LIST OF APPENDICES – VOLUME III

Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management

FINAL

U.S. Department of the Interior
Bureau of Land Management

August 1997

Dear Reader,

After nearly two years of hard work, I am proud to announce the completion of "Standards for Rangeland Health and Guidelines for Livestock Grazing Management" for Idaho. These standards and guidelines, which provide the resource measures and guidance needed to ensure healthy, functional rangelands, went into effect on August 12 after they were approved by the Secretary of the Interior.

As you will recall, the BLM presented proposed standards and guidelines, developed by the 45 members of our three Resource Advisory Councils, to the public for feedback earlier this spring. We received 22 letters from individuals and organizations suggesting revisions. We provided a copy of each letter, as well as a summary of comments, to our Resource Advisory Councils and asked them to carefully consider each suggestion and provide us with recommendations for changes. We used our Resource Advisory Councils' recommendations, as well as input from the BLM Washington Office and the Department of the Interior, to develop the final standards and guidelines.

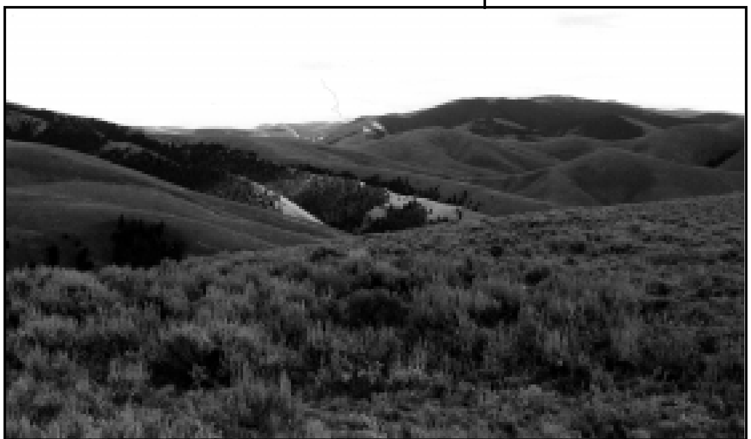
Subsequently, we conducted a comprehensive review of all of our existing land use plans in Idaho and found that the final standards and guidelines conform with them. We then prepared an Administrative Determination to that effect to meet National Environmental Policy Act requirements.

Now, we turn our attention away from developing standards and guidelines to implementing them. We are currently in the process of developing a strategy to prioritize our livestock grazing allotments and evaluate them to determine if standards and guidelines are being met or if significant progress towards meeting them is being achieved. As soon as this strategy is completed, sometime in the next few weeks, we will provide you with the appropriate detailed information.

The final standards and guidelines are the product of extensive discussion, debate, and compromise by individuals and organizations representing a wide variety of interests. Please be assured that we will offer many opportunities for interested parties to provide input as we implement the standards and guidelines and that your continued participation is critical to our success.

Sincerely,

Martha Hahn
BLM Idaho State Director



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Standards for Rangeland Health

The Standards for Rangeland Health, as applied in the State of Idaho, are to be used as the Bureau of Land Management's management goals for the betterment of the environment, protection of cultural resources, and sustained productivity of the range. They are developed with the specific intent of providing for the multiple use of the public lands. Application of the standards should involve collaboration between the authorized officer, interested publics, and resource users.

Rangelands should be meeting the Standards for Rangeland Health or making significant progress toward meeting the standards. Meeting the standards provides for proper nutrient cycling, hydrologic cycling, and energy flow.

Monitoring of all uses is necessary to determine if the standards are being met. It is the primary tool for determining rangeland health, condition, and trend. It will be performed on representative sites.

Appropriate to soil type, climate, and landform, indicators are a list of typical physical and biological factors and processes that can be measured and/or observed (e.g., photographic monitoring). They are used in combination to provide information necessary to determine the health and condition of the rangelands. Usually, no single indicator provides sufficient information to determine rangeland health. Only those indicators appropriate to a particular site are to be used. The indicators listed below each standard are not intended to be all inclusive.

The issue of scale must be kept in mind in evaluating the indicators listed after each standard. It is recognized that individual isolated sites within a landscape may not be meeting the standards; however, broader areas must be in proper functioning condition. Furthermore, fragmentation of habitat that reduces the effective size of large areas must also be evaluated for its consequences.

