

APPENDIX O

Monitoring Plan

INSPECTION & ENFORCEMENT

During pad construction, the site will be monitored to ensure compliance with the terms of the drilling permit and the well site construction plan.

Pit liner installation will be witnessed to ensure proper preparation of the construction material upon which the liner will be laid, and that the liner meets specifications described in the standard management practices section (Appendix B).

Conductor casing cementing will be witnessed to ensure shallow ground waters (less than 120 feet) are protected.

Surface casing cementing will be witnessed to ensure all fresh water zones are isolated from the drilling medium and other water zones, and that the casing installed complies with the drilling permit specifications.

Blow out prevention equipment will be tested in accordance with regulations. Testing will be witnessed monthly to ensure the equipment functions safely at the rated operational pressure.

Drilling operations will be inspected weekly to ensure compliance with federal regulations and conditions outlined in the drilling permit and hydrogen sulfide contingency plan.

All plugging and plug back operations will be witnessed to ensure fresh water and producing formations are isolated from each other and from the surface.

A visitation log will be maintained by the operator at each producing well site.

All wells will be inspected at least monthly after initial production for the first six months.

Because these wells are classified as high priority, they will be inspected at least annually for compliance with all environmental, technical, and mitigative requirements and regulations.

WILDLIFE MONITORING PROGRAM - BLACKLEAF GAS FIELD

Introduction

The Interagency Rocky Mountain Front Monitoring and Evaluation

Program, initiated in 1980, resulted in development of the "Wildlife Guidelines" (BLM, 1987). The Montana Department of Fish, Wildlife and Parks, U.S. Fish and Wildlife Service, U.S. Forest Service, and the Bureau of Land Management were members of this program. This task force collectively administered wildlife studies and developed the guidelines which have an emphasis on mitigating effects from oil and gas activities.

These guidelines were a basis for alternative development. They also provide most of the mitigation for wildlife in the Blackleaf EIS. The agencies involved have the same collective need to validate the guidelines as the Blackleaf gas field develops as they did when the guidelines were developed from 1980-1987. Therefore, these agencies have once again agreed to form a task force to administer and design wildlife studies which will monitor the long-term effects over the life of this field, projected to be 25 or more years.

Purpose of Monitoring

The purpose of this monitoring shall be threefold:

1. To determine the extent of wildlife displacement, in relation to time and space, caused by development of the Blackleaf Gas Field.
2. To monitor wildlife population parameters to determine changes brought about by development and operation of the Blackleaf Gas Field.
3. To monitor changes in habitat use patterns by wildlife brought about by operation of the gas field.

Organizational Structure

The Blackleaf Gas Field Monitoring Task Force will be comprised of either the administrator or an appointed representative from each of the four agencies listed above. These individuals will form the Executive Committee and will be responsible for:

1. Approving initial monitoring program studies.
2. Approving changes to monitoring programs based on study priorities and availability of funding levels.
3. Making decisions, as appropriate, to ensure the continued operation of the Blackleaf gas field monitoring program.
4. Periodically reviewing the wildlife monitoring program and agreements concerning the program. Make needed revisions and/or additions to such agreements.

5. Ensuring administrative communication between agencies, organizations and companies involved with regard to on-going or planned resource uses and activities (especially gas field activity) and the monitoring program within the program area.
6. Approving/disapproving changes in wildlife guidelines or management practices as a result of monitoring study findings and Technical Committee recommendations.

A Technical Committee will be comprised of one or more representatives from each of the agencies represented on the Executive Committee. In addition, other agencies, organizations, or companies which are contributing financial or technical assistance to this monitoring program may wish to be represented on the Technical Committee. The Technical Committee will be responsible for:

1. Developing the Executive Committee annual budgets and study proposals within the framework of this monitoring program as described below in the "Monitoring Levels" section.
2. Providing critique and suggestions on study design and other technical aspects of active monitoring studies to the principal field investigator(s).
3. Preparing and presenting brief progress reports on active monitoring studies as requested by the Executive Committee.
4. Providing site specific information and recommendations as requested by the Executive Committee or participating units in relation to proposed resource uses or development activities.
5. Maintaining technical communication between agencies, organizations and companies involved with regard to approved on-going or planned monitoring activities.
6. Reviewing and evaluating the current wildlife guidelines and management practices when results of wildlife monitoring studies become available. Recommend any necessary improvements/changes to the Executive Committee. Consult additional technical experts who should be involved in evaluation of data.

