

The Forest Service’s proposal to replace the NSO stipulation in the Upton/OSage deer winter range with a “Control Surface Use stipulation” is an intelligent and logical proposal. The NSO designation is much too restrictive and is an overkill in this particular instance since the area only becomes deer winter release habitat about one out of every ten years when severe weather conditions mule deer and whitetail deer to concentrate in the area.

Sincerely,

H. A. True, Jr.

---

Mr. Terry B. Dilts
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts,

I am writing as a professional geologist and a concerned citizen about the USFS choice of “Alternative 4-Greater Recreation Emphasis” as its preferred alternative with respect to oil and gas leasing.

The Draft Environmental Impact Statement (DEIS) considered six options ranging from “No Action” to “No New Leasing” as prescribed by law. However, it failed to demonstrate that any of the “issues” identified during scoping (such as negative impacts to cultural resources, riparian areas, endangered species, etc.) would be adversely affected by oil and gas leasing under standard lease terms.

Therefore, this evening’s comments in public comments in support of leasing (15 letters) were largely ignored while the anti-leasing comments (3 letters) have been incorporated. For instance the Sierra Club requested that the “Upton/OSage area, Rochelle Hills and Weston...areas be off limits to oil and gas leasing.” Coincidentally these areas are exactly where the USFS “preferred alternative 4” recommends recreation emphasis to the practical exclusion of oil and gas leasing.

While the USFS efforts to increase recreation are laudable, its supposition that oil and gas activities conflict with “semi-primitive motorized recreation” is misguided.

As the DEIS states, “tracts with a No Surface Occupancy (NSO) stipulation would not be leased” therefore the NSO designations for these 22,240 acres constitute a surreptitious withdrawal from multiple use.

The following facts should have been considered in the draft EIS:

The Powder River Basin geologic province, whose heart is covered by the Thunder Basin, contains the highest estimated conventionally recoverable oil reserves of any onshore basin in the contiguous United States (UBGS-NS03, 1980).

“All of the proposed “semi-primitive motorized recreation areas” (SPMRAs) are within the most prospective fairways for the major-reserve play ( debated today). Most of these areas have been surveyed down to the depth of the highly prospective horizons. However, expected discoveries will be small in area extent and randomly distributed, effectively nullifying any impacts.

The four southern SPMRAs have major reserves of stripable coal (Bausel, 1976) with the northwesternmost of these parcels in sight of the presently operating Antelope Mine. Amazingly, the DEIS states that “Coal mining and the facilities needed to support coal mining, such as roads, powerlines and railroad lines are part of the existing character of the TENO” and that the mines “employ the latest reclamation techniques, frequently returning a mined area to a more productive state than the native range prior to mining” while oil and gas “production facilities would essentially be permanent.” I submit that modern oil production facilities are both more ephemeral and less visible than strip mines and that even the huge, old, intensely developed fields like Salt Creek have a much smaller visual impact than any of the Powder River Basin
strip mines. (Note that reclamation of oil and gas operations is required under the standard lease terms and reclaimed oil leases will return to their natural state much faster than strip mined lands).

There are almost unlimited opportunities for semi-primitive motorized recreation on USFS and BLM lands within the Powder River Basin and in the adjoining Black Hills, Laramie and Bighorn Mountains. The residents of this area appreciate that their livelihoods depend on energy production and that they are fortunate to live in a place with superb outdoor recreation possibilities.

-Motorized recreation requires fuel. The only fuel source for motor vehicles at present time is extracted from hydrocarbons. To permit driving without allowing for fuel production is hypocritical.

-Oil operators built many of these roads that recreationists now enjoy; roads built in the future can be either reclaimed or added to the recreational inventory.

-Directional drilling has advanced to the point where sensitive areas, such as the see fishing reservoirs, can be reasonably accomplished. However the MSG designation on tracts of thousands of acres ensures that they will not be developed.

-Revenues derived from oil and gas leasing and production royalties have been dedicated to public land acquisition. Forgoing the expected revenue from these lands could lessen opportunities to acquire prime recreational or wildlife areas in the future.

The oil industry has repeatedly shown how well it can operate in environmentally sensitive areas. Here in Oklahoma we have the finest example of tallgrass prairie in the world, in an area that has seen hundreds of wells drilled over almost 100 years. The Tallgrass Prairie Preserve, managed by the Nature Conservancy in cooperation with the Osage tribe (mineral owners), oil operators, and cattlemen has developed a first-class resource for users across the "recreational opportunity spectrum" without denying mineral access.

All federal leases state that "Lessees shall conduct operations in a manner that minimizes impacts to the land, air and water, to cultural, biological, visual and other resources and to other land users or users." It is hard to imagine why motorized recreationists should have problems with operations conducted in such a manner, especially since the areas are open to cattle grazing, strip mining and motorized recreation impacts.

For the above stated reasons I urge you to adopt "Alternative 6: Standard Lease Terms"; the only alternative that keeps these lands in multiple use as Congress intended them.

Sincerely,

Edward T. Beattie
3405 S. Dran ton
Tulsa, Oklahoma 74105

55G

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55J

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55N

Robert Stanley Love
Project Coordinator
Medicine Bow National Forest
Laramie, WY 82070

Re: Draft Environmental Impact Statement (DEIS) for Oil and Gas Leasing on the Thunder Basin National Grassland (TBNG)

August 4, 1992

Mr. Jerry B. Dilts

Dear Mr. Dilts:

I am writing in response to a call for comments on the above-captioned DEIS related to the TBNG. I support alternative 6 for the reasons hereinafter stated.

At the outset, I should tell you I have traveled over the course of many years through much of the area that is the subject of this DEIS. I am personally acquainted with it, therefore, and find it difficult to imagine why any rational person would even advocate a no-surface occupancy (MSG) stipulation on any of this property. The ludicrousness of such a suggestion is underscored by the fact there just simply are no environmentally sensitive features about that area to my personal knowledge. The DEIS itself states, "grazing livestock, road, railroad track, and mineral activities are part of the view."

I have carefully weighed the proposed alternatives, and under the circumstances based on my personal observation and knowledge, I cannot conceive of any other rational alternative than Alternative 6. Leasing for mineral development "with standard stipulations only" is the only thing that makes sense to me. Accordingly, I am compelled by common sense to oppose the other five Alternatives.

Very truly yours,

R. Stanley Love

RSL/t/lh
July 30, 1992

Terry R. Dilts
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts,

Enclosed are my comments regarding the Draft Environmental Impact Statement concerning the Oil and Gas Leasing on the Thunder Basin National Grassland. My comments directly concern Chapter III, Affected Environment, with some comments pertaining to Appendix B, A Detailed Discussion of Oil and Gas Activities and Processes That Affect the Thunder Basin National Grassland.

The initial discussion of the Geology of Chapter III (attached) may be considered "nit picky" by some. However, I have been through the "draft" phase many times of writing major reports and technical journal articles, and I am always surprised at mistakes I have overlooked during the process. Therefore, I do not assume all mistakes in a draft will be corrected. I feel if I do not point out errors or omissions that people expect to be found, then I am not doing what is expected of me, and I expect no more from others. The bottom line is that errors of any kind will detract from the quality of the final product if they are not eliminated.

I believe that your data base is flawed in that you only discuss the activities and effects on the 520,000 acres of Federally controlled surface and minerals (page 1-3). This is less than 29% of the gross 1.8 million acres within the TBNG boundaries. This assumes that activities on the more than 1.2 million acres of non-Federally controlled surface have absolutely no effect on the Federally controlled surface and that activities on the Federally controlled surface have absolutely no effect on the remaining lands. This is totally untrue and cannot be defended logically. The two types of land are intimately intermeshed, and what happens on either type affects the other type. Therefore, your ignoring activities on non-Federally controlled surface lands in the vast majority of your statistics skews your data to lesser levels of activity. Using only the activities on the non-Federally controlled surface lands, and ignoring the Federally controlled lands, would just as dramatically show the data to increased levels of impact. The TBNG needs to be evaluated statistically as one unit, not two totally separated, independent units.

A defense that the Forest Service is mandated to examine only the Federal lands, generate statistics concerning activities only on the Federal lands, and present forecasts of activities and effects on only Federal lands is so totally illogical that the concept approaches being ludicrous.

As stated on page 1-3,

"The Forest Service decision will apply to lands with Federal Surface (TBNG lands) and with Federal oil and gas mineral lands (520,000 acres)." (italics yours)

This approach deals with less than 29% of the TBNG total lands. This is like the following analogy:

Analyze the streets in a small town. One third of the streets are east-west and two-thirds of the streets are north-south. The major streets are north-south. Study traffic flow, accidents, pedestrian and bicycle activity on the east-west streets. The only streets to be studied statistically and on which forecasts are to be made are the east-west streets. No data relative to the north-south streets is to be considered. The final analysis would be skewed to the lesser used east-west streets, and lesser activity would be emphasized. Just trade "Federally controlled surface with Federal minerals" with east-west streets and trade "fee and state lands" with north-south streets. We now have projections of activities and effects on the TBNG. How would you explain to the drivers, the public, the pedestrians and bicyclists on the north-south streets that their existence is denied and the decisions made by studying the east-west streets alone? The activity and effect on them whatsoever? If someone drove an eighteen wheeler down a north-south street at 80 miles per hour, what Federal official would explain to the families of those killed who were using the east-west streets that the effects of the north-south traffic were unimportant and not taken into account?

The DEIS is far to biased to a lesser activity and effect mode than is realistic for an area containing 1.8 million acres. Removing nearly an entire township from oil and gas drilling and allowing every other multiple use on the same acreage is incomprehensible. I do not understand it.

Some final nits to pick; Interstate 25 does not exist between Douglas and Gillette, Wyoming (see vicinity map, page 1-4), and I believe it does not cross the TBNG. Also, I believe Interstate 16 connects Macon to Savannah, Georgia, and does not run north from...
Gillette, Wyoming (see Vicinity Map, page 1-4); I believe "NF" is left off the block immediately northwest of Sundance, Wyoming that is labeled "Black Hills". You might want to check legal descriptions on pages D-19 and D-21. T70N, T54W, Section 19 seems incorrect.

Thank you for the opportunity to comment on the Draft EIS on the Oil and Gas leasing on the Thunder Basin National Grassland.

Sincerely,

Gary C. Mitchell
Certified Professional Geologist #4771

cc: Mr. Frederick J. Crockett

July 29, 1992

Frederick J. Crockett
Div. of Min. Res., Branch of Fluid Min.
Bureau of Land Management
1701 East 8 Street
Casper, WY 82601

Dear Fred,

Enclosed are comments and materials concerning Appendix C, Reasonably Forseeable Development Scenario for oil and gas, you authored for the Draft Environmental Impact Statement on Oil and Gas Leasing on the Thunder Basin National Grassland. Some comments and materials deal with Appendix B in the same DEIS that you also authored.

Our comments regarding Appendix C deal with the following topics; economics, well depths, reservoir quality, producing units, horizontal drilling, Niobrara stratigraphy and Muddy stratigraphy. Enclosed are some tables and illustrations we used with our discussion.

Also enclosed, is a preprint entitled "Extensional Tectonic Influence on Lower and Upper Cretaceous Stratigraphy and Reservoirs, Southern Powder River Basin, Wyoming." This preprint has been submitted to The Mountain Geologist (TMG), Denver, Colorado, for publication. We have not received editorial comment from The Mountain Geologist as of this date, thus, this preprint is preliminary and subject to change. We have added the TMG outline to some of the maps so you can see how it overlaps our Study Area.

We feel the RFD you wrote needs to significantly take into consideration horizontal drilling applications. Horizontal failures will not exceed your drilling projections. Failures seldom create new industry interest or activity. However, success using horizontal technology could cause a significant increase in production, and thus reserves, as well as industry activity. As we demonstrate, initial economic success of horizontal drilling is not necessary for horizontal drilling to be expanded. This is seen at Silo Field, Larimar County, Wyoming, where the first six horizontal
wells drilled were economic failures. Yet with a minor change in producing technology (without a change in pricing or drilling technology), the horizontal wells are now very economic and drilling activity has increased.

Also, unlike at Silo, several units are suited to being evaluated with horizontal technology in the Powder River basin. These include fractured, conventional and additional fractured, unconventional reservoirs.

None of the materials enclosed are of a proprietary or confidential nature. Please feel free to contact us if you have any questions or you wish to discuss anything. Thank you for your assistance and cooperation.

Sincerely,

[Signature]
Gary C. Mitchell
Certified Professional Geologist #4771

COMMENTS ON OIL AND GAS LEASING ON THE THUNDER BASIN NATIONAL GRASSLAND: DRAFT EIS

SECTION III
Page 3 Map 3-2 Generalized Geology Map of TBNG

You do not indicate the Muddy Formation (Newcastle Formation) outcrop. This formation is listed on page C-1 as one of the "most active plays" for oil and gas in the Thunder Basin National Grassland (TBNG), yet you ignore it on your surface geologic map.

You also show the Belle Fourche Formation directly overlying the Skull Creek Formation in the northeastern portion of the map. This means the Hovry Formation is totally absent. This does not happen anywhere on the west flank of the Black Hills uplift, especially where you show it, southeast of Upton, Wyoming.

Also, you show the Lance Formation directly overlying the Pierre Formation, indicating the Fox Hills Formation is totally absent. This is incorrect in the area south of Upton, Wyoming. The Fox Hills Formation separates the Lance Formation from the Pierre Formation and is present along the entire length of the west flank of the Black Hills uplift.

I understand your Map 3-2 is a "Generalized Geology Map of TBNG." However, generalized means the formation boundaries, as to locations of the lines, are not exact. "Generalized" is not license to ignore significant formations, nor to make formations disappear, when in fact, they are present on the ground.

Perhaps you should reexamine the two maps you reference or, examine a better geologic map, such as Plate 1 in USGS Professional
reservoirs are present; the Parkman and the Teapot (see Stratigraphic Nomenclature Chart attached). Thus, there are at least 15 "known hydrocarbon bearing formations" on the TBNG, not 12.

On page 111-16 you discuss geophysical exploration. Your final sentence, stating "Current Seismograph activity is less than 10 miles per year," is totally misleading. Again, this applies to only the Forest Service controlled surface, less than 1/3 of the TBNG. This would lead one to conclude that a lack of current seismic data acquisition indicates a lack of industry interest. This is totally untrue. Most of the seismic acquired to date on the TBNG is available for purchase by those who are doing exploration (see map attached). Why spend four or five times the cost to acquire new data when previously existing data can be purchased far cheaper and quicker. To adequately equate seismic acquisition in the field and exploration activity, you should look into how many miles of previously acquired seismic data have been acquired in the TBNG. Present seismic activity is not an indication of exploration interest by industry in an area, unless there is no previously existing seismic data available.

The above comments regarding seismic exploration also apply to Section B, pages B-5 through B-7. The "Past and Current Activity" section, p. B-6, ignores the reality that most petroleum companies will purchase already existing seismic data rather than go through the long, expensive process of acquiring new data. New data is usually a final step in drill site selection, if then. Also, ignoring over 2/3 of the TBNG without Forest Service controlled
surface biases the data in a negative sense.

The comments above regarding "Total Oil and Gas actions" should be applied to Section 8, pages 8-7 through 8-13. The insistence by the Forest Service to ignore, and totally discount, all activities on the over 71% of the total THNG that are on non-Forest Service controlled lands demonstrates that the Forest Service believes that oil and gas activities on non-Federally controlled lands have no impact on Forest Service controlled lands. Thus, a 500 BOD well on fee or state lands, surrounded by Federally controlled lands, would not impact the Federal lands. This is hardly a realistic situation.

We have forwarded our comments on the RFD Scenario, Section C, to Mr. Frederick J. Crockett, BLM, Casper, Wyoming. We believe there is significant data regarding horizontal drilling, economics, reservoir identification and petroleum potential that needs to be added to the RFD scenario. Much of this information has taken place during and after 1990, which is the publication date of the basis for much of the RFD Scenario, USGS Open-Files Report 88-450 P.
August 4, 1992

Terry B. Dilts
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

This letter is to urge the Forest Service to resume oil and gas leasing on the Thunder Basin National Grassland. Most people in the local area, and probably Wyoming as well, would probably support what is clearly the best use of this land: development of oil and gas deposits. Any thoughts or statements that these oil and gas deposits can be developed from the odd checkerboard of fee lands are clearly misinformed or uninformed. The oil and gas deposits will only be developed when and if oil and gas leasehold can be acquired covering an entire prospect area. In addition, oil and gas development will not seriously hinder any other contemplated uses for these lands. Consequently, I also support the proposal to replace the no surface occupancy stipulation in the Upton-Geage Deer Winter Range with a controlled surface use stipulation.

Sincerely yours,

William N. Heiss

August 4, 1992

Mr. Terry B. Dilts
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

Following are the Rocky Mountain Oil and Gas Association’s (RMOGA) comments on the Draft Environmental Impact Statement (DEIS) on Oil and Gas Leasing on the Thunder Basin National Grassland (TBNG). RMOGA supports the Forest Service’s efforts to comply with 36 CFR 228.102 in order for oil and gas leasing to resume on the TBNG. As you know, the TBNG is an extremely important area for oil and gas exploration and development. We also appreciate the Forest Service’s achievement in getting the DEIS out to the public in less than a year from the initial public scoping notice. This accomplishment sets an excellent example for other Forests in Region 2 and other Forest Service Regions that should be as timely in their efforts.

We thoroughly support the Forest Service’s proposal to replace the NSO stipulation in the Upton-Geage deer winter range with a Controlled Surface Use (CSU) stipulation. All information in the DEIS regarding this area indicates that NSO is far too restrictive. Specifically, the Forest Service states "this area becomes severe winter relief habitat about one out of every 10 years, when severe weather concentrates both mule deer and white-tailed deer in the area". [emphasis added] While it is also mentioned, "that displacement due to oil and gas activities during abnormally severe winters and other "cas of severe stress could cause significant mortality", it is conventional wisdom that an elevated big game mortality rate would be expected, regardless of what level and type of activity is occurring, during an abnormally severe winter. Nevertheless, it is likely that operators would voluntarily reduce certain activities at such a time. Even so, the Forest Service states in the DEIS on page IV-14 that "Anelope, deer and elk populations are generally above the Wyoming Game and Fish Department objectives within TBNG." Therefore, the potential threat to the deer population is much lower than if big game populations were in a degenerative state. Obviously, other viable means of mitigation which do not completely preclude access to these areas on a permanent basis should be utilized.
We are extremely disturbed, however, by the Forest Service’s Preferred Alternative 4 because it would place a high degree of emphasis on motorized recreation opportunities—a use which has historically been deemed fully compatible with energy activities—at the expense of future oil and gas exploration and development in five areas encompassing 22,240 acres of land with high potential for oil and gas resources. Yet, the Forest Service has not demonstrated in the draft EIS that the projected impacts from oil and gas activities justify the proposed access restrictions to areas identified for semi-primitive motorized recreation. As such, the data contained in Chapter 3 does not support the premise that recreation activities are of such a magnitude on the TBNG that exceptional management consideration should be given to motorized recreation. In fact, quite the opposite is true, as shown on page III-20, that essentially all recreation use of the TBNG is low. By virtue of their characteristics and features, motorized recreation areas offer only limited opportunities for solitude, tranquility or a closeness with nature. In other words, one would expect to encounter other people using the area for a variety of reasons.

The DEIS states that the TBNG does not contain wilderness, wild and scenic rivers, prime farmlands or prime forest lands. It further states that Visual Quality Objectives (VQO) for the TBNG are Modification to Maximum Modification, with the exception of lands adjacent to Highway 16, which are subject to Retention and Partial Retention VQOs and CSU stipulations. Additionally, it is explained that "[g]razing livestock, roads, railroad tracks and mineral activities are part of the view. Travelers can observe working ranches with fences, windmills and castle; active coal mines with huge open pits, coal sliles, draglines and trucks, oil and gas fields with pump-jacks, treater tanks, storage tanks, pipelines and trucks; and a wide variety of wildlife species." (emphasis added) It is, therefore, reasonably safe to assume that when members of the public venture out to the TBNG in their cars or trucks, they do not expect a "wilderness" experience. In fact, the DEIS at page III-19 indicates the "communities involved are tolerant of the impacts of all types of intrusions for economic reasons." It is thus ironic that the Forest Service proposes to restrict the very resource recovery program which makes motorized recreation possible in the first place.

The Forest Service appears to use the surface features of these semi-primitive motorized recreation areas as the basis to severely restrict oil and gas opportunities with a No Surface Occupancy (NSO) stipulation instead of the CSU stipulation as required by the Medicine Bow National Forest Plan. The DEIS states these areas contain topographic relief, ponderosa pine and pines/juniper vegetation which offer very pleasant viewing. Even though many flat areas are included within the NSO boundary, these areas obviously offer superb opportunities to screen and otherwise mitigate oil and gas activities to reduce the evidence of intrusion, unlike the extremely limited opportunities available to mitigate visual effects in the remaining flatlands of the TBNG. Combined with the facts that a drill rig is up only for one to two weeks and that well sites which go into production shrink to approximately one-half acre, the impacts from oil and gas development are minimal, especially in those areas where a wide variety of other uses have already occurred rendering them less than prime semi-primitive recreation areas. Additionally, since other, less stringent forms of mitigation are available, it is undeniable that the Forest Service’s proposed use of an NSO stipulation in these areas is arbitrary, capricious and politically motivated.

We strongly disagree with the statement on page IV-25, "Since movement of ROS classes toward development is relatively easy and restoration toward the primitive end of the scale is difficult and expensive, a movement toward development should be considered an irreversible and irrevocable commitment of the recreation resource." Oil and gas development requires a small area for a limited time after which it is returned to its natural condition. Furthermore, roadless access may be controlled where the Forest Service deems it necessary so that an ROS classification is not altered. To declare that oil and gas development will result in an irrevocable loss of recreation opportunities is a glaring over-statement, especially for semi-primitive motorized recreation, and does not recognize that oil and gas activities are short-term and fully compatible with other uses on the TBNG, as demonstrated by the wide variety of activities which have occurred in the area over the last several decades.

We also believe the RFD is flawed because the basis for predicting the level and general locations of activities is limited to data collected from a period of very low activity on the TBNG. In our initial scoping letter, we made several suggestions for how the RFD should be formulated. Specifically, we recommended that an average of the drilling activity which occurred on the Grassland during the period from 1979 to 1984 be used to predict future activity. Using this period for analysis would provide a broader spectrum from which to more accurately project a potential future development scenario.

The Forest Service has failed to accurately identify and analyze the impacts each alternative could have on opportunities for future exploration and development. Furthermore, the RFD is misapplied because the number of wells which may be drilled over the next 10 to 15 years should vary in concert with the degree of restriction placed on a lease instead of being static. The assumption that the same number of wells will be drilled regardless of the alternative selected is erroneous. The level of restrictions imposed on a lease would have a considerable effect on whether a lease is ever bought and/or drilled. The Forest Service must not assume that if no new leasing were to take place, the wells would be drilled on private or
state lands. If that were the case, companies would not be anxiously waiting for the Forest Service to complete this leasing document. Many companies are as yet unable to drill their prospects because they have been unable to establish a sufficient land base to cover a potential reservoir.

We believe the economic study is equally flawed. Realistically, state and federal revenue projections should also significantly vary by alternative. The DEIS states, "because these (NSO) restrictions would apply to less than 6% of the total leasable acres on the TBNG and because it may be possible to develop these mineral resources from alternative sites, it is assumed that production and royalty revenue is not affected by the No Surface Occupancy stipulations." Directional drilling or horizontal drilling techniques are not remedies for a lack of access. Moreover, special drilling techniques can dramatically increase the cost of drilling, which would have a direct impact on the viability of a project. In addition, other less restrictive stipulations can result in severely constrained access when taken cumulatively. This situation would also make a lease tract unattractive to a potential bidder; hence the tract may not be leased and all exploration or production activities on that lease would be foregone. Therefore, it is vitally important to consider the effects of restrictions by alternative and to show how future taxes, rental revenue, and royalties could be affected by lease stipulations.

We object to the Forest Service’s assertion on Table 4-2, Cumulative Soil Disturbance Impacts on the TBNG, that reclaimed or revegetated sites can be judged "Existing Impacts". The Forest Service not only establishes the reclamation standards which must be met, but it must also sign off on all reclamation projects before the reclamation bond is released to the company responsible for the disturbance. A more precise description would be that Table 4-2 displays historical uses of the TBNG.

While the Forest Service attempts to display reasonably foreseeable impacts from future oil and gas activities, in addition to plugging and reclaiming wells, the Forest Service has failed to consider the fact that once a well goes into production, the well site normally shrinks in size. Therefore, long-term effects associated with development are less than the 250 acres discussed in the DEIS; 50 acres of long-term disturbance over a fifteen-year period would be more accurate.

We recommend the Forest Service revise Issue 13 as follows: "There is concern about the management of chemicals and hazardous wastes used and generated and used as oil and gas sites." Exploration and production wastes are not considered "hazardous" and are exempt from regulation under the Resource Conservation and Recovery Act (RCRA), Subtitle C, governing the management of hazardous wastes. Therefore, use of the term "hazardous materials" is inappropriate when discussing oil field chemicals and wastes. Further, the Forest Service has elected to discuss only selected bits and pieces of numerous environmental issues, which can only create intra-agency and external misunderstandings and confusion. Regulatory terms are specifically defined and related to particular environmental statutes. They cannot be used arbitrarily.

Benzene and toluene are not "chemicals" used in oil and gas drilling and production. They are naturally occurring "substances" which are often present in crude oil; and trace amounts - measured in parts per million – are sometimes present in produced water. It is true that produced waters may contain high concentrations of salt; however, heavy metals (generally barium and chromium in non-toxic forms) associated with drilling muds cannot contaminate groundwater because they are not water soluble. In fact, the barium sulfate found in drilling muds is intentionally and safely ingested by patients during diagnostic x-ray procedures. Additionally, the produced water in Wyoming is of such low salinity, it is commonly discharged to the surface and beneficially used for irrigation and livestock watering under Clean Water Act permits.

The reference to hydrogen sulfide should be deleted, as Issue 13 focuses primarily on water pollution, not air pollution. Moreover, given that sweet crude is produced from wells on the TBNG, it is very unlikely H2S would be encountered.

The last two sentences on page 11-18 should be revised to read: "Water-quality for Wyoming surface waters, hazardous materials disposal and hazardous material cleanup Oilfield chemicals, wastes and releases are governed by the Wyoming Department of Environmental Quality (DEQ) and the Wyoming Oil and Gas Conservation Commission. These regulations (in part) are applicable to all alternatives. If the State water-quality rules and regulations are met, there will be no measurable direct effects on water quality in any alternative."

In conclusion, we oppose the Forest Service’s proposal to single out oil and gas activities for restrictive management while all other uses of the TBNG will be allowed to continue unimpeded. The TBNG is not an area where many sensitive resource values exist which would necessitate a high level of restriction and mitigation of oil and gas activities. It is an area which has already experienced many uses, including coal mining, ranching and oil and gas development. In fact, over one-third of the area is already under oil and gas lease. While we do not advocate an unchecked exploitation land management policy, the Forest Service must acknowledge that one of the highest and best uses of the TBNG is energy and mineral
August 4, 1992

Mr. Terry B. Dilts
Project Coordinator
Medicine Bow National Forest

Page 6

production, where recreation use is limited at best. It must also be recognized that the value of existing leases will be directly impacted by the issuance of new leases with no surface occupancy. Moreover, the effects anticipated from the maximum reasonably foreseeable development scenario indicate that less than 1/10th of 1% of the Grassland would likely be impacted over the 15-year planning period. Such minimal impacts do not justify the increased restrictions proposed in the Preferred Alternative 4.

We, therefore, strongly encourage the Forest Service to develop and adopt a new alternative which combines the Forest Plan management requirements presented in Alternative 2 as well as the management element in Alternative 4 which relaxes year-round restrictions in the Upton-Osage winter range area. We firmly believe such an alternative would best serve the needs of the Forest Service and the public on the TBNG.

We appreciate this opportunity to provide you with our views. Please do not hesitate to contact me if you would like to discuss these comments in greater detail or if you have any questions.

Sincerely,

Claire M. Moseley
Manager
Federal Land Planning

CMM: T

cc. F. Dale Robertson, Chief
G. Lynn Sprague, Minerals Director
Tom L. Thompson, Acting Regional Forester
Gerald G. Heath, Forest Supervisor
William M. Robinson, Acting Minerals Director, Region 2

Aug 6, 1992

Dear Mr. Dilts

I am writing as a member of the oil & gas community and I am well aware of the extreme importance of TBNG for oil & gas exploration and development. I would encourage the Forest Service to support efforts to comply with 36 C.F.R. 228.102 in order to ensure oil & gas leasing on the TBNG.

Sincerely,

[Signature]
ARCO Oil and Gas Company

August 8, 1991

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

RE: Draft Environmental Impact Statement
Thunder Basin National Grasslands

Dear Mr. Dilts:

ARCO Oil and Gas Company appreciates the opportunity to participate in the planning and evaluation processes conducted by the National Forest Service. These comments reflect concerns of only ARCO Oil and Gas Company and are not intended to represent concerns of any other division of Atlantic Richfield Corporation.

We urge you to consider the presence of oil and gas with the fullest consideration given for multiple use. It is not uncommon for new technology to make possible discoveries in areas previously considered to be of low or no interest. Industry has repeatedly shown that it can operate in a sound environmental manner and in concert with other land users including recreation, wildlife and agriculture.

We also urge you to consider the possible economic impacts of any decisions that are made. These also can have a key impact on the environment and the surrounding economy.

It is imperative that the Forest Service consider the need for oil and gas operators to lease blocks of land, or to be able to put several blocks of land together, in order to explore for and develop oil and gas reserves. In order for this to happen large contiguous areas need to be considered and offered for leasing at the same time or in such a way that acreage may be accumulated and tested during the standard lease terms and overlap of lease terms.

The presumption that if the Forest Service does not resume leasing, oil and gas operations will be conducted on adjacent lands is not necessarily true. As noted above, if the acreage position can not be put together, exploration and production will probably not occur. The sub-surface geology is also a key consideration. Drilling targets may only look promising to the Forest Service lands, if seismic is even allowed to be run. The Forest Service should resume leasing at the earliest possible opportunity.

Sincerely,

Elizabeth S. Bush
Regulatory and Compliance Coordinator

ARCO Oil and Gas Company
Thunder Basin National Grasslands
August 6, 1992

The "no surface occupancy" stipulation should be a choice of the last resort. We object to this option in semi-primitive motorized recreation areas. In reality, oil and gas operations would probably result in less traffic and be a lesser presence than motorized recreation.

The presence of the oil and gas industry should not automatically be considered to result in negative impacts. Industry can use the natural environment to screen their operations and minimize visual impacts while still providing revenues and other land use enhancements.

We suggest the Service consider "controlled use stipulations" in place of "no surface occupancy" for areas of potential critical winter habitat. As is pointed out in the draft only about 1 year in 10 results in a critical habitat situation. Denying access and operations for ninety percent of the time is unreasonable.

ARCO Oil and Gas could support adoption of alternative 2, including modifications for controlled use versus no surface occupancy. We object to the selection of alternative 4, the Forest Service's preferred choice, because we feel it does not realistically embrace the concept of multiple use and favors non-industry activities in an area where industry already has a presence.

Please add me to your mailing list for additional information distribution and receipt of the final document concerning the Thunder Basin National Grasslands. All mail can be addressed to my attention at the above address.

Sincerely,

Elizabeth S. Bush
Regulatory and Compliance Coordinator

E51

WY: thunder
August 6, 1992

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Re: Draft Environmental Impact Statement (DEIS)
Oil and Gas Leasing - Thunder Basin National Grassland (TBNG)
Powder River Basin - Wyoming

Dear Mr. Dilts:

Concerning the referenced DEIS I strongly oppose the "No Surface Occupancy" stipulation for the five designated semi-primitive motorized recreational areas.

I personally own in fee oil, gas and other mineral rights within the TBNG. This action would be detrimental to me in that I might not possibly be able to lease or have my mineral estate developed.

I also own interests in oil and gas leases covering 2800 acres within the TBNG and over the past 10 years have invested, drilled and caused to be drilled numerous wells within the TBNG. All of this, I hope you realize, translates to lease money, exploration/drilling money, and production income and taxes generated therefrom is revenue to local, state and the federal government!

By imposing "no surface occupancy" stipulations, myself as well as others will just go elsewhere - this will prevent the true mineral potential of a particular property from ever being evaluated; will deny much needed revenue to local, state and federal jurisdictions; and is not fair to those who own private surface and or minerals within the TBNG. The stipulation will not only directly affect the designated lands, but indirectly will affect offsetting fee, state and federal lands/minerals.

For years oil and gas activities have been fully compatible with other uses on the TBNG! Why the change? What are your specific reasons?

Yours very truly,

[Signature]

JEM

August 7, 1992

Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Re: Draft Environmental Impact Statement
Oil and Gas Leasing on the Thunder Basin National Grassland

Dear Mr. Dilts:

We appreciate the opportunity to comment on the Draft Environmental Impact Statement prepared by your office to address oil and gas leasing within the Thunder Basin National Grassland. Our company supports oil and gas leasing of lands within the grassland and strongly recommends the multiple use of these lands.

Your Preferred Alternative 4 has designated five (5) "semi-primitive motorized recreational areas" consisting of 22,240 acres. It is our understanding that any Federal oil and gas leases to be issued within these five areas would have No Surface Occupancy stipulations attached. This places a high priority on motorised recreation at the expense of oil and gas exploration and development in these areas. We believe such restrictive stipulations in areas of significant petroleum resource development potential are unjustified. A controlled surface use stipulation for these areas would provide the opportunity for the Forest Service and the Oil and Gas Industry to jointly, and cooperatively, address situations as they arise under the controlling multiple use mandate.

We encourage you to adopt Alternative 2 as your Preferred Alternative, subject to the Winter Range modification for the area north of Osage as outlined in your Alternative 4.

Sincerely,

[Signature]

Patterson Shaw
President
PSI, Inc.

SAVANT RESOURCES, INC.
216 15th Street
Suite 1320
Denver CO 80202 9126
(303) 582-1905
Mr. Terry B. Dilts
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

August 11, 1992

Dear Mr. Dilts:

I am writing to express my concern over the proposed "No Surface Occupation" in the Thunder Basin National Grassland. This would be an additional severe blow to the mineral industry in this area, one which we can little afford.

More importantly, I am writing to inquire as to the reasoning behind such a proposal. I grew up in this area and have lived here most of my life. I have not witnessed a reduction in game animals as a result of oil and gas activities. I have seen antelope and deer graze contentedly right next to oil production facilities. Many of the facilities provide additional water for the animals which helps them get through the frequent dry times in that area. I do not think decisions which will severely impact the economic viability of critical industries should be taken in the absence of scientific research which in some way supports the decision.

I have a Ph.D. in Geography and taught for a number of years in California at the university level. I was Chairman of the Department of Geography and very involved in the development and coordination of the environmental studies program. Restricting use on federal lands should be done only when absolutely necessary and only when it can be proven beyond any doubt that the use is dangerous to humans, livestock or wild game. Even then, consideration must be given to which use is of the greatest value and often special use permits are justified.
I am not aware of any significant destruction of human life, livestock or wild game in the Thunder Basin National Grassland as the result of mineral activity. However, I am very aware of the permanent jobs created, the mineral tax revenues generated, and the benefits to our communities, schools and children because of the wise use of these resources. The reclaimed areas near the current mine sites are superior to any vegetation that existed there prior to the mining. The surface impact of an oil production location is so slight as to be meaningless.

I would be very interested to see any scientific information that you might have that rationally supports the "No Surface Occupation" in the Thunder Basin. The antelope, deer, raptors, and livestock that inhabit this area get along fine with coal mines, oil wells and gas plants and have for years. The communities that depend on the jobs and taxes generated by the wise economic use of the area will not get along so well without the continued potential for mineral development.

We can little afford to limit viable economic use of the Thunder Basin. The Wilderness Act set aside areas for the rare individual that might be offended by the occasional oil well. As you know, most of these persons arrive there in their four wheel drive vehicles, feel they have the right to drive anywhere, and as a result do more damage than the oil companies that build and then stay on well defined roads.

Yours truly,

William V. Ackerman, Ph.D.
President

65D 65E 65F

1105 Waterford
Casper, Wyoming 82609
August 10, 1992

Mr. Terry Dills, Project Manager
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Re: Oil and Gas Leasing on the Thunder Basin Medicine Bow National Grassland Environmental Impact Statement

Dear Mr. Dills:

It is my understanding that there is currently being considered an alternative that would allow no surface occupancy on a considerable portion of the Thunder Basin Medicine Bow National Grassland. Being a Wyoming resident and native of this state I would like to make a few observations concerning this Alternative and the Environmental Impact Statement for the Grasslands.

1. The Oil and Gas Industry is already currently pulling out of the State and has been for several years, as evidenced by the reduction in drilling activity. To make these lands No Surface Occupancy will only serve as another "nail in the coffin" to an already declining industry. The current Operators in the Powder River Basin have persevered the tough times and have survived by being good conscientious Operators.

2. The Thunder Basin National Grasslands has no wilderness, no wild and scenic rivers, no prime farmlands and no prime forest lands. Therefore it appears that the No Surface Occupancy is directed toward maintaining a pristine environment for semi-primitive motorized recreation. Motorized recreationists often take advantage of the roads built by the oil industry to view the areas and get to the best fishing holes. It is unreasonable to give motorized vehicle opportunities precedence over oil and gas activities when the two activities should be and are compatible.

3. I strongly support the Forest Service's recommendation to continue leasing on the Thunder Basin National Grassland, however I encourage your acceptance of Alternative 2 along with the Forest Service's recommendation of Controlled Surface Use for the Upton-Geise Deer winter range instead of the No Surface Occupancy.