STANDARD 1 (WATERSHEDS)

Watersheds provide for the proper infiltration, retention, and release of water appropriate to soil type, vegetation, climate, and landform to provide for proper nutrient cycling, hydrologic cycling, and energy flow.

Indicators may include, but are not limited to, the following:

1. The amount and distribution of ground cover, including litter, for identified ecological site(s) or soil-plant associations are appropriate for site stability.

2. Evidence of accelerated erosion in the form of rills and/or gullies, erosional pedestals, flow patterns, physical soil crusts/surface sealing, and compaction layers below the soil surface is minimal for soil type and landform.

STANDARD 2 (RIPARIAN AREAS AND WETLANDS)

Riparian-wetland areas are in properly functioning condition appropriate to soil type, climate, geology, and landform to provide for proper nutrient cycling, hydrologic cycling, and energy flow.

Indicators may include, but are not limited to, the following:

1. The riparian/wetland vegetation is controlling erosion, stabilizing streambanks, shading water areas to reduce water temperature, stabilizing shorelines, filtering sediment, aiding in floodplain development, dissipating energy, delaying flood water, and increasing recharge of groundwater appropriate to site potential.

2. Riparian/wetland vegetation with deep strong binding roots is sufficient to stabilize streambanks and shorelines. Invader and shallow rooted species are a minor component of the floodplain.

3. Age class and structural diversity of riparian/wetland vegetation is appropriate for the site.

4. Noxious weeds are not increasing.

STANDARD 3 (STREAM CHANNEL/FLOODPLAIN)

Stream channels and floodplains are properly functioning relative to the geomorphology (e.g., gradient, size, shape, roughness, confinement, and sinuosity) and climate to provide for proper nutrient cycling, hydrologic cycling, and energy flow.

Indicators may include, but are not limited to, the following:

1. Stream channels and floodplains dissipate energy of high water flows and transport sediment. Soils support appropriate riparian-wetland species, allowing water movement, sediment filtration, and water storage. Stream channels are not entrenching.

2. Stream width/depth ratio, gradient, sinuosity, and pool, riffle and run frequency are appropriate for the valley bottom type, geology, hydrology, and soils.

3. Streams have access to their floodplains and sediment deposition is evident.

4. There is little evidence of excessive soil compaction on the floodplain due to human activities.

5. Streambanks are within an appropriate range of stability according to site potential.

6. Noxious weeds are not increasing.

STANDARD 4 (NATIVE PLANT COMMUNITIES)

Healthy, productive, and diverse native animal habitat and populations of native plants are maintained or promoted as appropriate to soil type, climate, and landform to provide for proper nutrient cycling, hydrologic cycling, and energy flow.

Indicators may include, but are not limited to, the following:

1. Native plant communities (flora and microbiotic crusts) are maintained or improved to ensure the proper functioning of ecological processes and continued productivity and diversity of native plant species.

2. The diversity of native species is maintained.

3. Plant vigor (total plant production, seed and seedstalk production, cover, etc.) is adequate to enable reproduction and recruitment of plants when favorable climatic events occur.

4. Noxious weeds are not increasing.

5. Adequate litter and standing dead plant material are present for site protection and for decomposition to replenish soil nutrients relative to site potential.

STANDARD 5 (SEEDINGS)

Rangelands seeded with mixtures, including predominately non-native plants, are functioning to maintain life form diversity, production, native animal habitat, nutrient cycling, energy flow, and the hydrologic cycle.

Indicators may include, but are not limited to, the following:

1. In established seedings, the diversity of perennial species is not diminishing over time.

2. Plant production, seed production, and cover are adequate to enable recruitment when favorable climatic events occur.

3. Noxious weeds are not increasing.

4. Adequate litter and standing dead plant material are present for site protection and for decomposition to replenish soil nutrients relative to site potential.

STANDARD 6 (EXOTIC PLANT COMMUNITIES, OTHER THAN SEEDINGS)

Exotic plant communities, other than seedings, will meet minimum requirements of soil stability and maintenance of existing native and seeded plants. These communities will be rehabilitated to perennial communities when feasible cost effective methods are developed.

Indicators may include, but are not limited to, the following:

1. Noxious weeds are not increasing.

2. The number of perennial species is not diminishing over time.

3. Plant vigor (production, seed and seedstalk production, cover, etc.) of remnant native or seeded (introduced) plants is maintained to enable reproduction and recruitment when favorable climatic or other environmental events occur.