Monitoring Levels

An interagency meeting was held December 3, 1990 to determine what monitoring would be required to document changes, if any, in wildlife parameters and habitat use patterns; and to determine the effectiveness of the Wildlife Guidelines. It was agreed that three different levels of monitoring would occur, depending on the kind and extent of oil and gas activity occurring in the area encompassed by the Birch/Teton Bear Management Unit, and primarily

the area of the Blackleaf Gas Field. The monitoring levels were defined as existing, low and high.

A. Existing Monitoring

Some monitoring will occur in this portion of the Rocky Mountain Front, regardless of additional oil and gas activity. This ongoing monitoring measures wildlife parameters and habitat use that could be changing because of such activity. Ongoing monitoring includes:

1. Traditional seasonal ungulate surveys deer, elk, bighorn sheep, Rocky Mountain goat, conducted by the Montana Department of Fish, Wildlife and Parks.
2. Ongoing elk study of Blackleaf-Dupuyer elk herd financed by the Boone and Crockett Club and undertaken by Montana Department of Fish, Wildlife and Parks personnel. This study involves radio-collared animals.
3. Yearly monitoring of grizzly bear parameters, especially females with young, as specified in the 1990 draft Grizzly Bear Recovery Plan.
4. Monitoring of grizzly bears trapped and radio-collared because of damage complaints.
5. The Fish and Wildlife Service has initiated a state-wide wolf monitoring program designed to detect wolf pack formation and to monitor their numbers and distribution. The program involves three phases: (1) detection of wolves or their sign, using a standardized observation system; (2) confirmation of pack activity using surveys; and (3) trapping and radio-collaring pack members. Current Forest Service monitoring on the Rocky Mountain Front is a part of this state-wide program.

B. Low Level of Monitoring

This level of monitoring would be "triggered" by either of the following industry activities; (1) For any activity, road construction, pipeline, drilling, etc., permitted that does not adhere to the Wildlife Guideline's timing window for a species, the effects on that species will be monitored, or (2) if two wells (either exploratory or step out) are drilled concurrently, the effects on wildlife will be monitored. Three wells cannot be drilled concurrently as dictated by the EIS and the ESA Biological Opinion. The study design on monitoring will be site specific and will be the responsibility of the Technical Committee. For this level of monitoring the surface management agency permitting the

activity will usually be the lead for conducting the monitoring.

No special monitoring effort will be required for any permitted industry activity when total adherence to the wildlife "guidelines" occurs; however, this will not prevent the Technical Committee from encouraging additional monitoring study.

C. High Level of Monitoring

This level of monitoring will measure the effects on all wildlife species that were studied in the original "Wildlife Guidelines" program from an active (year round) gas field in production. It will be "triggered" when six producing wells are brought on line, or, in other words, when greater than 50% of the theoretical gas field has been developed. The goal of these higher level monitoring studies will be to identify responses (determine sensitivity) of species to field development, which may require radio-tracking.

The Technical Committee shall be responsible for designing the monitoring studies needed or for preparing the appropriate research study proposals for contract. Each study will be designed to prove or disprove specific hypothesis of effects so that conclusions can be reached concerning effectiveness of wildlife guidelines and management strategies. From these results the Technical Committee can make recommendations to the Executive Committee on possible changes in the Wildlife Guidelines and operating procedures which will lessen impacts to wildlife populations.

So that monitoring does not continue indefinitely (for the life of the field) without results being reported and recommendations being made, the study design for each species will adhere to the following or similar schedule: trapping and radio-collaring will occur in the initial 2 years, monitoring will occur for at least 2 to 3 years, and 1 year will be allowed for data analysis and report writing.

Funding for this level of monitoring should be a shared responsibility between industry (operator) and the surface management agencies. Additional aid from other groups, either industry or environmental related, will be sought and encouraged.

One cost effective means of conducting this level of monitoring would be to sponsor such a program through the University system as a series of graduate thesis studies.

GLOSSARY

AIRSHED.

Class I Area. Any area which is designated for the most stringent degree of protection from future degradation of air quality. The Clean Air Act designates as mandatory Class I areas each national park over 6,000 acres and each national wilderness area over 5,000 acres.

Class II Area. Any area cleaner than federal air quality standards which is designated for a moderate degree of protection from future air quality degradation. Moderate increases in new pollution may be permitted in a Class II area.

Class III Area. Any area cleaner than federal air quality standards which is designated for a lesser degree of protection from future air quality degradation. Significant increases in new pollution may be permitted in Class III area.