Thank you for allowing our concerns and comments to be heard. I strongly believe that this area will not be harmed by oil and gas activities. Again please support Alternative 2 and allow the industry to continue to look for oil. In spite of what many environmentalists would like people to believe the industry has come along way in understanding the delicacy of the environment.

Sincerely yours,

Jerry Moyle

66A 66B 66C 66D

66E 66F

A-145
Mr. Terry B. Diltz
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Re: Oil and Gas Leasing on the Thunder Basin Medicine Bow National Grassland Environmental Impact Statement

Dear Mr. Diltz,

It is my understanding that there is currently being considered an alternative that would allow surface occupancy on a considerable portion of the Thunder Basin Medicine Bow National Grassland. Being a Wyoming resident and a businessman for over 35 years, I appreciate the opportunity to make my voice heard. The following items should be strongly considered prior to making a decision concerning this matter.

1. Currently the major portion of the exploration done in the State of Wyoming is being done the Independent Oil Men and Companies. This area is traditionally an Independents area and by taking these areas away from the Independents less economic activity will take place in the State. In recent years the Independents have become very aware of the environment and worked to restore drill sites to original condition or better.

2. The Thunder Basin National Grasslands is not as sensitive as many other areas in the West. This area has already had exploration and drilling activities and in fact many of the roads built for industry use are used for other activities. To restrict access to the oil industry because of recreational activities appears to be excessive and unreasonable. Recreational activities are only a part of the use for these lands as they are an important area for oil and gas exploration and development.

3. I strongly support the Forest Service’s recommendation to continue leasing on the Thunder Basin National Grassland, however I encourage your acceptance of Alternative 2 along with the Forest Service’s recommendation of Controlled Surface Use for the Upton-Orange Deer winter range instead of the No Surface Occupancy.

Thank you for allowing our concerns and comments to be heard. I strongly believe that this area will not be harmed by oil and gas activities. Again please support Alternative 2 and allow the oil and gas activities to continue in this area.

Sincerely yours,

Maurice W. Brown

CHORNEY OIL COMPANY
Suite 1000
565 Seventeenth Street
Denver, Colorado 80202-3910

August 11, 1992

Mr. Terry B. Diltz
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Re: Draft Environmental Impact Statement
Thunder Basin National Grassland

Dear Mr. Diltz:

We appreciate the opportunity to comment on the Draft EIS expeditiously prepared by your office concerning oil and gas leasing within the Thunder Basin National Grasslands (TBNG). As current leasehold owners in thousands of acres located in the TBNG we strongly support oil and gas leasing of lands and recommend the multiple use of these lands.

Your Preferred Alternative 4 has designated five (5) “semi-primitive motorized recreational areas” consisting of 22,240 acres. It is our understanding that any Federal oil and gas leases issued within these five areas would have No Surface Occupancy Stipulations attached. We are very disturbed that the Forest Service’s Alternative 4 places such a high degree of emphasis on motorized recreation opportunities (a use which has historically been deemed fully compatible with energy activities) at the expense of future oil and gas exploration and development in these areas. The level of restrictions imposed on these leases will have a considerable negative impact on drilling activity in the TBNG and would drastically reduce values on those leases currently in effect. It must be duly noted that current oil and gas activity is one of the most restricted and regulated activities in the TBNG.

Chorney Oil Company emphatically encourages you to adopt Alternative 2 as the Preferred Alternative along with the Winter Range modification outlined in Alternative 4.

Very truly yours,

L. Stanley
Mr. Terry B. Dilts
Project Coordinator
Methow Tow National Forest
2468 Jackson
Savannah, Wy., 82070

Dear Mr. Dilts,

I strongly support the Forest Service efforts to comply with 36 CFR 228.102 in order to resume oil and gas leasing on the Thunder Basin National Grasslands.

I am a Wyoming native who loves this state. I am also a retired geologist, but I have no financial interest in the Thunder Basin National Grasslands. My major concern is that a well-financed and aggressive non-development mentality segment of our society has non-surface occupancy as their long term goal for most Rocky Mountain public lands. The development of our resources is essential to the economy of the Rockies and the security of our country.

During my 35 year career in geology, I have seen good cooperation between the Forest Service and industry, grazing and recreation. Unless there are compelling reasons, the public must not be locked out of public lands.

I have deer in my backyard in southwest Wyoming almost every day. Development certainly doesn’t scare them away. Thanks for listening.

Sincerely,

[Signature]
[Name]

A-149
August 10, 1992

Thunder Basin National Grassland
Draft Environmental Impact Statement (EIS)
Medicine Bow National Forest

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Dear Mr. Dilts:

Texaco has reviewed the Draft Environmental Impact Statements (DEIS) on oil and gas leasing for Thunder Basin National Grassland (TBNG). We offer the following comments:

- TBNG is an area that is highly prospective for oil and gas [Texaco currently holds 25 leases within the TBNG boundaries that are either producing or held by production]. This area should be managed in a manner that encourages oil & gas exploration and development activities with minimal restrictions necessary to protect other uses and resources in the area.

- Texaco supports your proposal to replace the No Surface Occupancy (NSO) stipulation with a Controlled Surface Use (CSU) stipulation in the Upton–Osage deer winter range. All information in the DEIS suggests that NSO stipulations were too restrictive for the area. The mortality rate for the deer population during severe winter conditions is likely to increase regardless of oil and gas activity.

- We oppose Preferred Alternative 4 which places a high priority on motorized recreation at the expense of future oil and gas exploration and development activity. There is no demonstration in the DEIS that the projected impacts from oil and gas activities justify the proposed access restrictions. In fact, many motorized recreational opportunities on the TBNG are due to oil and gas access roads.

When members of the public drive through the TBNG they do not expect a "wilderness" experience. In fact, the DEIS [page III-19] indicates the communities are tolerant of the impacts of all types of activities for economic reasons.

- We disagree with the statement on page IV-25 that "... a movement toward development should be considered an irreversable and irretrievable commitment of the recreation resource." Oil and gas development only requires a small area for a limited time after which it is returned (reclaimed) to its natural condition. Oil and gas activities are compatible with other uses on the TBNG as demonstrated over the last thirty years.

- The DEIS has failed to fully analyze what impacts each alternative would have on opportunities for future exploration and development. Nor have the alternatives considered the degree of restrictions on oil and gas activity in projecting "reasonable foreseeable development (RFD) scenarios". These projections should vary from alternative to alternative depending on how severe oil and gas restrictions are.

- The Forest Service has failed to weigh the fact that once a well is producing, the size of the well site normally shrinks. Thus, long term effects of such development is less than the 250 acres discussed in the DEIS. Disruption of 50 acres over a fifteen year period would be more realistic.

- Texaco's first preference is Alternative 6 which is the least restrictive alternative, yet adequately balances commodity, recreational, environmental, and aesthetic factors in the DEIS. Our second preference would be Alternative 2 which minimizes the use of NSO stipulations and would require disclosure of availability determinations and lease stipulations prior to advertising the federal lease sale.

Texaco appreciates this opportunity to comment on the Thunder Basin National Grassland DEIS. Please contact Mr. T. M. Belton [2033] 793-43711 if you need further information.

Sincerely,

E. C. Barritt
Chief Geologist

TMR:
Mr. Terry B. Dilts,
Project Coordinator
Thunder Basin National Grasslands
and Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Re: For Alternative Number 2
Draft EIS - Thunder Basin National Grasslands

Dear Mr. Dilts:

I have driven through one of the larger proposed No Surface Occupancy (NSO) areas in Township 39 North, Ranges 67 and 68 West of the Thunder Basin National Grasslands and believe that the vast majority of Americans would consider this to be the ideal area to look for oil and gas. It is an arid, desolate, uninhabited, inaccessible, inhospitable, rugged and sparse area. Arguably the highest use for the area is, has been, and will in oil and gas exploration! The impact of exploration and development will be about as low here as could be anticipated anywhere. Much of the ground in this area is so parched and rocky that no vegetation of any kind can grow on it. And when there is no more oil and gas to be extracted, this area can be almost totally returned to its original condition. Virtually no harm would have been done.

If a comparison was made with other Forest lands where EIS's have been done, virtually none of the Grasslands would be designated NSO because it is not of the type and quality requiring such designation when judged against areas that clearly do need a NSO designation. It seems here the Forest Service decided to restrict surface access in a few areas just because they anticipated no one would object to a percentage being withheld from multiple use. The Forest Service should be consistent and acknowledge that NSO designation is not appropriate in 99% of the National Grasslands and

that a Controlled Service Use (CSU) restriction would be sufficient in those few areas that have unusual conditions requiring planning of any use of the surface.

Alternative number 2 should be chosen as the one which best accomplishes the multiple use goals of the BLM and Forest Service. If the Forest Service insists on changing the historic use of certain areas, CSU restrictions will more than adequately regulate surface use.

Sincerely,

Paul J. Cella
Land Manager
Cub Oil & Gas, Ltd.

Pic/ebp
cc: Mr. Gerald G. Heath
August 12, 1992

Oil and Gas Team Leader
Medicine Bow National Forest and
Thunder Basin National Grassland
2440 Jackson
Laramie, WY 82070

Re: Draft EIS on Oil and Gas Leasing
Thunder Basin National Grassland (TBNG)
Powder River Basin, Wyoming

I commend your efforts in preparing the draft Environmental Impact Statement (EIS) and I hope you will be able to proceed quickly with your remaining tasks in preparation of the final EIS. In my view, the crucial matter in this whole process is that oil and gas leasing has been suspended. As a result, multiple use of the lands for all users has been suspended. Exploration for oil and gas in one of the nation’s most productive basins has been suppressed. When oil and gas leasing opportunities are lost, frustration begins to set in and oil companies will choose to spend their exploration dollars elsewhere.

I think it is time for the Forest Service to clear away the confusion, re-consideration, and confrontation of the past. You can embrace an encouraging and optimistic approach to oil and gas leasing. I invite you to start down that path by selecting Alternative 2 as your preferred alternative for the TBNG. In addition, I would like to propose a challenge for the TBNG. This group of talented and Interdisciplinary Team members. This group may have the ability to identify ways to permit experienced operators to lease new areas in a routine and passive way to avoid the troublesome leasing decisions. I hope that you will use the expertise of the existing Forest Service personnel to develop innovative ways to actively forge new avenues of cooperation that will make multiple use a reality for all users.

Sincerely,
Coastal Oil & Gas Corporation

J. Michael Desmond
Land Manager-Denver Exploration

20 July 1992

Terry B. Dills
TBNG Oil and Gas Leasing EIS Project Coordinator
2440 Jackson
Laramie, Wyoming 82070

Dear Terry:

These are our comments on the Thunder Basin National Grassland (TBNG) Oil and Gas leasing Draft EIS.

Right up front, I must say that we were glad -- and, in fact, somewhat surprised -- to see that the agency's preferred alternative would protect, through No Surface Occupancy stipulations (NSOs), all five inventoried semi-primitive (SP) motorized recreation areas on the TBNG. This will help to ensure that 22,240 acres of the 572,224 acres of the TBNG administered by the USFS will retain some natural character. We do agree that oil and gas developments are incompatible with semi-primitive recreation uses, and we appreciate the Forest Service holding true to its Recreation Opportunity Spectrum classification and to its LRMP's standards and guidelines for these SP areas.

However, while we feel that Alternative 4 is the best of the leasing alternatives considered, we still see some major deficiencies. These are discussed below, and we would like to see them addressed in the FEIS, either through a new alternative (or alternatives) or through modification of Alternative 4.

1. Reasonable Range Of Alternatives. First, even with NSOs applied to all five inventoried semi-primitive areas, the total acreage protected under Alternative 4 from future road development amounts to less than 4% of the nation's grassland.1 This figure really makes one question whether a balance of multiple uses is occurring on the TBNG. It is important to note that 4% is the greatest acreage of NSOs proposed in any alternative. The next more "protective" alternative considered in the DEIS is Alternative 5 which essentially excludes oil and gas leasing on 100% of the TBNG. Certainly there are some reasonable alternatives offering more than 4% and less than 100% of protection. We would like to see consideration given to the use of No Lease stipulations for protection of particularly important biological, cultural, and recreational areas.

In addition, there are only two levels of "No Lease" acreages considered in the alternatives: 0.0 acre designated No Lease (Alternatives 1-4 and 6) and 520,000 acres designated No Lease (Alternative 5). We would like to see consideration given to the use of No Lease stipulations for protection of particularly important biological, cultural, and recreational areas.

1 Table 4-1 indicates that the Upton-Osage severe winter relief range (4,800 acres) will be protected through NSOs. Yet, the discussion on page 8-8 and 8-9 of the DEIS implies that NSOs stipulations will apply to this range. This should be clarified in the FEIS. Our comments are based on the DEIS statement that the winter relief range will be regulated under CBUs, and that the total NSO acreage for Alternative 4 will therefore be 22,240 acres (SP areas) plus 320 acres associated with the Walker Tipi Ring site. Using these numbers, the total NSO acreage is 22,560 or 3.9% of the total federally administered TBNG.
2. NSO vs. No Leasing. The reason we would like to see more emphasis on "No Lease" stipulations is that we are not convinced NSOs will prevent road construction and degradation of important resources such as the SP areas. For instance, it appears to us that seismic exploration may be performed on NSO lands without violating the Surface Occupancy restriction. Such activities will necessitate construction of roads. The restrictions, and more importantly, the allowances of exploration and development activities under NSOs should be better clarified in the FEIS.

In requesting that more consideration be given to the use of No Lease stipulations, we would like to point out that imposing a No Lease stipulation at this time will not cause any loss of the resource. Oil and gas will not go away by leaving them in the ground for a while. In fact, they will no doubt become more valuable as other oil and gas reserves are depleted. Also, as new technologies (such as horizontal/directional drilling) are put into use in the future, our oil and gas resources will be extractable with greater efficiency and less disruption of surface resources (critical wildlife habitat, recreation areas, etc.). For these reasons, and to prevent a "boom and bust" economy from developing when all lands are opened for leasing, it makes sense to leave some areas reserved for later exploration and use.

3. Bases For Imposing Leasing Stipulations. The leasing stipulations considered in formulating the alternatives were limited to: (i) protecting reservoirs and inventoried SP Motorized areas for recreation use, (ii) protecting several winter range for deer, and (iii) protecting a site of cultural importance (Walker Tp Ring). While protection of these resources is certainly essential, we do not believe that protecting just these resources satisfies the agency's obligation to provide for a balance of multiple uses (there are no semi-primitive non-motorized areas designated on the TBNG) or to ensure a sustainable short-grass prairie ecosystem.

Among others, the following resources should be protected through lease restrictions:

- Uninventoried semi-primitive areas, particularly those areas with few roads. It is the condition on the ground, not the official status, which determines the character of an area. A thorough inventory should be completed before limiting consideration of surface protection to just the five inventoried SP areas.
- Locations of endangered, threatened, ESA candidate, rare, and sensitive plants. Unlike many animal species, plants cannot relocate to avoid impacts from the significant ground disturbances associated with oil and gas developments. Little consideration appears to have been given to the protection of plant species. The USFS should contact the Nature Conservancy and Wyoming Natural Heritage Program in Laramie, and the U.S. Fish and Wildlife Service in Denver to obtain information about which plants are of concern, and where they are located. The USFS should consider all plants on the revised R2 draft sensitive species list.
- Other critical wildlife habitat areas including swift fox burrows and foraging habitat, grouse leks, potential black-footed ferret reintroduction sites, and known Mountain Plover habitat. In many cases, it is not enough to simply apply a seasonal restriction on oil and gas activity; surface disturbances can permanently affect habitat.

We are concerned with the need to protect wildlife and wildlife habitat quite pointedly in our scoping comments. The DEIS's discussion of the affected wildlife environment is lacking specificity. Leasing stipulations should be based on known, suspected, or potential habitat of sensitive species. It is not likely that imposing NSO or No Lease stipulations on these important areas would significantly reduce the acreage available for leasing, so we do not feel that this request is unreasonable.

4. Cumulative Impacts. There is little discussion about cumulative effects caused by extensive development of the TBNG. Detailed discussion should be given about the past developments (drilling, mining, grazing, road building, etc.) and likely future developments. The cumulative impacts should be considered with the original, pre-settlement condition of the grassland ecosystem used as a baseline. Impacts should also be considered with respect to the existing situation.

Thank you for considering these comments, and please keep us informed about any work that will be done to inventory important plant and animal habitat, and to reinventor the TBNG's semi-primitive areas.

Sincerely,

Donald J. Duerr
for Friends of the Bow
P.O. Box 6032
Laramie, Wyoming 82070
August 13, 1992

Mr. Terry B. Dilts
Project Coordinator
Thunder Basin National Grasslands
and Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Re: In favor of Alternative Number 2
Draft EIS - Thunder Basin National Grasslands

Dear Mr. Dilts,

Club Oil & Gas, Ltd. is presently working towards drilling a significant number of wells in and around the Thunder Basin National Grasslands. We own BLM, Forest, Fee and State leases and have expended a great deal of effort and capital to pursue our exploration plans. The Forest Service Alternative number 4 in the draft EIS creates large areas in which all leases would be issued with No Surface Occupancy (NSO) restrictions. This would make it difficult, if not impossible, for industry to put together adequate drilling blocks on which to drill an exploratory well, plus it severely limits our ability to expand our efforts if a discovery is made on adjacent fee or State lands.

Historically, the Forest Service, the BLM and the Oil and Gas Industry have worked hard together in Wyoming to protect the environment while pursuing legitimate economic goals. Without the extreme restriction of NSO lease restrictions, the BLM will remain in a position to closely monitor oil and gas operations as they have always done. Club requests that the on-going, workable, mutually beneficial relationship between the industry, the Forest Service and the BLM be continued so that our substantial and expensive exploration program is not curtailed by unanticipated arbitrary restrictions on accessibility to Forest lands. Alternative number 2 is our preferred alternative with Controlled Service Occupancy (CSO) lease restrictions being attached only to those leases the Forest Service believes absolutely need close watching.

Sincerely,

CLUB OIL & GAS, LTD.

Vincent J. Duncan
President

cc: Mr. Gerald G. Heath
 Memorandum

To: State Director (394)
From: District Manager, Casper
Subject: Comments on the Draft Environmental Impact Statement (EIS) for Oil and Gas Leasing on the Thunder Basin National Grassland

The Branch of Fluid Minerals, Casper District, has completed its review of the Draft Environmental Impact Statement (EIS) for Oil and Gas Leasing on the Thunder Basin National Grassland. Our concerns and comments, in order of importance, are detailed below.

1. Our primary concern with the plan is the No Surface Occupancy (NSO) stipulation placed on five areas, Miller Hills, Cow Creek Buttes, Red Hills, Dry Creek, and Weston. These areas comprise a total of 22,240 acres within the Grassland and have been classified as semi-primitive motorized recreation areas. The Thunder Basin National Grasslands are located in the central portion of the Powder River, one of the richest petroleum provinces in the Rocky Mountain region. The Powder River Basin has a long history of oil and gas production. Since the late 1800's, approximately 2.3 million barrels of recoverable oil have been discovered. There are currently 58 developed oil and gas fields in the Thunder Basin National Grasslands. It is apparent that oil and gas activities are an integral part of economic activities in the region.

   a. These stipulations would effectively prohibit oil and gas leasing, along with subsequent exploration and development activities in these areas, since it is unlikely that potential oil and gas reservoirs could be economically tested or developed more than 3000 feet from the surface location.

   b. There is no provision for drainage protection of the NSO block areas. A basic factor in drainage evaluations is that the Federal leases has to be able to drill an economic well. The NSO stipulation severely handicaps the economics of a well if it has to be a directionally drilled hole. Any deviation of the wellbore would significantly add to the cost of drilling the well.
c. All five NSO areas lie within areas which have been classified as having high potential for the occurrence of oil and gas (by District Fluid Minerals staff). These areas are included within hydrocarbon play areas ranging in age from Pennsylvanian to the Upper Cretaceous as defined by the U. S. Geological Survey. Development potential is estimated at low to moderate potential for all but one area, Weston, which is rated at high development potential. Currently these areas are relatively unexplored, with a few dry holes and little or no production. However, the majority of the acreage is under lease. All five of the areas have oil and gas production from stratigraphic traps in one or more productive intervals in the near vicinity (5 miles or less). Even though development potential has been estimated to be low to moderate for the next 5 to 10 years, this does not mean that development will not occur or is unlikely. An oil and gas development potential map is intended to provide an estimate of average development. A designation of low development potential does not indicate discovery and development of an oil and gas field is unlikely, only that the average density of drilling is estimated to be less. These NSO areas may very well contain undiscovered economically recoverable oil and gas resources.

d. There is also a concern for reservoir integrity and conservation of the oil and gas resource. Companies require a sufficient land base to effectively drill a potential reservoir. Without an adequate land base to develop the oil and gas reservoir, some reservoirs may be damaged beyond repair due to the application of limited or inadequate recovery techniques. Although secondary recovery can proceed without the entire reservoir being leased, it is generally not desirable or economic to do so.

2. We also have a concern with the Controlled Surface Use (CSU) designation around artificial, mamade, fishing areas in the Upton-Osage and Rochelle Hills areas. Even though visible fishing areas of some type may be a scarce resource on the Grassland, this does not necessarily mean they should be protected at the expense of significant, long term and ongoing, oil and gas exploration and development. If these are the only viable fisheries in northeastern Wyoming, protection of these areas may be of some value. However, the 440 yard (1320 feet) buffer zone around these artificial fishing reservoirs appears to be excessive.

A buffer of 500 feet would be more appropriate. Before the 440 yard (1320 feet) CSU stipulation is applied, the adverse effects on the fishing experience (i.e. how many fishing days, quality, etc.) should be compared to the effects to the oil and gas resources (i.e. lack of access to the resource and loss of revenue). A reduction of the buffer zone from the excessive 1320 feet to 500 feet would reduce the restricted area by about 80%.

Additiona! concerns and comments relating to specific sgments of the plan are listed below:

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<thead>
<tr>
<th>Page</th>
<th>Parag</th>
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<th>Comment</th>
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<tbody>
<tr>
<td>I-9</td>
<td>5</td>
<td>6</td>
<td>Additional cement plugs are required to protect groundwater zones.</td>
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<td>II-15</td>
<td>4</td>
<td>1</td>
<td>The drilling of wells on Federal minerals is not governed by the WOCC. Federal regulations and Onshore Orders via BLN govern drilling.</td>
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<td>II-15</td>
<td>4</td>
<td>3</td>
<td>&quot;Grouting&quot; is not an industry term &quot;cementing&quot; is the proper term.</td>
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<td>II-18</td>
<td>3</td>
<td>3</td>
<td>When drainage occurs, the losing mineral owner is due compensation for the loss - it just doesn't receive it.</td>
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<tr>
<td>III-15</td>
<td>4</td>
<td>1</td>
<td>Reclaimed sites are not commonly called &quot;dry holes&quot;. When a well is plugged and abandoned as a dry hole it does need to be reclaimed, but so does any producing well that's reached the end of its' useful life.</td>
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<td>III-15</td>
<td>4</td>
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<td>BLN Onshore Order states you can have a dry hole marker or a buried plate. The USFS would probably opt for the latter to minimize long term impacts.</td>
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<td>III-18</td>
<td>1</td>
<td>5</td>
<td>The statement is made that 98% of the Grassland is suitable for livestock foraging. Under Alter. 4, are the oil and gas NSO areas also off-limits to grazing?</td>
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III-19 last  last How does USFS quantify entirely non-facility based recreation pursuits? It is very difficult to quantify driving for pleasure and hunting hours. In the demand for semi-primitive motorized recreation areas, other than for hunting purposes, really that high?

IV-5  1  1 Does the USFS intend to allow leasing in areas where it may be in conflict with coal producing areas?

IV-8  2  2 WOCC rules do not govern development of Federal minerals.

IV-29  3  1 Lowest discount rate over last 8 years for evaluating industry oil and gas investments was 8 - 9%. It is a little unrealistic.

In conclusion, it is our recommendation that USFS readdress the application of the NRO stipulations to the above referenced areas, and reevaluate the CES stipulations with respect to the buffer zone distance for oil and gas activities. We question the need to impose such new restrictive stipulations in areas in which oil and gas activities have been historically the most significant economic use of these lands and have been generally accepted as compatible with whatever recreation opportunities are available. The District Fluids Staff is concerned that the NRO and CES stipulations will negatively impact existing oil and gas operational planning by the petroleum industry and preclude future oil and gas development. This in turn may cause millions of barrels of oil to be left in the ground; hence promoting the gross waste of a significant resource and the loss of federal and state revenues from one of the most active oil and gas producing basins in the lower 48 states.

If you have any questions or comments, please contact Earl S. Oswald, Chief, Branch of Fluid Minerals, at (307) 261-6211, or Leslie Thielke, Senior Geologist, at (307) 261-7614.

cc: Terry Dilts, Project Coordinator Medicine Bow National Forest 2468 Jackson Laramie, WY 82070 USF 923

8-165 3-17

August 14, 1985

Mr. Terril E. Dilts
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

I understand that the Forest Service is proposing a bill stipulation on oil and gas leases in the Thunder Basin National Grasslands. This would appear to be preferentially restricting one industry. An industry which has operated in the Thunder Basin for many years and developed many oil fields.

I am sure that many companies still want to explore for oil in the area. This exploration and potential development is vital to the economy of this state. I for one do not wish to see a state income tax to which will effect all Wyoming citizens. I bet most of us would put us with an extra fiscal in the area for a few years if it meant that our taxes would not go up.

I view my understanding that there is private land adjacent to federal lands in the Thunder Basin. Restrictions leasing to private lands will hinder proper development of our oil reserves. The finding of oil on private property does not mean that the majority of oil is under that property. It could be under the federal land next door. Thus the idea that any surface occupancy restriction would mean that companies would be forced to adore drill under federal lands to recover the oil. This is even more so, twice the cost of normal drilling. This added cost could exclude development of an oil property. It has in the past, made drilling and its costs probably would stop many companies from drilling projects if they had to drill from private property.

There also some concern about the deer winter range. There are those people who say that drilling disturbs the deer. I have pictures of elk and deer grazing within 200 yards of operating drill rigs. They are not disturbed in the least bit. I wish pictures is what I like. Most of what I have to say comes down to jobs and the economy of Wyoming and the environment. The oil industry uses the surface of the earth for only a few years, when the oil is recovered, the land is restored. That is the law, we need employment now.

Sincerely,

Roger Hotten

Roger Hotten

197 Indian Paintbrush Casper, WY 8204

A-166
Dear Mr. Dilts:

In response to the captioned DEIS, the Denver Association of Petroleum Landmen would like to make the following comments regarding oil and gas leasing within the Thunder Basin National Grassland (TBNG).

Our association recommends the multiple use of the grassland and strongly supports the leasing for oil and gas within these lands. The TBNG is an extremely important area for oil and gas exploration and development. The Forest Service’s Preferred Alternative 4 would give motorized recreation a high degree of emphasis at the expense of future oil and gas exploration and development. Alternative 4 would result in a No Surface Occupancy stipulation attached to any leases issued within the five (5) “semiprimitive motorized recreational areas” consisting of 22,240 acres. We believe these restrictive stipulations are unjustified in areas of such significant petroleum resource development potential. In contrast, Alternative 2 would provide for a controlled surface use stipulation in which the Forest Service and the Oil and Gas industry could together address situations as they arise under the controlling multiple use mandate.

In consideration of the above, the Denver Association of Petroleum Landmen would like to recommend that the Forest Service adopt Alternative 2 as your Preferred Alternative, subject to the Winter Range modification for the area north of Osage, as outlined in your Alternative 4.

Thank you for the opportunity to comment on the TBNG Draft Environmental Impact Statement.

Sincerely yours,

Mary C. Sellers, CPL
Treasurer

Therm +.. Diltz, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

RE: Draft Environmental Impact Statement
Oil & Gas Leasing
Thunder Basin National Grasslands

Conoco Inc. would like to take this opportunity to briefly comment on the proposed Draft Environmental Impact Statement (DEIS) for oil and gas leasing on the Thunder Basin National Grassland (TBNG) in Northeastern Wyoming. The TBNG is located in the Powder River Basin geologic province, one of the major oil producing regions in Wyoming. Conoco believes that it is in the public’s best interest to resume oil and gas leasing in the TBNG. Accordingly, Conoco supports the Forest Service’s efforts to comply with 36 CFR 228.102.

As was stated above, the TBNG is one of the principal hydrocarbon producing areas in Wyoming. The oil and gas industry has already demonstrated that production operations can be conducted in harmony alongside other activities in the area. Conoco recommends that the Forest Service resist efforts to apply no surface occupancy (NSO) restrictions in the semi-primitized motorized recreation areas in the TBNG.

The issuance of federal leases is critical to the continued development of hydrocarbon resources in the TBNG. Although some state and fee leaseholds do exist in the area, it can not be assumed that these properties would cover a sufficient portion of a potential reservoir to justify drilling it. Making the federal acreage available for leasing will help assure that oil and gas operations will be conducted in the most efficient manner.

Should any questions arise concerning this matter, please contact Mr. Paul Schultz, of this office at the letterhead address and phone number.

Yours very truly,

Paul Schultz
Senior Conservation Advisor
Dear Terry,

This is an addendum to our TBNG DEIS comments of June 25, 1992.

Please include in the DEIS an alternative which incorporates the agency’s new ecosystem management direction and policy as expressed in the letters from the Chief of June 4, 1992 and June 25, 1992.

We believe this direction/policy applies to natural grasslands as well as forests. We also feel that such an ecosystem - based alternative is in line with our extensive comments on wildlife considerations in the DEIS.

Thank you!

Dan Daigle
Owner of the Bow
P.O. Box 6032
Laramie, WY 82070

August 18, 1992

Mr. Terry Dilts
Project Coordinator
Medicine Bow National Forest
2448 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

Exxon Company, USA is pleased to offer the following comments on the Draft Environmental Impact Statement (DEIS) on Oil and Gas Leasing for the Thunder Basin National Grassland (TBNG).

Exxon supports the Forest Service’s efforts to expeditiously complete the subject leasing analysis. We believe it complies with the requirements established in 36 CFR 279.102 and we wish to commend the Forest Service for completing the analysis in less than a year.

We are in agreement with the Forest Service that the No Surface Occupancy (NSO) stipulation in the Upton-Deepe deer winter range is too restrictive and strongly support the proposal to replace it with the Controlled Surface Use stipulation.

Exxon is concerned, however, about the selection of Alternative 4 as the preferred alternative because it unfairly restricts industry activities while other uses continue unimpeded. The TBNG is host to a large number of multiple use activities including oil and gas exploration and production, and we question whether adequate justification exists to support the DEIS’ proposal to impose NSO in the five semi-primitive motorized recreation areas. There are no wilderness areas, wilderness candidate lands, or wild and scenic rivers in TBNG. In fact, the Visual Quality Objectives are mostly in the Modification to Maximum Modification classes with minor amounts of Retention and Partial Retention.

We believe the current environmental analysis process for project proposals provides ample opportunity for public involvement, identification of site-specific impacts, and application of appropriate impact mitigation and should be used in lieu of the NSO stipulation in the recreation emphasis areas. The existing process promotes flexibility and therefore represents a clear advantage over NSO stipulations for all concerned parties.

Please feel free to contact Mr. Fernando Blackmon on my staff at 915-688-8778 if you have any questions or if we can provide additional information.

Sincerely,

Charlotte Harper

A Division of Exon Corporation
PRENALTA CORPORATION
625 FIRST INTERSTATE BUILDING
P.O. BOX 2514
CASPER, WYOMING 82602

August 17, 1992

Medicine Bow National Forest
2688 Jackson
Laramie, WY 82070

Attention: Mr. Terry B. Dilts,
Project Coordinator

RE: DRAFT ENVIRONMENTAL IMPACT STATEMENT - THUNDER BASIN NATIONAL GRASSLAND

Gentlemen:

Prenalta Corporation has conducted oil and gas operations in the Powder River Basin, for the past thirty years. We are involved both on National Grasslands and adjacent lands.

We strongly recommend that the Forest Service adopt ALTERNATIVE 2 as the preferred alternative. We can see no justification for "no surface occupancy" in the five semi-primitive motorized recreational areas. These areas have good potential for oil and gas exploration and production and there is nothing in oil and gas operations which would be incompatible with motorized recreation. Well controlled oil operations are much less destructive to the surface than unrestricted, unsupervised recreational vehicles. In fact, the type of "set aside" which you propose would have an unwarranted negative impact on the soils and vegetation as well as the wildlife in these areas.

It is interesting to note that this proposal portends to protect wildlife from the oil and gas activities which have operated side by side with wildlife habitat since the drilling of the first well in the Powder River Basin. It seems to us that since wildlife and other uses of the National Grasslands have existed with oil and gas operations for the past fifty years or more there can be no justification for additional restrictions in the future.

Further restrictions on the National Grasslands will have an adverse economic impact on State and local government at a time when the State and its citizens are already feeling a severe economic pinch. We would question the economic evaluation in the DEIS and feel that the basic numbers used to come to these conclusions be re-evaluated for their accuracy. The economic impact of further restrictions on the grassland will have a much greater impact than stated in the DEIS.

Very truly yours,

Elmer S. Parson, Jr.
Vice President

ESP/ww

CC: BNM, JAM
August 18, 1992

Mr. Terry B. Dits, Project Coordinator
Medicine Bow National Forest
2468 Jackson Street
Laramie, WY 82070

Dear Mr. Dits:

On behalf of the Petroleum Association of Wyoming (PAW), we offer the following comments in response to the Draft Environmental Impact Statement (DEIS) for Oil and Gas Leasing on the Thunder Basin National Grassland (TBNG). PAW is a division of the Rocky Mountain Oil and Gas Association (RMOGA), whose members account for over 90% of the oil and gas exploration, production and transportation in the state of Wyoming. As representatives of the oil and gas industry, PAW and RMOGA have been active and cooperative participants in all phases of the planning process.

PAW is deeply concerned with the restrictive management being applied in the preferred alternative to oil and gas activities in semi-primitive motorized recreation areas. Forest Service efforts to place a greater emphasis on recreation does not necessitate or justify the application of highly restrictive NSO in these areas. Oil and gas activities have historically been accepted as compatible with recreation opportunities in the TBNG. The mere identification, during the scoping process, of potential conflict or incompatibility as an issue is not justification for imposing highly restrictive stipulations. Documentation in the analysis does not support the need for NSO. We believe the Forest Service would be remiss to single out oil and gas for such unjustifiable restrictions.

We strongly support the Forest Service's proposal to replace the NSO stipulation in the Osage-Upton winter range with a Controlled Surface Use (CSU) stipulation. As with the aforementioned, all information in the DEIS indicated that NSO is too restrictive.

Following extensive review of the DEIS, we concur with RMOGA's August 4, 1992 comments to the Medicine Bow National Forest. Therefore, please consider RMOGA's comments, as attached, the opinion and response of PAW as well.

Sincerely,

[Signature]  
Cheryl M. Feraud

cc: Elmer Parson  
John Kauchich  
Bob Anderson  
Alice Benitez  
Claire Moseley
Ref: SWM-EA

AUG 18 1982

Terry Dilts, Project Coordinator
USDA Forest Service
Medicine Bow National Forest
2468 Jackson
Laramie, Wyoming 82070

Re: Thunder Basin National Grassland: Oil and Gas Leasing Draft Environmental Impact Statement

Dear Mr. Dilts:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the Region VIII office of the Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for Oil and Gas Leasing on the Thunder Basin National Grassland, Wyoming (TBNG). We offer the following comments for your consideration in preparing the Final EIS.

We appreciate the effort on behalf of yourself and other members of the ID team for meeting with my staff earlier this year to discuss some of the issues addressed in this EIS. We believe it was helpful to identify each other's concerns regarding NEPA requirements. Given the increased emphasis that the Forest Service has recently placed upon the ecosystem management approach of analysis, we would be amenable to future meetings of this type to discuss evolving issues with the Forest Service.

Information Adequacy Concerns

During the course of our review, we found that the DEIS provides a good narrative synopsis of baseline resources information, but does not extract sufficient data from the referenced materials to allow the reviewer to independently analyze potential environmental impacts. The limited data presented in this document appears to lack critical information in a number of areas which are identified in our detailed comments. Consequently, without sufficient documentation of existing environmental conditions in the project areas, the EPA believes an adequate analysis of potential impacts, direct, indirect or cumulative, is not possible.

As a result of concerns expressed from many quarters, critical analyses addressing the adequacy of the information available to the Forest Service and the BLM in support of their oil and gas leasing decisions were conducted by the General Accounting Office (GAO) and the National Academy of Sciences (NAS). The goal was to insure "...that those activities were
neither prematurely excluded from, or indiscriminately included on, federal lands by inadequately informed planning decisions.

(Land Use Planning and Oils and Gas Leasing on Oklahoma Federal Lands: FRA, 1989) (Using these criteria, the EPA feels that the Thunder Basin DEIS fails to document sufficient information upon which to base oil and gas leasing decisions.

Based upon our meeting earlier this year and the various materials that are referenced in the DEIS, it appears that the necessary data is currently available. We recommend that the Final RIS be supplemented with sufficient available information, in a summarized tabular format, to document and support conclusions made in the DEIS. As suggested in our previous discussions, the information obtained from the existing database need not be voluminous, but should be adequate to characterize resources in areas of the THB where activities are most likely to occur.

Baseline Monitoring Data

The document indicates that site specific analysis will occur at the Application for Permit to Drill (APD) stage. The DEIS also notes that validation monitoring will occur at the lease proposal stage. This monitoring serves to verify the site conditions anticipated in the analysis, the adequacy of NEPA analysis, and identify site-specific stipulations for lands that are to be authorized for leasing. (Page IV-31)

As a possible means of addressing environmental database needs, the EPA recommends that validation monitoring particularly focus on the sufficiency of site-specific baseline data to be used for monitoring during the life of the proposed project. For leases where validation monitoring indicates that the baseline data is insufficient to effectively conduct resources monitoring, we recommend that such leases be issued with the stipulation that adequate environmental baseline data be collected prior to submitting the APD.