4. Adequate litter and standing dead plant material is present for site protection and for decomposition to replenish soil nutrients relative to site potential.

STANDARD 7 (WATER QUALITY)

Surface and ground water on public lands comply with the Idaho Water Quality Standards.

Indicators may include, but are not limited to, the following:

1. Physical, chemical, and biologic parameters described in the Idaho Water Quality Standards.

STANDARD 8 (THREATENED AND ENDANGERED PLANTS AND ANIMALS)

Habitats are suitable to maintain viable populations of threatened and endangered, sensitive, and other special status species.

Indicators may include, but are not limited to, the following:

1. Parameters described in the Idaho Water Quality Standards.

2. Riparian/wetland vegetation with deep, strong, binding roots is sufficient to stabilize streambanks and shorelines. Invader and shallow rooted species are a minor component of the floodplain.

3. Age class and structural diversity of riparian/wetland vegetation are appropriate for the site.

4. Native plant communities (flora and microbiotic crusts) are maintained or improved to ensure the proper functioning of ecological processes and continued productivity and diversity of native plant species.

5. The diversity of native species is maintained.

6. The amount and distribution of ground cover, including litter, for identified ecological site(s) or soil-plant associations are appropriate for site stability.

7. Noxious weeds are not increasing.

Guidelines for Livestock Grazing Management

INTRODUCTION

Guidelines direct the selection of grazing management practices, and where appropriate, livestock management facilities to promote significant progress toward, or the attainment and maintenance of, the standards. Grazing management practices are livestock management techniques. They include the manipulation of season, duration (time), and intensity of use, as well as numbers, distribution, and kind of livestock. Livestock management facilities are structures such as fences, corrals, and water developments (ponds, springs, pipelines, troughs, etc.) used to facilitate the application of grazing management practices. Livestock grazing management practices and guidelines will be consistent with the Idaho Agricultural Pollution Abatement Plan.

Grazing management practices and facilities are implemented locally, usually on an allotment or watershed basis. Grazing management programs are based on a combination of appropriate grazing management practices and facilities developed through consultation, coordination, and cooperation with the Bureau of Land Management, permittees, other agencies, Indian tribes, and interested publics.

These guidelines were prepared under the assumption that regulations and policies regarding grazing on the public lands will be implemented and will be adhered to by the grazing permittees and agency personnel. Anything not covered in these guidelines will be addressed by existing laws, regulations, Indian treaties, and policies.

The BLM will identify and document within the local watershed all impacts that affect the ability to meet the standards. If a standard is not being met due to livestock grazing, then allotment management will be adjusted unless it can be demonstrated that significant progress toward the standard is being achieved. This applies to all subsequent guidelines.

GUIDELINES

1. Use grazing management practices and/or facilities to maintain or promote significant progress toward adequate amounts of ground cover (determined on an ecological site basis) to support infiltration, maintain soil moisture storage, and stabilize soils.

2. Locate livestock management facilities away from riparian areas wherever they conflict with achieving or maintaining riparian-wetland functions.

3. Use grazing management practices and/or facilities to maintain or promote soil conditions that support water infiltration, plant vigor, and permeability rates and minimize soil compaction appropriate to site potential.

4. Implement grazing management practices that provide periodic rest or deferment during critical growth stages to allow sufficient regrowth to achieve and maintain healthy, properly functioning conditions, including good plant vigor and adequate vegetative cover appropriate to site potential.

5. Maintain or promote grazing management practices that provide sufficient residual vegetation to improve, restore, or maintain healthy riparian-wetland functions and structure for energy dissipation, sediment capture, ground water recharge, streambank stability, and wildlife habitat appropriate to site potential.

6. The development of springs, seeps, or other projects affecting water and associated resources shall be designed to protect the ecological functions, wildlife habitat, and significant cultural and historical/archaeological/paleontological values associated with the water source.

7. Apply grazing management practices to maintain, promote, or progress toward appropriate stream channel and streambank morphology and functions. Adverse impacts due to livestock grazing will be addressed.

8. Apply grazing management practices that maintain or promote the interaction of the hydrologic cycle, nutrient cycle, and energy flow that will support the appropriate types and amounts of soil organisms, plants, and animals appropriate to soil type, climate, and landform.

9. Apply grazing management practices to maintain adequate plant vigor for seed production, seed dispersal, and seedling survival of desired species relative to soil type, climate, and landform.