ANTICLINE. An arched, inverted-trough configuration of folded and stratified rocks.

ALLOTMENT. An area of land where one or more livestock operators graze their livestock. Allotments generally consist of BLM lands but may also include state owned and private lands. An allotment may include one or more separate pastures. Livestock numbers and seasons of use are specified for each allotment.

ALLOTMENT MANAGEMENT PLAN (AMP). A written program of livestock grazing management, including supportive measures if required, designed to attain specific management goals in a grazing allotment.

AMBIENT AIR QUALITY STANDARDS. The permissible level of various pollutants in the atmosphere, as contrasted with emission standards which are the permissible levels of pollutants emitted by a given source.

ANIMAL UNIT MONTH (AUM). A standardized measurement of the amount of forage necessary for the complete sustenance of one animal for one month; also the measurement of the privilege of grazing one animal for one month.

BACKTHRUST. In general, a backwards movement or movement opposite the general direction of thrust movement. In the Blackleaf area, the general movement was from west to east; backthrusting from east to west.

BEAR MANAGEMENT UNIT (BMU). An analysis area delineated using criteria for provision of sufficient constituent elements and effective habitat to meet a subpopulation goal for adult female grizzlies, general fit of movement patterns observed for radio-collared grizzlies, and similarities in mountain orientation and topography as it influences forage richness, movements, and travel corridors.

CONFIRMATION WELL. The second producer in a new field, following the discovery well.

CRITICAL HABITAT. Any habitat, which if lost, would appreciably decrease the likelihood of the survival and recovery of a threatened or endangered species, or a distinct segment of its population. Critical habitat may represent any portion of the present habitat of a listed species and may include additional areas for reasonable population expansion. Critical habitat must be officially designated as such by the Fish and Wildlife Service or National Marine Fisheries Service.

CRUCIAL WILDLIFE HABITAT. Parts of the habitat necessary to sustain a wildlife population at critical periods of its life cycle. This is often a limiting factor on the population, such as breeding habitat, winter habitat, etc.

DRY HOLE. Any well that does not produce oil or gas in commercial quantities.

ENDANGERED OR THREATENED SPECIES. Determined for plants and animals by one or a combination of the following factors:

1. The present or threatened destruction, modification or curtailment of a species habitat or range.
2. Over-utilization of a species for commercial, sporting, scientific or educational purposes.
3. Disease or predation of the species.
4. The inadequacy of existing regulatory mechanisms.
5. Other natural or human caused factors affecting a species' continued existence.

EXPLORATION WELL. A well drilled in an area where no oil and gas production exists.

HELD BY EXISTING LEASES. The federal mineral estate currently leased for oil and gas.

HELD BY PRODUCTION. Leases are issued for generally a 10 year period; however, if the lease is producing, the terms of the lease are extended for the life of the production.

LEKS. A display or breeding area. In the case of sharp-tailed grouse this area is commonly called a dancing ground.

MOUNTAIN GOAT HABITAT (as per Joslin, 1986).

Occupied Yearlong — The heart of the habitat on the RMF. It is used yearlong and contains all known kidding — nursery areas and breeding areas.

Suitable Low Occupancy — Possesses all the environmental features of occupied habitat, but mountain goats have not been observed in these areas.

Transitional — By virtue of its juxtaposition with occupied and suitable areas, is used by goats primarily for travel, although some mineral licks do occur there.

Mineral Licks — Are more than simply a location where goats congregate to lick salt; they are important physiographic features which influence home range size and configuration of each goat using the area.

NORTHERN CONTINENTAL DIVIDE ECOSYSTEM. The large area in northern Montana which contains occupied grizzly bear habitat. The Rocky Mountain Front is part of this ecosystem.

NOTICE TO LESSEE-2B. Notice to Lessees and Operators of Federal and Indian Oil and Gas leases explaining the requirements for the handling, storing, or disposing of water produced from oil and gas wells on such leases.

NOXIOUS PLANT. According to the Federal Noxious Weed Act (PL 93-629), a weed that causes disease or has other adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

OUTSTANDING NATURAL AREA. Areas of outstanding splendor, natural wonder or scientific importance that merit special attention and care in management to ensure preservation in their natural condition. These areas are usually undisturbed, and may contain rare botanical, geological, or zoological values which are of interest for scientific research purposes. Access roads and public use facilities are normally located on the periphery of the area.

PRIMARY MULE DEER WINTER RANGE. Areas where a herd segment tends to concentrate during the winter, principally because it is a preferred habitat of the lowest available elevation that provides sufficient escape and thermal cover.