The baseline data should be suitable to serve the following purposes:

1) To meet State and Federal agency guidelines and standards.

2) Support the goals of the Forest Plan.

3) To document environmental impacts of the proposed actions.

4) To assist the Decision Maker in evaluating whether to approve the APD and accompanying Surface Use Plan of Operations (SUPP), as proposed or subject to additional conditions of approval.

We recognize that, because of Agency resource limitations and time constraints once the APD has been submitted, collection of monitoring data frequently does not receive the desired degree of priority. The validation monitoring stage appears to be an appropriate time to evaluate sufficiency of existing site-specific baseline data for proposed lease parcels that are to be issued.

This recommendation serves several purposes. The site-specific baseline data should complement the recently announced ecosystem management approach that the Forest Service is currently pursuing. Additionally, upon issuance of the lease, the proposed of the proposed drilling should be able to more narrowly define where impacts are most likely to occur and, therefore, where monitoring should be more effective. Finally, the recommended action provides a more reasonable timeframe in which to collect environmental impact data, which typically has seasonal characteristics that may result in wide variations in the database.

Document Rating

Based on the procedures EPA uses to evaluate the environmental impacts and the adequacy of information provided in DEIS of the proposed action and alternatives, the EPA Region VIII rates the Draft Environmental Impact Statement (DEIS) for Oil and Gas Leasing on the Thunder Basin National Grassland as category BC-3 (Environmental Concerns, Insufficient Information). This rating indicates that EPA has identified potential environmental impacts, particularly concerning the preservation of surface and ground water quality, which should be avoided in order to fully protect the environment. Additionally, the DEIS does not contain sufficient information to fully assess environmental impacts that should be avoided and specific mitigation methods to minimise those impacts.

If you may have questions related to our comments, please contact Larry Kimmel at (303) 293-1697. Enclosed are additional detailed comments discussing issues in the Draft RIS.

Sincerely,

[Signature]

Robert R. Despain, Chief
Environmental Assessment Branch
Water Management Division

Enclosure
Wetlands/Riparian Areas:

The EIS stresses the importance, unique character, and rarity of riparian and wetland resources for the analysis area. Because of the importance of these areas in terms of biodiversity, productivity and ecological integrity, several issues need further consideration in the FEIS.

1. The DEIS indicates that wetland and riparian areas will receive Controlled Surface Use (CSU) stipulations under the preferred alternative (Alternative 4). A stipulation within the CSU allows development in wetlands and riparian areas when:
   a. No reasonable alternative exists
   b. Given an authorized officer's satisfaction

   Given that wetlands occupy less than 1% of the TMDL (FEIS, page III-7), the EPA recommends that the Forest Service apply a No Surface Occupancy (NSO) stipulation to protect these limited resources. This additional measure of protection to wetlands should not substantively impact oil and gas development, which is not a water-dependent activity.

2. Similarly, development in floodplains carries significant risks to aquatic and riparian resources since high flows are concentrated during the Spring season and may be quite extreme (areas with zero flow during late Summer-early Fall have been documented with maximum flows up to 16,000 CFS during April-May; Meshe and Johnson, 1980). A NSO provision within 100 year floodplains should be the preferred option, due to the long-term nature of development activities (increased risk), and due to potential for off-site transport of contaminants from disturbed areas and drilling materials during high flows within these areas.

3. Mapping of wetlands and riparian areas was conducted by the University of Wyoming Extension. Delination was done using color enhanced photos at a scale of 1:88,900. According to the Aquatic and Riparian Resources Current Conditions Report (3-6-92):

   "Because of the scale of the photos, specific vegetation types were difficult if not impossible to pick out. Names were labelled with geographic feature involved, the major physiognomic type, and often the vegetation type found there (key was submitted with overlays)."

This suggests that a large degree of uncertainty existed in delineation procedures. There is no indication in the EIS of the extent of 'ground-truthing' of wetland resources having been conducted to date. It would be very helpful to know what % of wetland can be distinguished at the scale used (one acre, ten acres, etc.) This information would provide a better understanding of the resolution and adequacy of wetlands mapping methods employed.

Definitive delineation should be performed prior to approval of drilling or construction activities. The FEIS should state that any dredge or fill operations in wetlands will be regulated under Section 404 of the Clean Water Act, and must be referred to the Army Corps of Engineers for further consideration.

4. Standard Lease Terms allow the Forest Service to move proposed well locations 200 meters in order to protect riparian/wetland areas. This language does not, however, require such actions. A clarification of when these actions will be employed should be specifically stated and more importantly when riparian protection will not be required.

5. The Aquatic and Riparian Resources Alternatives Analysis (12-20-91) indicates that springs or artesian wells provide perennial flow for relatively short reaches downstream (USD). 1996. These flows do not continue far from their source because of infiltration and evaporation. These relatively short reaches of perennial flowing water forms some of the best wetland on the TMDL. It is apparent that these resources have not been adequately identified and mapped at this point. Therefore, comprehensive inventories will need to be conducted prior to development. These habitats should be identified on a site-specific basis prior to drilling or construction and encroachment in these areas should be prohibited due to their unique nature. Other waterbodies such as natural pools and transitory (non-perennial) wetlands should be included in this inventory.

6. The definition of riparian/wetland areas is not clear. As specified in the EIS (pp. II-3), the 'riparian ecosystem (characterized by distinct vegetation), and adjacent ecosystems that remain within approximately 100 feet (30.5 meters) measured horizontally from both edges of all perennial streams and from the shores of lakes and other still water bodies (Forest Plan III-205). The FEIS should clarify how lease stipulations will be applied to protect intermittent streams.
Surface Water Quality:

1. The analysis identifies several impaired waters. Cumulative effects and the implications of anti-degradation must be considered when analyzing the impacts of the proposed project. The following excerpts from the DEIS regarding criteria and beneficial uses are ‘disjointed’ and should be clarified:

   a. The Aquatic and Riparian Resource Alternatives Analysis (12-20-91) indicates that "a small portion of Eagle Thunder Creek, within the Cheyenne River drainage, has unacceptable levels of heavy metals to support aquatic life or to meet human health criteria."

   b. The RIS (pg. III-11) states that "Manganese concentrations exceed the 90 µg/L secondary drinking-water standard in a high percentage of the samples..... but are still below concentrations considered toxic to aquatic life."

   c. Less than 5% of the sites violate the 300 µg/L iron standard (Secondary Drinking Water), while a few sites exceed 1000 µg/L (Aquatic Life Support).

   d. The EIR (p. III-11) states that "Other potentially toxic trace minerals that occur in concentrations higher than the national primary drinking water standard, but generally not higher than concentrations to support aquatic life, are cadmium, lead, and mercury. These data should be re-checked, since for many metals the freshwater acute toxicity values are below drinking water levels. For example the freshwater acute toxicity value for cadmium is 3.9 mg/L while the drinking water standard is 5.0 mg/L. For mercury the acute toxicity value is 2.4 while the drinking water value is 2.0 (Source: EPA Water Quality Criteria). This seems to contradict the conclusions reached in the EIS.

It appears that not all significant waterbodies were addressed in the document. The final EIS should provide a tabular summary of water quality information for the TRHCC. It should contain all known waterbodies (including lakes, streams, wetlands and reservoirs), the Wyoming beneficial use designation, and criteria/standards of the waterbody to disclose existing conditions. Water hardness is essential for a discussion of most chemical constituents, particularly heavy metals and should, therefore, be included in this table.

2. Water use in the area is identified as being approximately 90% irrigation use. Offsite (i.e., downstream) water uses which might be affected by actions within TRHCC should also be discussed in the final EIS.

3. From a water quality standpoint, suspended solids appear to be the key issue encountered. The RIS states that 31,000 sheep and 20,000 cattle are grazed on 201 allotments on an annual basis. Livestock impacts are cited as the largest contributor to water quality degradation. The cumulative effects of these practices should be reviewed in discussions of the alternatives. The impacts of allotment management practices should be addressed in the EIS.

4. Coal development is also a major activity in the analysis area which needs to be included in the cumulative effects analysis. The number of active coal mines in the area require their inclusion in the cumulative effect analysis of water quality.

5. Oil spills or spills of contaminated water have occurred on TRHCC with impacts primarily to intermittent drainages (Aquatic and Riparian Resources Alternatives Analysis; 12-20-91). Given that spills or blowouts are low probability but high-risk occurrences, design considerations should be employed which minimize risk to water resources. The PEIS should identify mitigation engineering features (barriers, interception pits, etc.) necessary to provide adequate protection to water resources against unforeseen occurrences. Considering the seasonally low flows in most TRHCC drainages, any contamination is a major concern. Localized, large-scale impacts could be realized since dilution would be minimal or non-existent.

6. Areas of highly eroding soils have been identified within the analysis area. Development activities should be carefully controlled and mitigated or restricted in these areas to help protect water quality in surrounding drainages.

Fisheries and Associated Biotic Communities:

1. The Wyoming Game and Fish Department, Buffalo (WY) Fisheries Management Office has made various maps and tables regarding fish, wildlife, and other species. The maps show the location of waterbodies and the distribution of various species. The EIS should include a detailed discussion of the effects of the proposed project on these species. The EIS should also include a discussion of the effects of the proposed project on the aquatic and riparian ecosystems of the area. The EIS should also include a discussion of the effects of the proposed project on the aquatic and riparian ecosystems of the area.
2. While sport fisheries are limited within THMG, activities such as waterfowl nesting and feeding are documented within the Grassland. Non-game fish and aquatic life in general are protected under law. Therefore, water quality and toxic concerns are important considerations in all reservoir, plays, riparian and wetland areas.

Ground Water Quality:

1. A comprehensive list of the ground waters present and the quality of each should be included in the final document. The aquifers should be completely characterized from available referenced information.

2. Describe the current and reasonably foreseeable future uses of ground waters in the analysis area.

3. Direct impacts to ground water quality are adequately discussed in the DEIS. The FEIS should also include a discussion of indirect impacts to ground water quality and quantity. The Forest Service should address possible mitigation for all impacts, direct, indirect and cumulative, under each option.

4. What state/local regulations governing use and protection of ground water currently apply and how are these regulations to be included in the decision-making process for this area?

5. What ecologically important ground waters are present in the area and what measures will be used to protect them?

Monitoring Plan:

1. Extensive oil and gas production, coal mining, and other development activities have been pursued on THMG for decades; however, the baseline monitoring data displayed in the document is often inadequate or dated. The DEIS discusses the importance of baseline, implementation, and effectiveness monitoring activities. When a site is selected for potential drilling or construction, aquatic/riparian resources should be inventoried prior to development. Systematic monitoring with predetermined analysis parameters, sampling frequency and reporting schedules should be implemented before construction begins. Site-specific monitoring should determine if Wyoming Water Quality Standards are currently being met, and whether Antidegradation provisions are likely to be violated.

The Surface Water Quality Monitoring Plan (3-17-92) addresses baseline monitoring requirements. "Data from the 1986 USGS hydrology report of the Grasslands and other sources describes existing conditions and will be used as baseline data for monitoring." While this provides a good starting point, this level of sampling at a few fixed stations is inadequate for determining specific impacts on leased lands. Site-specific baseline monitoring should be required for each leased site where drilling or construction is to occur.

3. The Aquatic and Riparian Resources Alternatives Analysis (12-20-91) suggests that Effective Monitoring "is already being conducted by Wyoming Department of Environmental Quality (WDEQ) at specific locations on Thunder Basin National Grasslands". However, the level of monitoring necessary to estimate the impacts of site-specific leasing activities needs to be determined and a monitoring plan developed. This should include both biological and chemical monitoring, more than once per year, at all potentially affected sites.

4. The Monitoring Schedule Table 4-13 (FEIS, page IV-33) limits the frequency of monitoring activities to "During ground disturbance activities". This language should be amended to "Prior, during, and post ground disturbance activities". This broadens the definition to include baseline and effectiveness monitoring.

5. Sampling proposed is limited to water chemistry parameters. Biological sampling should be an integral part of all monitoring (before, during and after disturbance).

6. Seasonal variability is not addressed in the monitoring plan. Due to the extreme variation in the flow regime, and the intermittent nature of many of the area streams, a single annual sampling period is inadequate. Quarterly sampling would give a more detailed picture of potential impacts. More frequent sampling should also help reduce sample variance, resulting in better detection of significant impacts due to management activities.

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A-182

A-183
August 19, 1992

Mr. Gerald G. Heath
Supervisor
National Forest
2468 Jackson St.
Laramie, WY 82070

Re: Notice of Analyses in Progress for the Medicine Bow National Forest

Dear Mr. Heath:

This is in response to a request by the State Planning Coordinator's Office that the Public Service Commission comment on the referenced matter.

We note with interest that these analyses are for oil and gas leasing, land exchanges, and timber operations. The Commission requests that no unreasonable restrictions be placed on the provision of utility service or on the construction of utility and pipeline facilities as a result of the referenced analyses.

The Commission requests that, in cases involving oil and gas leasing, the Forest Service not restrict the construction of utility and pipeline facilities necessary for the exploration and production of oil and gas.

The Commission requests that, when the Forest Service exchanges lands, the rights of the utilities and pipeline operators holding rights-of-way agreements from the private land owner and right-of-way grants from the Forest Service be protected. The Commission suggests that the private landowner acquiring private lands issue new right-of-way grants to the utilities and pipeline operators for their existing facilities.

The Commission requests that, when the Forest Service exchanges lands, the rights of the utilities and pipeline operators holding rights-of-way agreements from the private land owner and right-of-way grants from the Forest Service be protected. The Commission suggests that the private landowner acquiring private lands issue new right-of-way grants to the utilities and pipeline operators for their existing facilities.

Sincerely,

R.G. Wilford
Chairman

Wyoming Public Service Commission
Where construction is undertaken, the Forest Service or those managing the construction should contact and coordinate with the utilities serving and otherwise present in the area to prevent contact with and damage to utility facilities. If it becomes necessary for utility facilities to be modified or relocated, the cost of modifying or relocating any utility facilities to accommodate construction, should be borne by the Forest Service or those benefitting from the construction. If these costs are not borne by the Forest Service or those benefiting from the construction, those costs would fall unfairly on the ratepayers of the affected utility.

The Forest Service should make provisions requiring those with timber operations to contact and coordinate with the utilities serving or otherwise present in the area to prevent contact with and damage to utility facilities. This should also apply to those clearing future rights-of-way. Consideration should also be given to the establishment of utility corridors through timbered areas, with maintenance of cleared areas for construction.

If you should have any questions regarding this matter, please let me know.

Sincerely,

[Signature]

Jon F. Jacquot
Chief Engineer

xc: State Planning Coordinator’s Office
August 24, 1992

Mr. Terry B. Dilts, Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

I would like to express my support of oil and gas leasing on the Thunder Basin National Grasslands. These lands and others open to multiple use can successfully be utilized for oil and gas development and be compatible with other resources on lands administered by the Forest Service. Recent exploration and development of oil and gas resources on Forest Lands has been conducted in an environmentally sound manner and I firmly believe that the oil and gas industry is committed to continuing that practice. Two wells drilled by Marathon Oil Company in Park County, Wyoming, prove that exploration can be conducted in environmentally sensitive areas without long term impacts to the environment. Oil and gas operations on the Wasatch-Cache National Forest also prove that development of hydrocarbon resources are compatible with the National Forest.

As a concerned citizen of the State of Wyoming, I strongly disagree with the surface occupancy restrictions currently proposed on Thunder Basin National Grasslands.

Sincerely,

Steve Daniels
2309 Davidson
Cody, WY 82414
92-309/vsm

Mr. Terry Dilts
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

The Draft Environmental Impact Statement for Oil and Gas Leasing on the Thunder Basin National Grasslands has been reviewed by the staff in the Wyoming State Office and by the staff in the Casper District Office. No comments were received from the Wyoming State Office but comments were received from the Casper District Office concerning the DEIS. Those comments are attached.

Thank you for the opportunity to review this document. If you have any questions concerning this review, please contact Roger Wickstrom at (307) 775-6106 in Cheyenne, Wyoming.

Sincerely,

James K. Murkin
Deputy State Director, Lands and Renewable Resources

Attachment
August 19, 1992

Mr. Terry B. Dilts
Project Coordinator
Medicine Bow National Forest
2468 Jackson
Laramie, WY 82070

Dear Mr. Dilts:

This letter is to reaffirm Larry Pate’s discussion with you on September 9, in Douglas on the subject of the crucial winter range designation for mule deer in the Skull Creek area of the Thunder Basin National Grassland. As Larry stated at the meeting, a time restriction on Seismic and Exploration activities in this area should provide ample protection of the wildlife resource rather than the no surface occupancy restriction previously recommended.

Larry has visited with me about the context of your meeting with him on the 9th and I believe this type of communication maximizes the opportunities for all of us to alleviate misunderstandings and conflicts between various user groups on the public lands in the state.

If I may be of further assistance, please feel free to contact me at the above address.

Sincerely,

[Signature]

Terry Cleveland, District Supervisor

cc: Harry Harju
    Tim Byers
We suggest that this wording could be clarified and stated in the body of the Final Environmental Impact Statement as follows:

The black-footed ferret is listed in the Forest Plan, General Direction (page III-29) as a Recovery Species, discretely for the Grassland. General Direction (page III-30)(0600) provides for the Forest to "Manage and provide habitat for recovery of endangered and threatened species."

Should known populations of black-footed ferret (either fortuitously found, or introduced) become present in potential oil and gas development areas, input to the Surface Use Plan of Operations (required by 36 (A 228.106) at the Application for Permit to Drill stage of development would be utilized to customize surface operations to be compatible with ferret habitat occupancy. The following are examples of conservation measures that would be applied:

1. To minimize raptor predation of black-footed ferrets, power lines will be buried or power poles designed to preclude their use as hunting perches by raptorial species such as great horned owls, ferruginous hawks, and golden eagles.

2. Night traffic will be minimized to reduce the possibility of vehicular mortality to black-footed ferrets.

3. Operators, contractors and employees are prohibited from taking dogs into the area to reduce the opportunity for transmission of canine distemper and to minimize the chances of predation by dogs.

Based on implementation of the above outlined conservation measures, the effects of oil and gas activities and degradation of black-footed ferret habitat is expected to be insignificant and insignificant. Based on this intent, we concur with your determination that revised oil and gas leasing on the Thunder Basin National Grassland is not likely to adversely affect the endangered bald eagle (Haliaeetus leucocephalus) peregrine falcon (Falco peregrinus), and the black-footed (Mustela nigripes). However, if the proposed action is modified, or the above conservation measures are not implemented, consultation should be initiated with the Fish and Wildlife Service. Any future citation of this concurrence in Forest Service documents should cite this action as a "concurrence with conditions."

We invite a representative of your staff to attend the annual black-footed ferret Interstate Coordinating Committee meeting in Denver this December. We consider the Grasslands to have important potential for ferret reintroduction efforts. In that regard, we have some concerns with your Prairie Dog Management Plan, which we would like to coordinate with you during your upcoming Forest Management Plan revision efforts.

We appreciate your efforts to ensure the conservation of endangered species and their habitats as part of our joint responsibilities under the...
If you have additional questions regarding endangered species, please contact me or Jane Roybal of my staff at the letterhead address or call (307) 772-2374.

Sincerely,

Charles P. Davis
State Supervisor
Wyoming State Office

cc:
Director, WGFD, Cheyenne, WY
Mongame Supervisor, WGFD, Lander, WY
Black-footed ferret specialist, FWE, Denver, CO
Field Supervisor, MT/WY Field Office, Helena, MT

APPENDIX B

DETAILED DISCUSSION OF OIL AND GAS ACTIVITIES, PROCESSES AND LEASING
A DETAILED DISCUSSION OF OIL AND GAS ACTIVITIES AND PROCESSES THAT AFFECT THE THUNDER BASIN NATIONAL GRASSLAND

INTRODUCTION

Oil and gas activity on the Thunder Basin National Grassland (TBNG) results, almost entirely, from requests by the oil and gas industry. Those requests are based on commodity prices, advances in technology, interest in oil and gas plays and many other factors, with economics being the common denominator. This report contains a detailed discussion of activity caused by the presence, or anticipated presence, of economically recoverable oil and gas resources. Leasing, drilling operations and production operations are discussed separately.

LEASING

A federal oil and gas lease is the only way a person or corporation can obtain the right to oil and gas resources on federal lands in the TBNG. Through the U. S. Forest Service (USFS) land use planning system, the effects of leasing federal oil and gas under public domain and acquired surface are analyzed, and conflicts between oil and gas development and other resources are identified and hopefully resolved.

Process: Leases on federal oil and gas are offered by the Wyoming State Office (WSO) of the Bureau of Land Management (BLM), in Cheyenne. Acreage may be nominated for lease by interested parties. Acreage is offered first in a competitive lease sale, then that which did not receive a minimum bid, is offered non-competitively, over the counter.

Acreage to be offered for lease is proportioned into groups called parcels. Legal descriptions of these parcels are sent to the USFS Douglas Ranger District (DRD) for review and application of lease stipulations. These stipulations are designed to mitigate the effects of oil and gas operations on other resources. The lease stipulations used, USFS guidance, and how the stipulations are applied in the TBNG are given in APPENDIX D of the Thunder Basin National Grassland Leasing Environmental Impact Statement.

The parcel descriptions are then returned to the WSO. A description of leases (including stipulations) to be offered for sale and information about the sale are compiled in a book. Copies are distributed to interested parties and available in BLM offices about 45 days before the sale date.

Lease sales are conducted by the BLM on the first Tuesday of even numbered months. They are usually held in Cheyenne, Wyoming. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 requires that competitive sales be held at least four times a year. Leases are offered via competitive oral bid. Minimum bid is $2.00 per acre or part thereof. The winning bidder is also charged a $75.00 per lease administrative fee. The BLM usually issues leases within one month of the sale date, but may take as long as three months, since leasing is a discretionary act of the Secretary of Interior, a minimum bid does not compel the BLM to lease any of the acreage offered if there is sufficient justification not to issue a lease. Leases issued via the competitive sale have a ten-year primary term, after October 23, 1992, and one-eighth royalty. Yearly rentals are $1.50 per acre for the first five years and $2.00 per acre thereafter.

Acreage in lease offerings that do not receive a minimum bid is available, non-competitively, for two years starting the day after the competitive sale. Applications for non-competitive oil and gas leases are processed in the WSO. If two or more applications are received the same day, for the same acreage, a drawing is held. Leases sold non-competitively have a ten-year primary term and one-eighth royalty. Yearly rentals are the same for competitive and non-competitive leases.

Half of the bonus money received from the sale of leases on public domain minerals, as well as half of the rental money, is returned to the State of Wyoming. On acquired minerals, one-fourth of lease bonus money and one-fourth of the rentals received are returned to the counties based on their proportion of the TBNG. No money goes to the state from the sale of leases on acquired minerals.

Past and Current Activity: Land and Mineral Status Maps published by the BLM indicate that the USFS manages 524 thousand acres of federal surface with federal oil and gas ownership and 48 thousand acres of federal surface with no federal oil and gas ownership. These maps also indicate an additional 577 thousand acres of federal oil and gas ownership has non-federal surface. The remainder of the planning area (699 thousand acres) is non-federal surface and minerals (see Figure B-1).

OIL AND GAS AND SURFACE OWNERSHIP

From February 1990, through August 1991, a total of approximately 72,000 acres within the external boundary of the planning area was offered for lease, and approximately 47,000 acres received the minimum $2.00 per acre bid. The amount of federal acreage offered and sold in each sale is shown in Figure B-2. Figure B-2 indicates that the amount of acreage offered has varied somewhat but decreased rather steadily. The amount of acreage offered after February 1990, is less because that was the last month federal oil and gas acreage under federal surface was offered for lease.
FEDERAL OIL AND GAS LEASE SALES
ACREAGE OFFERED AND ACREAGE SOLD

ACRES
20,000
15,000
10,000
5,000
0

MONTH AND YEAR OF SALE
FEB 90 APR 90 JUN 90 AUG 90 OCT 90 DEC 90 FEB 91 APR 91 JUN 91 AUG 91

Figure B-2 This graph shows federal oil and gas acreage offered and sold at competitive lease sales from February 1990, through August 1991. Data were compiled on a township basis and include some acreage outside but close to the planning area.

The amount of acreage sold as a percent of that offered is shown in Figure B-3. The amount of acreage sold in these lease sales varies but in most cases is over 50% of what was offered. The average successful bids in these sales varies from about four to thirty-five dollars per acre (see Figure B-4). Average bids were highest in the August and October 1990 sales. Likewise, the bonus dollars received per sale vary from less than ten thousand to slightly over two-hundred thousand dollars (see Figure B-5). It is interesting to note that Iraq invaded Kuwait on August 2, 1990, and the average bid for the lease sale held August 7, 1990, was nearly double ($26.19 compared to $13.58) the average of the three previous sales. More bonus money was received in the August 1990 sale than any other sale summarized in Figure B-5. Acreages displayed in Figures B-2 through B-5 were compiled on a township basis, and a small amount of acreage outside, but near, the planning area boundary was included.

FEDERAL OIL AND GAS LEASE SALES
PERCENT OF ACREAGE SOLD

MONTH AND YEAR
FEB 90 APR 90 JUN 90 AUG 90 OCT 90 DEC 90 FEB 91 APR 91 JUN 91 AUG 91

Figure B-3 This graph shows acreage sold as a percent of acreage offered at federal, competitive oil and gas lease sales. Note the apparent increase during the Persian Gulf crisis. Data were compiled on a township basis and include some acreage outside, but close to, the planning area.

FEDERAL OIL AND GAS LEASE SALES
AVERAGE HIGH BID FOR LEASES SOLD

MONTH AND YEAR OF SALE
FEB 90 APR 90 JUN 90 AUG 90 OCT 90 DEC 90 FEB 91 APR 91 JUN 91 AUG 91

Figure B-4 This graph shows average dollar per acre successful bids at federal, competitive oil and gas lease sales. Note the apparent increase at the beginning of the Persian Gulf crisis. Data were compiled on a township basis and include some acreage outside, but close to, the planning area.
After the permit has been received, fees collected, bond in place, environmental assessment done, and appropriate mitigating stipulations applied, the USFS notifies the seismic operator that the prospecting permit is prepared for their signature and approval.

If a seismic survey is conducted on behalf of an oil and gas lessee, a Notice of Intent must be filed with the appropriate BLM area office. A lease bond of at least $10,000, a statewide bond of at least $25,000, or a nationwide bond of at least $150,000 is required. No per-mile fee is required. The BLM Area Manager determines if the seismic survey will adhere to lease stipulations and may specify how shot holes are to be plugged.

After the seismic survey is complete, the operator is required to call the USFS within 48 hours. Within two weeks, the USFS must inspect the survey site and determine if shot holes are adequately plugged, fences repaired, and in general, whether or not the stipulations have been complied with. If reclamation of the survey site is adequate the USFS releases the bond and closes the prospecting permit.

Past and Current Activity: From 1966 through 1990, 51 prospecting permits were approved, 118 miles of seismic surveys were conducted on the TBNG, and the USFS collected $82,152 (in 1986 a higher per-mile fee was charged) in fees. Since 1986, the number of permits approved and miles surveyed has decreased considerably. Figures B-8 and B-7 show this decrease on an annual basis.

Most of seismic surveys were conducted in the Spring Creek Unit (T. 54-55 N., R. 69-70 W.), and the southwestern part (R. 68-73 W.) of the TBNG. The Spring Creek Unit is by far the most intensely surveyed part of the TBNG. From 1984-1990 the number of miles surveyed has been approximately evenly distributed between the western part of the TBNG and the Spring Creek Unit.

**APPROVED SEISMIC PROSPECTING PERMITS**

**FOR PUBLIC SURFACE ONLY**

![Graph showing the number of approved seismic prospecting permits](image)

---

**SEISMIC EXPLORATION**

Seismic exploration is a process where energy is transmitted into the subsurface, usually by explosives or low frequency vibrations. The reflected energy waves are recorded and computer processed. Seismic exploration usually involves the operation of small and medium-size trucks on the surface and often involves drilling shallow (to about 200 feet) shot holes. After the seismic data are collected and further processed cross-sections or three dimensional diagrams of the earth's geologic layers are produced. Seismic surveys help locate and determine the extent of oil and gas reservoirs.

Process: Before a seismic survey is conducted on USFS administered surface, even if oil and gas ownership is non-federal, the seismic operator must have a prospecting permit approved by the District ranger. A $200 per mile fee and $5,000 bond is required for each prospecting permit. A fee is not required if the survey is on behalf of an oil and gas lessee. The permittee is also required to give specific information about the location and exploration method to be used. Attached to this document is a copy of the permit application.

Before the prospecting permit is approved, the USFS does an environmental analysis which will be documented in accordance with the National Environmental Policy Act and the Council of Environmental Quality Implementing Regulations. Depending on the significance of the environmental impacts, the environmental analysis will be documented in a Categorical Exclusion, an Environmental Assessment or an Environmental Impact Statement. The prospecting permit is approved or disapproved in a Decision Memo, Decision Notice, or Record of Decision accompanying the appropriate environmental document. Compliance with laws, such as the Endangered Species Act and Historic Preservation Act, are insured in the environmental analysis.
APPRIVED SEISMIC PROSPECTING PERMITS
MILES OF PUBLIC SURFACE

<table>
<thead>
<tr>
<th>YEAR</th>
<th>MILES SURVEYED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>60</td>
</tr>
<tr>
<td>1987</td>
<td>55</td>
</tr>
<tr>
<td>1988</td>
<td>40</td>
</tr>
<tr>
<td>1989</td>
<td>35</td>
</tr>
<tr>
<td>1990</td>
<td>20</td>
</tr>
</tbody>
</table>

Figure B-7 This graph shows the number of miles of federal surface covered by seismic surveys in the planning area. Data are from USFS files.

OIL AND GAS DRILLING OPERATIONS

Once a potential hydrocarbon reservoir (prospect) has been located and the leases acquired, the next step is drilling one or more wells. If an oil or gas reservoir is present, the wells must also be completed for production. This is usually the single most expensive step in developing an oil and gas reservoir. Although most drilling is usually early in the life of a field, additional wells are often drilled later, as more is learned about the reservoir, and more drilling is needed to maximize recovery or replace unusable wells; however, before any drilling operations can begin on federal minerals, an application to drill (APD) must be approved.

Process: Once a location is determined, the well needs to be staked (surveyed). The BLM and USFS are notified either by a notice of staking or an APD. Before any surface-disturbing activity can occur, the APD must be approved by the BLM with the concurrence of the USFS District Ranger. A site-specific Environmental Assessment (EA) is done for each APD on the TBNG. The USFS and operator representatives conduct an on-site inspection of the proposed drilling location before an APD is approved. APDs are subject to site-specific conditions of approval. These conditions of approval implement lease stipulations on a site specific basis and mitigate the impact of oil and gas operations on other resource values, even though these values were not known at the time the lease was issued. At the time of APD approval, lease stipulations may not be modified by the District Ranger without going through the NEPA process.

The District Ranger may restrict oil and gas drilling operations on specific parts of federal leases during some times of the year and in some locations, in order to protect other resource values, such as crucial deer winter range or stream channels. Generally, these areas and times are identified in the lease stipulations or on the approved APD.

If oil and gas operations are expected to have an adverse impact on other resource values, and these impacts cannot be mitigated by the site-specific conditions of approval, then an environmental impact statement (EIS) must be prepared.

While federal wells are being drilled and tested, BLM and USFS personnel are authorized to inspect operations to ensure that Federal Regulations, Guidelines, and the terms of the approved APD are being complied with. The BLM inspections focus on how operations are being conducted and are mainly concerned with such things as integrity of equipment and safety. USFS inspections focus on the environmental protection aspects of operations. All high priority federal wells, such as wells in high subsurface pressure areas or in environmentally sensitive areas, are inspected by the BLM at some time during drilling operations. The BLM inspects some, but not all, lower priority wells during drilling and completion operations. The USFS usually inspects wells twice during drilling and completion operations.

Past and Current Activity: Figure B-8 shows the number of APDs, with USFS administered surface approved, and number of wells drilled from 1977 through 1990. During these years 0.6% (1989) to 5.0% (1982) of all APDs approved in Wyoming were on federal surface in the TBNG. It is interesting to note that 1981 and 1982 are considerably out of line with other years. In 1989 and 1990, the number of approved APDs was only five percent of the 1981-1982 high. Figure B-9 shows how approved APDs were distributed by county. All three counties (Campbell, Converse, and Weston) have had significant numbers of APDs. Figure B-10 suggests the number of APDs varies directly with oil price, although after 1986 this relationship is less obvious. Even though the oil price has increased since the 1986 low, a corresponding increase in APDs on the TBNG has not occurred.

APPLICATIONS APPROVED AND WELLS DRILLED
FOR PUBLIC SURFACE ONLY

Figure B-8 This graph shows the number of APD's approved and number of wells drilled on USFS administered surface in the TBNG. Note the decline from 1981 through 1986 and the relatively large number of untrilled APD's during this period. Data are from USFS files.
Drilling applications approved for public surface only.

Drilling depths increase from east to west across the TBNG. On the east side of the planning area, in Osage Field, some wells are only a few hundred feet deep, but at the southwest edge, drilling depths to the Madison Formation are about 16,000 feet. Depths in the north block vary from about 5,200 to 7,700 feet depending on location and target. The deepest producing interval in the TBNG is the Muddy Formation in the 22-19 Russell well, Section 15, T. 38 N., R. 73 W. The well was completed in January 1985, at a depth of 13,332-13,345 feet below the surface.

Well spacing also changes across the TBNG. On the east side in Osage Field, there is over one well per 40 acres, but fields on the west side have only about one well per 160 acres.

As exploration wells were drilled, new oil and gas fields were discovered. Figure B-11 shows the number of new field discoveries compiled by five-year increments since 1945. Since 1960, there has been an increasing number of new field discoveries except for the 1985-1989 interval. The data were provided by the Wyoming Oil and Gas Conservation Commission and include fields that were officially named by the commission, and are listed as wholly or partly within Townships of the planning area.

**NUMBER OF FIELDS DISCOVERED SINCE 1945**

**SORTED BY DISCOVERY YEAR INTERVAL**

Although the number of fields discovered per five-year interval has increased since 1960, the size of the fields as measured by number of producing wells has decreased. This is shown in Figure B-12. The large spike in the 1985-1989 interval is due to the Finn-Shurlay field which was discovered in 1965, but developed mostly from 1979 through 1983.
enhanced oil recovery (EOR). EOR may begin at any stage of reservoir development but usually is initiated later in the life of an oil and gas field. It involves injection of carbon dioxide, surfactants, or other chemicals to increase oil recovery. EOR allows recovery of up to about 50% of original oil in place.

Oil and gas production operations are not subject to prior approval by the District Ranger unless there is additional surface disturbance or operations are non-routine or unusual. Examples of activities requiring prior approval by the District Ranger are: building flow lines off location, running power lines, enlargement of overflow pits, and road construction. Examples of activities not requiring prior approval are: installation of a new pumping unit, repair of a treater, and all downhole work.

Production operations and facilities must meet Federal requirements and are subject to inspection by BLM and USFS personnel. BLM guidance requires that high priority inspection items, such as leases producing over 12,000 barrels of oil per month, or leases with one major or five minor violations in the past 24 months, be inspected at least once every year. Lower priority inspection items are inspected at least once every three years. The USFS inspects wells once every three years unless there are discrepancies, in which case wells are inspected once per year. When violations are found, the USFS contacts the operator immediately, and if the violation is not corrected, the USFS contacts the BLM and the BLM may access civil penalties.

Past and Current Activity: Data from the Wyoming Oil and Gas Conservation Commission indicate that in 1989 there were 67 productive and 14 nonproductive fields, wholly or partially, within the planning area boundary. Fifty-eight of those fields involve public surface.

In 1989, the 67 productive fields produced a total of 4.39 million barrels of oil (MMBO) and 25.3 billion cubic feet of gas (BOFG). This was 4.0% of the oil and 2.9% of the gas produced in Wyoming in 1989. Powell Field had the most production with 4.17 MMBO equivalent (BOE, 6 MCFG=1 BOE). Finn-Shurley was second with 67 MMBOE, and Porcupine was third with .51 MMBOE. These three fields produced 46% of the total oil and 78% of the total gas.

In 1989, there were a total of 1,768 productive oil and gas wells in the fields, wholly or partially, within the planning area boundary. This is an average of 26 productive wells per producing field. The field with the most wells (439) was Finn-Shurley, and 20 fields had only one productive well. Figure B-13 shows the field size distribution by number of wells. There were fourteen fields which were either abandoned or shut-in during 1989. Forty-eight of the productive fields were discovered since 1970, and in 1989 these fields averaged 6.7 producing wells each. The largest is Poiseon Draw (discovered in 1972) with 58 wells. The largest new field discoveries since 1970, an average of the three largest and five largest newly discovered fields, are shown in Figure B-14. Note that all trends are downward. Many new field discoveries ultimately have only one or two productive wells and are uneconomical.
NUMBER OF FIELDS BY PRODUCING WELLS
FOR FIELDS PRODUCING IN 1989

Figure 5-13 This graph shows the number of producing fields sorted by number of producing wells in the field. Data are from the Wyoming Oil and Gas Conservation Commission.

NUMBER OF PRODUCING WELLS FOR LARGEST FIELDS
AVERAGE NUMBER OF WELLS FOR FIELD GROUPINGS

Figure 5-14 This graph shows the average number of producing wells for the largest fields discovered since 1970. The average number of wells for all fields is shown for comparison. Note that the average number of wells per field, even for the largest fields, is decreasing significantly.

SUMMARY
About one-third of the area within the planning area boundary is Federal surface with Federal oil and gas. The area is in a prolific oil and gas producing region and has undergone considerable oil and gas development. About three to four percent of the oil and gas produced in Wyoming comes from fields which are at least partly within the planning area boundary.
REFERENCES

Petroleum Information, Historical Well Data Base.