10. Implement grazing management practices and/or facilities that provide for complying with the Idaho Water Quality Standards.

11. Use grazing management practices developed in recovery plans, conservation agreements, and Endangered Species Act, Section 7 consultations to maintain or improve habitat for federally listed threatened, endangered, and sensitive plants and animals.

12. Apply grazing management practices and/or facilities that maintain or promote the physical and biological conditions necessary to sustain native plant populations and wildlife habitats in native plant communities.

13. On areas seeded predominantly with non-native plants, use grazing management practices to maintain or promote the physical and biological conditions to achieve healthy rangelands.

14. Where native communities exist, the conversion to exotic communities after disturbance will be minimized. Native species are emphasized for rehabilitating disturbed rangelands. Evaluate whether native plants are adapted, available, and able to compete with weeds or seeded exotics.

15. Use non-native plant species for rehabilitation only in those situations where:

a. native species are not readily available in sufficient quantities;

b. native plant species cannot maintain or achieve the standards; or

c. non-native plant species provide for management and protection of native rangelands.

Include a diversity of appropriate grasses, forbs, and shrubs in rehabilitation efforts.

16. On burned areas, allow natural regeneration when it is determined that populations of native perennial shrubs, grasses, and forbs are sufficient to revegetate the site. Rest burned or rehabilitated areas to allow recovery or establishment of perennial plant species.

17. Carefully consider the effects of new management facilities (e.g., water developments, fences) on healthy and properly functioning rangelands prior to implementation.

18. Use grazing management practices, where feasible, for wildfire control and to reduce the spread of targeted undesirable plants (e.g., cheatgrass, medusa head, wildrye, and noxious weeds) while enhancing vigor and abundance of desirable native or seeded species.

19. Employ grazing management practices that promote natural forest regeneration and protect reforestation projects until the Idaho Forest Practices Act requirements for timber stand replacement are met.

20. Design management fences to minimize adverse impacts, such as habitat fragmentation, to maintain habitat integrity and connectivity for native plants and animals.

Glossary

ACCELERATED EROSION — Soil loss at a rate in excess of natural or geologic erosion as a result of human-caused disturbance.

AGE CLASS — A classification of woody plant species according to relative age, e.g., seedling, young, mature, or decadent.

ALLOTMENT MANAGEMENT PLAN — A documented program which applies to livestock grazing on public lands, prepared by consulting, cooperating, and coordinating with the permittee(s), lessee(s), or other interested publics.

ANIMAL HABITAT —T he place and environment where an animal lives including all biotic, climatic, and edaphic factors.

BEST MANAGEMENT PRACTICE (BMP) — A component practice or combination of component practices determined to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. (Idaho Agricultural Pollution Abatement Plan, August 1993)

COMPONENT PRACTICES — Approved practices, used alone or in combination with other practices, are used to develop BMPs. (Idaho Agricultural Pollution Abatement Plan, August 1993)

CONNECTIVITY — The state of being functionally connected by movement of organisms, material, or energy. The opposite of habitat fragmentation.

CONSULTATION, COORDINATION, AND COOPERATION — A process prescribed by the Public Rangelands Improvement Act of involving the permittee(s), lessee(s), federally recognized Indian tribes, and interested publics in the development of allotment management plans and other management programs on public lands. The process also includes trust responsibilities to Federally recognized Indian tribes.

COLLABORATION —T o work jointly with others.

COVER — (See Ground Cover)

DEFERMENT — Nongrazing, either by delay or discontinuance of grazing, from the beginning of plant growth until the seed is set or the equivalent stage of vegetative reproduction.

DIVERSITY — (1) The absolute number of species in a community, species richness; and (2) a measure of the number of species and their relative abundance in a community; low diversity refers to few species or unequal abundances, high diversity to many species or equal abundances.

ECOLOGICAL SITES — A kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and its response to management. Ecological site is synonymous with range site and ecological type.

ENERGY FLOW — The capture of sunlight energy by plants and the conversion through photosynthesis to biomass.

EXOTIC PLANT COMMUNITIES, OTHER THAN SEEDINGS — Assemblages of plants that are not indigenous to the area, such as cheatgrass, yellow star thistle, and medusa head rye.

FRAGMENTATION — The process of dividing habitats into smaller and smaller units until their utility as habitat is lost.

GRAZING MANAGEMENT PRACTICES — Techniques used to manage livestock and include season, duration (amount of the time grazing occurs), intensity of use, numbers of livestock, kind of livestock, and distribution (e.g., salting, herding, and water development).