PRODUCTION UNIT. Several leases that are operated by one company.

RANGE CONDITION. The present state of vegetation of a range site in relation to the climax plant community of that site. It is an expression of the relative degree to which the kinds, proportions and amounts of plants in a plant community resemble that of the climax plant community for that site. Range condition is basically an ecological rating of the plant community. Air-dry weight is the unit of measure used in comparing the composition and production of the present plant community with that of the climax community.

RANGE DEVELOPMENT. A structure, excavation, treatment or development to rehabilitate, protect or improve public lands to advance range betterment. "Range Development" is synonymous with "Range Improvement."

RANGE FACILITIES. Any structure or excavation such as water sources, shade sources, etc. designed to facilitate range management.

RANGE SITE. A distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. A range site is the product of all the environmental factors responsible for its development. It is capable of supporting a native plant community typified by an association of species that differs from that of other range sites in the kind or proportion of species or in total production.

RANGE TREND. The direction of change in range condition and soil.

REVERSE FAULT BOUNDED HORST. A block of the earth's crust that has been uplifted along faults relative to the rocks on either side.

RIPARIAN. Zones along streams, ponds, or other water bodies characterized by plants and animals requiring substantial amounts of water. This includes floodplains, wetlands and all areas within approximately 100 feet of the normal high waterline.

ROADED NATURAL. A term used to classify recreation opportunities where human activities create an environment with moderate evidences of the sights and sounds of people. Such evidences may harmonize with the natural environment. Some facilities for motorized use are present.

SECONDARY MULE DEER WINTER RANGE. The remainder of the total winter range area that receives less use than the primary portion and which probably does not have as desirable habitat characteristics as the primary range.

SEMI-PRIMITIVE MOTORIZED. A term used to classify recreation opportunities where human activities create or maintain an area or site that is characterized by an essentially unmodified natural environment. Facilities are provided for challenging motorized experiences.

SEMI-PRIMITIVE NON-ROADED. A term used to classify recreation opportunities where human activities maintain an area in an essentially unmodified natural environment, without roads.

SPECIAL STIPULATIONS. Conditions or requirements attached to a lease or contract that apply in addition to standard stipulations (see below). They frequently provide additional protection of the environment from resource developments, e.g., coal mining, oil and gas development. Special stipulations become effective by their specification in an RMP.

SPECIES OF SPECIAL INTEREST OR CONCERN. Species not yet listed as "endangered or threatened" but whose status is being reviewed because of their widely dispersed populations or their restricted ranges. A species whose population is particularly sensitive to external disturbance.

STABILIZED. To reduce accelerated erosion rates to natural geologic erosion rates.

STANDARD STIPULATIONS. Conditions or requirements attached to a lease or contract that detail specific actions to be taken or avoided during resource development, e.g., coal mining, oil and gas development. They usually provide basic protection of the environment.

STEP-OUT WELL. A well drilled adjacent to or near a proven well to ascertain the limits of the reservoir.

STRATA. Distinct, usually parallel beds of rock. An individual bed is a stratum.

STRATIFICATION. Natural layering or lamination characteristic of sediments and sedimentary rocks. (See Strata).

STRUCTURE. A formation of interest to drillers. For example, if a particular well is on the edge of a structure, the well bore has penetrated the structure near its periphery.

SYNCLINE. A down warped, trough-shaped configuration of folded, stratified rocks; the reverse of an anticline.

THREATENED SPECIES. A species that the Secretary of Interior has determined to be likely to become endangered within the foreseeable future throughout all or most of its range. See also "Endangered or Threatened Species."

TRANSITIONAL MULE DEER RANGE. These ranges can be the same as summer range for many deer that summer east of the Continental Divide. Animals which summer west of the Continental Divide appear to move to

transition areas east of the Divide with the first major fall storms. The major use of transition ranges is during October — December when they apparently provide a measure of security during hunting season. Spring movement (May — June) routes pass through the transition areas indicating that these areas may serve as fawning sites for some does.

THRUST FAULT. A fault resulting from compression in which older rocks are generally thrust over younger rocks.

THRUST SHEET. The geologic formations above the plane of the thrust fault.

TRANSITION RANGE. Range that is suitable for use of a nonenduring or temporary nature over a period of time.

TRAP. Layers of buried rock strata that are arranged so that petroleum accumulates in them.