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U.S. DEPARTMENT OF AGRICULTURE
Forest Service
APPLICATION FOR PROSPECTING PERMIT

Applicant Name: ___________________________ Date of Application: _____________

Street: ___________________________ Company Project Name: __________________

City: ___________________________ State: _______ Zip: ___________ Phone: ___________

Application is hereby made for a USDA-Forest Service Prospecting Permit for geophysical exploration for ___ oil and ggs, ___ other (specify) on lands with the

National Forest/Grasslands

In addition to supplying the following data, as applicable, the applicant is requested to submit sufficient additional information as is necessary to fully describe the proposed plan of operations.

EXPLORATION METHOD(S) PROPOSED

<table>
<thead>
<tr>
<th>Portable Techniques</th>
<th>Conventional Shothole</th>
<th>Surface Charge</th>
<th>Gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vibroseis or Thumper</td>
<td>Poulter Method</td>
<td>Magnetic</td>
</tr>
<tr>
<td></td>
<td>Temperature Gradient</td>
<td>Portadrill</td>
<td>Magneto-teric</td>
</tr>
<tr>
<td>Other (explain)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EXPLORATION SPECIFICATIONS

Shothole Depth: ___________ Type of Explosives: ___________

Charge Size: ___________ Shot Points/Patterns per mile: ___________

Number, size & spacing of surface, etc., charges per shot point: ___________

Total miles of seismic line proposed for National Forest/Grassland: ___________

Type of hole plug to be used & identifying mark to be used on the plugs: ___________

Number of miles of seismic line proposed for lands under lease to applicant: ___________

Crew size: _______ No. of drilling rigs: _______ No. of helicopters: _______

No. of vehicles and/or other equipment (specify): ___________

Proposed starting date: ___________ Proposed duration: ___________

Bond information: ___________
LOCATION OF EXPLORATION

Exploration is proposed for the following described lands (sec., T.R.):

Maps: Please attach map(s), preferably USGS 7½ min. Topo. Quad. or at a minimum a Forest Service 1" = 1 mi. map, showing the locations of all proposed exploration lines.

APPLICANT'S GEOPHYSICAL CONTRACTOR

Name: ________________________________
Address: ________________________________
City: ____________________
State: _________ Zip: ________
Phone: ________________________________

Crew No.: ________________________________

LOCAL REPRESENTATIVE

Name: ________________________________
Address: ________________________________
City: ____________________
State: _________ Zip: ________
Phone: ________________________________

MOP PIPING PERFORMED BY:

Name: ________________________________
Address: ________________________________
City: ____________________
State: _________ Zip: ________
Phone: ________________________________

OFFICIAL USE

Date received: ______________________ Date work begun: ______________________
Date appli. complete: ______________________ Date work complete: ______________________
Date permitted: ______________________ Date permit closed: ______________________

APPENDIX C

REASONTABLY FORESEEABLE DEVELOPMENT SCENARIO FOR OIL AND GAS
REASONABLY FORESEEABLE DEVELOPMENT SCENARIO
FOR OIL AND GAS

INTRODUCTION

This report presents a scenario for oil and gas leasing and development activities in the planning area. This scenario is an estimate of future activity on USFS administered surface acreage.

Ten major oil and gas plays have been identified and described by the U.S. Geological Survey (Dolton et al, 1990). These plays are summarized in Table C-1. Most of the oil produced from fields within the planning area is from these plays. The percentages shown in Table C-1 were estimated from the maps shown in Dolton et al. 1990. The reader is cautioned from estimating how much undiscovered oil and gas remains in the planning area based on the information in Table C-1. Due to geologic heterogeneities, uneven development, and variations in reservoir size, it cannot be assumed that if 20% of a play area is within the planning area, that approximately 20% of the undiscovered reserves are also within the planning area.

Table C-1

<table>
<thead>
<tr>
<th>PLAY</th>
<th>UNDISC. RESERVES</th>
<th>RESERVES MMB</th>
<th>% OF FIELDS</th>
<th>% OF PLAY AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UNDISC. FLOD</td>
<td>MMB*</td>
<td>BCF³</td>
<td>IN PLAY</td>
</tr>
<tr>
<td>DAKOTA</td>
<td>21</td>
<td>158</td>
<td>158</td>
<td>90</td>
</tr>
<tr>
<td>DEEP FRONTIER</td>
<td>8</td>
<td>37</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>LAKE</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>LEO</td>
<td>80</td>
<td>110</td>
<td>30</td>
<td>65</td>
</tr>
<tr>
<td>MEBEVERE &amp; LEWIS</td>
<td>10</td>
<td>88</td>
<td>91</td>
<td>25</td>
</tr>
<tr>
<td>MINNELUSA</td>
<td>165</td>
<td>622</td>
<td>203</td>
<td>90</td>
</tr>
<tr>
<td>MOWRY SHALE</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>55</td>
</tr>
<tr>
<td>MUDY</td>
<td>39</td>
<td>441</td>
<td>1288</td>
<td>90</td>
</tr>
<tr>
<td>SUSSEX &amp; SHANNON</td>
<td>20</td>
<td>126</td>
<td>103</td>
<td>50</td>
</tr>
<tr>
<td>TURNER</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>40</td>
</tr>
</tbody>
</table>

* includes natural gas liquids.

The percentages shown in Table C-1 are approximate. Data are from USGS National Resource Assessment project (Dolton personal communication and Dolton et al, 1993). These numbers are mean value estimates of undiscovered, economically recoverable conventional oil, gas, and natural gas liquids as of January 1, 1987. Estimates for fields with less than 1 MMB of gas were not included.

Even though several oil and gas plays are present in the planning area all are not undergoing active exploration. Due to depth, reservoir quality, and risk, some plays are more attractive than others. Currently, the most active plays in the planning area are the Minnelusa, Dakota, Muddy, and Turner. There has also been some interest in horizontal drilling to develop fractured reservoirs in the Niobrara and Frontier formations, but there has been little exploration of this play to date and it was not summarized by Dolton et al. (1993).

Map C-1 is a generalized oil and gas occurrence potential map for the planning area and surrounding townships. It was drawn to show the occurrence potential of hydrocarbon resources. It does not indicate that these resources can be developed economically. Note that most of the planning area has high occurrence potential. Oil and gas occurrence potential used in this document and on the attached maps are defined as follows:

High - There is a demonstrated existence of petroleum source, reservoir quality strata, and traps. Areas of high potential have discovered oil occurrences or free oil recovery from well tests.

Moderate - There is direct or indirect geological evidence that petroleum source, reservoir quality strata, and trapping mechanisms are present. Discovered occurrences are not present but there may be shows of oil in core or drill stem tests.

Low - There is geological evidence that a petroleum source, reservoir quality strata, or trapping mechanisms are not present.

Oil and gas activity in the planning area is primarily based on three factors:

1) Crude oil prices and anticipated oil price changes.
2) Development of new plays (such as horizontal drilling in the Niobrara Formation) or renewed interest in old plays.
3) Advances in and application of technology (such as secondary and enhanced oil recovery, seismic reflection surveys, and horizontal drilling).

These factors are difficult to predict with much certainty, but some generalizations are possible. The estimates presented in this appendix are based on past trends and current information. What actually happens may be significantly different.

LEASING

Leasing is an early phase of oil and gas development in the TBNG and is often based on speculation. The last sale that offered leases in the TBNG was February 1990. If leasing is resumed at past levels in the planning area, it is anticipated that the amount of acreage sold competitively will be 3,000 to 6,000 thousand acres per sale (18 to 36 thousand acres per year) after the initial backlog of acreage is offered. In November 1991, the backlog was 72,369 acres. This indicates acreage is building at a rate of about 43,000 acres per year. It would probably take one to three sales to offer the entire backlog. If this were done, it is anticipated about half would be sold competitively.

If there is an anticipated long term price increase for oil or a new play becomes active, the amount of acreage sold competitively and the average per acre bids will probably increase. Likewise, if anticipated price and play developments are negative, then bids will be lower.

SEISMIC

In 1986-1990 a total of 58 exploration permits were approved and 118 miles were surveyed. As Figure C-1 shows most of this activity occurred in 1990. After that it dropped drastically. Companies will use existing seismic data, if practical, rather than collect new data. Until a more active oil and gas play develops, or an attractive discovery renews interest in a current play where adequate seismic data are sparse or not available, it is unlikely that seismic activity will increase much. During the next five years prospecting permits will probably average no more than 10 per year and miles surveyed no more than 25 per year. Most of this activity will probably continue to be in the Spring Creek Unit and the western part of the planning area; although localized activity in other areas may also occur.
SEISMIC ACTIVITY
PERMITS APPROVED AND MILES OF
PUBLIC SURFACE SURVEYED

DRILLING OPERATIONS
As shown in Figure B-10 there appears to be a direct correlation between drilling permits and oil price. Figures C-2 and C-3 show the number of approved drilling permits and the number of wells drilled plotted against oil price for the years 1978-1990. Linear regression lines are shown for reference. These figures seem to indicate that an increase in permits and wells should be expected when oil prices reach about $25.00 per barrel and are anticipated to stay at that level or go higher. Gas prices will have less effect because the value of gas production is less than oil production in the planning area. If play developments are positive the number of drilling permits could also abruptly increase.

It is anticipated that for the next five years, oil USFS managed surface in the planning area, drilling permits will average less than 20 per year and may average less than 10 per year. The number of permits should be no lower than the 1990 level. If the price of oil increases or is anticipated to increase above $25.00 per barrel, or if play developments are positive the number of permits and wells should also increase; however, an average of more than 20 new wells drilled per year on Federal surface is not anticipated.

The number and size of new fields that will be discovered is, at best, difficult to predict; however, Figure B-11 indicates that several discoveries should be anticipated. Since 1945 there has been an average of about 1.8 discoveries per year. This rate will probably not be maintained considering the relatively low level of exploration activity in the planning area area. Discovery rates over the next ten years, in the planning area, will probably be closer to the 1.2 fields per year discovered from 1985-1999 or perhaps less. The average number of wells per field will probably be less than the overall average of 17 wells per field for the 1945-1999. The average will probably be closer to the 3.9 wells per field average for 1975-1989 (see Figure B-12).

Figure C-1 This graph shows the number of exploration permits approved and number of miles of USFS administered surface surveyed from 1986-1990. Note the drop in both permits and miles since 1986.

Figure C-2 This graph compares oil price to the number of approved drilling permits. The solid line is a linear regression through all the points (n=87). This figure seems to indicate that the number of APDs will not increase significantly until the oil price is about $25/barrel or higher.

Figure C-3 This graph compares oil price compared to the number of approved drilling permits. The solid line is a linear regression through all the points (n=81). This figure seems to indicate that drilling will not increase significantly until the oil price is about $25/barrel or higher.

WELLS DRILLED VS. AVERAGE OIL PRICE
FEDERAL SURFACE ONLY (1978-1990)
The number of new field discoveries, and field sizes could increase if a more active oil and gas play develops or an attractive discovery renews interest in a current play.

Horizontal drilling technology has been extensively and successfully used in selected areas (i.e. Silo Field) since the late 1980's. Although few horizontal wells have been drilled in the planning area, several should be anticipated in the next five years. If a horizontal drilling play develops, the number of wells could increase significantly. Based on drilling activity in North Dakota and the Silo Field area, Wyoming, this increase could be several fold in one or two years. However, unless a major play develops, these wells should be within the maximum average of 20 wells per year estimated for federal surface in the TBNG.

Map C-2 shows oil and gas development potential for the planning area and surrounding townships. The development potential was estimated in part from 1983-1986 drilling activity and 1990 and 1991 competitive lease sale results. The number of wells (both producing and dry holes) drilled during 1983-1996 was obtained from the Petroleum Information data base and plotted by computer. The number of wells per township was counted and plotted on a base map of the planning area. The $2.00, $10.00, and $50.00 per-acre bid contour from a computer-generated map of competitive leasing activity were drawn on the base map. Development potential was estimated based on 1983-1986 drilling, the average dollar per acre bids, a general knowledge of the play areas, and the amount of undrilled acreage.

The development potential map subsequently generated (Map C-2), is only a rough estimate and will most likely not represent all drilling activity in the planning area during the next five years. Since 1983-1986 drilling activity data were used the map is probably, in general, slightly optimistic.

PRODUCTION

Based on currently available data, oil and gas production from fields within or near the planning area will most likely continue to decline from the 1989 rate of about 4.4 MMBO and 25.3 BCFG (8.4 MMBOE) per year. New fields will probably be discovered but overall production is estimated to decline about four percent per year. Statewide oil production declined about four percent per year from 1985-1991. Several small or moderate size discoveries, or one or two larger discoveries, could temporarily reverse this trend in the TBNG planning area.

SUMMARY

Oil and gas activity in the planning area has diminished greatly since the mid-1980's and production is declining. Activity should be expected to remain relatively low but variable, and production should continue to decline until the economic picture changes. Increased commodity prices, positive play developments, and application of, or advancements in technology are the most likely variables that could cause activity to increase.

REFERENCES


Petroleum Information, Historical Well Data Base.

APPENDIX D

PROPOSED STIPULATIONS AND FOREST PLAN AMENDMENT RECOMMENDATIONS

APPENDIX D

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Table D-1 SUMMARY OF OIL & GAS LEASING STIPULATIONS BY ALTERNATIVE D-11

Descriptions of lease stipulations with Justification, Application Methodology, Conditions for Waivers, Exceptions or Modifications, and Forest Plan Consistency.

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BACKGROUND INFORMATION FOR UNDERSTANDING APPENDIX D, STIPULATIONS, WAIVERS, MODIFICATIONS, AND EXCEPTIONS

This appendix displays the stipulations (stips) that will be applied and a short explanation of the reasons for the stipulations. This is mandated by Section 102(2)(j)(6) of the oil and gas regulations found in 36 CFR parts 228 and 104. Oil and Gas Resources, where it states: "As part of the analysis, the authorized Forest officer shall identify on maps those areas that will be open to development but subject to constraints that will require the use of lease stipulations such as those prohibiting surface use on areas larger than 40 acres or such other standards with discussion as to why the constraints are necessary and justifiable. "Section 102(e)(2) also reiterates this direction in its discussion of leasing decisions for specific lands. "Forest Service policy states (FSM 2822-42) that the stipulations should be "held to a minimum consistent with those purposes," meaning that the stipulation should be no more restrictive than necessary to protect the target resource. This section will also discuss the guidelines by which future waivers, exceptions, or modifications may be granted.

Background information useful in understanding this appendix is:

1. The basic approach is to use the Forest Plan management direction as a gateway to compliance with environmental laws in making decisions at the project level (Application for Permit to drill and Sundry Notice). The Forest Plan will be amended to include the stipulations for the selected alternative.

2. The Uniform Format for Oil and Gas Lease Stipulations, prepared by the Rocky Mountain Regional Coordinating Committee in March 1989, summarizes the various types of stipulations (including sample forms) and their use, gives definitions, provides general direction and process for allowing waivers, exceptions, or modifications. The Uniform Format is the basis for the discussion regarding the application of stipulations and the granting of waivers, exceptions, or modifications.

3. Standard lease terms apply to all leases. They require that the "lessor shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and recreational values, and to other land uses or users." Standard lease terms are commonly considered to be adequate to mitigate most adverse environmental impacts (40 CFR part 1505.2(c) and Part 1508.20). They are common to all leases; therefore, to all leasing alternatives being analyzed.

The standard terms also apply to all non-discretionary standards and reasonable measures required by the Authorizing Officer to minimize adverse impacts to other resources and users. Under standard lease terms, mitigation may include moving the site of developments up to 200 meters, or lowering restrictions of up to 60 days (43 CFR 3101.12), facility design changes and reclamation efforts. These are mitigation measures at the APO stage as "conditions of approval." Many other protection measures can be applied and negotiated under standard terms. It must be demonstrated that standard lease terms are insufficient in order to apply supplemental stipulations.

Many of the resources and conditions for requiring stipulations are for areas less than 40 acres, or small narrow features (e.g. mostly woody draws, grousse breeding grounds, slopes >40%, etc.). Although mitigation (i.e., relocating a proposed well location) may be accomplished by relocation of less than 200 meters, the identification of these small areas will be done to inform "up front" to potential lessors that a condition or resource exists which will require protection. These small areas in the lease will be designated as a "portion of" a 40-acre parcel (the smallest legal description denoted in the lease). If the area requiring protection is scattered over an entire section but surface occupancy is still permissible on parts of every "forty," the legal description describing the area would be "portions of" the section specified.

The 200 meter and 60 day figures under standard lease terms also provide protection for resources which are not known or identified at the time of lease (e.g., the establishment of a new prairie falcon nest).

4. The intent of the No Surface Occupancy is NO SURFACE OCCUPANCY, including road construction and ancillary facilities. Use of existing roads would be permitted to the extent that the overall character of the area were not altered. For example four wheel drive use of a primitive road would be permitted, whereas removing obstacles from that road for larger vehicle access would be inconsistent.

5. Lease Notices are attached to leases to transmit information at the time of lease issuance to assure 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 law, regulation, standard lease term, or onshore oil and gas order. A Lease Notice is not signed by the lessor. Guidance in the use of Lease Notices is found in BLM Manual 3101 and 43 CFR 3101.1-3.

A Lease Notice should contain the following elements: (1) the resource/use/value and the lands affected, if applicable; (2) the reason (s); (3) the effect on lease operations or what may be required; and (4) a reference to the lease term, regulation, law, or order from which enforcement authority is derived.

If a situation or condition is known to exist that could constrain lease operations, there should be full disclosure at the time of lease issuance via a Lease Notice. If a lessee may be prevented from extracting oil and gas through a prohibition mandated by a specific non-discretionary statute, such as the Endangered Species Act, then a stipulation may be used even though a Lease Notice would be sufficient. It is at the discretion of the authorized Forest Officer whether a situation is sufficiently sensitive to warrant the use of a lease stipulation.

6. Subsequent to lease issuance, an operator submitting a surface use plan of operations may request the authorized Forest Officer to request the BLM to modify (permanently change), waive (permanently remove), or grant an exception (case-by-case exemption) to a stipulation included in a lease at the direction of the Forest Service (36 CFR 228.104).

A thorough review shall be conducted of the waiver, exception, or modification proposal as specified in 36 CFR 228.104(b)(2). The authorized Forest Officer may authorize the Bureau of Land Management to modify, waive, or grant an exception to a stipulation if: (i) The action would be consistent with applicable Federal laws; (ii) The action would be consistent with the current forest land and resource management plan; (iii) The management objectives which led the Forest Service to require the inclusion of the stipulation in the lease can be met without restricting operations in the manner provided for by the stipulation given the change in the present condition of the surface resources involved or given the nature, location, timing, or design of the proposed operations; and (iv) The action is acceptable to the authorized Forest Officer based upon a review of the environmental consequences.
**STANDARD LEASE TERMS**

BLM Form 3100-11

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**UNITED STATES**

**DEPARTMENT OF THE INTERIOR**

**BUREAU OF LAND MANAGEMENT**

**OFFER TO LEASE AND LEASE FOR OIL AND GAS**

The undersigned officer, in fulfillment of his duties, has determined that the proposal to lease specified below is subject to the provisions of the Oil and Gas Act of 1938, 43 U.S.C. 1711-1721, as amended, and to the standard conditions of the Department and as amended to the extent necessary to meet the requirements of the Act. All leases are subject to the provisions of the Act, the regulations promulgated thereunder, and the terms of the lease and shall be subject to all applicable laws and regulations, including those governing the reclamation and stabilization of lands and waters, and the restoration of lands and waters to a condition suitably suited for their future use. All leases are subject to valid existing rights and to the conditions applicable to the land at the time of the lease. All leases are subject to all applicable laws and regulations, including those governing the reclamation and stabilization of lands and waters, and the restoration of lands and waters to a condition suitably suited for their future use. All leases are subject to valid existing rights and to the conditions applicable to the land at the time of the lease.

**Lease Terms**

1. **Date**
   - [Day] [Month] [Year]
2. **County**
   - [County]

**Legal Description**

- **Legal description of land**
- **Present use**
- **Future use**

**Terms and Conditions**

- **Term of lease**
- **Rental rate**
- **Realty transfer fees**
- **Reclamation and restoration**
- **Environmental conditions**
- **Surface use and damages**
- **Other terms and conditions**

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**DO NOT WRITE BELOW THIS LINE**

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**Subject to the provisions of the Act, the regulations promulgated thereunder, and the terms of the lease and shall be subject to all applicable laws and regulations, including those governing the reclamation and stabilization of lands and waters, and the restoration of lands and waters to a condition suitably suited for their future use. All leases are subject to valid existing rights and to the conditions applicable to the land at the time of the lease. All leases are subject to all applicable laws and regulations, including those governing the reclamation and stabilization of lands and waters, and the restoration of lands and waters to a condition suitably suited for their future use. All leases are subject to valid existing rights and to the conditions applicable to the land at the time of the lease.**

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**Cont. on reverse**
SUPPLEMENTAL LEASE STIPULATIONS

and

DESCRIPTIONS

- Justification, Application Methodology
- Conditions for Waivers, Exceptions or Modifications
- Forest Plan Consistency.
UNDERSTANDING STIPULATIONS AND THEIR RELATIONSHIP TO A FOREST PLAN AMENDMENT

Standard lease terms found in the Offer to Lease and Lease for Oil and Gas Form 3100-11, U.S. Department of Interior. Bureau of Land Management, June 1988, can be modified by special, or supplemental stipulations, which may be attached to the lease. These additional or supplemental stipulations have been developed to meet resource concerns that cannot be mitigated by standard lease terms. This section of Appendix D lists the proposed supplemental lease stipulations. Table D-1 summarizes, for the readers convenience, the alternatives to which each stipulation applies.

Each stipulation is preceded by a description which details: 1) the justification for a supplemental stipulation; 2) the methodology by which the stipulation will be applied; 3) the conditions under which a waiver, exception or modification may be granted; and 4) a statement on whether the stipulation is consistent with the Forest Plan or whether the Forest Plan would have to be amended to implement the stipulation.

The Medicine Bow National Forest and Thunder Basin National Grasslands Land and Resource Management Plan will be amended in accordance with the selected alternative. The decision on the selected alternative and the amendment to the Forest Plan will be documented in a Record of Decision based on this final EIS. The following supplemental stipulations applicable to the selected alternative along with their description will be incorporated into an amendment to Forest Plan, Appendix D, Standard and Special Stipulations for Mineral Leasing.

In addition to amending Forest Plan, Appendix D, some alternatives require amending Forest Plan Standards and Guidelines. When Forest Plan Standards and Guidelines have to be amended they are described in CHAPTER II, ALTERNATIVE DESCRIPTIONS and in the Forest Plan consistency portion of the description for individual supplemental stipulations.

### Table D-1 SUMMARY OF OIL & GAS LEASING STIPULATIONS

<table>
<thead>
<tr>
<th>Resource</th>
<th>Stipulation</th>
<th>Alternative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildlife</td>
<td>TLS</td>
<td>1,2,3,4,7</td>
<td>Indicator Species (raptors &amp; grouse)</td>
</tr>
<tr>
<td>Wildlife</td>
<td>TLS</td>
<td>3,4,7</td>
<td>Forest Plan 05, Critical Winter Range</td>
</tr>
<tr>
<td>Wildlife</td>
<td>CSU</td>
<td>3,4,7</td>
<td>Forest Plan 05, Critical winter range</td>
</tr>
<tr>
<td>Wildlife</td>
<td>CSU</td>
<td>1,2,3,4</td>
<td>Indicator Species (raptors &amp; grouse)</td>
</tr>
<tr>
<td>Wildlife</td>
<td>CSU</td>
<td>7</td>
<td>Indicator Species (includes golden eagle)</td>
</tr>
<tr>
<td>Wildlife</td>
<td>NOO</td>
<td>1,2</td>
<td>Forest Plan 05, Critical Winter Range</td>
</tr>
<tr>
<td>Recreation</td>
<td>CSU</td>
<td>3,4,7</td>
<td>Fisheries</td>
</tr>
<tr>
<td>Recreation</td>
<td>NOO</td>
<td>1,2,3,4,7</td>
<td>Cultural Resources, Walter Tanks Ring Site</td>
</tr>
<tr>
<td>Special Values</td>
<td>CSU</td>
<td>4,7</td>
<td>Rarified Natural and Biological Diverseity</td>
</tr>
<tr>
<td>Special Values</td>
<td>NOO</td>
<td>3,4,7</td>
<td>Semi-pristine Motivated and Biological Diverseity</td>
</tr>
<tr>
<td>Soil &amp; H2O</td>
<td>CSU</td>
<td>1,2,3,4,7</td>
<td>Mass Wasting, Soil Movement</td>
</tr>
<tr>
<td>Soil &amp; H2O</td>
<td>CSU</td>
<td>1,2,3,4,7</td>
<td>Salt Productivity</td>
</tr>
<tr>
<td>Soil &amp; H2O</td>
<td>CSU</td>
<td>1,2,3,4,7</td>
<td>Riparian</td>
</tr>
<tr>
<td>Soil &amp; H2O</td>
<td>NOO</td>
<td>1,2,3,4,7</td>
<td>Mass Wasting, Soil Movement</td>
</tr>
<tr>
<td>H2O</td>
<td>Lease Notice</td>
<td>1,2,3,4,6,7</td>
<td>Water Quality Monitoring</td>
</tr>
</tbody>
</table>

* Type of stipulation: Timing Limitation Stipulation (TLS), Controlled Surface Use (CSU), No Surface Occupancy (NOO).
* Alternatives to which the stipulation applies.

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**Timing Limitation, Indicator Species**

**Resources: WILDLIFE**

**Stipulation:** INDICATOR SPECIES: Timing Limitations Stipulation to maintain effective crucial habitat for Forest Plan Management Indicator Species.

This stipulation is to prevent oil and gas activities from causing degradation of the crucial wildlife habitat for Forest Plan Management Indicator Species.

**Justification:**

- Forest Plan direction, pages III-29 thru III-36.
- Allowing development in crucial wildlife habitat for Management Indicator Species without special consideration generates an unacceptable risk of causing habitat degradation. Additionally many of the Management Indicator Species are protected by law and the stipulation is to ensure compliance with these laws.

**Application Methodology:**

- This stipulation would apply to ALTERNATIVES 1, 2, 3, 4 and 7.

When lease parcels are proposed, they will be compared to the Project Map Record for the Oil and Gas Leasing EIS (1:24,000 Wildlife overlays) to determine if the lease parcel includes crucial habitat for the Management Indicator Species. If so, the indicator species timing limitations stipulation will be applied.

- Areas classified as crucial habitat for Forest Plan Management Indicator Species are identified on the project file maps. These areas are associated with raptors, sage grouse, sharp-tailed grouse and bird rookeries. Since the crucial habitats change, the maps will be periodically updated.

The stipulation is written to allow oil and gas related developments, if a determination is made that they have no effect on crucial habitat for Forest Plan Management Indicator Species.

- Developing oil and gas is a staged process, first a lease must be obtained and then an approved Application Permit to Drill (APD). As required by C& Shore Order Number 1, must be obtained. Using the NEPA process, the Decision Officer makes decisions about what site specific plans, techniques and mitigation to require in the Surface Use Plan of Operations (SUPO) portion of the APD. To be approved the APD must be consistent with lease terms and stipulations, the Forest Plan and required mitigation. Once the plan is approved, it is the Operator's responsibility to successfully implement it. It is the Forest Service's responsibility to monitor implementation of the SUPO and insure it is successfully implement.

- Conditions for Waivers, Exceptions or Modifications:

  - Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36 Cod of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

- Forest Plan Consistency:

  - This stipulation is consistent with the Forest Plan Standards and Guidelines.

- A Forest Plan amendment is not required to implement this stipulation.
TIMING LIMITATION STIPULATION
INDICATOR SPECIES:
Surface occupancy or use is subject to the following operating constraints.

For an individual lease parcel being authorized, only those constraints (1 thru 5 below) applicable to that parcel will be listed:

1. No activities shall be allowed within one mile of an active bald eagle nest or peregrine falcon nest from February 1 to July 31 if they would cause nesting failure or abandonment. (Forest Plan Standard & Guideline 7007MB);

2. No activities shall be allowed within one mile of an active bald eagle winter roost site from November 1 to April 1, if they would cause a reduction in use of the roost. (Forest Plan Standard & Guideline 7009MB);

3. No activities shall be allowed within one-quarter mile of an active golden eagle nest from February 1 to July 31, if they would cause nesting failure or abandonment. (Forest Plan Standard & Guideline 7009MB);

4. No activities shall be allowed within one-quarter mile of an active ferruginous hawk, Swainson’s hawk, goshawk, osprey or prairie falcon nest from March 1 to July 31, if they would cause nesting failure or abandonment. (Forest Plan Standard & Guideline 7010MB);

5. No activities shall be allowed within one-quarter mile of any rookery from March 1 to July 31 if they would cause abandonment of the rookery, unless specific practices are successfully implemented to maintain or increase the opportunities at other rookery sites. (Forest Plan Standard & Guideline 7013MB)

On the lands described below:

For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here:

Areas classified as crucial habitat for Forest Plan Management Indicator Species are identified on the Project Map Record for the Oil and Gas Leasing EIS (1 24,000 Wildlife overlays). These areas are associated with raptors, sage grouse, sharp-tailed grouse and bird rookeries.

For the purpose of:
This stipulation is to prevent oil and gas activities from causing degradation of crucial wildlife habitat for Forest Plan Management indicator Species.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1524 and 3101 or FS Manual 1950 and 2820.)
TIMING LIMITATION STIPULATION
CRUCIAL WINTER RANGE

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

No oil and gas exploration or development will be allowed from December 1 through April 30. This timing restriction does not apply to production activities.

On the lands described below:

<<<<For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here.>>>>

Areas classified as crucial winter habitat for deer, Forest Plan Management Area 5, Management emphasis on big game winter range.

For the purpose of:

This stipulation is to prevent oil and gas activities from causing degradation of crucial winter wildlife habitat for Forest Plan Management Featured Species (deer).

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.)

Controlled Surface Use, Crucial Winter Range

Resources: WILDLIFE

Stipulation: CRUCIAL WINTER RANGE: Controlled Surface Use to maintain effective crucial winter range for deer.

This stipulation is to prevent oil and gas activities from degrading crucial winter range for deer.

Justification:

Forest Plan direction, pages III-29 thru III-36.

Approximately 4,600 acres of crucial winter range for deer have been identified on the Grasslands by the Wyoming Game & Fish Department and have been classified as Forest Plan Management Area 5. Emphasis of big game winter range. This area is shown on the Forest Plan Management Area map in Sections 15, 21, 22, 26-28, 33-35, T.47N, R.63W and Sections 3 & 4, T.46N, R.63W. The area is in the Upton-Osage community pasture. This area becomes crucial winter habitat approximately eight out of every 10 years. Crucial winter range is necessary for maintaining the deer population at or above objective.

To utilize this area for the development of the oil and gas resource without special consideration generates an unacceptable risk of causing degradation of the area's effectiveness as crucial winter range, which could result in major mortality of the deer population in an area with a radius of approximately 25 miles of Management Area 5.

Application Methodology:

This stipulation would only apply to ALTERNATIVES 3, 4 and 7. This stipulation will be applied in conjunction with the Crucial Winter Range Timing Limitation stipulation.

When lease parcels are proposed they will be compared to the Forest Plan map to determine if the lease parcel includes crucial winter range. If so, the crucial winter range Timing Limitation stipulation will be applied.

Conditions for Waivers, Exceptions or Modifications:

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Forest Plan Consistency

To implement this stipulation the Forest Plan Standards and Guidelines would be amended to allow oil and gas roads to be constructed in Management Area 5 when no feasible alternatives exist to locate the oil and gas activities outside the area.
CONTROLLED SURFACE USE STIPULATION

CRUCIAL WINTER RANGE:

Surface occupancy or use is subject to the following operating constraints:

1. No surface occupancy is permitted unless there is no feasible alternative to locate the oil and gas activities outside the area.

2. When surface occupancy is permitted:
   a) Oil and gas operations will prevent or minimize disturbance of wintering big game animals. Oil and gas activities will not prevent the area from functioning as winter range at any time.
   b) Roads will be constructed at the minimum distance feasible to access oil and gas activities within the crucial winter range area (Forest Plan Standard and Guideline 0668).
   c) Road traffic and road cut or fill slopes must not block big game movement in delineated migration routes or corridors. (Forest Plan Standard and Guideline 0323).
   d) Temporary roads will be obliterated within one season after planned use ends.
   e) Snow plowing of roads, or other oil and gas activities must not block big game movement.

On the lands described below:

<< For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here. >>

The area classified as crucial winter range for deer and identified on the Forest Plan map as Management Area 5A. This area occurs in Sections 15, 21, 22, 26 - 28 and 33 - 35, T. 47 N., R. 63 W. and Sections 3 and 4, T. 46 N., R. 63 W.

For the purpose of:

Preventing oil and gas activities from causing degradation of crucial deer winter range.

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 2620.)

Resources: WILDFIRE

Stipulation: INDICATOR SPECIES: Controlled Surface Use to maintain effective crucial habitat for Forest Plan Management Indicator Species.

This stipulation is to prevent degrading crucial wildlife habitat for Forest Plan Management Indicator Species by oil and gas activities.

Justification:

Forest Plan direction, pages III-29 thru III-36.

Allowing development in crucial wildlife habitat for Management Indicator Species without special consideration generates an unacceptable risk of causing habitat degradation. Additionally, many of the Management Indicator Species are protected by law and the stipulation is to ensure compliance with these laws.

Application Methodology

This stipulation would apply to ALTERNATIVES 1, 2, 3 and 4.

Areas classified as crucial habitat for Forest Plan Management Indicator Species are identified on the Project Map Record for the Oil and Gas Leasing EIS (1:24,000 Wildlife overlays). These areas are associated with raptors, sage grouse, sharp-tailed grouse and bird rookeries. Since the crucial habitats change, the maps will be periodically updated.

When lease parcels are proposed they will be compared to the project file maps to determine if the lease parcel includes crucial habitat for the Management Indicator Species. If so, the indicator species Controlled Use Stipulation will be applied.

The stipulation allows oil and gas related developments, if it is determined they will not affect crucial habitat for Forest Plan Management Indicator Species.

Developing oil and gas is a staged process, first a lease must be obtained and then an approved Application Permit to Drill (APD), as required by On Shore Order Number 1, must be obtained. Using the NEPA process, the Deciding Officer makes decisions about what site specific plans, techniques and mitigation to require in the Surface Use Plan of Operations (SUPO) portion of the APD. To be approved the APD must be consistent with lease terms and stipulations, the Forest Plan and required mitigation.

Once the plan is approved, it is the operator’s responsibility to successfully implement it. It is the Forest Service’s responsibility to monitor implementation of the SUPO and ensure it is successfully implemented.

Conditions for Waivers, Exceptions or Modifications:

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer’s decision will be based on this information.

Forest Plan Consistency

This stipulation is consistent with the Forest Plan Standards and Guidelines.

A Forest Plan amendment is not required to implement this stipulation.
CONTROLLED SURFACE USE STIPULATION

INDICATOR SPECIES:

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

1. No activities shall be allowed within one-half mile of an active bald eagle or peregrine falcon nest at any time if they would cause disturbance of the adult birds on the nest. (Forest Plan Standard & Guideline 7007MB).

2. No activities shall be allowed within 300 feet of any fernigous hawk, Swainson’s hawk, goshawk, osprey or prairie falcon nest at any time if they would cause nest abandonment, unless specific practices are successfully implemented to maintain or increase nesting opportunities at other sites. (This does not apply to existing surface occupancies. (Forest Plan Standard and Guideline 7011MB with species listed)).

3. New roads or other developments shall be placed out of sight of the existing raptor nest if possible, unless specific practices are successfully implemented to maintain or increase nesting opportunities. (Forest Plan Standard and Guideline 7012MB).

4. No activities shall be allowed within one-quarter mile of a sage grouse or sharp-tailed grouse lek at any time if they would cause abandonment of the lek, unless specific practices are successfully implemented to maintain or increase the existing habitat capability for grouse. (Forest Plan Standard and Guideline 7014MB).

On the lands described below:

Areas classified as crucial habitat for Forest Plan Management Indicator Species are identified in the Project Map Record for the Oil and Gas Leasing EIS (1:24,000 Wildlife overlays). These areas are associated with raptors, sage grouse, and sharp-tailed grouse.

For the purpose of:

This stipulation is to prevent degradation of crucial wildlife habitat for Forest Plan Management Indicator Species by oil and gas activities.

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 1524 and 3101 or FS Manual 1950 and 2620).
CONTROLLED SURFACE USE STIPULATION
INDICATOR SPECIES (including Golden Eagle)

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

1. No activities shall be allowed within one-half mile of an active bald eagle or peregrine falcon nest at any time if they would cause disturbance of the adult birds on the nest. (Forest Plan Standard & Guideline 7007MB)

2. No activities shall be allowed within 300 feet of any golden eagle, ferruginous hawk, Swainson’s hawk, goshawk, osprey or prairie falcon nest at any time if they would cause nest abandonment, unless specific practices are successfully implemented to maintain or increase nesting opportunities at other sites. This does not apply to existing surface occupancies. (Forest Plan Standard and Guideline 7011MB with species listed)

3. New roads or other developments shall be placed out of sight of the existing raptor nest if possible, unless specific practices are successfully implemented to maintain or increase nesting opportunities. (Forest Plan Standard and Guideline 7012MB)

4. No activities shall be allowed within one-quarter mile of a sage grouse or sharp-tailed grouse lek at any time if they would cause abandonment of the lek, unless specific practices are successfully implemented to maintain or increase the existing habitat capability for grouse. (Forest Plan Standard and Guideline 7014MB)

On the lands described below:

Areas classified as crucial habitat for Forest Plan Management Indicator Species are identified in the Project Map Record for the Oil and Gas Leasing EIS (1:24,000 Wildlife overlays). These areas are associated with raptors, sage grouse and sharp-tailed grouse.