GRAZING PLAN OR PROGRAM — A combination of grazing management and/or facilities used to ensure an expectation of meeting or making significant progress toward meeting the Standards for Rangeland Health.

GROUND COVER — The percentage of material, other than bare ground, covering the land surface. It may include live and standing dead vegetation, microbiotic crust, litter, cobble, gravel, stones, and bedrock. Ground cover, plus bare ground, totals 100 percent.

HUMAN ACTIVITIES — Any activity that is initiated or controlled by people, such as recreation, timber harvest, livestock grazing, road and other construction, and mining.

HYDROLOGIC CYCLE — The circulation of water in the atmosphere, on the surface of the earth, in the soil, and in the underlying rocks.

INDIAN TREATY — A contract in writing between the United States Government and Indian tribes formally signed by duly authorized representatives and ratified by the United States Senate.

INDICATOR — Components or attributes of a rangeland ecosystem that can be observed and/or measured that provides evidence of the function, productivity, health and/or condition of the ecosystem.

INFILTRATION — A soil, as influenced by soil texture, aspect, slope, and vegetation cover.

LANDFORM — A naturally formed element of the landscape that controls or influences hydrologic, physical, and ecological processes.

LANDSCAPE — Landform of a region in aggregate.

LAND USE PLAN — Land use plan means a resource management plan or management framework plan, developed under the provisions of 43 CFR 1600. These plans are developed through public participation in accordance with the provisions of the Federal Land Policy and Management Act of 1976 and establish management direction for resource uses of public lands. (43 CFR 4100)

LIFE FORM — Characteristic form or appearance of a plant species at maturity, e.g., tree, shrub, forb, grass, etc.

LITTER — Dead plant or animal material on the soil surface.

LIVESTOCK MANAGEMENT FACILITIES — Physical facilities, such as fences, water developments, and corrals that are used to handle and control livestock.

MICROBIOTIC CRUST — Community of non-vascular primary producers that occur as a "crust" on the surface of soils and made up of a mixture of algae, lichens, mosses, and cyanobacteria (bluegreen algae).

MONITORING — The orderly collection, analysis, and interpretation of resource data and information to evaluate progress toward meeting Standards for Rangeland Health and/or management objectives.

MULTIPLE USE — The definition of multiple use is defined in the Federal Policy and Management Act of 1976 as follows:

"The management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resource or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform with changing needs and conditions; the use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historic values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of the uses that will give the greatest economic return or the greatest output."

NATIVE SPECIES — Plants or animals indigenous to the area.

NON-NATIVE SPECIES — Plants or animals that are not indigenous to the area.

NOXIOUS WEEDS — Exotic plants that are listed by the State of Idaho and subject to Idaho weed control laws.

NUTRIENT CYCLE — The cyclical process by which plants and animals use chemical compounds and elements in the soil, water, and atmosphere to produce plants and animals and the decomposition of plants and animals to return chemical compounds and elements to the soil, water, and air for future use.

PRODUCTIVITY — The ability of a site to produce vegetation.

PROPER FUNCTIONING CONDITION (RIPARIAN) —
"Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve floodwater retention and ground-water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity."

> USDI. 1993, Revised 1995. Riparian Area Management, Process for Assessing Proper Functioning Condition, Technical Report 1737-9, p. 4. Bureau of Land Management, BLM/SC/ST-93/003+1737+REV95, Service Center, CO. 51 pp.
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> USDI. 1994. Riparian Area Management, Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas. Technical report 1737-11. Bureau of Land Management, BLM/SC/ST-94/008+1737, Service Center, CO. 37 pp.

RANGELAND — A kind of land on which the native vegetation is predominately grasses, grass- like plants, forbs, or shrubs. Rangelands include natural grasslands, savannas, shrublands, most deserts, alpine communities, riparian areas, and wet meadows.

RANGELAND CONDITION — The present status of a unit in terms of specific values or potential.

RANGELAND HEALTH — The degree to which the integrity of the soil and ecological processes of rangeland ecosystems is maintained.

> National Research Council. 1994. Rangeland Health: New Methods to Classify, Inventory and Monitor Rangelands.