UNNECESSARY OR UNDUE DEGRADATION. Surface disturbance greater than what would normally result when an activity is being accomplished by a prudent operator in usual, customary, and proficient operations of similar character and taking into consideration the effects of operations on other resources and land uses, including those resources and uses outside the area of operations.

VALID EXISTING RIGHTS. Legal interests that attach to a land or mineral estate that cannot be divested from the estate until that interest expires or is relinquished.

VISUAL ABSORPTION CAPABILITY. A measurement of the landscapes potential to accept alterations without significant loss of natural landscape character.

VISUAL CONDITION RATING. Existing visual condition is the present state of visual alteration which is measured in degrees of deviation from the natural appearing landscape.

VISUAL QUALITY OBJECTIVES. A desired level of excellence based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration of the characteristic landscape.

Preservation — A VQO that provides for ecological changes only.

Retention — A VQO that in general means mans activities are not evident to the casual visitor.

Partial Retention — A VQO that in general means mans activities may be evident but must remain subordinate to the characteristic landscape.

Modification — A VQO meaning mans activity may dominate the characteristic landscape, but must, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middle ground.

Maximum Modification — A VQO meaning mans activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

LITERATURE CITED

- Andryk, T.A. 1983. Ecology of bighorn sheep in relation to oil and gas development along the east slope of the Rocky Mountains, northcentral Montana. M.S. Thesis, Mont. State Univ., Bozeman. 100 pp.
- Aune, K. "Draft" Final Report. Rocky Mountain grizzly bear monitoring and investigation, Mont. Dept. Fish, Wildlife and Parks, Helena.
- Aune, K. 1985. Rocky Mountain Front grizzly bear monitoring and investigation. Mont. Dept. Fish, Wildlife and Parks. Helena. 138 pp.
- Aune, K. and Brannon, M. 1987. East Front Grizzly Studies. Mont. Dept. Fish, Wildlife and Parks, Helena. 195 pp.
- Aune, et al. 1986. Rocky Mountain Front grizzly bear monitoring and investigation. Mont. Dept. Fish, Wildlife, and Parks, Helena. 175 pp.
- Aune, Madel, and Hunt. 1986. Rocky Mountain grizzly bear monitoring and investigation. Mont. Dept. Fish, Wildlife, and Parks. Helena. 175 pp.
- Aune and Stivers, T. 1981. Rocky Mountain Front grizzly bear monitoring and investigation. Mont. Dept. Fish, Wildlife and Parks, Helena. 50 pp.
- _____. 1982. Rocky Mountain Front grizzly bear monitoring and investigation. Mont. Dept. Fish, Wildlife and Parks, Helena. 143 pp.
- _____. 1983. Rocky Mountain Front grizzly bear monitoring and investigation. Mont. Dept. Fish, Wildlife and Parks. Helena. 180 pp.
- _____. 1985. Ecological studies of the grizzly bear in the Pine Butte Preserve. Mont. Dept. Fish, Wildlife and Parks, Helena. 154 pp.
- Aune, Stivers, and Madel, M. 1984. Rocky Mountain grizzly bear monitoring and investigation. Mont. Dept. Fish, Wildlife and Parks, Helena. 238 pp.
- Bromley, M. 1985. Wildlife management implications of petroleum exploration and development in wildland environments. General Technical Report INT-191, U.S.D.A., Forest Service, Intermountain Research Station, Ogden, UT. 42 pp.
- Clarkson, E.N.K. 1979. Invertebrate paleontology and evolution. George Allen and Unwin, London, England.
- Clayton, J.L. Mudge, M.R. Lubeck, Sr. Carlos M., and Daws, T.A. Hydrocarbon source-rock evaluation of the Disturbed Belt, northwestern Montana. Rocky Mountain Assoc. of Geologists, Geologic Studies of the Cordilleran Thrust Belt, Vol. II, p. 777.
- Dood, A.R. et al. 1986. Final Programmatic EIS, the grizzly bear in northwestern Montana, Mont. Dept. of Fish, Wildlife and Parks, Helena. 287 pp.
- Downey, S. 1984. Blackleaf Canyon Field and Knowlton Field, Teton County, Montana; in northwest Montana and adjacent Canada 1984 field conference and symposium, Montana Geological Society. 325-330 pp.
- DuBois, K. 1984. Rocky Mountain Front raptor survey — December 1982-November 1983. U.S. Fish and Wildlife Service. 135 pp.
- Erickson, G.L. 1972. The ecology of Rocky Mountain bighorn sheep in the Sun River area of Montana with special reference to summer food habits and range movements. M.S. Thesis, Mont. State Univ., Bozeman. 50 pp.
- Flath, D.L. 1984. Vertebrate species of special interest or concern. Mont. Dept. Fish, Wildlife and Parks, Helena. 76 pp.
- Frisina, M.R. 1974. Ecology of bighorn sheep in the Sun River area of Montana during fall and spring. M.S. Thesis, Mont. State University, Bozeman. 68 pp.
- Geist, V. 1970. A behavioral approach to the management of wild ungulates. In: Duffey, E., Watt, A.S., eds. The scientific management of animal and plant communities for conservation: eleventh symposium British Ecological Society. Oxford: Blackwell Scientific Publications; 1970: 413-424.
- Geist, V. 1971. Bighorn sheep biology. The Wildlife Society News. 136:61.
- Hook, D.L. 1984. Rocky Mountain Front wildlife studies. Proj No. FW-4-R-4. Job No. 1a. Montana Dept. Fish, Wildlife and Parks, Wildlife Div, Helena. 94 pp.
- _____. 1986. A mountain goat population decline and energy exploration along Montana's Rocky Mountain Front, etc.
- Hook, D., Olson, G., and Irby, L., 1982. East Front wildlife monitoring study: mule deer, annual report, No. 81-Mar. 82. MDFW&P, Ecological Services Div., Helena. 13 pp.
- Horner, John R., 1984. The nesting behavior of dinosaurs. Scientific American, Vol. 250, p. 130.
- Hornocker, M.G., and H.S. Hash. 1981. Ecology of the wolverine in northwestern Montana. Can. J. 2001. 59:1286-1301.