For the purpose of:

This stipulation is to prevent degradation of crucial wildlife habitat for Forest Plan Management Indicator Species by oil and gas activities.

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 1824 and 3101 or FS Manual 1950 and 2920)
NO SURFACE OCCUPANCY STIPULATION

CRUCIAL WINTER RANGE

No Surface occupancy on the crucial winter range for deer, Forest Plan Management Area 5.

No surface occupancy or use is allowed on the lands described below:

For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here.

The area classified as crucial deer winter range and identified in the Forest Plan and on the Forest Plan map as Management Prescription 5. This area occurs in Sections 15, 21, 27, 29 thru 33 and 33 thru 35, T. 47 N., R. 63 W., and Sections 3 and 4, T. 46 N., R. 63 W.

For the purpose of:

Preventing oil and gas activities from causing degradation of crucial winter range for deer.

Resources: RECREATION

Controlled Surface Use, Fisheries

Stipulation: FISHERIES AREAS: Controlled surface use on areas identified as fisheries.

This stipulation is to maintain a quality fishing recreation experience on five reservoirs by controlling the noise level from oil and gas production.

Justification:

Viable fisheries are a unique and scarce resource on TBNG. On the 572,224 acres of National Forest System land only five have been identified. These fisheries have the potential to provide a viable and quality fishing experience.

Current Forest Plan direction does not protect the existing fisheries from noise related to the oil and gas mineral resource production. Noise created by leasing activities has the potential to degrade the recreation quality at the existing eight fisheries. The constant noise from oil and gas production facilities is the concern. Noise from temporary activities, such as drilling and testing of production and work over rigs, is not a concern because those activities only last for a short time.

Application Methodology:

This stipulation would be applied to ALTERNATIVES 3, 4 and 7.

When lease parcels are proposed, they will be compared with fishery stipulation areas to determine if the stipulation would apply.

Areas where the fishery stipulation is to be applied, are identified on the Project Map Record for the Oil and Gas Leasing EIS (124,000 Wetlands, Riparian and Playa overlays). If additional fisheries are discovered or constructed, they will be added to the inventory and the supplemental stipulation applied to subsequent leases. The stipulation would be applied to the following reservoirs:

Weston Reservoir: 2.5 acres, T. 70 N., R. 54 N., Section 19
Upton Cent. No. 2: 3.0 acres, T. 65 N., R. 47 N., Section 11
Kellog Dam: 6.5 acres, T. 63 N., R. 47 N., Section 17
Upton Bass Pond: 10.0 acres, T. 65 N., R. 48 N., Section 12
Turner Reservoir: 6.0 acres, T. 53 N., R. 47 N., Section 21

Developing oil and gas is a staged process; first a lease must be obtained and then an approved Application Permit to Drill (APD), as required by On Shore Order Number 1, must be obtained. Using the NEPA process, the Deciding Officer makes decisions about what site specific plans, techniques and mitigation to require in the Surface Use Plan of Operations (SUPO) portion of the APD. To be approved the APD must be consistent with lease terms and stipulations, the Forest Plan, and required mitigation. Once the plan is approved, it is the operator's responsibility to successfully implement it. It is the Forest Service's responsibility to monitor implementation of the SUPO and ensure it is successfully implemented.

Conditions for Waivers, Exceptions or Modifications:

Since this stipulation provides for developing oil and gas facilities, and many techniques exist which permit the operator flexibility in meeting the requirements, it is anticipated that few waivers, exceptions or modifications of the stipulation will be requested or granted.

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will...
be conducted in considering the request. The Deciding Officer’s decision will be based on this information.

Forest Plan Consistency:
The existing Forest Plan Standards and Guidelines do not provide for protecting the fishing experience at these five reservoirs from noise.

Because the stipulation is more restrictive than the Standards and Guidelines a Forest Plan Amendment is not required to implement this stipulation.

CONTROLLED SURFACE USE STIPULATION
FISHERIES AREAS

Surface occupancy or use is subject to the following operating constraints:

Noise from Oil and Gas production facilities will not exceed 70 decibels as measured by the A-weighted Sound level (dBA) system of measurement within 400 meters of the high water line of the fisheries identified below.

This stipulation applies to oil & gas production activities that are not temporary in nature. It does not apply to drilling, work over rigs or other activities that are temporary in nature.

On the lands described below:

<<<For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here.>>>>

The lands within 400 meters of the mean high water line of the following fisheries:

Weston Reservoir: 2.5 acres; T. 70 N., R. 54 N., Section 19
Upton Cent. No.2: 3.0 acres; T. 65 N., R. 47 N., Section 11
Kellog Dam: 6.5 acres; T. 63 N., R. 47 N., Section 17
Upton Bass Pond: 10.0 acres; T. 66 N., R. 48 N., Section 12
Turner Reservoir: 6.0 acres; T. 63 N., R. 47 N., Section 21

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.)
No Surface Occupancy, Cultural Resources

Resources: CULTURAL RESOURCES

Stipulation: CULTURAL RESOURCES: No Surface Occupancy on lands with significant cultural resources.

This stipulation is to prevent degradation to the Walker Tepee Ring site, an important significant cultural resource.

Justification:
Forest Plan direction, Page III-18 thru 19.

Code of Federal Regulations Title 36, Part 800

The Walker Tepee Ring Site is eligible for nomination to the National Register of Historic Places. It has unique scientific research potential and is an excellent candidate for an interpretive project.

Application Methodology:

This stipulation applies to ALTERNATIVES 1, 2, 3, 4 and 7.

When lease parcels are proposed they will be compared to the stipulation area for the Walker Tepee Ring site to determine if the stipulation would apply.

The Walker Tepee Ring site is approximately 320 acres in size. Its location is identified in the Project Map Record for the Oil and Gas Leasing EIS (1:24,000 ROS, Cultural Resources overlays). The stipulation area is all the National Forest System land south of the Raven Creek Road in the SW1/4 of SW1/4 of Section 7 and in the W1/2 of Section 18, T. 46 N., R. 66 W.

Developing oil and gas is a staged process; first a lease must be obtained and then an approved Application Permit to Drill (APD), as required by On Shore Order Number 1, must be obtained. Using the NEPA process, the Deciding Officer makes decisions about what site specific plans, techniques and mitigations to require; the Surface Use Plan of Operations (SUPO) portion of the APD. To be approved the APD must be consistent with lease terms and stipulations, the Forest Plan and required mitigation. Once the plan is approved, it is the operator’s responsibility to successfully implement it. It is the Forest Service's responsibility to monitor implementation of the SUPO and ensure it is successfully implement-ed.

Conditions for Waivers, Exceptions or Modifications:

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Waivers, exceptions or modifications would be granted, only when it can be clearly established that management of the area would be fully consistent with T36 CFR, Part 800 and the Forest Plan.

Forest Plan Consistency:

This stipulation is consistent with the existing Forest Plan Standards and Guidelines.

A Forest Plan amendment is not required to implement this stipulation.
Controlled Surface Use, Special Value Areas

Resources: SPECIAL VALUE AREAS

Stipulation: AREAS WITH SPECIAL VALUES VALUES: Rochelle Hills & Upton- Osage.

This stipulation is to protect areas with special biological diversity or recreation values (roaded natural Recreation Opportunity Spectrum (ROS) class). ROS classes are described in the U.S. Department of Agriculture, Forest Service, ROS User’s Guide, 1992.

Justification:

During scoping, protection of the areas with higher biological diversity and semi-primitive motorized recreation opportunity surfaced. Current Forest Plan direction does not provide for retaining these areas. Roaded and oil & gas production facilities would change the values associated with these areas. The recreation opportunities provided by these areas would move toward the urban end of the spectrum. From a biological diversity viewpoint, the roaded and development would disrupt the relationships between natural communities presently in the areas and reduce their diversity value in the landscape.

This stipulation retains the areas in a condition similar to that presently existing.

Application Methodology:

The stipulation would be applied in ALTERNATIVE 4 and ALTERNATIVE 7.

When lease parcels are proposed, they will be compared with areas identified on the Project Map Record for the Oil and Gas Leasing EIS as having high recreation values (1,24,000 ROS, Cultural Resources overlays). Where they occur, the Controlled Surface Occupancy stipulation will be applied.

Developing oil and gas is a staged process; first a lease must be obtained and then an approved Application Permit to Drill (APD), as required by On Shore Order Number 1, must be obtained. Using the NEPA process, the Deciding Officer makes decisions about what site specific plans, techniques and mitigation to require in the Surface Use Plan of Operations (SUPO) portion of the APD. To be approved the APD must be consistent with lease terms and stipulations, the Forest Plan and required mitigation. Once the plan is approved, it is the operator’s responsibility to successfully implement it. It is the Forest Service’s responsibility to monitor implementation of the SUPO and ensure it is successfully implemented.

Conditions for Waivers, Exceptions, or Modifications:

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer’s decision will be based on this information.

Forest Plan Consistency:

The existing Forest Plan Standards and Guidelines do not provide for protecting the high recreation values associated with the Rochelle Hills and Upton-Osage community pastures.

Because the stipulation is more restrictive than the Standards and Guidelines, a Forest Plan Amendment is not required to implement this stipulation.

CONTROLLED SURFACE USE STIPULATION

AREAS WITH SPECIAL VALUES

Rochelle Hills & Upton-Osage

Surface occupancy or use is subject to the following operating constraints:

1. Noise from Oil and Gas production facilities will not exceed 70 decibels as measured by the A-weighted Sound level (dBA) system of measurement at a distance of over 90 meters from the oil & gas production facility producing the noise. This 70 decibels noise stipulation does not apply to activities other than oil & gas production. It does not apply to drilling, work over rigs or other activities that are temporary in nature.

2. Well access roads may be developed when road density, after construction, will not exceed 2 miles of road per 640 acres. Only minor re-alignment for curves or road junctions are to occur. Exceptions are when (1) unnecessary existing roads are reclaimed bringing the road density to less than 2.1 miles per 640 acres, or (2) when the new road is less than 0.2 miles in length. Road length is to be measured from centerline of the existing transportation route to the well bore.

3. In the event of field development, additional road access will be permitted in accordance with the field development plan and full National Environmental Policy Act compliance.

On the lands described below:

<<<<<<For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here.>>>

This stipulation is to be applied to the areas identified as having high recreation and biological diversity value. The specific area on which the stipulation is to be applied is identified on the ALTERNATIVE 4 and 7 analysis maps in APPENDIX H. In general these areas identified are Rochelle Hills and the area between Upton and Osage, Wyoming.

For the purpose of:

Protecting areas existing special values (recreation and biological diversity).

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 1824 and 3101 or FS Manual 1950 and 2820.)
No Surface Occupancy, Special Value Areas

Resources: SPECIAL VALUES


This stipulation is to protect the unique recreation values associated with areas having a semi-primitive motorized recreation opportunity and/or higher biological diversity.

Justification:

During spring, protection of the areas with higher biological diversity and semi-primitive motorized recreation opportunity surfaced. Current Forest Plan direction does not provide for retaining these areas. Road and oil & gas production facilities would change the values associated with these areas. The recreation opportunities provided by these areas would move toward the urban end of the spectrum, at least to roaded natural. From a biological diversity viewpoint, the road and development would disrupt the relationships between natural communities presently in the areas and reduce their value as undeveloped areas in the landscape.

Application Methodology

The stipulation would only be applied to ALTERNATIVES 3, 4 and 7. In ALTERNATIVE 3, three of four inventoried semi-primitive motorized would be protected. Under ALTERNATIVE 4, all four of the inventoried semi-primitive motorized areas would be protected. In ALTERNATIVE 7, four areas of special values including both biological diversity and semi-primitive motorized recreation would be protected.

Areas having special values are identified on the alternative maps (APPENDIX H). When lease parcels are proposed the stipulations will be applied in accordance with the Forest Supervisors selected alternative.

Developing oil and gas is a staged process; first a lease must be obtained and second an approved Application Permit to Drill (APD), as required by On Shore Order Number 1, must be obtained. Using the NEPA process, the Deciding Officer makes decisions about what site specific plans, techniques and mitigation to require in the Surface Use Plan of Operations (SUPO) portion of the APD. To be approved the APD must be consistent with lease terms and stipulations, the Forest Plan and required mitigation. Once the plan is approved, it is the operator's responsibility to successfully implement it. It is the Forest Service's responsibility to monitor implementation of the SUPO and ensure it is successfully implemented.

Conditions for Waivers, Exceptions or Modifications

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 229. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Forest Plan Consistency

The existing standards and guidelines do not provide for protecting the unique recreation values associated with areas having a Recreation Opportunity Spectrum class of semi-primitive motorized.

Because the stipulation is more restrictive than the standards and guidelines a Forest Plan Amendment is not required to implement this stipulation.

D. 31

NO SURFACE OCCUPANCY STIPULATION

SPECIAL VALUE AREAS

No surface occupancy or use is allowed on the lands described below:

<<<<< For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here. >>>

This stipulation is to be applied to areas of special values as identified on the Forest Supervisors selected alternative map (APPENDIX H).

The stipulation would only be applied in ALTERNATIVES 3, 4 and 7. In ALTERNATIVE 3, three of four inventoried semi-primitive motorized would be protected. Under ALTERNATIVE 4, all four of the inventoried semi-primitive motorized areas would be protected. In ALTERNATIVE 7, four areas of special values including both biological diversity and semi-primitive motorized recreation would be protected.

For the purpose of:

Protecting the unique recreation values associated with areas having a semi-primitive motorized recreation opportunity.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2920.

D. 32
Controlled Surface Use, Mass Wasting, Soil Movement

Resources: SOL & WATER

Stipulation: MASS WASTING, UNSTABLE AREAS, STEEP SLOPES: Controlled Surface Use on lands with potential for massive soil movement.

This stipulation is to prevent landslides and mass soil movements being caused by oil and gas activities.

Justification:

Forest Plan direction, Page III-58, Item c, page III-59 Items c.1. and c.2. and pages III-74 thru III-76.

Areas within the classification of "mass wasting potential areas" and slopes under 60 percent and over 34 percent that are unstable. Using these areas for the development of the oil and gas resource generates a risk of massive soil movement.

Application Methodology:

This stipulation would apply to ALTERNATIVES 1, 2, 3, 4 and 7

When lease parcels are proposed they will be compared to the Project Map Record for the Oil and Gas Leasing EIS (124,000 Soils maps) to determine if the mass wasting, unstable areas, slopes under 60 percent and over 34 percent stipulation would apply.

The areas with soils classified as "mass wasting potential areas" are identified in the project file maps. The maps are topographic maps and the percent slope is easily determined. In general, larger areas meeting these criteria are located on side slopes of the Rochelle Hills, Miller Hills, Red Hills, HA Divide, Cow Creek Buttes and portions of the Spring Creek unit. Areas less than 40 acres meeting these criteria are scattered throughout the National Grassland.

The stipulation will allow the development of oil and gas facilities only when; (1) no other reasonable alternatives exist, and (2) it is clearly established that the site specific design for the facilities will not cause massive soil movement.

Developing oil and gas is a staged process; first a lease must be obtained and second an approved Application Permit to Drill (APD), as required by On Shore Order Number 1, must be obtained. Using the NEPA process, the Deciding Officer makes decisions about what site specific plans, techniques and mitigation to require in the Surface Use Plan of Operations (SUPO) portion of the APD. To be approved the APD must be consistent with lease terms and stipulations, the Forest Plan, and required mitigation. Once the plan is approved, it is the operator’s responsibility to successfully implement it. It is the Forest Service’s responsibility to monitor implementation of the SUPO and ensure it is successfully implemented.

Conditions for Waivers, Exceptions or Modifications:

Since this stipulation provides for developing oil and gas facilities, it is not anticipated any waivers, exceptions; or modifications of the stipulation will be requested or granted.

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer’s decision will be based on this information.

Forest Plan Consistency:

This stipulation is consistent with the existing Forest Plan Standards and Guidelines.

A Forest Plan amendment is not required to implement this stipulation.
CONTROLLED SURFACE USE STIPULATION

MASS WASTING, UNSTABLE AREAS, STEEP SLOPES

Surface occupancy or use is subject to the following operating constraints:

On areas identified as having a high potential for soil mass wasting and on unstable areas with slopes greater than 34 percent but less than 60 percent no surface occupancy will be allowed unless:

1. No other reasonable alternatives exist, and

2. It is established to the authorized officer’s satisfaction, that the site specific design for the facilities will not cause massive soil movement.

On the lands described below:

For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here.

This stipulation is to be applied to the areas identified as mass wasting, unstable areas with slopes under 60 percent and over 34 percent on the Project Map Record for the Oil and Gas Leasing EIS. In general, the larger areas meeting these criteria are located on the slopes of the Rochelle Hills, Miller Hills, Red Hills, HA Divide, Cow Creek Buttes and portions of the Spring Creek unit. Smaller areas meeting these criteria are scattered throughout the National Grassland.

For the purpose of this stipulation is to prevent land slides and mass soil movements being caused by oil and gas activities.

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.)

Resources: SOIL & WATER

Stipulation: PERMANENT IMPAIRMENT TO SOIL PRODUCTIVITY: Controlled Surface Use on lands with potential for oil and gas development to permanently impair soil productivity.

This stipulation is to prevent oil and gas activities causing a significant and permanent decrease in soil productivity.

Justification:

Forest Plan direction. Page III-58, item c, page III-59 items c.1. and c.2. and pages III-74 thru III-76.

Areas with a classification of "mass wasting potential areas" and with slopes over 34 percent are unstable if disturbed significantly. Using these areas for the development of the oil and gas resources, including roads and pipelines, requires special consideration.

Riparian soils are sensitive and easily damaged. Using these areas for the development of the oil and gas resource, including roads and pipelines, requires special consideration.

Application Methodology:

This stipulation applies to ALTERNATIVES 1, 2, 3, 4 and 7.

When lease parcels are proposed they will be compared to the Project Map Record for the Oil and Gas Leasing EIS (1:24,000 Soils maps). In general, the larger areas meeting these criteria are located on the slopes of the Rochelle Hills, Miller Hills, Red Hills, HA Divide, Cow Creek Buttes and portions of the Spring Creek unit. Smaller areas meeting these criteria are scattered throughout the National Grassland.

The areas with soils classified as "mass wasting potential areas" are identified in the project file maps. The maps are topographic maps and the percent slope is easily determined. In general, these areas are located on side slopes of the Rochelle Hills, Miller Hills, HA Divide, Cow Creek Buttes and portions of the Spring Creek unit.

The areas with soils classified as riparian are identified in the project file maps. Generally, these are the soils associated with water drainages and playas.

The stipulation is written to allow oil and gas related developments. If (1) no other reasonable alternatives exist, and (2) it is clearly established the development will not cause permanent impairment of the soil productivity.

Conditions for Waivers, Exceptions or Modifications:

Since this stipulation provides for developing oil and gas facilities, it is not anticipated any waivers, exceptions or modifications of the stipulation will be requested or granted.

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer’s decision will be based on this information.

Forest Plan Consistency:

This stipulation is consistent with the existing Forest Plan Standards and Guidelines.

A Forest Plan amendment is not required to implement this stipulation.
CONTROLLED SURFACE USE STIPULATION
PERMANENT IMPAIRMENT TO SOIL PRODUCTIVITY

Surface occupancy or use is subject to the following operating constraints:

1. No other reasonable alternatives exist, and
2. It is established to the authorized officer's satisfaction, that the site specific design for the facilities will not cause permanent impairments to soil productivity.

On the lands described below:

For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here.

This stipulation is to be applied to the following areas:

1. With soils classified as "mass wasting potential area" as identified in the project file maps located on slopes greater than 34 percent. In general these areas are located on side slopes of the Rochelle Hills, Miller Hills, HA Divide, Cow Creek Buttes and portions of the Spring Creek unit.

2. Those areas with soils classified as riparian as identified in the project file maps. Generally, these are the soils associated with water drainages and playas.

For the purpose of:

This stipulation is to prevent significant and permanent decrease in soil productivity by oil and gas activities.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2920.)

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Controlled Surface Use, Riparian

**Resources:** SOIL & WATER

**Stipulation:** RIPARIAN, PLAYAS, FLOODPLAINS & WETLANDS: Controlled Surface Use to prevent degradation of the riparian, playas, floodplains and wetland values by oil and gas development.

This stipulation is to prevent oil and gas activities from causing degradation of the riparian, playas, floodplains and wetland values.

**Justification:**

Forest Plan direction, pages III.51 thru III.53 and pages III.74 thru III.76.

Riparian areas, playas, floodplains and wetlands are sensitive. Utilizing them for the development of the oil and gas resource without special consideration causes an unacceptable risk of degradation of their values.

**Application Methodology**

This stipulation would apply to ALTERNATIVES 1, 2, 3, 4 and 7.

When a proposed lease parcel is received it will be compared to the Project Map Record for the Oil and Gas Leasing EIS (both the 1:24,000 Wetland, Riparian and Playas overlays developed by the Medicine Bow National Forest and the 1:24,000 scale U.S. Fish and Wildlife Service Wetland overlays). This stipulation will be applied to lease parcels which have inventoried riparian areas, playas, floodplains and wetlands. The resolution of the inventory maps is approximately 1 acre. Riparian areas, playas, floodplains and wetlands less than one acre are adequately protected under standard lease terms which permit the Forest Service to move a location up to 200 meters.

Oil and gas related developments may be approved, if (1) no other reasonable alternatives exist, and (2) it is clearly established the development will meet Forest Plan Standards and Guidelines about riparian, playas, floodplains and wetland areas.

Developing oil and gas is a staged process; first a lease must be obtained and then an approved Application Permit to Drill (APD), as required by On Shore Order Number 1, must be obtained. Using the NEPA process, the Deciding Officer makes decisions about what site specific plans, techniques and mitigation to require in the Surface Use Plan of Operations (SUPO) portion of the APD. To be approved the APD must be consistent with lease terms and stipulations, the Forest Plan and required mitigation. Once the plan is approved, it is the operator's responsibility to successfully implement it. It is the Forest Service's responsibility to monitor implementation of the SUPO and ensure it is successfully implemented.

**Conditions for Waivers, Exceptions or Modifications**

Since this stipulation provides for developing oil and gas facilities, it is anticipated few waivers, exceptions or modifications of the stipulation will be requested or granted.

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

**Forest Plan Consistency**

This stipulation is consistent with existing Forest Plan Standards and Guidelines.

A Forest Plan amendment is not required to implement this stipulation.
CONTROLES SURFACE USE STIPULATION

RIPARIAN, PLAYAS, FLOODPLAINS AND WETLANDS:

Surface occupancy or use is subject to the following operating constraints:

1. No other reasonable alternatives exist and
2. It is established to the authorized officer’s satisfaction, that the development will meet Forest Plan Standards and Guidelines about riparian, playas, floodplains and wetland areas.

a. Design activities to protect and manage the riparian ecosystem. (0401)
   1. Initiate timely and effective rehabilitation of disturbed areas Restore riparian areas so that a vegetation ground cover or suitable substitute protects the soil from erosion and prevents increased sediment yield. (0724)
   2. Maintain the integrity of the ecosystem including quantity and quality of water. (1377MB)

b. Locate oil and gas activities away from the water’s edge or outside the riparian areas, playas, wetlands and floodplains unless alternatives have been assessed and determined to be more environmentally damaging. If necessary to locate activities in these areas, then:
   1. Deposit no waste material (silt, sand, gravel, soil, slash, debris, chemicals or other material) below high water lines, in riparian areas, in areas immediately adjacent to riparian areas or in natural drainageways (draws, land surface depressions or other areas where overland flow concentrates and flows directly into streams or lakes). (1358MB)
   2. Prohibit the depositing of soil material from drilling, processing or site preparation in natural drainageways. (6612)
   3. Locate the lower edge of disturbed or deposited soil banks outside the active floodplain.
   4. Prohibit stockpiling of topsoil or any other disturbed soil in the active floodplain. (6618)
   5. Locate drilling mud pits outside riparian areas, playas, wetlands and floodplains. If location is unavoidable in these areas, seal and dike all pits to prevent leakage. (6624)
   6. Drain and restore roads, pads and drill sites immediately after use is discontinued. Revegetate to 80 percent of ground cover in the first year. Provide surface protection during stormflow and snowmelt runoff events. (6626)
   7. Avoid constructing roads, drill pads and tank batteries in, or immediately adjacent to riparian areas, playas, wetlands and floodplains. (0718) Facilities will be located a sufficient distance from the water’s edge so that sediment entering the water is minimized. (7211MB)
   8. Gravel pits shall be rehabilitated to simulate a natural riparian/aquatic situation if permitted in riparian zones. (7210MB)

9. Do not parallel streams when road location must occur in riparian areas except where absolutely necessary. Cross streams at right angles. (7209MB) Locate crossings at points of low bank slope and firm surfaces. (6628)

   c. Riparian areas, playas, floodplains and wetlands, will not exceed a visual quality objective (VQO) of partial retention. This visual management system, as well as the terms partial retention and visual quality objective, are explained in the Forest Service manuals and handbooks.

On the lands described below:

<<<< For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here. >>>>

This stipulation is to apply to riparian, playas, floodplains or wetland areas as identified in the Project Map Record for the Oil and Gas Leasing EIS (both the 1:24,000 Wetlands, Riparian and Playas overlays developed by the Medicine Bow National Forest and the 1:24,000 scale U.S. Fish and Wildlife Service Wetland overlays).

For the purpose of:

This stipulation is to prevent oil and gas activities from causing degradation of the riparian, playas, floodplains and wetland values.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820)
No Surface Occupancy, Mass Wasting, Soil Movement

**Resources:** SOIL & WATER

**Stipulation:** MASS WASTING, UNSTABLE AREAS, STEEP SLOPES: No Surface Occupancy on lands with potential for massive soil movement.

This stipulation is to prevent oil and gas activities from causing landslides and similar massive soil movements.

**Justification:**

Forest Plan direction, Page III-58, Item c, and page III-59 Items c.1. and c.2.

Areas with a classification of 'mass wasting potential areas' and with slopes over 60 percent are unstable, using these areas for the development of the oil and gas resource causes an unacceptable risk of massive soil movement.

**Application Methodology**

This stipulation would apply to ALTERNATIVES 1, 2, 3, 4 and 7.

When lease parcels are proposed they will be compared to the Project Map Record for the Oil and Gas Leasing EIS (1:24,000 Soils maps) to determine if the mass wasting, unstable areas, steep slopes stipulation would apply.

The areas with soils classified as 'mass wasting potential areas' are identified in the project file maps. The maps are topographic maps and the percent slope is easily determined. In general, larger areas meeting these criteria are located on side slopes of the Rochelle Hills, Miller Hills, Red Hills, HA Divide, Cow Creek Buttes and portions of the Spring Creek unit. Areas less than 40 acres meeting these criteria are scattered throughout the National Grassland.

Developing oil and gas is a staged process; first a lease must be obtained and then an approved Application Permit to Drill (APD), as required by On Shore Order Number 1, must be obtained. Using the NEPA process, the Deciding Officer makes decisions about what site specific plans, techniques and mitigation to require in the Surface Use Plan of Operations (SUPO) portion of the APD. To be approved the APD must be consistent with lease terms and stipulations, the Forest Plan and required mitigation. Once the plan is approved, it is the operator's responsibility to successfully implement it. It is the Forest Service's responsibility to monitor implementation of the SUPO and ensure it is successfully implemented.

**Conditions for Waivers, Exceptions or Modifications**

Waivers, exceptions or modifications will be considered in accordance with the requirements of Title 36, Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

**Forest Plan Consistency**

This stipulation is consistent with the existing Forest Plan Standards and Guidelines.

A Forest Plan amendment is not required to implement this stipulation.

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**NO SURFACE OCCUPANCY STIPULATION**

MASS WASTING, UNSTABLE AREAS, STEEP SLOPES

No surface occupancy or use is allowed on the lands described below:

- For an individual lease parcel being authorized, the specific legal description applicable to that parcel will be listed here.

This stipulation is to be applied to the mass wasting potential areas with slopes of, or over 60 percent as identified on the Project Map Record for the Oil and Gas Leasing EIS (1:24,000 Soils maps).

In general, larger areas meeting these criteria are located on side slopes of the Rochelle Hills, Miller Hills, Red Hills, HA Divide, Cow Creek Buttes and portions of the Spring Creek unit. Areas less than 40 acres meeting these criteria are scattered throughout the National Grassland.

For the purpose of:

Preventing oil and gas activities causing landslides and similar mass soil movements.

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 1824 and 3101 or FS Manual 1950 and 2820.)
Lease Notice, Baseline Water Quality/Monitoring

Resources: WATER

Lease Notice: BASELINE WATER QUALITY/MONITORING: Notification that short-term studies or minor inventories may be required of the lessee in areas where the water resource could be affected.

Justification:


To improve or maintain water quality to meet State water quality standards.

Standard Lease Terms, Section 6.

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 sufficient to establish existing conditions, prior to ground disturbing activities, under guidelines provided by lessor.

Application Methodology:

This Lease Notice applies to all alternatives that permit leasing.

The notice will be part of every lease package. It will inform the lessee that monitoring requirements in Section 6 of the Standard Lease Terms may be exercised. The rationale for providing the Lease Notice in every lease package results from the lack of sufficient water quality data on small-scale areas. Sufficient water quality data may already exist for some areas, in this case the notice serves to inform the lessee that continued monitoring may be required. Therefore, the Lease Notice should be included in every lease package to insure that the lessee is aware of their responsibility to maintain water quality.

The provisions in the notice will be implemented when the Interdisciplinary Team determines that additional data is needed to adequately assess water quality conditions on leased land. Specific instructions will be provided to the lessee upon review of the site(s) where ground-disturbing activities could occur.

Conditions for Waivers, Exceptions or Modifications:

Waivers, exceptions or modifications do not apply for the implementation of the Lease Notice. The notice does not place additional restrictions on the lessee or operations. It is informational only.

Forest Plan Consistency:

This notice is consistent with existing Forest Plan Standards and Guidelines.

A Forest Plan amendment is not required to include the notice as part of the lease package.

LEASE NOTICE

BASELINE WATER QUALITY/MONITORING

This lease was issued based on limited available information regarding water resources that may be affected by oil and gas operations. No activities can be approved that would violate the "Clean Water Act of 1972," as amended and associated Federal and State regulations. In order to assure protection and antidegradation of water quality, the lessee may be required to collect baseline information for any surface and subsurface waters that could be adversely affected, prior to approval of proposed operations. Baseline water quality information may include flow, physical, chemical and biological components of the water resource. Authority for this requirement can be found in Section 6 of the Standard Lease Terms. Whereas, "Prior to disturbing the surface of leased lands... Lessee may be required to complete minor inventories or short-term special studies under guidelines provided by the lessor."

Section 6 also requires that the lessee conduct operations in a manner that minimizes adverse impacts to water and biological resources. The lessee shall take reasonable measures deemed necessary by the lessor to protect these resources. The lessee will be required to establish a monitoring program capable of identifying and measuring any impacts to flow, physical, chemical and biological components of the water resource that may occur as a result of operations.

Requirements for baseline data collection and water monitoring will be determined on a site specific basis.
APPENDIX E

SAMPLE MITIGATION MEASURES WHICH MAY BE APPLIED AT THE
APPLICATION FOR PERMIT TO DRILL (APD)
DEVELOPMENT STAGE

Purpose of APPENDIX E

Many who commented on the draft EIS expressed concern about various mitigation measures which will be applied at the Application for Permit to Drill (APD) stage of oil and gas development.

Leasing Reform Act implementing regulations (36 CFR 228.100 et seq.) institute a staged decision making process. The regulatory framework provides the following decision points: (1) The determination of lands available for leasing (36 CFR 228.102 (d)), (2) The leasing of specific lands decision (36 CFR 228.102 (w)), (3) Application for Permit to Drill (APD), and (4) Amendment of the permit to drill if field development occurs. Each decision is based on environmental analysis and disclosure of the probable effects in accord with the National Environmental Policy Act (see CHAPTER 1, PURPOSE AND NEED, OIL AND GAS LEASING). The first two of these decisions will be made in a Record of Decision (ROD) based on this FEIS (see CHAPTER 1, PURPOSE AND NEED, DECISIONS TO BE MADE). Additional environmental analysis will be required at the APD and field development stages.

This FEIS constitutes a leasing analysis as required by 36 CFR 228.102 (c). The analysis identifies the areas open to development subject to the terms and conditions of the standard oil and gas lease form; the areas open to development subject to constraints that require the use of lease stipulations; and the areas that are closed to leasing (see APPENDIX D). Lease Stipulations are identified in APPENDIX D.

Based on the leasing analysis, as required by 36 CFR 228.102 (d), the lands which are administratively available for leasing have been identified as "the entire TBD" for all alternatives except ALTERNATIVES 5. In order to consider a full range of alternatives, ALTERNATIVES 5 would make all Forest Service administered lands unavailable for leasing. As documented in the CHAPTER II, ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY; the ID Team tried to develop an alternative whereby less than the entire TBD was available for leasing. Four reasons are documented for not including such an alternative.

The specific lands decision required by 36 CFR 228.102 (e), is not implemented until the Forest Service has reviewed the land parcel being considered for lease and validated the decision to authorize the BLM to offer the lease tracts. A specific lease parcel is not actually offered and issued until it has been determined that the information disclosed in this FEIS is accurate for a proposed parcel, and that the required stipulations are applied. Further, no ground disturbance is authorized until an APD is approved by both the Forest Supervisor and the authorized office of the BLM. A separate NEPA analysis and document is required before an APD is approved.

For clarity and for the information of those who expressed concern over site specific mitigation measures, samples of mitigation measures to be included at the APD stage of development have been included in this appendix.

Sample Mitigation Measures - Soil & Water Resource

Introduction: Soil Erosion

The area covered for this section is only the federal lands that constitute the Thunder Basin National Grassland, 572,224 acres. The analysis applies to lands with federal oil and gas, about 520,000 acres (see CHAPTER I, LANDS INVOLVED). The National Environmental Policy Act (NEPA) regulations (40 CFR 1502.14) require an evaluation of the reasonable range of alternatives. Federal agencies are also required to include and discuss appropriate mitigation measures for
environmental impacts that could result from a proposed action. The following sections on mitigation measures are considered as a sample of those available.

The referenced (project file) maps of TSAG show the different erosion or mass wasting potential hazard areas. Riparian areas may not necessarily be delineated, due to size limitations in some cases. The measures discussed later apply to the National Grassland. Areas outside of the delineated severe erosion hazard or mass wasting potential polygons have standard lease terms apply and other mitigation measures if needed. The mitigation measures are described later in this appendix.

SOIL SURVEY OF CONVERSE COUNTY, WY, Northern Part

[Soil Survey of Converse County, WY, Northern Part]

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SOIL SURVEY OF WESTON COUNTY, WY

[Soil Survey of Weston County, WY]

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SOIL SURVEY OF WESTON COUNTY, WY

[Soil Survey of Weston County, WY]

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The "severe" erosion hazard map units are identified above as described in the Soil Survey Reports. The published soil survey reports show the expected soil textures, topo
depths and other information for the soil map units.

Mitigation Measures

All mitigation measures discussed below are considered compatible with existing state and federal regulations. The following documents are referenced: Wyoming State Office DEQ - Water Quality Division, WATER QUALITY RULES AND REGULATIONS (Chpt. 1 1980 and Chpt. VII 1978). The WY DEQ GUIDELINES 1 through 13 should also be consulted for additional information. The standards and guidelines of the LAND AND RESOURCE MANAGEMENT PLAN, (Medicine Bow National Forest and Thunder Basin National Grassland) need to be met, where applicable. Pages III-74 thru 76 discuss Soil Resource standards and guidelines; pages III-57 thru 63 discuss Oil/Gas S&Gs. Appendix D of the L&RMP also contains more information.

The WY DEQ Guide line 1 contains detailed information on "topsoil." When the term topsoil is used it .. means soil which may consist of the A, B and C horizons or any combination thereof .. determined .. to be suitable as plant growth medium for the postmining land user" (DEQ Guideline 1, App. IV). The term mass wasting means the .. -"dislodgement and downslope transport of soil and rock material under the direct application of gravitational body stresses. Mass wasting includes slow displacements, such as creep and solifluxation and rapid movements such as rock falls, rock slides and debris flow" (A.G.I. 1980). Documents noted are available for review from the authoring agency cited and/or the Medicine Bow NF in Laramie, WY.

General Soil & Water:

1. Contour disturbed areas to roughly pre-existing topographical conditions, unless otherwise approved by the FS Administrator. The reclaimed area must be meta-stable and not have large rills (or gullies) evident. No active head cutting in drainages should be evident.
2. After disturbance(s), ensure that effective ground cover meets or exceeds the values specified in the "Guide for Effective Ground Cover Minimum Values" (below).

3. Residual highwalls or bluffs (if applicable) may be approved on a case-by-case basis by the FS Administrator.

4. Insure that mass wasting potential is minimized (meta-stable) or the potential is at least similar or better to pre-existing conditions.

5. Establish an acceptable level of long-term visual quality by mitigating the visual contrast created by surface disturbance and the reclamation. Soil colors exposed by cut slopes shall meet visual requirements (post rehabilitation) as mandated by the FS Administrator. The reclaimed landscape should have characteristics that approximate the visual quality of the adjacent area with regard to location, scale, shape, color and orientation of major landscape features. The reclaimed landscape should meet the needs of the post disturbance land use. Further information is found in LANDSCAPE DESIGN GUIDELINES.

6. The subsurface should be properly stabilized, holes and underground workings properly plugged, and subsurface integrity assured. Open or unplugged holes/shafts, unstabilized or unprotected underground workings are not permissible. There should be no subsidence, slumping, or significant downward movement of surface soil materials evident. Wells must be plugged or cased to prevent migration of water from one aquifer to another.