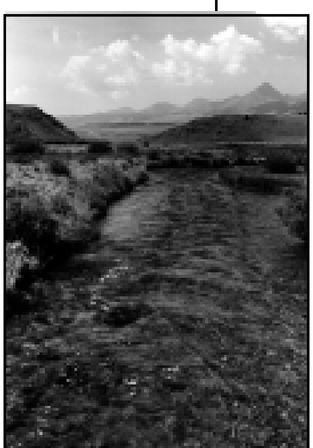
RESIDUAL VEGETATION — Amount, cover, and species composition of the vegetation on a site after it has been grazed for a period of time.

REST — Nongrazing for a specified period of time, generally a full growing season up to a full year.

RIPARIAN AREAS — A form of wetland transition between permanently saturated wetlands and uplands. The areas exhibit vegetation or physical characteristics that reflect permanent surface or subsurface water influence. Typical riparian areas include such areas as lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers, streams, glacial potholes, and shores of lakes and reservoirs with stable water levels. Riparian areas do not include ephemeral (permanently above the water table and flows only during or immediately after a rainstorm or snowmelt) streams that do not exhibit the presence of vegetation dependent upon free water in the soil. (Bureau of Land Management Technical Reference TR 1737-9 and 11)

SENSITIVE PLANTS AND ANIMALS — Plants and animals listed by the Bureau of Land Management State Directors.

SIGNIFICANT PROGRESS — Measurable and/or observable (i.e., photography, use of approved qualitative procedures) changes in the indicators that demonstrate improved rangeland health.



SPATIAL SCALE — The relative size of an area under consideration. For example, a small scale is a site, a mid-scale is a watershed, and a large scale is a basin.

SPECIAL STATUS SPECIES — Plant and animal species that are federally listed as threatened or endangered, proposed threatened or endangered, candidate species, State listed as threatened or endangered, or listed by a Bureau of Land Management State Director as sensitive.

SUSTAINED PRODUCTIVITY OF THE RANGE — Maintaining the production capability of the rangeland for long periods of time (100 years +).

TREND — The direction of change in ecological status or resource value rating observed over time.

USE — Human activities (e.g., mining, forestry, livestock grazing, vegetation manipulation, road construction and maintenance, other construction and maintenance activities, wild horses, recreation, habitat manipulation, and management facility construction and maintenance).

WATERSHED — An area that collects and discharges runoff to a given point. It is often used synonymously with drainage basin or catchment.

WETLAND — Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Typical wetlands include marshes, shallow swamps, sloughs, lake shores, bogs, wet meadows, and riparian areas. (Bureau of Land Management Technical Reference TR 1737-9 and 11)

APPENDIX B

LAWS AND EXECUTIVE ORDERS AFFECTING BLM PLANNING AND MANAGEMENT

MANAGEMENT OF LAND & RESOURCES APPROPRIATION LANGUAGE CITATIONS

16 U.S.C. 594,	P.L. 103-332;
43 U.S.C. 17015,	P.L. 104-208;
30 U.S.C. 181 *et seq*.,	P.L. 105-83;
30 U.S.C. 351-359;	P.L. 105-277;
43 U.S.C. 2, 31(a), 52, 315;	P.L. 106-113; and
43 U.S.C. 1701 *et seq*., and 1901 *et seq*., 78 *Stat*. 986;	P.L. 106-291

16 U.S.C. 594, Protection Act of September 20, 1922 pro-vides for the Secretary of the Interior to protect and pre-serve, from fire, disease, or the ravages of beetles or other insects, timber on the public lands owned by the United States.

30 U.S.C. 181 et seq., the Mineral Leasing Act of 1920 as amended, provides for the leasing of deposits of coal, phosphate, sodium, potassium, oil, oil shale, native asphalt, solid and semi-solid bitumen, and bituminous rock or gas, and lands containing such deposits owned by the United States, including those in national forest, but excluding those acquired under other acts subsequent to February 25, 1920, and those within the national petroleum and oil shale re-serves. The Act also preserves the right of pre-1920 oil shale mining claims to be patented.

30 U.S.C. 351-359, the Mineral Leasing Act for Acquired Lands, provides for the leasing of coal, phosphate, oil, oil shale, gas, sodium, potassium, and sulfur which are owned or acquired by the United States and which are within the lands acquired by the United States, with the consent of the head of the agency having jurisdiction over the lands containing such deposits.

43 U.S.C. 2, provides that the Secretary of the Interior, or such officer as he may designate, shall perform all executive duties appertaining to the surveying and sale of the public lands of the United States, or in anyway respecting such public lands, and, also, such as relate to private claims of land and the issuing of patents for all grants to land under the authority of the Government.