- Ihse, H.B. 1982. Population ecology of mule deer with emphasis on potential impacts of gas and oil development along the east slope of the Rocky Mountains, north central Montana. M.S. Thesis, Unpubl. Montana State University, Bozeman. 85 pp.
- Ihse-Pac, H., et al. 1988. "Ecology of the Mule Deer, *Odocoileus hemionus*, along the east front of the Rocky Mountains, Montana. Canadian Field-Naturalist 102(2): 227-236.
- Irby, L.R. and Mackie, R.J. 1983. Mule deer monitoring, Rocky Mountain Front. Final Report, Montana Dept. of Fish, Wildlife and Parks, Helena. 9 pp.
- Johnson, E.H. 1984. Blackleaf Canyon Field and Knowlton Field, Teton County, Montana; in, northwest Montana and adjacent Canada 1984 Field Conference and Symposium, Montana Geological Society, 325-330 pp.
- Joslin, G.L. 1980. Mountain goat habitat management for the Cabinet Mountains Montana, MDFW&P, Ecological Services Div. and Kootenai National Forest, U.S.D.A. Forest Service. 122 pp.
- _____. 1981. Distribution and population characteristics of the Rocky Mountain goat along the east slope of the Rocky Mountains in northcentral Montana. Progress Report W-120-R-12 Study No. BG-6.0. Montana Dept. of Fish, Wildlife and Parks, Helena. 12 pp.
- _____. 1982. Montana mountain goat investigations along the East Front of the Rocky Mountains, Lewis and Clark National Forest. Progress Report. Ecological Services Division, Montana Dept. Fish, Wildlife and Parks in cooperation with Lewis and Clark National Forest, U.S.D.A. Forest Service. 69 pp.
- _____. 1983. Montana mountain goat investigations along the East Front of the Rocky Mountains, Lewis and Clark National Forest, Ecological Services Div., Montana Dept. Fish, Wildlife and Parks in cooperation with Lewis and Clark National Forest, U.S.D.A. Forest Service. 121 pp.
- _____. 1986. Montana mountain goat investigation, Rocky Mountain Front, Final Rep. Montana Dept. of Fish, Wildlife and Parks in cooperation with the U.S. Fish and Wildlife Service, and Bureau of Land Management. 169 pp.
- Kasworm, W.F., et al. 1980. "East Slope Rocky Mountain Front Mule Deer Study and Investigation Annual Report. Montana Dept. of Fish, Wildlife, and Parks. 25 pp.
- Kasworm, W.F. 1981. Distribution and populations characteristics of mule deer along the East Front, northcentral Montana. Unpubl. M.S. Thesis. Montana State University, Bozeman. 73 pp.
- Kasworm, W.F. and L.R. Irby. 1979. East Slope Rocky Mountain Front mule deer study and investigation, Annual Report. Montana Dept. of Fish, Wildlife and Parks, Bozeman. 14 pp.
- Koehler, G.M., et al. 1979. Lynx movements and habitat use in Montana. Canadian Field-Naturalist 93(4): 441-442.
- Layton, D.W., Cederwall, R.T., Rickel, Y.E., Shinn, J.H., O'Banion, K.D., 1984, Accidental releases of sour gas from wells and collection of pipelines in the Overthrust Belt. Calculating and Assessing Potential Health and Environmental Risks, Lawrence Livermore National Laboratory, Livermore, California.
- Mackie, R.J. and L. Irby. 1982 Mule Deer Monitoring Rocky Mountain Front, Annual Report, BLM, Great Falls. 4 pp.
- Marshall, S., 1983. Saltwater disposal consideration for oil and gas development along the Rocky Mountain Front. U.S.D.A. Forest Service, Unpublished Report.
- Mattson, I. and Ream, R.R. 1978. Current status of the gray wolf, *Canis lupus*, in the Rocky Mountain Front. Wolf Ecology Project. University of Montana, Missoula.
- Montana Geological Society. 1979. 30th Anniversary Field Conference, Sun River Canyon-Teton Canyon Montana Disturbed Belt. pg 20 (66 pp).
- Montana Deer Studies. 1980. Job. Prog. Rept., Fed Aid Proj. W-120-R-11. 204 pp. Multilith.
- Mudge, M.R. 1982. A resume of the structural geology of the Northern Disturbed Belt, northwestern Montana. Rocky Mountain Association of Geologist, Geologic Studies of the Cordilleran Thrust Belt, Vol. I., p. 91.
- _____. 1983. Bedrock geologic map of part of the Northern Disturbed Belt, Lewis and Clark, Teton, Pondera, Glacier, Flathead, Cascade and Powell Counties, Montana. U.S. Geologic Survey, Misc. Investigation Series I-1375.
- Mudge, Melville R., Earhart, Robert L. 1983. Bedrock Geologic Map of Part of the Northern Disturbed Belt, Montana. U.S. Geological Survey, Misc. Investigation Services I-1375, Description of Maps Units, Blackleaf and Marias River Formations.
- Mudge, M.R., Earhart, Robert L., Clayton, Jerry L., Michols, K.M., Campbell, Harry W., Scott, Douglas F. 1984, Geologic, sample locality, and mineral reserve potential maps of wilderness study areas east of the Bob Marshall Wilderness, Teton and Lewis and Clark Counties, Montana. U.S. Geological Survey, U.S. Bureau of Mines, Open File Report 84-0566.
- Mussehl, P., et al. 1971. Forest grouse, game management in Montana, Montana Dept. of Fish, Wildlife and Parks, publ., Game Mgmt. Div., Helena. pp. 143-151.