7. Development activities may be curtailed (or otherwise restricted) by the FS Administrator when watershed conditions exhibit (near) saturated soils. This will help in protecting the watershed resources from soil slumping, increased erosion potential, unwanted compaction or soil displacement, etc.

8. There shall be no contaminated materials remaining at or near the surface and all buried undesirable materials shall be physically isolated for long-term stabilization. Ref. WATER QUALITY RULES AND REGULATIONS, op. cit. See also item 6 of "Other Area Disturbances."

9. Where disturbed areas are NOT needed for operations of the Lessee, these areas should be revegetated as soon as possible. If a producing well is developed, then the unused disturbed areas adjacent to the well area should be re-contoured and revegetated. Some of the stockpiled soil shall be used in the recontoured areas. Mulching of the recontoured area may be needed, as determined by the FS Administrator. Construction activity should not use deeply frozen or saturated soil material as fill.

10. In addition to re-contouring and revegetation, other conservation measures may be advantageous. Such practices may include terracing, contour trenching, gougling (or other depression-storage improvements) and mulching.

11. The Standard Lease Terms require that the operator "...conducts operations in a manner that minimizes adverse impacts to the land, air and water...and other resources." (40CFR 1906.2 and 1908.20).

12. After final grading and before replacement of topsoil, the surface of the site will provide for adequate drainage, as approved by the FS Administrator.

13. Waterbars may be needed on some disturbed areas to: (1) simulate the imaginary contour lines of the slope with a grade of one or two percent; (2) drain excess water away from the disturbed area; and (3) begin and end in undisturbed vegetation or soil.

14. Seeding: Disturbed areas will normally be drill seeded. Where drilling is impractical, seed may be broadcast and the area raked or chained to cover seed and insure a good seedbed. Seeding will normally be done during the fall period, as practicable, and may need to be repeated if a satisfactory catch is not obtained within the next year. When using broadcast seeding, approximately twice the recommended drill rate should be used.

The following species are generally approved. Other seed mixes may be approved or required by the FS Administrator:

- Artemisia frigida
- Rosa woodsi
- Regreen* (lingering annual)
- Agropyron smithii
- Stipa viridula
- Bouteloua gracilis
- Eutroia lanata
- Artemisia ludoviciana

*Use of Regreen does not constitute exclusive endorsement by the USDA FS. Other similar seed type(s) may be suitable.

15. Fertilization may be required on a site specific basis. Rates are not given here due to the variability of soil fertility.

16. Disturbed areas can be mulched to add to the protective ground cover over the soil surface, especially where slope exceed about 15 percent gradient. The mulch material should be spread somewhat evenly and mulch depth should be approximately 1/2 inch or more.

17. A herbicide or pesticide plan must be approved before any such chemicals can be used in the lease area. Use of these chemicals must meet federal/state and label (proper use) requirements.

Drainages & Riparian

1. Reclaiming "natural depressions" (or pre-existing playas) is encouraged and approved on an individual basis. A wetlands restoration and replacement plan will be required on disturbed wetlands identified as such.

2. Creation of new playas (or wetlands) in reclaimed areas may be approved by the FS Administrator on a case-by-case basis.

3. Insure adequate drainage, that is, ephemeral streams (of any magnitude), similar in capacity to pre-existing conditions. These drainages must normally be capable of containing 100 year storm events, unless otherwise noted. Any hydrologic modifications should not conflict with specifications in WYOMING NONPOINT SOURCE MANAGEMENT PLAN, (Draft 1989 and revisions).

4. Drainage Crossings: The crossings of drainages will be constructed to prevent any blocking, diversion, or restriction of the existing channel. Material removed should be stockpiled for use in reclamation of the crossing. Topsoil should not be stored within the active
channel of the stream course, except for a short term need. Topsoil will be spread evenly over areas to be reclaimed, except where designated in the active stream channel (the sandy or cobbly stratum). Approximately 30 percent of the topsoil will be spread over fills that constitute a drainage terrace and side slopes. Construction activity will not be conducted using deeply frozen or saturated soil material.

5. Culverts, where required, will be placed on channel bottoms on firm, uniform beds which have been shaped to accept them and aligned parallel to the channel to minimize erosion. Backfill will be thoroughly compacted. Structures compatible with fish passage may be required on a local basis.

6. Low Water Crossings: These should be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Drainages will be reclaimed to approximate the original bank configuration, stream bottom width, and channel gradient. Pile debris, or other obstructions, will be removed from drainage channels. In some cases, where access across a drainage is very short-term, improvements may not be required or may be minimal.

7. Road crossings of drainages should normally be as close to perpendicular as practical, so as to minimize the impact distance.

8. Riparian areas are generally mapped (or located) for an oil/gas lease (per FSM 2520 direction).

9. See Appendix D for Controlled Surface Use and other stipulations.

10. In some instances, an additional buffer strip may be required between the riparian area and the oil and gas activities, depending upon slope and erodibility of the adjacent upland (LRMP, IF-75, S&G 2.a.).

11. Generally, consideration must be given to degree of slope, soils, amount of riparian involved, importance of the riparian involved and the importance of the area to other related resources such as wildlife, and fisheries. These factors must be weighed in term of maintaining State Water Quality Standards.

12. In cases of unresolved conflict between riparian dependent resources and other uses and development, riparian values will be given preferential treatment. If riparian, wetlands, or floodplains are affected, a soil and water mitigation plan or a wetlands restoration plan can be required on all lands mapped as floodplains and wetlands (DEQ Water Quality Rules and Regulations 1990).

13. Application of the standard lease terms allows relocation up to 200 meters and can be applied to protect the riparian area during well or road siting.

14. Playas are a common landform of TBMG and are subject to the measures for riparian areas. Playas are defined as seasonally inundated areas with runoff from adjacent uplands and have deep, poorly drained and fine-textured soils. A very distinctive grassland-type with western wheatgrass is usually the dominant species occurring on playa sites.

15. The Clean Water Act limits the implementation of activities and new construction in wetlands (riparian) whenever there is a practical alternative. Evaluation of proposed actions in wetlands will consider factors relevant to the proposal's effect on the survival and quality of the wetlands. Executive Order 11990 requires the Forest Service to "take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out agency responsibilities" [Executive Order 11990, section 1 (a)]. Also, it is recognized that there is a direct relationship between impacts on such areas and effects on water quality and aquatic ecosystems. There is a risk of irreversible and irretrievable impacts on the latter with operations and developments in wetlands (riparian areas) and floodplains.

Linear Disturbances

1. Pipelines: The pipeline will be buried to a sufficient depth to allow at least 12 inches of backfill above the top of the pipe. The backfill will not extend above the original ground surface after the fill has settled. Where the underground pipeline crosses rocky or very shallow (to bedrock) soils, it will be buried to a depth as approved by the FS Administrator.

(a) Pipeline trenches will be compacted during backfilling.

(b) Pipelines spanning drainages will provide adequate clearance for anticipated streamflow resulting from a 100 year storm event minimum.

(c) After revegetation is completed and the site(s) abandoned, the area should be made inaccessible to vehicular traffic. (Exceptions may be needed for administrative access). Linear disturbances should be blocked from access by the use of waterbars, dikes, trees/brush, fencing or closed gates, whatever approved means prevents access.

2. Road construction should follow the guidelines in GUIDES FOR CONTROLLING SEDIMENT FROM SECONDARY LOGGING ROADS. ("Packer's Guide").

3. Existing roads should be used, where possible, to avoid further impacts to the soil and other resources.

4. The reclaimed roadway should be rough-graded to approximate the original contours. It may be required to construct waterbars and otherwise drain abandoned linear disturbances (roads, pipelines). A general guideline for waterbar spacing (if not naturally drained) follows:

   Slopes from 0 to 2 percent - 200 ft. spacing; slopes 2 to 5 percent - 75 ft. spacing; slopes greater than 5 percent - 50 ft. or less spacing. A closer spacing may be required on unstable slopes. The entire roadway, including cut and fill slopes, will be obliterated and scarified. Topsoil spreading may be required, depending on the cut-and-fill needed to create the roadway.

Other Area Disturbances

1. Construction of PADS: The site(s) chosen for the construction of PADS (or production sites) should avoid unstable areas. Steep slopes (greater than 25 percent) should normally be avoided. Sites that provide the least disruption to scenic values (less cut or fill slopes) should be chosen. Deep vertical cuts and steep, long fill slopes should be avoided. Floodplains, wetlands and riparian areas should normally be avoided also.

2. Erosion control structures such as water bars, sediment traps, filter cloth or buffer strips should be designed so that runoff does not pass directly into stream courses.
3. Topsoil stockpiling: The Soil Survey Report (where published) gives specific information on topsoil depths for certain areas. Where that information is not available, the Administrator may determine the topsoil depth to be stockpiled. Generally, the upper 12 inches of topsoil should be saved for later recovering of the recontoured area.

4. Pits: The dike embankment will be constructed in approximately 8 inch lifts. Each lift will be uniformly compacted over each 8 inch lift. Soil material high in clay content and free of frozen or vegetative materials shall be used. The reserve pit shall be examined after construction and a permeability test may be conducted to determine if a liner is needed. The type of lining, if used, will be subject to approval by the Administrator. (An impermeable liner is any liner having a permeability less than or equal to 1 x 10^-7 cm/sec). Any liner installed will not leak and will be chemically compatible with any substances within the constructed pit.

5. Any water well drilled to provide water for development purposes must be turned over to the Forest Service (with the water right) if mutually agreed upon and approved by the Administrator.

6. Applicable federal and state rules and regulations on hazardous wastes (or hazardous substances) must be met. A brief overview of legal requirements for handling exempt (from RCRA, sub.C) and non-exempt wastes is found in Fitzpatrick (no date). Other sources of information on regulations include U.S. EPA 1987, U.S. EPA 1988 and A.P.I. 1989.

7. Areas where soil mass wasting could be triggered by disturbance, either natural or man caused, are shown on 1:24,000 maps on file in the Forest Supervisors office in Laramie, Wyoming. Generalized larger scale maps also show these areas. These maps are not intended to be all-inclusive. Smaller areas may exist where they were not shown at the 1:24,000 scale.
Soil Resource Monitoring Plan

[types of monitoring may include: a. Implementation - monitoring used to determine if prescribed mitigation measures are carried out as planned; b. Effectiveness - measures the effectiveness of mitigation measures; it is conducted during and following management activities to evaluate specific mitigation measures; c. Validation - Are the mitigation measures appropriate for meeting Forest Plan objectives; Determine whether prescribed measures maintain soil productivity as intended. See FSH 2508.18, Soil Monitoring Handbook, Chapter Two.]

Determining Effectiveness of Reclamation:

1. A minimum of 2 to 3 years of protection may be required prior to evaluating the site for release. The site could be inspected at any time, however, by the Administrator.

2. Effective vegetative cover must be established on at least 85% of the Oil/Gas Leasing site. Bare areas or sparsely vegetated areas on up to 15% of the site may be acceptable since they represent conditions sometimes natural to the pre-mining conditions. Some areas may not meet this standard due to exposed rock outcrop or badlands present.

3. Suggested Sampling Method to Determine Effective Ground Cover (EGC).
   a. Identify a representative area on the average slope gradient for the reclaimed or stabilized site.
   b. Run a minimum of one (1) 100 foot transects diagonally across the slope. Each transect should be randomly placed in relation to each other but in the same general area. Photograph at least one of the transects for a file record. Number of transects is determined by the size of the area involved. Occular estimates can be used by the trained inspector.
   c. For each transect, record the cover (bare ground, litter and plant cover by species) at each one-foot increment, starting at the 1’ mark for a total of 100 points. Record litter, woodchip and plant cover ONLY when they are "Effective Ground Cover", otherwise record the point as bare ground. The EGC is the value that will be used in the table below for evaluating site stability. Effective Ground Cover is litter, wood chips or ≤ a plants that are a half an inch or more thick directly on the soil surface. EGC for a plant is a hit on a perennial plant basal area (or some seeded annual plants).
   d. Use a surveying chain pin, drop the pin at each one foot increment and record exactly what the pin first hits. Use the EGC rules listed above to determine if the hit was on effective litter, woodchip, or plant species. Record plants by species so that you have an idea of what plants were successful in the seeding.
   e. For each transect, calculate the following:
   \[ \text{Sum of} \left( \frac{\text{average effective perennial plant cover}}{3} + \frac{\text{average effective applied mulch cover}}{2} + \frac{\text{average effective litter cover}}{2} \right) \]
   This data is collectively called the
Effective Ground Cover (EGC). Surface coarse fragments (or rock) normally DO NOT count as EGC components.

If the overall average values calculated are equal to or greater than the values listed in the tables that follow, then the site has adequate effective ground cover.

If other oil & gas leasing sites meet the standard by an ocular estimate, then no further transect work need be performed. At a minimum, one may take a photograph with notes about the site.

Guide for Effective Established Ground Cover Values

The guidelines below present minimum effective ground cover values (percent) to use as a baseline for oil & gas leasing and other rehabilitated sites. Ground cover would consist of perennial grasses, forbs and shrubs and any residual organic debris (such as litter, woodchips, etc.) Surface rock fragments DO NOT count as effective ground cover. The guidelines were developed from the RUSLE and assume a tolerance soil loss value of 2.0 tons/acre/year. The guideline also assumes a 100 foot slope length on an R value of 50 and a somewhat continuous surface texture (e.g. clays or sandy loams, etc.). Deposition between values can be used with caution. Increases in the amount of surface rock will tend to lower the minimum effective ground cover (EGC) values needed to protect the soil:

\[
K = 0.15 \text{ (erosivity factor)} \\
(\text{loamy sand, sand or clay reclaimed soil surfaces})
\]

<table>
<thead>
<tr>
<th>Slope (%)</th>
<th>Min. EGC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>level [0%]</td>
<td>10 percent</td>
</tr>
<tr>
<td>4%</td>
<td>15</td>
</tr>
<tr>
<td>10%</td>
<td>20</td>
</tr>
<tr>
<td>20%</td>
<td>30</td>
</tr>
<tr>
<td>30%</td>
<td>50</td>
</tr>
<tr>
<td>40% plus</td>
<td>60 plus</td>
</tr>
</tbody>
</table>

\[
K = 0.25 \\
(\text{sandy loam, silty clay or loamy reclaimed soil surfaces})
\]

<table>
<thead>
<tr>
<th>Slope (%)</th>
<th>Min. EGC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>level [0%]</td>
<td>10 percent</td>
</tr>
<tr>
<td>4%</td>
<td>15</td>
</tr>
<tr>
<td>10%</td>
<td>20</td>
</tr>
<tr>
<td>20%</td>
<td>50</td>
</tr>
<tr>
<td>30%</td>
<td>60</td>
</tr>
<tr>
<td>40% plus</td>
<td>65</td>
</tr>
</tbody>
</table>

[above derived from: USDA 1991. RUSLE version TEST 0.14. ARS, SCS, Tucson AZ]

Materials Helpful for Documenting Re-established Vegetation:

- Surveying pins.
  - 1:100' tape with 1' increments marked, pins to hold tape ends secure
  - Site map to plot transect locations
  - Transsect data record form
  - 35mm Camera with slide/print film
  - Photo record sheet
  - Clinometer for measuring slope.
  - Illustrations of planted species may be helpful
  - Range site descriptions may be helpful
  - Shovel for sampling topsoil samples
  - Soil sample containers

Monitoring by district representatives and/or the Medicine Bow NF resource specialists will be maintained on a regular basis; The lessee may participate in monitoring of certain items. Monitoring occurs during different phases of the construction, production stage and rehabilitation processes. The rehabilitated sites and linear disturbances should be inspected during the first growing season. The SOIL MANAGEMENT HANDBOOK, Chapter two (draft FSH 2509.18, R-2 Suppl No. 1 of 4/91) also has Soil Quality Monitoring standards for soil disturbances. Standards for "detrimental compaction," "detrimental puddling" and others are discussed and should be referred to where applicable. It is recognized that oil and gas activities are a "disturbance" to the soil resource. Constructed roads are typically compacted during use and this is to be expected. Mitigation measures are designed to rehabilitate disturbed sites and reduce soil erosion and sedimentation.

Monitoring for oil and gas activities on both federal and non-federal minerals are conducted under the authority of the State of Wyoming, Oil and Gas Conservation Commission. Additionally, the BLM monitors production-related activity. The review necessary for approval of any permits will serve as an initial monitoring of oil and gas activity that may result from the EIS. The Forest Plan specifies monitoring criteria for various issues (Forest Plan pages IV-1 to IV-67), including compliance with terms of operating plans for minerals and consistency with the Forest Plan these monitoring criteria and methods would be applied.
Surface Water Quality Monitoring Plan

Introduction:

This water quality monitoring plan is designed to augment the 'Water Report (Wilcox, 1992) on oil and gas leasing in the Thunder Basin National Grassland. Monitoring is an essential phase of project development and must be considered in all environmental analyses. It is important to understand the purpose and need for developing a good monitoring plan. It is also important to understand what resources will be impacted and how damage can be avoided. Several types of monitoring can be used to fully assess environmental impacts to water resources. Water quality standards have been developed by federal and state regulatory authorities that describe the bounds of clean water. Existing conditions of the Grassland must be identified in order to realize changes in water quality due to oil and gas development. Water quality monitoring is not only required by the Medicine Bow National Forest Land and Resource Management Plan (Forest Plan), but it is also one of the best ways to identify and deter impacts to the water resource.

Purpose and Need:

The purpose of developing a water quality monitoring plan can be defined in a legal context (MacDonald, Smart and Wissmar, 1991). There is a broad mandate to ensure that the designated uses of water are protected. Several federal laws (Federal Water Pollution Control Act of 1972 and amendments) and Wyoming statutes (35-1-302) have been enacted to protect surface waters from point and nonpoint sources of pollution. The State of Wyoming has issued water quality standards which must be met when conducting activities that affect surface waters (WW DEQ, 1990). Specific rules and regulations pertaining to oil and gas production and its subsequent impacts on water quality, have also been developed (WW Oil and Gas Conservation Commission, 1991). Monitoring requirements, as stated in the Medicine Bow National Forest and Thunder Basin National Grassland and Resource Management Plan, require compliance with State and Federal Water Quality Standards (USDA, 1985). All activities on the Grassland have the potential for impacting water quality. The degree to which water quality is affected depends on the type of management activity, its intensity, where it is applied and the best management practices (BMPs) used.

The water quality monitoring plan will address only leasing option alternatives in the oil and gas leasing environmental impact statement (EIS). Under all leasing alternatives, a controlled surface use stipulation for riparian areas, playas, floodplains and wetlands shall be in effect (proposed amendment to the Forest Plan). This stipulation is designed to prevent the degradation of sensitive areas. Water quality monitoring will be required whenever oil and gas development occurs in or adjacent to riparian areas, playas, floodplains or wetlands. Site specific monitoring will be implemented upon recommendation from the Interdisciplinary Team.

Description of Monitoring

Several aspects of monitoring can be used to assess water quality impacts from oil and gas development. The following types of monitoring should be considered when developing any monitoring plan (MacDonald, Smart and Wissmar, 1991):

1. Baseline monitoring. This type of monitoring is used to characterize existing water quality conditions, and to establish a database for planning purposes. Data from the 1986 USGS hydrology report of the Grassland and other sources describes existing conditions and will be used as baseline data for monitoring. When existing data from the 1986 USGS hydrology report is not adequate for baseline monitoring, the lessee may be required to provide data through a minor inventory or short-term study. Additional information may be gathered through the Forest Plan monitoring effort.

2. Implementation monitoring. Monitoring used to determine if activities, such as BMPs, are carried out as planned. This type of monitoring occurs during the development and production stage of a project. It is a cost-effective method to reduce nonpoint source pollution because it provides immediate feedback and allows adjustments to the activities. Violations of water quality standards due to oil and gas development will be best identified during implementation monitoring. A site specific monitoring plan should be developed for each production site that has the potential to impact water resources.

3. Effectiveness monitoring. This type of monitoring measures the effectiveness of mitigation measures. It is conducted during and following management activities to evaluate specific BMPs. Effectiveness monitoring will be used to evaluate BMPs used in oil and gas development projects.

4. Project monitoring. The impact of a particular activity on water quality is assessed through project monitoring. Spatial (using location) and temporal (based on timing) methods can be employed in this type of monitoring. Evaluations are performed by comparing data taken from an upstream site to that sampled from downstream of a developed area, or matching current data from a sampling site with baseline monitoring from the same location. Changes in the data from one location to another, or over time determines the amount of impact to water quality. As with implementation monitoring, alterations to BMPs can be made when water quality violations are observed.

5. Compliance monitoring. This determines whether specified water quality criteria are being met. Individual measurements of physical, biological, and chemical parameters require criteria that specify the location, frequency, and method of measurement. Compliance monitoring ensures that sampling and analysis is conducted within professional and legal standards. Procedures to be used for water quality testing in Wyoming are outlined in 40 CFR, Part 136, or any modifications to that regulation. Parameters not listed in 40 CFR shall be tested within standards of: The latest edition of EPA Methods for Chemical Analysis of Water and Wastes; or, Standard Methods for the Examination of Water and Wastewaters; or, A.S.T.M. Standards, Part 31, Water (WW DEQ, 1990). Water quality monitoring for oil and gas development on the Grassland shall follow Forest Plan monitoring requirements (USDA, 1985).

Stream Classifications:

Surface water classifications are outlined in the Wyoming Department of Environmental Quality, Water Quality Rules and Regulations, Chapter I, 1990. There are four classes of surface water in Wyoming:

1. Class I - 'Those surface waters in which no further water quality degradation by point source discharge other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. In designated Class I waters, the Environmental Quality Council shall consider water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archaeological, fish and wildlife, the presence of significant quantities of developable water and other values of present and future benefit to people.'
2. Class 2: "Those surface waters, other than those classified as Class 1, which are determined to:
   (a) Be presently supporting game fish; or
   (b) Have the hydrologic and natural water quality potential to support game fish; or
   (c) Include nursery areas or food sources for game fish.*

3. Class 3: "Those surface waters, other than those classified as Class 1, which are determined to:
   (f) Be presently supporting nongame fish only; or
   (ii) Have the hydrologic and natural water quality potential to support nongame fish only; or
   (iii) Include nursery areas or food sources for nongame fish only.*

4. Class 4: "Those surface waters, other than those classified as Class 1, which are determined to not have hydrologic or natural water quality potential to support fish and include all intermittent and ephemeral streams. Class 4 waters shall receive protection for agriculture uses and wildlife watering.*

Existing Conditions:
Water quality impacts should be referenced from existing conditions and potentials. The hydrologic condition of the Grassland is described in the 1992 Water Report (Wilcox, 1992). Further analysis of water quality and quantity are provided in the Aquatic and Riparian Resources Report (Speas, 1992). Most aquatic life known to exist on the TBNG are tolerant to a wide range of environmental conditions. A comprehensive list of fish and macroinvertebrate species with associated pollution tolerance levels is available in the Biological Diversity Assessment in the project file at the Forest Supervisors Office in Laramie, Wyoming.

Soil's condition, erosion potential and mitigation measures for oil and gas development on the Grassland are addressed in the Soil Resource Report (Edwards, 1991). Other data pertaining to surface water and ground water quantity and quality can be found in U.S. Geological Survey (USGS) report on the hydrology of the Grassland area (Lowry et al, 1988). Additional information can be obtained from the USGS, Wyoming Department of Environmental Quality (WY DEQ) and the Wyoming Water Research Center. Surface waters in the Grassland have been classified by the Wyoming Department of Environmental Quality (WY DEQ, 1990).

Affected Systems:
Major streams within the Grassland are Class 2, or lower (WY DEQ, 1990) and are considered "very low production waters" for trout fisheries (WY Game and Fish, 1991). The Cheyenne and Little Powder River are the two primarily affected drainages. Water quality data is available for these systems (Lowry et al, 1988) and will be used as a baseline for water quality monitoring. Mostly, streams within the Grassland are intermittent or ephemeral in nature (USDA, 1986) and are therefore Class 4 streams (WY DEQ, 1990). However, some intermittent streams feed into perennial systems with higher ratings and may affect downstream water quality. Intermittent systems will carry pollutant loads during spring or storm runoff. Therefore, it is still important to protect the riparian and channel areas of intermittent and ephemeral streams. In fact, State regulations prohibit the discharge of drilling fluids into any drainages that lead to live water (WY Oil and Gas Conservation Commission, 1991).

Anti-integration:
The following statement is extracted from Chapter I of the WY DEQ, Water Quality Rules and Regulations, 1990: "Water uses in existence on June 27, 1979, and the level of water quality necessary to protect those uses shall be maintained and protected." Any deviation from this requirement must be approved by the WY DEQ and still comply with State Water Quality Standards.

Water Quality:
Pollutants from oil and gas production that are of concern to water quality are: Sedimentation from road and drill pad construction; wastes, such as drilling muds and well bore cuttings; highly saline produced water; heavy metals, hydrogen sulfide and; spillage of oil, produced water and drilling fluids (USDA and USDI, 1991). The potential impact on water resources from oil and gas production varies with the phase of development (Table 1). Speas (1991) describes the mechanisms of the effects of oil and gas pollutants on the aquatic environment. Surface water quality standards for Wyoming are described in the water quality rules and regulations (WY DEQ, 1990). These standards are applied at all times except during periods of low flow, as defined by the WY DEQ rules and regulations. Standards for the following pollutants apply at all streamflow conditions: Dead animals and solid waste; settleable solids; floating and suspended solids; taste, odor and color; and, undesirable aquatic life (WY DEQ, 1990). State water quality standards which could be affected by oil and gas production on the Grassland include: Toxic materials; solid waste; settleable solids; floating and suspended solids; taste, odor and color; human health; agricultural water supply; protection of aquatic life; turbidity; dissolved oxygen; temperature; pH; undesirable aquatic life; and oil and grease. To comply with State laws the following standards must be met or exceeded (WY DEQ, 1990).

Table 1. Oil and Gas Activities and Potential Effects on Water Resources

<table>
<thead>
<tr>
<th>Activity</th>
<th>Potential Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration and Construction</td>
<td>Increased runoff, erosion and sediment to streams and impoundments.</td>
</tr>
<tr>
<td>Drilling and Reserve Pit</td>
<td>Release of brine, drilling mud and additives, and low hydrocarbons to surface and ground water.</td>
</tr>
<tr>
<td>Blow outs</td>
<td>Release of brine, drilling fluids and hydrocarbons to surface.</td>
</tr>
<tr>
<td>Production and Water Disposal</td>
<td>Leakage from collector lines to surface or shallow ground water. Leakage from injection wells to potable water aquifers. Spills in draw will kill vegetation and sterilize soil.</td>
</tr>
</tbody>
</table>
Abandonment and Well plugging  Migration of brines through incompetent seals to potable aquifers.


1. Toxic Materials - Toxic materials attributable to or influenced by activities of man shall not be present in levels considered as pollution (as defined by the State).

2. Solid Waste - Except as authorized by a "404" permit, solid waste shall not be placed in surface waters, nor shall it be allowed to become a contaminant.

3. Settleable Solids - Substances attributable to or influenced by management activities may not settle to form a sludge, bank or bottom deposits which could result in significant degradation of aesthetics, habitat for aquatic life, or adversely affect agricultural water use, plant life or wildlife.

4. Floating and Suspended Solids - Those attributable or influenced by activities of humans shall not be present in quantities which could significantly degrade aesthetics, habitat for aquatic life, or adversely affect agricultural water uses, plant life or wildlife.

5. Taste, Odor and Color - No Class 2 or 3 waters can contain substances attributable to or influenced by activities of humans that produce taste, odor and color or that would: a) impart an unpalatable or off-flavor in fish flesh; b) visibly alter the natural color of the water or impart color to skin, clothing, vessels or structures; or, c) produce detectable odor.

6. Human Health - Applies to Class 1 and 2 waters only. Levels may not exceed those specified by pollutant.

7. Agricultural Water Supply - Shall be maintained at a quality which allows continued use for agricultural purposes. Degradation shall not be to an extent that would cause measurable decrease in crop or livestock production. Unless otherwise demonstrated, all Wyoming surface waters have the natural water quality potential for use as an agricultural water supply.

8. Protection of Aquatic Life - Ammonia shall not exceed specified levels under various conditions of temperature and pH. Other toxicants must not exceed "acute levels" as listed by WY DEQ.

9. Turbidity - In Class 1 and 2 waters with a cold water fisheries, discharge of substances attributable to or influenced by human activities shall not be present in amounts which would increase turbidity by more than 10 nephelometric turbidity units (NTUs). In Class 3 waters and in Class 1 and 2 waters with warm water fisheries, NTUs can not be increased by more than 15 units.

10. Dissolved Oxygen - Wastes attributable to or influenced by human activities shall not be present in Class 1 and 2 waters in amounts which will result in death or injury to existing aquatic life or which will result in a dissolved oxygen content lower than state minimums.

11. Temperature - Effluents attributable to or influenced by activities of humans shall not be discharged in amounts which change natural water temperatures to levels which are deemed to be harmful to existing aquatic life in Class 1, 2 and 3 waters. Additional restrictions apply to coldwater and warmwater fisheries.

12. pH - Wastes attributable to or influenced by activities of humans shall not be present in amounts which will cause the pH to be less than 6.5 or greater than 9.0 standard units.

13. Undesirable Aquatic Life - All Wyoming surface waters shall be free from substances and conditions which are attributable to industrial or other practices in concentrations which produce undesirable aquatic life.

14. Oil and Grease - Substances attributable to or influenced by the activities of humans shall not be present in amounts which would cause: The oil and grease content to exceed 10 mg/l; or formation of a visible sheen; or visible deposits on the bottom or shoreline; or, damage or impairment of the normal growth, function or reproduction of human, animal, plant or aquatic life.

Monitoring and Evaluation:

Monitoring and evaluation of water quality shall occur at several stages of the oil and gas leasing and development process. Each of the following stages will have its own level of monitoring:

At the lease proposal stage - Existing baseline data shall be used to assess potential water quality impacts.

At the Application for Permit to Drill (APD) and Surface Use Plan of Operations (SUPO) stage - site specific monitoring plans will be developed to assess impacts on water quality for ground disturbing activities in or adjacent to riparian areas, playas, floodplains and/or wetlands. Monitoring may include physical, chemical and biological parameters. Implementation, effectiveness, project and compliance monitoring will be required in all sensitive areas.

At the field development stage - Water quality monitoring shall be site specific for the field development that occurs in riparian areas, playas, floodplains and/or wetlands. Implementation, effectiveness, project and compliance monitoring will be used to assess water quality impacts.

Post-lease monitoring activities will be conducted by the lessee and in some cases by federal and state agencies. Monitoring will occur during the following stages of the operational life of an oil and gas lease:

On-site inspections as part of the application for permit to drill.

Well production reports.

As part of any permit application.
Operational monitoring conducted by legal authorities.

As part of abandonment and closure of wells and roads.

Responsibilities:

It is the responsibility of the Medicine Bow National Forest to ensure that Federal and State Water Quality Standards are complied with on the Thunder Basin National Grassland. The Bureau of Land Management, Wyoming Department of Environmental Quality (Water Quality Division), and Wyoming Oil and Gas Conservation Commission also have responsibility for ensuring that water quality (surface and ground water) standards are not violated. However, specific monitoring may also be the responsibility of those developing oil and gas on the Grassland. Site specific monitoring plans will be developed at the APD and SUPO stage for all sites that will be located in or adjacent to riparian areas, plays, floodplains and/or wetlands. The Wyoming Department of Environmental Quality has the responsibility of monitoring permitted discharges from oil and gas operations. Nonpoint source pollutants may be monitored through the Forest Plan. In certain cases, the Oil and Gas Conservation Commission may require that the operator install a monitoring system if fresh water could be impacted.

Water Quality Violations:

All water quality violations of federal and state standards that occur during any phase of development shall be reported to the Medicine Bow National Forest and the Wyoming Department of Environmental Quality. Corrective actions must be taken immediately and shall be implemented by the operator(s). Sound BMPs and implementation monitoring will prevent most water quality violations.

Cumulative Effects:

Cumulative effects should address impacts from all activities (oil and gas development, coal mining, grazing and agriculture) occurring within the Grassland boundary. It should also consider activities occurring on other lands within the geographical region. Baseline data on major drainages can be used to assess overall impacts from activities occurring within the area. The major drainages most affected by any activity on the Grassland are the Cheyenne and Little Powder Rivers (Speas, 1991). Most of the land surface in these drainages is non-federal. Although some sub-drainages within the major systems may constitute up to 66 percent National Forest system land (see Table 3, Aquatic and Riparian Resources Report by Speas, 1991). Without knowledge of all the activities occurring on non-federal lands, it is virtually impossible to accurately assess the contribution of pollution from federal lands. It is estimated, however, that pollution stemming from activities on federal lands would have a minor affect on the Cheyenne and Little Powder River since National Forest system land constitutes only a small percentage of the overall drainage area. However, impacts from federal surfaces within the Grassland may be significant in smaller sub-drainages where the Forest Service is the primary manager.

Cumulative impacts on other resources that may affect water quality have been documented in the Soils Resources Report (Edwards, 1991). Approximately 3,447 acres of roads (federal, state, county and private) exist on the Grassland. The roads are damaged or improved within Forest Service specifications and may contribute a small amount of localized sediment on an ephemeral basis (Edwards, 1991). A description of area disturbance from oil and gas development is provided in the Soils Resource Report. Currently, producing wells sites affect approximately 750 acres. Another 20 to 50 acres of disturbed acres per year can reasonably be expected (Edwards, 1991). Unprotected disturbances from drill pads and roads on 35 acres per year could generate up to 186.1 tons of soil movement over the first year of disturbance. However, appropriate conservation measures can greatly reduce the rate of erosion (Edwards, 1991). Other cumulative effects include 11,053 acres of disturbed area by coal mining; about 8,073 of those acres have been reclaimed (4,980 acres are currently active). An additional 5,375 acres are under lease and could be mined within a 15 year period.

Oil and gas development disturbs approximately 0.1 percent of the federal acres within the Grassland. The extent to which these activities impact water quality depends upon their proximity to sensitive areas, intensity and type of development and best management practices applied. To date, only one drilling well has been located in a riparian area (Dills, personal communication, 1992). There have not been any documented problems with that site. Soil and water mitigation measures recommended by Edwards (1991) and leasing stipulations for riparian areas, plays, floodplains and wetlands should provide adequate protection to the water resource. Barring catastrophic events, the cumulative impact to regional surface water quality from oil and gas development should be negligible.
Literature Cited in Surface Water Quality Monitoring Plan:


Speas, C.C. 1991. Aquatic and riparian resources, affected environment, alternative analysis and environmental consequences for oil and gas leasing EIS, Thunder Basin National Grassland. Medicine Bow NF, Laramie, WY.


Wilcox, M.S. 1991. Oil and gas EIS, water report. Medicine Bow NF, Laramie, WY.

WY DEQ. 1990. Water quality rules and regulations: Chapter 1, Wyoming Department of Environmental Quality, Water Quality Division, Cheyenne, WY.

WY Game and Fish Department. 1991. Wyoming trout stream classification map Fish Division, Wyoming Game and Fish Department, Cheyenne, WY.

WY Oil and Gas Conservation Commission. 1991. Rules and regulations of Wyoming Oil and Gas Conservation Commission, Office of State Oil and Gas Supervisor, Casper, WY.
APPENDIX F

AUTHORITY OF THE FOREST SUPERVISOR TO MAKE THE DECISIONS

In 1987, Congress passed the Federal Onshore Oil and Gas Leasing Reform Act referred to as the “Leasing Reform Act.” The Leasing Reform Act expanded the role of the Secretary of Agriculture in the leasing decision process. Within the National Forest System, the Secretary of Agriculture is authorized to identify the lands for which leases can be sold and to determine the appropriate stipulations to apply to the lease to protect the surface resources. Regulations to implement the Leasing Reform Act were developed by the Forest Service and became effective April 20, 1990, (36 CFR, Part 228, 100 et seq.; 55 FR 10423).

Leasing Reform Act implementing regulations (36 CFR 228.100 et seq.) institute a staged decision making process. The regulatory framework provides the following decision points: (1) The determination of lands available for leasing (36 CFR 228.102 (b)), (2) The leasing of specific lands decision (36 CFR 228.102 (g)), (3) Application for Permit to Drill (APD), and (4) Amendment of the permit to drill if field development occurs. Each decision is based on environmental analysis and disclosure of the probable effects in accord with the National Environmental Policy Act (see CHAPTER 1, PURPOSE AND NEED, OIL AND GAS LEASING). The first two of these decisions will be made in a Record of Decision (ROD) based on this FEIS (see CHAPTER 1, PURPOSE AND NEED, DECISIONS TO BE MADE). Additional environmental analysis will be required at the APD and field development stages.

The implementing regulations gave the authority to make these decisions to Regional Foresters (reference 36 CFR 228.102(d) and 36 CFR 228.102(e)). The Regional Forester has delegated that authority to the Supervisor of the Medicine Bow National Forest (reference FBM 2822.040), Forest Service Manual Supplement No. 2800-90-2, 9/15/90). The Leasing Reform Act and implementing regulations are described later in this appendix.

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

GENERAL MINING LAW OF 1872 (later amended by the Mineral Leasing Act of 1920)

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

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

MINERAL RESOURCES ON WEEKS LAW LANDS

The Act of March 4, 1917 (36 Stat. 1150, as supplemented; 16 U.S.C. 520). This act authorizes the Secretary of the Interior to prescribe general regulations to permit prospecting, development, and utilization of the mineral resources of the lands acquired under the Act of March 1, 1911, known as the Weeks Act, for the best interests of the United States.

REORGANIZATION PLAN NO. 3 OF 1946

Part IV, Section 402 (80 Stat. 1097, 1099; 5 USC Appendix). This Plan provides that development of mineral deposits in certain lands pursuant to provisions of the Mineral Resources on Weeks Law Lands Act of March 4, 1917, (Ch. 179, 39 Stat. 1134, 1150, 16 USC 520) shall be authorized by the Secretary of the Interior only when he is advised by the Secretary of Agriculture that such development will not interfere with the primary purposes for which the land was acquired and only in accordance with such conditions as may be specified by the Secretary of Agriculture in order to protect such purposes.

MINERAL LEASING ACT FOR ACQUIRED LANDS OF AUGUST 7, 1947

Ch. 513, 61 Stat, 913; 30 USC 351, 352, 354, 359. This Act provides that all deposits of coal, phosphate, oil, oil shale, gas, sodium, potassium, and sulphur, which are owned or may be acquired by the United States, and which are within the lands acquired by the United States may be leased by the Secretary of the Interior under the same conditions as contained in the leasing provisions of the mineral leasing laws. No mineral deposit covered by this section shall be leased except with the consent of the head of the executive department, independent establishment, or instrumentality having jurisdiction over the lands containing such deposit, or holding a mortgage or deed of trust secured by such lands, which is unsatisfied of record, and subject to such conditions as that official may prescribe to ensure the adequate utilization of the lands for the primary purposes for which they have been acquired or are being administered.

ENERGY SECURITY ACT OF JUNE 30, 1980

P.L. 95-234, 94 Stat. 611; 42 USC 8801 (note), 8854, 8855. This Act directs the Secretary of Agriculture to process applications for leases and permits to explore, drill and develop resources on National Forest System lands, notwithstanding the current status of the land and resource management plan.

ORGANIC ACT

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

The Act provides in part that “...It is not the purpose or intent of these provisions, or of said section to authorize the inclusion therein of lands more valuable for the mineral therein, or for agricultural purposes, than for forest purposes.” (Ch. 2, Sec. 1, (30 Stat. 34)). Provision is made for regulations allowing free use of timber and stone for bona fide miners and prospectors in 16 USC 477. Authority for regulations providing access for prospecting, locating, and developing mineral resources is found in 16 USC 479.
The General Mining Law of 1872 (30 USC 22-54) preceded the Organic Act and the establishment of the Forest Reserves and National Forests.

MULTIPLE-USE SUSTAINED-YIELD ACT

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

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

NATIONAL FOREST MANAGEMENT ACT

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

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

NATIONAL ENVIRONMENTAL POLICY ACT

This statute (40 USC 4331, et. seq.) and its implementing regulations (40 Part 1500) apply to federal actions relating to oil and gas leasing on the National Forests. This statute requires the Forest Supervisor to perform an environmental analysis and disclose the effects of his decisions on the quality of the human environment. The law further requires the Forest Supervisor to identify and describe the significant environmental issues associated with his decision and to develop alternatives to his proposed action (including the alternative of no action). The Supervisor must disclose the direct, indirect and cumulative effects of the decisions, and adverse environmental effects which cannot be avoided, the relationship between short-term uses of man's environment and the maintenance of long-term productivity, and any irreversible or irretrievable commitments of resources made by the decision. For additional information on NEPA requirements as they relate to this analysis see CHAPTER I, PURPOSE AND NEED. For a description of how NEPA relates to the staged decision making process mandated by the Leasing Reform Act implementing regulations see CHAPTER I, OIL AND GAS LEASING.

THE CLEAN AIR ACT OF 1970

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

THE ENDANGERED SPECIES ACT OF 1973

Public Law 93-204; 16 USC 1531 et seq. As amended, this law requires special protection and management on federal lands for threatened or endangered species. The U.S. Fish and Wildlife Service (USFWS) is responsible for administration of this act. Federal agencies proposing an action or processing an action proposed by a third party which may affect, in any way, the existence of an identified species must consult with the USFWS to determine if, and how, the proposed action will affect those species. Mitigation measures will be developed through the consultation process and are put forth as suggested conservation measures included in the "FWS Biological Opinion."

CLEAN WATER AMENDMENTS

Federal Water Pollution Control Act Amendments of 1972; Act of October 19, 1972 (P.L. 92-500, 86 Stat. 186, as amended; 33 USC 1251, et seq). The act puts forth national standards to restore and maintain chemical, physical and biological integrity of the nation's waters. Upon passage of Environmental Quality Acts and adoption of water quality standards, state agencies were empowered to enforce water quality standards.

HISTORIC PRESERVATION ACT

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

THE FEDERAL OFFSHORE OIL AND GAS LEASING REFORM ACT OF DECEMBER 22, 1987

30 USC 181, et seq.; P.L. 100-203. The 1987 Reform Act expanded the authority of the Secretary of Agriculture in the management of oil and gas resources on National Forest System lands and directed the Secretary to issue rules on bonding and reclamation standards. Under the Act, leases for oil and gas on NFS lands cannot be issued by the BLM without the approval of the Forest Service. All surface-disturbing activities on NFS lands must be approved by the Forest Service before operations commence. The act also provides for inspections and enforcement of operations once commenced. Regulations implementing this statute were published in the Federal Register by the U.S. Forest Service on March 21, 1990. (55 FR 10423, et seq.) The regulations were amended November 1, 1991. (56 FR 56155, et seq.) The regulations are codified in 36 Code of Federal Regulations 228.100 et seq.
The 36 CFR 228 regulations set up a new process for issuing oil and gas leases in response to the Leasing Reform Act. The regulations, including the preamble to the regulations, has been reproduced on the following pages.
Federal Register / Vol. 55, No. 55 / Wednesday, March 21, 1990 / Rules and Regulations

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Section 122.101 Definitions

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form that the rights ordinarily granted are affected. The Department therefore believes that this definition, as used in this common term. The term "new successful maturity" refers to the same time frame as the "new successful re-growth time frame." This formulation makes it clear that the final ruling on the rule as to whether re-growth is acceptable should be based upon the current condition of the forest and the forest's potential for regeneration.

The rule also defines "area-wide leasing," which is the leasing of a forest by the Forest Service in a manner that does not discriminate between different areas within the forest. This definition is important because it provides for the leasing of an entire forest, regardless of any inherent differences between the areas within the forest. This definition also helps to ensure that the leasing of a forest is consistent with the overall management plan for that forest.
Department has determined that the statutory authority of the Forest Service to approve operations or to direct or require their discontinuance is not in jeopardy by the issuance decision (the leasing decision for lands that are not oil and gas leasebys in the national Forest System lands). Accordingly, when a decision is made to approve an oil and gas lease on Forest System lands, it is necessary to ensure that such lease would have development potential. However, it is not feasible, at the time a lease is issued, to meet regulations that would suggest that such operations could be approved on the lease, by the time such operations are proposed, they might be precluded, or an amendatory or nonconformity statute such as the National Environmental Policy Act (NEPA) would be in effect.

Once a decision is made with respect to the issuance of a lease, the Forest Service will make the following determinations, the Forest Service will authorize the Bureau of Land Management to offer the lease for lease sale only if it is determined that:

(1) leasing is consistent with the applicable forest plan;
(2) leasing is consistent with the applicable environmental policies; and
(3) the lease would not have an unacceptable impact on the environment.

The Forest Service must make the determination that the lease is consistent with the applicable forest plan before a lease sale is authorized to proceed. The Forest Service must make this determination in order to ensure that the lease is consistent with the applicable environmental policies. The Forest Service must also make this determination in order to ensure that the lease would not have an unacceptable impact on the environment.

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Congress in passing the Leasing Reform Act, that is, to obtain fair value for the public when leasing its resources. Members of Congress objected to the stipulation, not for its economic merits, but rather because they felt it would create uncertainty about the location of revenue derived from the land.

They believed that the introduction of land sale or lease prices on a per-acre basis on specific land bases would discriminate against the uses of energy resources and would result in lower land values because of the uncertainty of these prices. They were particularly concerned about the possibility that the BLM could enter into a lease agreement without knowing the development value of the area.

The House of Representatives, in its report, stated that the provision is objectionable because it would discriminate against the uses of energy resources, and would result in lower land values because of the uncertainty of the land sale or lease prices. They also believed that the provision would create uncertainty about the location of revenue derived from the land.

The Senate, on the other hand, supported the provision, arguing that it would provide a stable and predictable source of revenue for the federal government. They believed that the provision would not discriminate against the uses of energy resources, and would not result in lower land values because of the uncertainty of the land sale or lease prices.

The provision was ultimately approved by both the House and the Senate, but with amendments. The final version of the provision provides that the Secretary of the Interior shall designate by lease or sale the areas of the National Forest System lands that are

will be made in a two-stage process, the first being the identification of lands that are administratively available for leasing and the second being to authorize the Bureau of Land Management to offer leases for lands identified as administratively available.

Many of the respondents assumed that the decision to authorize leasing of National Forest System lands would be made in the applicable forest land and resource management plan. However, as explained in more detail in the response to comments on Section 2, the decision as to lands that are administratively available for leasing may be made as part of the decision adopting a forest plan, the decision to authorize issuance of leases already will not be made as part of the decision adopting a forest plan. This is because specific consideration of the leases to be offered will be required to decide whether it will be possible to conduct operations for the benefit of the leasee somewhere on each proposed lease.

Since the NEPA compliance process for the decisions as to the administratively available land and as to authorizing the issuance of leases already requires public participation, the Department agrees with respondents who observed that the public notice requirement in the proposed rule was repetitive and unnecessary. Therefore, the final rule does not require that the public be given separate notice of either the leasing decision analysis or the leasing decision for specified lands.

The requirement to notify the Bureau of Land Management of a Forest Service decision authorizing the issuance of leases for National Forest System lands that have been retained in the final rule. As explained above, the leasing decision for specified lands will not be the Department in the forest plan.

The final notice rule also requires an adequate notification to the Bureau of Land Management of a Forest Service decision authorizing the issuance of leases for National Forest System lands that have been retained in the final rule. The notice requirement is set forth in 38 C.F.R. 528 (2005).

Most of the comments on this section of the proposed rule focused on the necessity of making the NEPA compliance process for the leasing decision analysis and the leasing decision for specified lands adequate. The Department notes that in the proposed rule, the rule of the standard lease form convets the right to conduct operations on the area. However, the standard lease form also provides that the permittee must be the person to whom the lease is assigned.

Many of the respondents assumed that the standard lease form contains the right to conduct operations on the area. However, the standard lease form also provides that the permittee must be the person to whom the lease is assigned. The Department notes that the lease is assigned to the person who has the greatest demonstrated interest in the use of the land for the specified purpose.

In addition, the final rule requires notice to the Bureau of Land Management if any administrative appeals are subsequently filed challenging either the leasing analysis decision or the leasing decision for specified lands. Notice of administrative appeal to the Forest Service is necessary in order for the Bureau of Land Management to know whether or not the leasing decision for specified lands is necessary in order for the Bureau of Land Management to know whether or not the leasing decision for specified lands may be made.

It was not appropriate to include a provision in the proposed rule requiring an individual who files an administrative appeal to the Forest Service to file a bond in lieu of that appeal being denied. A requirement of this nature could not exist in the final rule in order for the administrative appeal to be considered.

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would indicate whether public notice was required prior to approving a modification or waiver.

Once any modifications were reviewed and approved, the Forest Service should be able to manage forest resources in a manner that achieves consistency within the overall plan. The issue of consistency with NEPA would remain to be determined. However, the Forest Service also needs to be consistent in its application of NEPA policies. The Forest Service has developed policies that are consistent with NEPA, but it is not clear how these policies will be applied.

In conclusion, the proposed plan is consistent with the Forest Service's goals for the area, and it is consistent with NEPA requirements. The Forest Service has a good plan for the area, and it is working to ensure that the public's concerns are addressed. However, more information is needed on how the plan will be implemented.

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informed of the manner by which the Forest Service will interpret and applying these factors to the context of evaluating capital projects. 

As part of the review of a proposed surface plan of operations, the authorized Forest Service officer shall prepare an operator's reclamation history, if such an operator has completed one for the Bureau of Land Management. The operator's reclamation history shall be reviewed by the Forest Service and, if approved, will be submitted to the Forest Service for inclusion in the operator's reclamation history, if such an operator has completed one for the Bureau of Land Management. The operator's reclamation history shall be reviewed by the Forest Service and, if approved, will be submitted to the Forest Service for inclusion in the operator's reclamation history, if such an operator has completed one for the Bureau of Land Management.

Finally, it was recommended that there be a sharing of reclamation information between the Forest Service and the Bureau of Land Management to ensure that the Forest Service had a complete and accurate picture of the reclamation efforts of the operator. The Forest Service had recommended that the Bureau of Land Management provide a summary of the reclamation efforts of the operator that had been completed to date, including a description of the types of reclamation activities performed, the dates of the activities, and the estimated costs of the reclamation efforts. The summary should be submitted to the Forest Service on a quarterly basis, with the first report due within 90 days of the date of the operator's application.

The Bureau of Land Management's reclamation requirements are covered in Title 31, Part 360. The Bureau of Land Management has not included in the regulations for the issuance of a mining permit any requirement for the submission of a reclamation plan or bond. However, the Bureau of Land Management has provided guidance in the form of a reclamation manual that describes the procedures and requirements for reclamation of lands affected by mining activities. The reclamation manual is available on the Bureau of Land Management's website, and mining applicants are encouraged to review it in order to ensure that they are in compliance with the requirements of the Bureau of Land Management.
increased at any time. Furthermore, the proposed
requirements would be identical at all times as
appears warranted. The fact that larger numbers
have rarely been reported and that the re-
nomination is inapplicable to the
Federal Land Management Service and the
Bureau of Land Management.

Because the Forest Service
was not a respondent to the
proposed rule, the Forest
Service conducted a survey of its
Field Offices to determine if in the
past 3 years there had been any need
to attach bonds in order to
obtain clarification or restoration, and, if so,
whether the bond amounts involved appeared
adequate for the work to be done. In fact, during this period, the
Forest Service has never found reason
to attach a bond. The survey responses indicated that the
amounts of bond funds appropriated to the
Forest Service had decreased between
1980 and 1982, and that the amount of
bonds needed for any damage done to the
natural resource by a lessee's operation was generally
against the public interest and would
disruptly reduce exploration and
management on National Forest System
lands, because it would deter joint
operations.

Several respondents recommended
changes. Two respondents suggested
that the rule state that only licenses of
land are liable for lease obligations,
and only to the extent that each
licensee's lands are involved.

A respondent simply asked questions
regarding an operator's liability for
fires, erosion, etc., caused by natural
occurrences.

Response: After analysis of these
comments, the Department has decided
to revise the proposed rule. Grants
existing law provide for the liability of
a lessee of a Federal Government lease for any damage done to the
line of a lessee's operation, but we see no reason
why indemnification would be to limit the liability to the
operator. One additional
recommendation appears to be
unrelated to the comment

Final rule. It should be noted that
the Forest Service and the Bureau of
Land Management have recently
entered into a Memorandum of
Understanding that provides the
framework for utilizing the Bureau of
Land Management's leasing provisions.

Section 288.100 Indemnification
This section of the proposed
rule would provide a means of
protecting the United States from
liability as a result of claims, demands,
losses or judgments caused by an
operator's use or occupancy.

Comments: Those commenting on
this section of the rule felt that the
provisions were in compliance with
national liability as a result of
claims, demands, losses or judgments
caused by an operator's use or occupancy.

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Comments: Those commenting on
the provision of the proposed rule,
the Forest Service conducted a survey of all Federal
Land Management Service proposals for
the period of 45 days or more. The
purpose of requiring notice was to
allow the Forest Service to determine if the proposal
required interim reallocation or erosion control
measures to stabilize the site.

Comments: Those commenting on
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required interim reallocation or erosion control
measures to stabilize the site.
For the proposed rule to become effective, the Department of Consumer Affairs will be required to take timely action. In the event that the proposed rule is not adopted in its entirety, the Department will be required to issue a new proposed rule. The Department will be required to provide adequate opportunity to comment on any proposed rule before it becomes final. The Department will be required to provide adequate opportunity to comment on any proposed rule before it becomes final.

The proposed rule would establish procedures for the enforcement of the law. The proposed rule would also establish procedures for the enforcement of the law. The proposed rule would also establish procedures for the enforcement of the law.

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Section 328.114 Additional Notice of Decisions

(a) The final rule provided Forest Service guidance for posting notices for the Bureau of Land Management as required by the National Forest Management Act. The Act directs the Department to provide

The final rule was not revised to reflect these comments. As stated, the intent of this section is to let

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[Content of the document is not shown, but it appears to be a legal or regulatory document, possibly related to environmental or resource management, given the context and titles like "Federal Register" and "Rules and Regulations." The text includes discussions on land use, regulations, and the process of issuing regulations or notices to the public.]
(5) Adoption of additional oil and gas areas.

(6) Prohibition of new oil and gas operations.

(7) Establishment of an additional oil and gas order.

(8) Application for additional oil and gas areas.

(9) Notice of intent for application for additional oil and gas areas.

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(135) Notice of intent for application for additional oil and gas areas.
Apparent material noncompliance includes, but is not limited to, operating without an approved surface use plan of operations or, after an extension approved by the authorized Forest officer, not being in compliance with the applicable requirements(s) or standard(s) identified in the notice of noncompliance by the deadline because the operator failed to comply with the requirements of the applicable requirements(s) or standard(s) identified in the notice of noncompliance by the deadline specified in the notice, or an extension approved by the authorized Forest officer.

(4) Manner of service. The authorized Forest officer shall serve notice of noncompliance or a decision on a request for extension of a deadline specified in a notice upon the operator, in person, by certified mail or by telephone, if the authorized Forest officer has initially provided in person or by telephone, the authorized Forest officer shall serve notice of noncompliance or decision on a request for extension of a deadline. If notice is initially provided in person or by telephone, the authorized Forest officer shall serve notice of noncompliance or decision on a request for extension of a deadline specified in the notice, or an approved extension, on the operator by any means by which the operator can reasonably be reached.

(5) Identification of the noncompliance. The authorized Forest officer shall advise the operator in writing, in a notice of noncompliance, of such noncompliance, the applicable requirements(s) or standard(s) identified in the notice of noncompliance, and any conditions as fire, flooding, or snowpack.

(6) Failure to correct noncompliance. If the operator fails to correct noncompliance within the time specified in a notice of noncompliance, or within any extension of such a deadline, the authorized Forest officer shall take such action as is necessary to bring the operator into compliance with the applicable requirements(s) or standard(s) identified in the notice of noncompliance by the deadline specified in the notice, or an extension approved by the authorized Forest officer.

(7) Assessment of penalties. The authorized Forest officer may assess penalties for the noncompliance.

(8) Notice of noncompliance. The authorized Forest officer may provide a notice of noncompliance to the operator.

(9) Dismissal of referral. The authorized Forest officer may dismiss the referral if the claims made by the applicant are not supported by any evidence to support a reasonable belief that:

(1) The operator was not in compliance with the applicable requirement(s) or standard(s) identified in the notice of noncompliance.

(2) The noncompliance with the applicable requirement(s) or standard(s) identified in the notice of noncompliance could not be remedied by the operator.

(3) The operator is not in compliance with the applicable requirement(s) or standard(s) identified in the notice of noncompliance.

(10) Notice of referral. The operator may appeal the operator's decision to the authorized Forest officer to the notices of noncompliance.

(11) Dismissal of referral. The authorized Forest officer may dismiss the referral if the claims made by the applicant are not supported by any evidence to support a reasonable belief that:

(1) The operator was not in compliance with the applicable requirement(s) or standard(s) identified in the notice of noncompliance.

(2) The noncompliance with the applicable requirement(s) or standard(s) identified in the notice of noncompliance could not be remedied by the operator.

(3) The operator is not in compliance with the applicable requirement(s) or standard(s) identified in the notice of noncompliance.

(12) Notice of referral. The operator may appeal the operator's decision to the authorized Forest officer to the notices of noncompliance.

(13) Dismissal of referral. The authorized Forest officer may dismiss the referral if the claims made by the applicant are not supported by any evidence to support a reasonable belief that:

(1) The operator was not in compliance with the applicable requirement(s) or standard(s) identified in the notice of noncompliance.

(2) The noncompliance with the applicable requirement(s) or standard(s) identified in the notice of noncompliance could not be remedied by the operator.

(3) The operator is not in compliance with the applicable requirement(s) or standard(s) identified in the notice of noncompliance.

(14) Notice of referral. The operator may appeal the operator's decision to the authorized Forest officer to the notices of noncompliance.
[Page 53]

[Page 54]
the proposed drill pad and its location with respect to topographic features is required. Cross-section diagrams of the drill pad showing, for each well and its facilities, the location of the source and the piping, access road over the pad, production and service roads, access roads, living facilities, and mineral conditions. A conceptual map of the city with respect to the pad and other facilities. Note, if any way a conception cannot be detailed.

2/2 Plan Presentation of the Surface. The program for surface evaluation upon completion of the operation, such as layout of the proposed topography, drainage system, segregation of spoil areas, surface conditions, waste disposal, construction methods, and soil stabilization, and other practices necessary to the maintenance of disturbed areas, including any access roads made of sandy materials when no longer needed, shall be stated. An evaluation of the need for the abandonment and reclamation of operations, including weather conditions and other factors, shall be provided.

2/2 B Surface Ownership. The surface ownership (Federal, Indian, State, or private) of the well location, and for all lands covered by which are to be constructed or expanded, shall be indicated. Where the surface of the well site is privately owned, the operator shall provide the name, address, and telephone number of the surface owner.

2/2 D Other Information. The lessee or operator is encouraged to submit any additional information that may be helpful in the proposal application.

2/2 E Leasing or Operator’s Representative and Certification. The name, address, and telephone number of the lessee’s or operator’s representative shall be indicated. The lessee or operator submitting the APD shall certify as follows: I hereby certify that I, or someone under my direct supervision, have inspected the proposed drill site and certify that I am in agreement with the conditions which currently exist that the equipment made in this plan is, to the best of my knowledge, true and correct, and that it is not associated with operators proposed to drill. The APD shall be prepared, signed, and sworn to by the operator and filed with the Department of Natural Resources in accordance with the procedure outlined above. The APD shall be filed in accordance with the procedure outlined above. This document is subject to the provisions of U.S.C. 1251 for the filing of an environmental statement.

Home and Title

PART 221-PROHIBITIONS


Subpart A-General Prohibitions

4. Amend §221.2 by adding a new paragraph to read as follows: §221.2 Definitions.

"Operating plan" means a plan of operations as provided for in 36 CFR part 221, subpart A, and a surface use plan of operations as provided for in 36 CFR part 221, subpart E.

[FR Doc. 95-13843 Filed 5-30-95; 4:45 am] BILLING CODE 3510-01-M

APPENDIX G

BASELINE WATER DATA

- 0 -
APPENDIX G

WATER RESOURCES

This appendix addresses the water resources which could be affected by oil and gas leasing on the TBNG. All known groundwater and surface water data for the region has been compiled in five Tables. Information in the Tables covers a wide area and describes water quantity and quality in broad terms. In a few instances minor drainages are discussed; however, the intent of compiling such data for the leasing stage was to describe general conditions on the Grassland. Site specific data, if required, will be collected during the Application to Drill (APD) and Surface Use Plan of Operations (SUPO) stages of development.

Water Quality Standards

Prior to describing conditions on the TBNG, it may be helpful to define some common water quality parameters and how various pollutants can affect the water resource. The source of this information is Wyoming Department of Environmental Quality (NY DEQ), Water Quality Rules and Regulations (Chapter I) and Quality Standards for Wyoming Groundwaters (Chapter VII). Water quality standards and explanations used for studies in the Grassland are listed below.

Total Dissolved Solids (TDS) Concentrations - This is the sum of the dissolved mineral constituents in water, expressed as mg/l. High concentrations of TDS can render water unusable for domestic (500 mg/l), agricultural (2000 mg/l) or livestock use (5000 mg/l). Various aspects of fish and aquatic life can be affected by elevated TDS concentrations: Egg hatching (500 mg/l), fish rearing (1000 mg/l) and aquatic life (2000 mg/l).

Trace Metal Concentrations - Trace metals can be toxic to human and aquatic life at certain concentrations. Toxic concentrations vary by the trace metal discussed and also by environmental factors affecting the mobilization of the metal. State water quality standards list the highest metal concentration acceptable for each use.

Temperature - Extremes in temperature can affect aquatic communities since they have adapted to certain patterns. Interruptions or wide fluctuations in the temperature range can also adversely affect the water resource. Discharges shall not induce a temperature change greater than 1.1 degrees C in cold water fisheries habitat. Warm water fisheries should not be exposed to rapid temperature changes greater than 2.2 degrees C. Maximum allowable daily temperatures should not exceed 26 degrees C for cold water fisheries, nor 32 degrees C for warm water fisheries.

pH - pH expresses the intensity of the acidic or basic condition of the water. Biological activity may be affected by pH. Acidic conditions affect aquatic life when pH falls below 6.5. Alkaline conditions greater than 9.0 can also impact aquatic life.

Total Hardness Concentrations - Hardness is a measure of the mineral content of water. Measured as mg/l of calcium carbonate, hardness does not have a direct impact on the water resource; however, high concentrations of hardness may alter the level at which certain metals affect aquatic life.

Specific Conductance - Specific Conductance is a measure of the electrical conductivity of water. Conductance relates to the ion content of water and indirectly measures pollutants. High conductivity equates to high ion content and potential pollution.

Alkalinity - Alkalinity is a measure of the quantity and kind of constituents in water that shift pH in basic conditions. This allows a system to buffer against the impact of acidity. Waters with high alkalinity are able to withstand acidic discharges.

Chloride and Sodium - Produced waters from oil and gas operations may contain elevated concentrations of chloride and sodium. High concentrations of these elements can alter the natural ionic composition of water and affect aquatic life. Chloride concentrations above 960 mg/l can be acutely toxic to aquatic life. Concentrations of chloride as low as 230 mg/l can chronically affect aquatic organisms.

Groundwater

Groundwater data is contained in Tables 1 and 2. The data was extracted from USGS WRI 83-545; Hydrology of Area 50, Northern Great Plains and Rocky Mountain Coal Provinces, Wyoming and Montana.

The groundwater information covers the TBNG and surrounding area. A large range of natural variability can be seen within the data. In Table 1 descriptions of the general condition of groundwater quality, by aquifer. Specific well locations were not identified.

Maximum concentrations of TDS in each aquifer exceeds the suitability level for domestic (500 mg/l) and agricultural uses (2000 mg/l). In most aquifers, the maximum concentration of TDS also exceeds values suitable for livestock use (5000 mg/l). However, the minimum concentrations in these aquifers can also be very low. Generally, wells situated near recharge areas tend to have lower TDS concentrations. Average concentrations may be in a range suitable for agriculture. Site specific analyses will determine local conditions.

Trace metal concentrations also fluctuate widely throughout the area (Table 3). Manganese, iron and lead pose the highest threat to drinking water. However, high manganese and iron concentrations are not considered a threat to livestock. Information in Table 2 describes overall trace metal concentrations for the TBNG.

General conditions of groundwater in the TBNG lend it to be suitable for livestock use. In a few locations, groundwater may be suitable for domestic and agricultural uses. Site specific or area analyses will further define groundwater conditions.

Surface Waters

Existing surface water quality data was obtained from the following sources: Wyoming Water Research Center; Wyoming Department of Environmental Quality; Wyoming Game and Fish; United States Geological Survey; Soil Conservation Service; and, various Forest Service contracts. The surface water data is organized in a tiered manner. Table 3 describes discharge characteristics and water quality parameters for major water bodies within the Grassland. In addition, information for smaller watersheds was provided and is available (Table 3).

As can be seen, discharges on the TBNG fluctuate considerably. Most of the systems on the Grassland are ephemeral or intermittent. Localized high-intensity thunderstorms result in tremendous short-duration flows. Water temperatures can exceed the maximum level suitable for cold water fish in most drainages. However, suitability levels for warm water fish are not exceeded. pH levels exceed the maximum State water quality limits in three of the major drainages. Alkaline conditions can exceed 9.0 in the South Fork Cheyenne River, Black Thunder Creek and Belle Fourche River. This may pose a problem for some aquatic organisms. Hardness can also be very
high in most locations. Specific conductance shows a fair amount of ion activity in all measured water bodies. Alkalinity displays "good to excellent" buffering capacity for the watersheds.

Aquatic organisms and their relative sensitivity to pollution can be found in the Biological Diversity Assessment for Oil and Gas Leasing on the Thunder Basin National Grassland [project file in Supervisor's Office]. Most aquatic organisms found on the Grassland are adaptive and tolerant to change. However, a few aquatic insects found in perennial waters are moderately sensitive to environmental degradation.

**Designated Uses**

Designated uses of water on the Grassland have been identified by the WY DEQ as: Warm-water fisheries; cold-water fisheries; public water supplies; recreation; livestock and wildlife watering; irrigation; and, industrial purposes. Waters on the TBNG have been mainly identified as Class 2; where, fisheries can be supported. The degree to which designated uses are supported within each watershed are listed in Table 4. In addition, the cause and source of any impairment to the designated use is listed. Sediment and flow alterations appear to be the major impact to designated uses on the Grassland.

**Additional Data**

Tables 3 and 4 provide general information relating to surface water quality on the Grassland. However, they are not a comprehensive review of all water resource studies available. The amount of material available for the TBNG would be too voluminous to include in this appendix. An index to all known water quality studies and sampling locations has been developed to identify additional information. Data sources and water body locations of studies have been listed in Table 5. In addition, the period of record for discharge, sediment and biological measurements have been noted for each sampling location.

**Concept for Use of Water Quality Data**

The concept of use for existing water quality data is simple. Existing data can be used as a baseline to compare against subsequent information. Data in Tables 1 and 2 should be used to gage general conditions of the groundwater resource of the TBNG. Samples taken from wells near a oil and gas development site can be compared with the existing data to determine what impacts have occurred. Surface water quality assessment should take a tiered approach with the use of Tables 3, 4 and 5. Table 3 provides a general description of water quality in major watersheds. This is used as a coarse filter for which data from monitoring can be compared. Once water quality on a large scale is examined, the types and degrees of existing designated uses (Table 4) should be assessed. This information provides a fine screen approach to what type of activities can occur in a certain watershed. If additional information is needed for site specific refinement, Table 5 can be used to search out supplementary data. When the information in these tables does not suffice for water quality assessment purposes, then the lessee will be required to collect (monitor) samples in the context of a minor inventory or short-term study.

**Example:** This is an example of how Tables 1 thru 5 should be used to assess existing conditions where a well is be placed near Black Thunder Creek in the Cheyenne River drainage.

1. From the APD and SUPO, locate where the well will be placed and determine what mitigation measures will be applied.

2. If the well is proposed for placement in a floodplain, riparian area, wetland or playa, standard lease terms may be exercised to move the well away from these sensitive areas.

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Table G-1. MEDIAN, AVERAGE, MINIMUM, AND MAXIMUM TOTAL DISSOLVED-SOLIDS CONCENTRATIONS IN WATER FROM THE AREA'S AQUIFERS

<table>
<thead>
<tr>
<th>Aquifer</th>
<th>Dissolved-solids concentration (milligrams per liter)</th>
<th>Median</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Number of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvium</td>
<td>1,700</td>
<td>2,128</td>
<td>106</td>
<td>6,610</td>
<td>919</td>
<td>38</td>
</tr>
<tr>
<td>Wasatch Formation</td>
<td>1,010</td>
<td>1,298</td>
<td>227</td>
<td>8,200</td>
<td>257</td>
<td>24</td>
</tr>
<tr>
<td>Fort Union Formation</td>
<td>1,260</td>
<td>1,464</td>
<td>209</td>
<td>5,620</td>
<td>790</td>
<td>4</td>
</tr>
<tr>
<td>Fox Hills-Hell Creek Formations</td>
<td>691</td>
<td>790</td>
<td>340</td>
<td>2,850</td>
<td>691</td>
<td>24</td>
</tr>
<tr>
<td>Fox Hills Sandstone</td>
<td>943</td>
<td>1,494</td>
<td>451</td>
<td>5,450</td>
<td>943</td>
<td>26</td>
</tr>
<tr>
<td>Hell Creek Formation</td>
<td>800</td>
<td>978</td>
<td>408</td>
<td>2,390</td>
<td>800</td>
<td>23</td>
</tr>
<tr>
<td>Lance Formation</td>
<td>977</td>
<td>1,218</td>
<td>251</td>
<td>2,850</td>
<td>977</td>
<td>31</td>
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<tr>
<td>Tenasleep Sandstone</td>
<td>254</td>
<td>874</td>
<td>230</td>
<td>6,820</td>
<td>254</td>
<td>15</td>
</tr>
<tr>
<td>Madison Group</td>
<td>987</td>
<td>1,503</td>
<td>65</td>
<td>3,240</td>
<td>987</td>
<td>25</td>
</tr>
</tbody>
</table>

Standard lease terms allow the relocation of a well up to 200 meters in any direction, at the discretion of the lessor, in order to avoid environmental degradation of a resource. In cases where the sensitive area is larger than 200 meters, or it is not feasible to place the well in any other location, specific measures will be developed to mitigate the impact of development.

3. Once the exact location has been established, use Table 1 and 2 to identify the general groundwater conditions for the TBNG. If the well is to be located in an area that is critical for groundwater protection (i.e. domestic water supply) then site specific monitoring will be required. This may be achieved through the use of samples from nearby monitoring wells.

4. General surface water quality for the watershed can be assessed with Table 3. This will provide the overall characteristics of the larger watershed and may be used as a comparison to future monitoring.

5. The designated uses of Black Thunder Creek (Table 4) should be examined to determine the types of uses currently supported and what may be impacted from development. This provides a picture of what is currently impacted and the cause. Activities which cause similar impact to already impared designated uses should be avoided.

6. Information from Table 5, if available, can be used to refine the baseline conditions for Black Thunder Creek. If amplifying data is insufficient, or unavailable, then the lessor will be required to provide data to adequately define existing water quality.
Table G-2 TRACE-METAL CONCENTRATIONS IN GROUND WATER OF THE TBNG.

<table>
<thead>
<tr>
<th>Metal</th>
<th>Number of analyses</th>
<th>Number of analyses exceeding drinking-water standards</th>
<th>Percent of analyses exceeding drinking-water standards</th>
<th>Drinking-water standard (micrograms per liter)</th>
<th>Median value (micrograms per liter)</th>
<th>Maximum analyzed value (micrograms per liter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe</td>
<td>154</td>
<td>1</td>
<td>0.6</td>
<td>'50</td>
<td>1</td>
<td>120</td>
</tr>
<tr>
<td>Cu</td>
<td>95</td>
<td>1</td>
<td>1.0</td>
<td>'1,000</td>
<td>100</td>
<td>1,100</td>
</tr>
<tr>
<td>Pb</td>
<td>165</td>
<td>1</td>
<td>0.6</td>
<td>'10</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Cd</td>
<td>116</td>
<td>0</td>
<td>0.0</td>
<td>'50</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Cr</td>
<td>123</td>
<td>0</td>
<td>0.0</td>
<td>'1,000</td>
<td>1</td>
<td>104</td>
</tr>
<tr>
<td>Mn</td>
<td>366</td>
<td>56</td>
<td>15.3</td>
<td>'300</td>
<td>100</td>
<td>120,000</td>
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<td>Co</td>
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<td>6</td>
<td>3.6</td>
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<td>180</td>
</tr>
<tr>
<td>Cr</td>
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<td>100</td>
<td>38.9</td>
<td>'50</td>
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<td>4,800</td>
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<td>0</td>
<td>0.0</td>
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<td>1.5</td>
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<td>Ni</td>
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<td>4</td>
<td>2.5</td>
<td>'10</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td>Cu</td>
<td>141</td>
<td>0</td>
<td>0.0</td>
<td>'5,000</td>
<td>20</td>
<td>1,800</td>
</tr>
</tbody>
</table>

Table G-3. Discharge and Ranges of Selected Water Quality Parameters for Forest Planning Watersheds within Thunder Basin National Grassland, Wyoming. Water quality parameters selected provide a general description of chemical conditions of water and those parameters that may change as a result of oil and gas activities.