- Napier, N.J., 1982. Knowlton Gas Field, Teton County, Montana. Rocky Mountain Assoc. of Geologists, Geologic Studies of the Cordilleran Thrust Belt, Vol. II, p. 575.
- Olson, G., 1984. Interagency Rocky Mountain Front wildlife monitoring/evaluation program "Guidelines", Mule Deer Monitoring Data Summarization. pp. 52-57.
- Ream, R.R., 1985. Wolf ecology project annual report. July 1984-June 1985, School of Forestry, Montana Cooperative Wildlife Research Unit, University of Montana, Missoula.
- Ream, R.R., et al. 1985. Movement patterns of a lone wolf, *Canis lupus*, in unoccupied wolf range, southeastern British Columbia. Canadian Field-Naturalist 99(2). pp. 234-239.
- Robbins, J. 1986. Wolves across the border, *Natural History Magazine*. May, 1986. pp. 6-15.
- Schallenger, A. 1966. Food habits, range use and interspecific relationships of bighorn sheep in Sun River area, west central Montana. M.S. Thesis, Mont. St. Univ., Bozeman. 44 pp.
- _____, A. 1974. Reconnaissance survey of grizzly bear habitat Rocky Mountain Division, Lewis and Clark National Forest, USFS, Great Falls. 46 pp.
- _____, A. 1976. Grizzly bear habitat survey Badger Creek-South Fork Two Medicine Management Unit, Lewis and Clark National Forest, USFS, Great Falls, MT. 70 pp.
- _____, A. 1977. Review of oil and gas exploitation impacts on grizzly bears. In Transactions of 4th Int. Bear Conf., Cliff Martinka, ed. (In press)
- Schallenger, A. and Jonkel, C., 1978. Rocky Mountain East Front grizzly studies. 1977. First Annual Report. Border Grizzly Project. Sch. of For., University of Montana, Missoula. BGP Spec. Rpt. No. 18. 69 pp.
- _____, 1979. Rocky Mountain East Front grizzly studies, 1978. Univ. of Mont., Missoula. BGP Spec. Rpt. No. 27. 115 pp.
- _____, 1979a. Antelope Butte-Muddy Creek grizzly bear habitat. Univ. of Mont., Missoula. BGP Spec. Rept. No. 35.
- _____, 1980. Rocky Mountain East Front grizzly studies, 1979 Annual Report, University of Montana. BGP Spec. Rpt. No. 39. 209 pp.
- Skaar, P.D. 1985. *Montana bird distribution*. 3rd ed. as revised by D. Skaar, D. Flath, and L.S. Thompson. Monograph No. 3, Montana Academy of Sciences. Suppl. to Proc. Vol. 44. pp. 1-70.
- Stemp, R.E. 1983. Heart rate responses of bighorn sheep to environmental factors and harassment. MS. Thesis, Univ. of Calgary, Alberta. 314 pp.
- U.S.D.A. Forest Service. 1986. Lewis and Clark forest plan. Great Falls, MT.
- Forest Service et al., 1987. Cumulative effects analysis process for the Rocky Mountain Front Northern Continental Divide grizzly bear ecosystem. 41 pp.
- U.S.D.I. Bureau of Land Management et al., 1987. Interagency Rocky Mountain Front wildlife monitoring/evaluation program, "Management guidelines for selected species." Montana State Office, Billings, MT. 71 pp.
- Warne, J. 1984. General map of the Overthrust Belt from southern Alberta to Utah. Western U.S., personal communication with Chuck Frey.

INDEX

Affected Environment	47	Noise	81, 143
Air Quality	47, 95	Oil and Gas Resources	75, 135
Alternatives	13	Paleontological Resources	50, 96
Alternative 1	17	Peregrine Falcon	68
Alternative 2	19	Population Characteristics	84, 147, 150, 153, 156
Alternative 3	25	Preparers	178
Alternative 4	31	Process to Formulate Alternatives	11
Alternatives Eliminated	12	Public Finance	91, 148, 151, 154, 157
Aquatic	53	Purpose and Need	5
Bald Eagle	68	Raptors	62
Bighorn Sheep	58	Recreation	80, 141
Black Bear	62	Regional Economy	87
Climate	47	Review	179
Comments and Responses	180	Rocky Mountain Elk	57
Comment Code	180	Rocky Mountain Goat	58
Comments	183	Scope of the Analysis	5
Responses	188	Scoping and Issue Identification	175
Comparison of Alternatives	39	Setting	1
Consultation and Coordination	175	Short-Term Use and Long-Term Productivity	171
Cultural Resources	51, 96, 158	Social Conditions	92, 148, 151, 154, 157
Description of the Alternatives	13	Social and Economic Conditions	84, 146
Distribution List	176	Soils	51, 98, 158
Earnings	90, 147, 150, 153, 156	State and Federal Agencies and	
Employment	89, 146, 149, 152, 155	Elected Official Letters	201
Environmental Consequences	95	Responses	209
Existing Management	7	Structural Geology	72
Forest Service Sensitive Species	68	Surface Geology	72
Boreal Owl	68	Surface Water	75, 139, 158
Ferruginous Hawk	69	Teton Roadless Area	69, 129
Harlequin Duck	69	Apparent Naturalness	70
Western Big-Eared Bat	68	Characteristics and Wilderness Features	70
Westslope Cutthroat Trout	69	Forest Plan Recommendation	69
Furbearers	62	Manageability Boundaries	71
General Oil and Gas Scenario	12	Natural Integrity	70
Geology	72	Remoteness	70
Gray Wolf	68	Solitude	70
Grizzly Bear	63	Special Features	71
Groundwater	79, 139	Special Places/Values	71
Health and Safety	84, 145	Threatened and Endangered Species	63
Irreversible and Irretrievable Commitment		Topography	47
of Resources	168	Transportation System	81, 143
Issues	7	Unavoidable Adverse Impacts	168
Livestock	52, 103	Vegetation	51, 100, 158
Mitigation	158	Visual Resources	80, 142, 159
Mountain Lion	62	White-tailed Deer	57
Mule Deer	55	Wildlife	53, 106, 158