<table>
<thead>
<tr>
<th>Water Body ID</th>
<th>Period of Record</th>
<th>Discharge (CFS)</th>
<th>Temp (Degrees C)</th>
<th>pH</th>
<th>Total Hardness (mg/l CaCO₃)</th>
<th>Specific Conductance (μMhos/cm)</th>
<th>Dissolved Solids (mg/l)</th>
<th>Alkalinity (mg/l)</th>
<th>Chloride (mg/l)</th>
<th>Sodium (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Powder River Watershed</td>
<td>1972</td>
<td>qₐ = 19</td>
<td>0-29.5</td>
<td>7.8-8</td>
<td>59-2000</td>
<td>350-5400</td>
<td>NA</td>
<td>57-770</td>
<td>2.6-12036-950</td>
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<tr>
<td>Little Powder River near Weston; USGS STA. 06324970; Latitude 44° 55' 37&quot; N; Longitude 105° 21' 10&quot; W; Weston Reservoir (MBNF)</td>
<td>Present</td>
<td>qₐ = 4869</td>
<td>28</td>
<td>8.0</td>
<td>NA</td>
<td>1969</td>
<td>1315</td>
<td>780</td>
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<tr>
<td>Antelope Creek Watershed</td>
<td>1977-81</td>
<td>NA</td>
<td>0-30</td>
<td>7.3-8.3</td>
<td>140-1200</td>
<td>435-2700</td>
<td>300-2450</td>
<td>56-440</td>
<td>3.7-3128</td>
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<tr>
<td>Antelope Creek near Teckla; USGS STA. 06364700; Latitude 43° 29' 07&quot; N; Longitude 105° 13' 29&quot; W;</td>
<td></td>
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<td>260-1700</td>
<td>630-2600</td>
<td>679-2450</td>
<td>110-620</td>
<td>5.3-73</td>
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<tr>
<td>Dry Fork Cheyenne River Watershed</td>
<td>1976-81</td>
<td>qₐ = 92</td>
<td>0-25</td>
<td>6.8-8.2</td>
<td>260-1700</td>
<td>630-2600</td>
<td>679-2450</td>
<td>110-620</td>
<td>5.3-73</td>
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<td>Dry Fork Cheyenne River near Bill, WY; USGS Sta. 06365300; Latitude 43° 13' 21&quot; N; Longitude 105° 40' 00&quot; W;</td>
<td>1965-87</td>
<td>qₐ = 3742</td>
<td>260-1700</td>
<td>630-2600</td>
<td>679-2450</td>
<td>110-620</td>
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<td>South Fork Cheyenne River Watershed</td>
<td>1977-81</td>
<td>qₐ = 17.9</td>
<td>0-31</td>
<td>6.8-9.2</td>
<td>170-1800</td>
<td>650-3800</td>
<td>350-3800</td>
<td>80-520</td>
<td>4.4-42</td>
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<td>Cheyenne river near Dull Center, WY; USGS Sta. 06365900; Latitude 43° 25' 45&quot; N; Longitude 105° 02' 43&quot; W;</td>
<td>1986-87</td>
<td>qₐ = 22.212</td>
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<tr>
<td>Dull Draw Reservoir; T. 40 N., R68 W., Section 9</td>
<td>1992</td>
<td>20.5</td>
<td>9.3</td>
<td>275</td>
<td>187</td>
<td>180</td>
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Black Thunder Creek Watershed
Little Thunder Creek near Hampshire, WY;
USGS Sta. 06375600; Latitude 43° 39' 20"; Longitude 104° 54' 20"

<table>
<thead>
<tr>
<th>Current</th>
<th>q_100</th>
<th>q_a</th>
<th>0-26.0</th>
<th>6.8-9.2</th>
<th>86-1000</th>
<th>240-7500</th>
<th>166-3660</th>
<th>40-550</th>
<th>2.0-260</th>
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<tr>
<td>1987-88</td>
<td>4635</td>
<td>6.7</td>
<td>0-17.5</td>
<td>7.6-8.1</td>
<td>140-360</td>
<td>300-1710</td>
<td>209-1220</td>
<td>33-170</td>
<td>2.7-11.0</td>
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</table>

Lodgepole Creek Watershed
Lodgepole Creek near Hampshire, WY; USGS Sta. 06373300; Latitude 43° 33' 40"; Longitude 104° 33' 40"

NA | 0-23 | 6.8-9.2 | 0-270 | 695-5000 | 430-3750 | 200-1400 | 3.6-33.0 |
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<td>1972-90</td>
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<td>6.7</td>
<td>0-17.5</td>
<td>7.6-8.1</td>
<td>140-360</td>
<td>300-1710</td>
<td>209-1220</td>
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Beaver Creek Watershed
Beaver Creek near Newcastle, WY;
USGS Sta. 06394000; Latitude 43° 32' 07"; Longitude 104° 07' 02"

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<th>q_a</th>
<th>0-29.5</th>
<th>6.5-8.3</th>
<th>100-3800</th>
<th>193-1000</th>
<th>423-8260</th>
<th>52-407</th>
<th>4.0-2100</th>
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</thead>
<tbody>
<tr>
<td>1944-45</td>
<td>8706</td>
<td>8.5</td>
<td>0-29.5</td>
<td>6.5-8.3</td>
<td>100-3800</td>
<td>193-1000</td>
<td>423-8260</td>
<td>52-407</td>
<td>4.0-2100</td>
</tr>
</tbody>
</table>

Roadfill Dam Reservoir; T. 47 N., R. 64 W., Section 11
1992 | 24.0 | 8.0 | -- | 249 | 168 | 120 | -- |

Upton Centennial No. 2 Reservoir, T. 47 N., R. 65 W., Section 11
1992 | 21.5 | 8.5 | -- | 1840 | 1244 | 140 | -- |

Upton Centennial No. 3 Reservoir, T. 47 N., R. 65 W., Section 11
1992 | 22.0 | 9.6 | -- | 2100 | 1397 | 160 | -- |

Kellogg Dam; T. 47 N., R. 63 W., Section 17
1992 | 23.5 | 8.4 | -- | 1310 | 867 | 140 | -- |

<table>
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<tr>
<th>Current</th>
<th>q_100</th>
<th>q_a</th>
<th>0-29.5</th>
<th>6.5-8.3</th>
<th>100-3800</th>
<th>193-1000</th>
<th>423-8260</th>
<th>52-407</th>
<th>4.0-2100</th>
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</thead>
<tbody>
<tr>
<td>1944-45</td>
<td>8706</td>
<td>8.5</td>
<td>0-29.5</td>
<td>6.5-8.3</td>
<td>100-3800</td>
<td>193-1000</td>
<td>423-8260</td>
<td>52-407</td>
<td>4.0-2100</td>
</tr>
</tbody>
</table>

Roadfill Dam Reservoir; T. 47 N., R. 64 W., Section 11
1992 | 24.0 | 8.0 | -- | 249 | 168 | 120 | -- |

Upton Centennial No. 2 Reservoir, T. 47 N., R. 65 W., Section 11
1992 | 21.5 | 8.5 | -- | 1840 | 1244 | 140 | -- |

Upton Centennial No. 3 Reservoir, T. 47 N., R. 65 W., Section 11
1992 | 22.0 | 9.6 | -- | 2100 | 1397 | 160 | -- |

Kellogg Dam; T. 47 N., R. 63 W., Section 17
1992 | 23.5 | 8.4 | -- | 1310 | 867 | 140 | -- |
<table>
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<tr>
<th>Website</th>
<th>Voltage</th>
<th>Current</th>
<th>Resistance</th>
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</thead>
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<td>Sample</td>
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<td>2.1</td>
<td>5.8</td>
</tr>
<tr>
<td>Sample 2</td>
<td>12.5</td>
<td>2.3</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Belle Fourche River Watershed

Belle Fourche River below Moorcraft (146):

USGS Sta. 06426500; Latitude 44° 1945-91
17° 44', Longitude 104° 56' 35":

\[ q_{av} = 0.31.0 \quad 6.7-9.4 \quad 140-1400 \quad 480-5500 \quad 890-3610 \quad 74-710 \quad 5.8-290 \]

* Period of record is inadequate to accurately estimate a 100-year discharge.
Table G-4  DESIGNATED USES AND DEGREE OF USE SUPPORT FOR SELECTED WATER BODIES ON THUNDER BASIN NATIONAL GRASSLAND AND IMMEDIATELY DOWNSTREAM AFFECTED AREAS

<table>
<thead>
<tr>
<th>Water Body Name</th>
<th>Data Source</th>
<th>Period of Record</th>
<th>State Classification</th>
<th>Water Body Type</th>
<th>Basin</th>
<th>Designated Uses and Degree of Use Support</th>
<th>Causes of Impairment</th>
<th>Sources of Impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belle Fourche River (005)</td>
<td>Sta. 6427850</td>
<td>1990-1992</td>
<td>Class 2</td>
<td>River</td>
<td>Belle Fourche River</td>
<td>WWF - Supported, PCR - Supported, LWW - Supported, IRR - Supported, IND - Supported, HHV - Supported</td>
<td>Flow alteration, Sediment/Silt, Nutrients</td>
<td>Pasture Land, Range Land, Flow regulation</td>
</tr>
<tr>
<td>Belle Fourche River (008)</td>
<td>Wy G&amp;F</td>
<td>1990-1992</td>
<td>Class 2</td>
<td>River</td>
<td>Belle Fourche River</td>
<td>WWF - Threatened, HHV - Supported, IND - Supported, LWW - Supported</td>
<td>Sediment/Silt, Nutrients</td>
<td>Pasture Land, Range Land</td>
</tr>
<tr>
<td>Keyhole Reservoir</td>
<td></td>
<td>1975</td>
<td>Class 2</td>
<td>Lake</td>
<td>Belle Fourche River</td>
<td>CWF - Not Supported</td>
<td>Dissolved Oxygen</td>
<td></td>
</tr>
<tr>
<td>Belle Fourche River (009)</td>
<td>Sta. 06426500</td>
<td>1990-1992</td>
<td>Class 2</td>
<td>River</td>
<td>Belle Fourche River</td>
<td>WWF - Supported, PCR - Not Supported, HHV - Not Supported, IND - Supported, LW - Supported, IRR - Supported</td>
<td>Pathogen Indicators, Metals</td>
<td></td>
</tr>
</tbody>
</table>
Table G-4  DESIGNATED USES AND DEGREE OF USE SUPPORT FOR SELECTED WATER BODIES ON THUNDER BASIN NATIONAL GRASSLAND
AND IMMEDIATELY DOWNSTREAM AFFECTED AREAS

<table>
<thead>
<tr>
<th>Water Body Name</th>
<th>Data Source</th>
<th>Period of Record</th>
<th>State Classification</th>
<th>Water Body Type</th>
<th>Designated Uses and Degree of Use Support</th>
<th>Causes of Impairment</th>
<th>Sources of Impairment</th>
</tr>
</thead>
</table>
| Belle Fourche River (001) | Wy G&F | 1990-1992 | Class 2 | River | WWF - Threatened  
HHV - Supported  
IND - Supported  
LWW - Supported  
IRR - Supported | Flow Alteration  
Pasture Land | Sediment/Silt  
Range Land |
| Caballo Creek (040) | Wy G&F | 1990-1992 | Class 2 | River | WWF - Threatened  
HHV - Supported  
IRR - Supported  
IND - Supported  
LWW - Supported | Flow Alteration  
Pasture Land | Sediment/Silt  
Range Land | Nutrients  
Flow regulation |
| Beaver Creek (007) | Wy DEQ | 1990-1992 | Class 2 | River | WWF - Partially Supported  
PCR - Supported  
LWW - Supported  
IRR - Supported  
IND - Supported  
HHV - Supported | Flow alteration  
Surface | Sediment/Silt  
Range Land | Natural |
| Beaver Creek (008) | Wy G&F | 1990-1992 | Class 2 | River | WWF - Threatened  
HHV - Supported  
IRR - Supported  
IND - Supported  
LWW - Supported | Flow Alteration  
Irrigated crops  
Flow regulation | Sediment/Silt  
Range Land  
Drain/ditch wetlands | Natural |
Table G-4 DESIGNATED USES AND DEGREE OF USE SUPPORT FOR SELECTED WATER BODIES ON THUNDER BASIN NATIONAL GRASSLAND AND IMMEDIATELY DOWNSTREAM AFFECTED AREAS

<table>
<thead>
<tr>
<th>Water Body Name</th>
<th>Data Source</th>
<th>Period of Record</th>
<th>State Classification</th>
<th>Water Body Type</th>
<th>Basin</th>
<th>Designated Uses and Degree of Use Support</th>
<th>Causes of Impairment</th>
<th>Sources of Impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Thunder Creek</td>
<td>Sta. 06376300</td>
<td>1990-1992</td>
<td>Class 2</td>
<td>River</td>
<td>Cheyenne River</td>
<td>NGF - Partially Supported</td>
<td>Sediment/Slit</td>
<td>Range Land</td>
</tr>
<tr>
<td></td>
<td>USGS Wy Conserv</td>
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<td></td>
<td>PCR - Supported</td>
<td></td>
<td>Hwy Rd</td>
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<td>Comm</td>
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<td>Bridge Const</td>
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<td>IRR - Supported</td>
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<td>Runoff/Storm</td>
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<td>sewers Natura</td>
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<td>River</td>
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<td>Sediment/Slit</td>
<td>Range Land</td>
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<td>Sources of Impairment</td>
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WWF - Warm Water Fisher  
HHV - Human  
IRR - Irrigation  
IND - Industrial  
LWW - Livestock and Wildlife Watering  
CWF - Cold Water Fishery  
PWS - Public Water Supply  
Special - Special Class 4 Pathogen  
SCR - Secondary Contact Recreation
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Table G-5 DATA SOURCE AND PERIOD OF RECORD FOR SURFACE WATER QUALITY COLLECTED ON THE TBNG (continued)

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APPENDIX H

STIPULATIONS BASE MAPS

The Stipulation Base Maps are designed to display the conditions that may be applied to leases on those lands being studied based on management alternatives. These maps are at a scale of 1:126,720 or 1/2 inch = one mile.

Standard lease terms and stipulations, No Surface Occupancy, Timing Limitations and Controlled Surface Use are coded by various cross-hatch patterns on the base maps. Areas smaller than 40 acres that may require restrictive stipulations were not mapped. There are no lands discretely removed for leasing except in ALTERNATIVE B. The scale of the base maps are so small that there are many areas of inclusions that were impossible to map. It is provided for general information only.

The Stipulation Base Maps were developed from the working maps and Primary Base Series maps used by the interdisciplinary Team in their impact analysis, and will be used in project implementation.

There are 87 Primary Base Series maps plus mylar overlays displaying resource information on each. The volume of the information makes it impossible to freely distribute to the public. The Primary Base Series maps from which the Stipulation Base Maps were developed will be available for public review at the following locations:

- Medicine Bow National Forest
  Forest Supervisor's Office
  2458 Jackson Street
  Laramie, Wyoming 82070

- The Douglas Ranger District Office,
  809 South 9th Street
  Douglas, Wyoming 82633

NOTE: FOR THE READERS UNDERSTANDING

ALTERNATIVES 1 and 2 are on the same map.

ALTERNATIVE 3 has a map enclosed.

ALTERNATIVE 4 has a map enclosed.

ALTERNATIVE 5 applies no new leasing uniformly across the TBNG and, therefore, needs no map.

ALTERNATIVE 6 applies standard stipulations uniformly across the TBNG and, therefore, needs no map.

ALTERNATIVE 7 has a map enclosed.
GLOSSARY

Abandon
To cease producing oil or gas from a well when it becomes unprofitable. A wildcat (exploration) well may be abandoned after it has been proven nonproductive. Usually, some of the casing is removed and salvaged, and one or more cement plugs placed in the borehole to prevent migration of fluids between formations.

Acquired Minerals
Mineral rights that were patented into non-federal ownership and were later re-acquired by the United States. In the Thunder Basin National Grassland this was through Title III of the Bankhead-Jones Farm Tenant Act of 1937.

Affected Environment
The biological and physical environment that will or may be changed by actions proposed and the relationship of people to that environment.

Airshed
Basic geographic units in which air quality is managed.

Allotment
See Range Allotment.

Allotment Management Plan
The document that contains the action program needed to manage the range resource for livestock grazing with consideration given to soil, watershed, wildlife, recreation, timber, and other resources on lands within a range allotment or on a wild horse or burro territory. Allotment management plans, territory plans, and where appropriate, coordinated resource management plans identify prescriptions and practices for the management of grazing and browsing lands for livestock and wild horses and burros.

Alluvial Material
Material, transported and deposited by running water in riverbeds, lakes, alluvial fans and valleys. It includes clay, silt, sand, gravel and mud.

Alternative
A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision making.
Alternative, No Action
An alternative that maintains established trends or management direction.

Animal Unit Month (AUM)
The quantity of forage required by the equivalent of a 1000 pound mature cow for one month.

APO
See Application for Permit to Drill

Application for Permit to Drill, Deepen or Plug Back (APO)
The Department of interior application permit form to authorize oil and gas drilling activities on Federal land.

Aquatic Ecosystem
The stream channel, lake bed, water, biotic communities and the habitat features that occur therein.

Aquifer
1. A layer of material that contains water.
2. The part of a water drive reservoir that contains the aquifer.

AUM
See Animal Unit Month.

BCFG
Billion cubic feet of gas at one atmosphere pressure.

Best Available Control Technology (BACT)
The best available air pollution control technology for a given purpose as stipulated by the U.S. Environmental Protection Agency.

Best Management Practices (BMP's)
A practice or combination of practices that after problem assessment, are determined to be the most technologically and economically feasible means of preventing or reducing nonpoint source pollution. (State of Wyoming, Department of Environmental Quality. WYOMING NONPOINT SOURCE MANAGEMENT PLAN. Draft 1985).

Big Game
Those species of large mammals normally managed as a sport hunting resource.

Biological Diversity
Biological diversity is the full variety of life in an area, including the ecosystems, plant and animal communities, species and genes, and the processes through which individual organisms interact with one another and with their environment.

BLM
See Bureau of Land Management.

Blowout
An uncontrolled expulsion of gas, oil, or other fluids from a drilling well. A blowout or "gusher" occurs when formation pressure exceeds the pressure applied to it by the column of drilling fluid and when blowout prevention equipment is absent or fails.

BMP
See Best Management Practices.

BO
Barrels of oil.

BOE
Barrels of oil equivalent. Gas volume is converted to barrels of oil according to some ratio.

Bureau of Land Management (BLM)
The Department of Interior agency responsible for managing most Federal Government subsurface minerals. It has surface management responsibility for Federal lands designated under the Federal Land Policy and Management Act of 1976.

Casing
Steel pipe placed in an oil or gas well to prevent the hole from collapsing.

CEQ
See Council of Environmental Quality.
Christmas Tree

The control valves, pressure gages, and chokes assembled at the top of a well to control the flow of oil and gas after the well has been completed.

Closed Mud System

A drill mud system that re-uses or reclaims all the drilling fluid used. Oil-base mud systems are often closed mud systems.

Community

One of four scales of biological diversity (landscape, community, species and genetic). At the community level, biological diversity is described as aggregations of species into communities with specific community structure. It can be evaluated as an index of species differences between contrasting communities. Succession is an important community process. The collective production of biomass by different species within a community, nutrient cycling and energy flow are important community functions.

Completion

The activities and methods to prepare a well for production. Includes installation of equipment for production from an oil or gas well.

Congressionally Designated Areas

Areas established by Congressional legislation, such as Wilderness, National Wild and Scenic Rivers, and National Recreation Areas.

Controlled Surface Use (CSU)

A type of supplemental stipulation used to modify standard lease terms in the Offer to Lease and Lease for Oil and Gas, Form 3100-11, U.S. Department of Interior, Bureau of Land Management, June 1988. Supplemental stipulations are standardized into three types (Uniform Format for Oil and Gas Leasing Stipulations, March 1989). Controlled Surface Use (CSU) stipulations is intended to be used when fluid mineral occupancy and use are generally allowed on all or portions of the lease year-round, but because of special resource concerns or values, lease activities must be strictly controlled and/or modified.

Council on Environmental Quality

An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.
Corridor
In a biological diversity context, a landscape element that connects similar patches through a matrix or an aggregation of patches. Rivers and pipelines are corridors.

CSU
See Controlled Surface Use.

Cultural Resources
The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

Deepen
To increase the depth of a well. Deepening is generally a work over operation to produce from a deeper formation or to control excessive gas found in the upper levels of a reservoir.

Development Well
A well drilled in proven territory (usually within 1 mile of an existing well).

Directional Drilling
The intentional deviation of a wellbore from vertical to reach subsurface areas off to one side from the drilling site.

Displacement
As applied to wildlife, forced shifts in the patterns of wildlife use, either in location or timing of use.

Disposal Well
A well into which produced water from other wells is injected into an underground formation for disposal.

District Ranger
The official responsible for administering the National Forest System Lands on a Ranger District.

Diversity
The distribution and abundance of plant and animal communities and species within the area covered by a land and resource management plan.

Douglas Ranger District (DRD)
The administrative unit of the Medicine Bow National Forest with direct, ground responsibility for the management of the Thunder Basin National Grassland.

Drainage
The un-compensated loss of hydrocarbons from Federal lands from wells on adjacent non-jurisdictional lands with lower participation, allocation, royalty rate or distribution of funds, resulting in revenue losses to the Federal lessee.

DRD
See Douglas Ranger District

Drill Pipe
The heavy seamless tubing used to rotate the drill bit and circulate the drilling fluid. The standard drill pipe section is 30 feet long (a joint).

Drill Rig
The mast, draw works, and attendant surface equipment of a drilling or work over unit.

Dry Hole
Any well incapable of producing oil or gas in commercial quantities. A dry hole may produce water, gas or even oil, but not enough to justify production.

Effects (See Impacts)
Physical, biological, social and economic results (expected or experienced) resulting from achievement of outputs. Effects can be direct, indirect or cumulative and may be either beneficial or detrimental.

Endangered Plants
Any plant species in danger of extinction throughout all or a significant portion of its range in Wyoming.

Endangered Species
Any species in danger of extinction throughout all or a significant portion of its range. These species are protected by The Endangered Species Act of 1973, as amended.

Enhanced Recovery
The use of artificial means to increase the amount of hydrocarbons that can be recovered from a reservoir. A reservoir depleted by normal extraction practices usually can be restored by injecting chemicals such as surfactants or carbon dioxide into the reservoir so that additional oil can be recovered.
Environmental Analysis

An analysis of alternative actions and their predictable short and long-term environmental effects which include physical, biological, economic, social, and air- and water-related design factors and their interactions.

Environmental Impact Statement, Draft (DEIS)

A detailed written statement as required by Sec. 102(2)(C) of the National Environmental Policy Act (NEPA).

Environmental Impact Statement, Final (FEIS)

The final version of the public document required by NEPA.

Erosion

The group of processes whereby earthy or rocky material is worn away by natural sources such as wind, water or ice and moved from any part of the earth's surface.

Exotic

Foreign, not native.

Exploration Well

A well drilled in an area where there is no oil or gas production. Same as a "wildcat" well.

Fish and Wildlife Service (USFWS)

The agency of the U. S. Department of Interior responsible for administering the Migratory Bird Treaty Act, the Threatened and Endangered Species Act and the National Wildlife Refuge system.

Flood Plain

The lowland and relatively flat area adjoining inland waters, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Forage

All browse and non-woody plants available to livestock or wildlife for feed.

Foreground View

The landscape area visible to an observer within one mile.

Forest Plan

Impacts (See Effects)

Physical, biological, social or economic results (expected or experienced) resulting from the achievement of outputs. Effects can be direct, indirect or cumulative and may be either beneficial or detrimental.

Indicator Species

A species of animal or plant whose presence is a fairly certain indication of a particular set of environmental conditions. Indicator species serve to show the effects of development actions on the environment.

Indirect Effects

Secondary effects which occur in locations other than the initial action or significantly later in time.

Injection Well

A well used to inject fluids into an underground formation to increase reservoir pressure.

Land Exchange

The conveyance of non-Federal Land or interests to the United States in exchange for National Forest System land or interests in land.

Landscape

As used in the science of landscape architecture the landscape is the view of the natural land or scenery, the landforms of a region in aggregate. National Forest landscape management is the art and science of planning, designing and administering the use of forest lands within the context of multiple-use land management in such ways that the visual effects maintain or enhance human psychological welfare (FSM 2396). See also Visual Quality Objective.

Also used as one of four scales of biological diversity (landscape, community, species and genetic). At the landscape level, communities aggregate and composition is described by characteristics of the relationships between the communities. Composition is described by characteristics of the matrix, patches, corridors and node structure of the landscape under consideration. Landscapes can vary in scale from a few hundred acres to many thousands of acres. Processes and functions are similar to those for communities, but are also described by large-scale aggregated affects due to climate change or geomorphic processes.

Lease

1. A legal document that conveys to an operator the right to drill for oil and gas.
2. The tract of land, on which a lease has been obtained, where producing wells and production equipment are located.

Management Area

Areas which have common management direction and may be noncontiguous in the Forest. These areas are identified in the Medicine Bow National Forest and Thunder Basin National Grassland Land and Resource Management Plan and identified on the Management Area Map.

Matrix

The vegetation that is most contiguous in a landscape. The matrix has strong connectivity characteristics and exerts strong control over ecosystem processes and functions.

MCG

Thousand barrels of oil.

MCFG

Thousand cubic feet of gas at one atmosphere pressure.

Mineral Rights

Mineral rights outstanding are third party rights, an interest in minerals not owned by the person or party conveying the land to the United States. It is an exception in the deed which is the result of a prior conveyance separating title of certain minerals from the surface estate.

Reserved mineral rights are the retention of ownership of all or part of the mineral rights by a person or party conveying land to the United States. Conditions for the exercising these rights have been defined in the Secretary’s Rules and Regulations to Govern Exercising of Mineral Rights Reserved in Conveyances to the United States’ attached to and made a part of deeds reserving mineral rights.

Mitigate

To lessen the severity.

Mitigation

1. Avoiding an impact by not taking a certain action or parts of an action.
2. Minimizing impacts by limiting the degree or magnitude of an action and its implementation.
3. Rectifying an impact by repairing, rehabilitating, or restoring the affected environment.
4. Reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action or the time period thereafter during which an impact continues.
Million barrels of oil.

Million cubic feet of gas at one atmosphere pressure.

See Visual Quality Objective (VQO).

The management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing need and conditions; that some lands will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

An act which encourages productive and enjoyable harmony between man and his environment; promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; enriches the understanding of the ecological systems and natural resources important to the Nation; and establishes a Council on Environmental Quality.

See National Environmental Policy Act.

A procedure involving environmental analysis and public comment whereby management of natural resources may be changed.

A well, usually a wildcard, that discovers a previously unknown oil and gas field.

The management direction, activities, outputs, and effects that are likely to exist in the future if the current plan would continue unchanged.

No Surface Occupancy (NSO)

A type of supplemental stipulation used to modify standard lease terms in the Offer to Lease and Lease for Oil and Gas, Form 3100-11, U.S. Department of Interior, Bureau of Land Management, June 1988. Sur plusional stipulations are standardized into three types (Uniform Format for Oil and Gas Leasing Stipulations, March 1989). No Surface Occupancy (NSO) stipulations are intended for use only when other stipulations are determined insufficient to adequately protect the public interest.

Nongame

Species of animals which are not managed as a sport hunting resource.

Nonpoint Source Pollution

Sources from which the pollutants discharged are: (1) induced by natural processes, including precipitation, seepage, percolation, and runoff; (2) not traceable to any discrete or identifiable facility; and, (3) better controlled through the utilization of Best Management Practices, including process and planning techniques. This includes natural pollution sources not directly or indirectly caused by man.

Notice of Staking (NOS)

Prior to filing a complete Application for Permit to Drill (APD), an Operator may wish to file a Notice of Staking (NOS). Under this procedure, the site is surveyed and staked, and the on-site inspection is used to provide information to the Operator prior to the Operator committing time and money in preparing an APD which might not reflect agency concerns.

See No Surface Occupancy.

A natural accumulation of oil and gas in the subsurface. Oil and gas may be present in two or more reservoirs at different depths.

A Federal Oil and Gas Lease is a legal document that gives the lease holder the right to explore for and develop any oil and gas that may be present under the area designated. The rights granted in the lease are modified by standard and supplemental stipulations, requirements which the lessee must meet, for protection of resources, land, and other land uses or users.

A geologic layer containing hydrocarbons and enough porosity and permeability so that the hydrocarbons can be produced.
Partial Retention (VQO)
See Visual Quality Objective (VQO)

Particulates
Small particles suspended in the air and generally considered pollutants.

Patches
Areas of vegetation that are relatively homogeneous internally but differ from their surroundings (the matrix or other patches).

Permitted Grazing
Use of a National Forest range allotment under the terms of a grazing permit.

Pioneer Plants
Plants that first inhabit a denuded area (secondary plant succession) or a newly formed area. (Primary plant succession)

Plant Succession
Plants which are more adapted to present environmental conditions replacing plants which are less adapted.

Play
An area of anticipated or known oil and gas reserves.

Plays
The flat floored bottom of an undrained desert basin that becomes at times a shallow lake.

Policy
A guiding principle upon which is based a specific decision or set of decisions.

Prehistoric Site
Archaeologic sites associated with American Indians and usually occurring before contact with Europeans.

Preservation (VQO)
See Visual Quality Objectives.

Prevention of Significant Deterioration of Air Quality (PSD)
A classification established to preserve, protect, and enhance the air quality in National Wilderness Preservation System areas in existence prior to August 1977 and other areas of National significance, while ensuring economic growth can occur in a manner consistent with the preservation of existing clean air resources. Specific emission limitations and other measures, by class, are detailed in the Clean Air Act (42 U.S.C. 1875 et 15c).

Primary Plant Succession
Plant succession that occurs on a newly formed area of land.

Primary Range
Areas which animals prefer to use and graze when management is limited. The area on which overuse will occur before secondary range is used when animal movement is not controlled.

Primitive Recreation Setting
See Recreation Opportunity Spectrum (ROS).

Public Domain Minerals
Mineral rights that have always been the property of the United States.

Range Allotment
A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range Allotment Management Plan. It is the basic land unit used to facilitate management of the range resource on National Forest System and associated lands administered by the Forest Service.

Reasonably foreseeable Development Scenario (RFDS)
The oil and gas leasing regulations 36 CFR 223.102 (c), require a leasing analysis be conducted and the amount and type of leasing activity that is reasonably foreseeable as a consequence of conducting a leasing program consistent with that described in the proposal for each alternative. The Reasonably foreseeable Development Scenario is in APPENDIX C for this EIS.

Reclamation
Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore it for use.

Recreation Capacity
The number of people that can take advantage of a recreation opportunity at any one time without substantially diminishing the quality of the experience that is sought.
Recreation Opportunities

The combination of recreation settings, activities and experiences provided by an area.

Recreation Opportunity Spectrum (ROS)

A system of classifying an area by the recreation opportunities and experiences it can provide (see U.S. Department of Agriculture, Forest Service, ROS User's Guide, 1981).

Primitive—Recreation settings with a very high probability of experiencing solitude, freedom, closeness to nature, tranquility, self-reliance, challenge and risk in an unmodified natural environment. Access to travel is non-motorized on trails or cross-country.

Semi-Primitive Non-Motorized—Recreation settings with a high probability of experiencing solitude, closeness to nature, tranquility, self-reliance, challenge and risk in a natural appearing environment. Access and travel is non-motorized on trails, some primitive roads or cross country.

Semi-Primitive Motorized—Recreation settings with a moderate opportunity for solitude, tranquility, and closeness to nature. A high degree of self-reliance, challenge, and risk in using motorized equipment in a predominantly natural appearing environment is required.

Roaded Natural—Recreation settings with opportunity to affiliate with other users in developed sites but with some chance for privacy. Self-reliance on outdoor skills is only moderately important. Little challenge and risk is required in a mostly natural appearing environment as viewed from sensitive roads and trails. Access and travel is conventional motorized including sedan and trailers, RVs and some motor homes.

Rural—Recreation settings where opportunity to observe and affiliate with other users is important as is convenience of facilities. Self-reliance on outdoor skills is of little importance. There is little challenge and risk. The natural environment is culturally modified yet attractive (i.e. pastoral farmlands). Alterations in the backdrop may range from not obvious to dominant. Access and travel facilities are for individual intensified motorized use.

Urban—Recreation settings where opportunity to observe and affiliate with others is very important as is convenience of facilities and recreation opportunities. Outdoor skills, risk and challenge are unimportant except in competitive sports. The environment is urbanized with dominant structures, traffic lights and paved streets. The backdrop may be natural appearing. Access and travel facilities are highly intense, motorized and often with mass transit supplements.

Recreation Visitor Day (RVD)

A measure of recreation visitor use equivalent to 12 hours of recreation visitor use (for example: 1 RVD equals 12 visitors for 1 hour apiece, or 1 visitor for 12 hours or any combination thereof).

Reform Act of 1987

The Federal Onshore Oil and Gas Leasing Reform Act of 1987.

Reserve Pit

1. Usually an excavated pit that may be lined with plastic, that holds drill cuttings and waste mud.
2. Term for the pit which holds the drilling mud.

Retention (VQO)

See Visual Quality Objectives (VQO).

Revegetation

The re-establishment and development of self-sustaining plant cover. On disturbed sites, human assistance will speed natural processes by seed bed preparation, reseeding and mulching.

RFD

See Reasonably Forseeable Development Scenario.

Rig (short for drill rig)

The mast, draw works, and attendant surface equipment of a drilling or work over unit.

Riparian Areas

Geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems.

Riparian Ecosystem

A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.
Rooded Natural Recreation Setting

See Recreation Opportunity Spectrum (ROS).

Rookery

The identifiable breeding place, or assembling place, or haunt of an assemblage of birds, e.g., mountain plover, concentration of nesting individual birds.

Rural Recreation Setting

See Recreation Opportunity Spectrum (ROS).

Saline Water

Water containing high concentrations of salt.

Secondary Recovery

A process whereby pressure in an oil and gas reservoir is artificially maintained or increased so that more oil can be recovered. This is usually done by injecting water or natural gas into the reservoir.

Sediment

Solid mineral or organic material that is transported by air, water, gravity, or ice.

Seismic Exploration

Seismic exploration is used to map underground geological features to obtain information on the earth's subsurface and to locate areas where accumulations of oil and gas might occur.

Seismic waves, generated at or near the surface, penetrate the earth's crust and reflect from subsurface rock layers back to the surface. The geophysicist receives a printed record or seismograph from which is measured the depth to various strata and from which subsurface structures with a potential for oil and gas accumulation can be determined such as faults, anticlines, and folds.

Portable- Where access limitations, topography, or other restraints prevent use of trucks, portable operations can be performed. Two portable techniques exist for collecting data. These are:

1. Surface charge programs involve the detonation of a series of charges placed directly on the ground, on snow, or on a variety of stakes or platforms. As many as ten, five pound charges (25-50 pounds of explosives) would be detonated at shot points located at intervals along the seismic line. All necessary equipment to conduct the operation is transported by helicopter and then conveyed by foot travel.

2. Various kinds of portable drills can be backpacked or delivered by helicopter to the area. A shallow subsurface portable program would involve drilling a pattern of approximately 16 holes, per mile of line, about 4 inches in diameter and up to 50 feet deep. At this depth, a 10 to 100 pound charge of explosive is placed and detonated. Recording cables and geophones are laid out by foot travel.

With both of these portable techniques, shock waves generated by detonation are received and transmitted via geophones and cable to a recording device. Portable methods are generally used on rough terrain.

Conventional: The conventional method of collecting seismic data includes the use of truck mounted drills and vehicle-supported crews and generally involves off-road travel. This technique involves drilling 5 to 18, 5-inch diameter holes per mile to a depth of 180 to 200 feet. At this depth, a 10 to 50 pound explosive charge is placed and detonated. Shock waves are received and transmitted via geophones and cable to a truck mounted recording device. Due to terrain restrictions, this method has limited application on the Forest.

Vibroseis: The vibroseis technique involves using truck-mounted hydraulic pads which generate energy waves through vibration rather than explosives. The vibrator method typically consists of four large trucks each equipped with a vibrator (a steel slab weighing about three tons) mounted between the front and back wheels. The vibrator pads (about 4 feet square) are lowered to the ground and vibrators on all trucks are triggered electronically from the recorder truck. Energy waves are received and transmitted via cable and geophones to a recorder truck. After the information is recorded, the trucks move forward a short distance and the process is repeated. The vibroseis operation is usually limited to roads and gentle terrain.

Seismic Operations

Use of explosive or mechanical thumpers to generate shock waves that can be read by special equipment to indicate subsurface conditions.

Semi-Primitive Motorized Recreation

See Recreation Opportunity Spectrum (ROS).

Senal

A biotic community which is development, a transitory stage in an ecologic succession.

Severe Winter Relief Range

Wildlife winter range that lacks habitat characteristics which would make it attractive or capable of supporting major portions of the population during normal years but is used by and allows at least a significant portion of the population to survive the occasional extremely severe winter (two years in ten).
Small Game
Birds and small mammals normally hunted or trapped.

Soil Productivity
The capacity of a soil to produce a specific crop such as fiber and forage, under defined levels of management. It is generally dependent on available soil moisture and nutrients and length of growing season.

Sour Well
A condition caused by the presence of hydrogen sulfur compounds in an oil or gas well.

Special Stipulations
Terms and conditions of use attached to leases where needed to protect specific resources or uses on National Forest System lands.

Species
One of four scales of biological diversity (landscape, community, species and genetic). At the species scale, biological diversity is described using species richness (kinds of species) or species evenness (distribution, abundance or importance of different species). Species richness or evenness can be evaluated in the context of the community or landscape scales of biological diversity. Processes which affect species biological diversity include competition, dispersal, and all other processes which affect population numbers. Function of species (populations) include biomass production and nutrient cycling which contribute to overall community and landscape functions.

Stratigraphic Trap
A condition of the rock strata where the oil bearing formation laterally changes to another rock type forming a pocket or trap where oil can collect.

Stipulations
Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to the lease at the discretion of the surface management agency to protect valuable surface resources or uses.

Strutting Grounds
Areas used by sage grouse for displays during the mating season.

Succession
A process where one community is replaced by another over time.

Surface Use Plan of Operations (SUPO)
As required by 36 CFR 228.106, an operator must obtain an approved surface use plan of operations before conducting operations that will cause surface disturbance. The SUPO should discuss the type, size, and intensity of the proposed operations. The amount of detail is determined by the sensitivity of the surface resources.

Sweet Well
An oil or gas well lacking sulfur and any significant amount of hydrogen sulfide or mercaptans.

Tank Battery
A group of production tanks that store crude oil in the field.

Taxa
Classifications of plants or animals; i.e. species, genus, family; singular taxon.

TBNQ
Thunder Basin National Grassland, administered by the U.S. Department of Agriculture, Forest Service.

Threatened Species
Any species, plant or animal, which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.

Timing Limitation
A type of supplemental stipulation used to modify standard lease terms in the Offer to Lease and Lease for Oil and Gas, Form 3100-11, U.S. Department of Interior, Bureau of Land Management, June 1988. Supplemental stipulations are standardized into three types (Uniform Format for Oil and Gas Leasing Stipulations, March 1988). Timing Limitation stipulations prohibit oil and gas exploration and development activities for specific time periods but for less than a year.
Visual Management System

A management system that establishes the "visual landscape" as a basic resource, treated as an essential part of the land. The visual management system provides a framework to inventory the visual resource and provides measurable standards for management.

Visual Quality Objective (VQO)

A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape.

Preservation: In general, human activities are not detectable to the visitor.
Retention: Human activities are not evident to the casual Forest visitor.
Partial Retention: Human activities may be evident, but must remain subordinate to the characteristic landscape.
Modification: Human activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in middle-ground or background.
Maximum Modification: Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.
Enhancement: A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists.

Visual Resource

The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

Wetlands

Those areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs.
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