43 U.S.C. 31(a), provides for the classification of the public lands and examination of the geological structure, mineral resources, and products of the national domain.

43 U.S.C. 52, provides that the Secretary of the Interior, or such officer as he may designate, shall cause to be surveyed, measured, and marked, without delay, all base and meridian lines through such points and perpetuated by such monuments, and such other correction parallels and meridians as may be prescribed; that all private land claims shall be surveyed after they have been confirmed by authority of Congress, so far as may be necessary to complete the survey of the public lands; and that he shall transmit general and particular plans of all lands surveyed by him to such officers as he may designate.

43 U.S.C. 315, The Taylor Grazing Act of 1934, as amended, provides that the Secretary of the Interior is authorized to establish grazing districts from any part of the public domain of the United States (exclusive of Alaska) which, in his opinion, are chiefly valuable for grazing and raising forage crops, to regulate and administer grazing use of the public lands, and to improve the public rangelands.

43 U.S.C. 1701 et seq., the Federal Land Policy and Management Act of 1976, as amended, provides for the public lands to be generally retained in Federal ownership; for periodic and systematic inventory of the public lands and their resources; for a review of existing withdrawals and classifications; for establishing comprehensive rules and regulations for administering public lands statutes; for multiple-use management on a sustained yield basis; for protection of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values; for receiving fair market value for the use of the public lands and their resource; for establishing uniform procedures for any disposal, acquisition, or exchange; for protecting areas of critical environmental concern; for recognizing the Nation's need for domestic sources of mineral, food, timber, and fiber from the public lands, including implementation of the Mining and Mineral Policy Act of 1970; and for payments to compensate States and local governments for burdens created as a result of the immunity of Federal lands from State and local taxation.

43 U.S.C. 1901 et seq., the Public Rangelands Improvement Act of 1978, provides for the improvement of range conditions on public rangelands, research on wild horse and burro population dynamics, and other range management practices.

78 Stat. 986, provides for the classification of certain lands administered exclusively by the Secretary of the Interior in order to provide for their disposal or interim management under principles of multiple-use and to produce a sustained yield of products and services. Although this authority has expired, the classifications remain in effect.

43 U.S.C. 1715, provides the Secretary of the Interior authorization to acquire, by purchase, exchange, donation, or eminent domain (for access to public lands only), land and interests in lands.

P.L. 106-291, the Department of the Interior and Related Agencies Appropriation Act, 2001, provides expenses necessary for the protection, use, improvement, development, disposal, cadastral surveying, classification, acquisition of easements and other interest in land, and performance of other functions. It also, includes the maintenance of facilities as authorized by law, in the management of lands and their resources under jurisdiction of the Bureau of Land Management, including the general administration of the Bureau, and the assessment of mineral potential of public lands.

AUTHORIZATIONS

The following are the primary laws governing BLM activities; they include General Authorizing Legislation, which authorize the general activities of the BLM or govern the manner in which BLM's activities are conducted; and Specific Authorizing Legislation, which governs specific program activities or activities in specific or designated areas.

Act of July 26, 1866, also known as the Lode Act (14 Stat. 251)	Granted rights of way (ROWs) over "public domain" for highways and to ditch and canal owners. Repealed and superseded by FLPMA.
Act of December 22, 1928 (Color of Title) (45 Stat. 1069) as amended (43 U.S.C. 1068, 1068a)	Allowed patents to be issued for claims of long standing, without reservation of minerals to government
Act of May 24, 1928, as amended (49 U.S.C. App. 211-213)	Authorizes the Secretary to lease contiguous unappropriated public lands (not to exceed 2,560 acres) for a public airport.
Americans with Disabilities Act Accessibility Guidelines (ADAAG)	Sets guidelines for accessibility to places of public accommodation and commercial facilities by individuals with disabilities.
American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)	Declares the United States policy of protecting and preserving the inherent right of freedom to believe, express, and exercise traditional religions; including access to religious sites, use and possession of sacred objects, and freedom to worship through ceremonials and traditional rites; for the American Indian, Eskimo, Aleut, and Native Hawaiian.
Antiquities Act of 1906 (16 U.S.C. 431 et seq.)	Protects cultural resources on Federal lands, and imposes penalties for excavation or appropriation without a permit.
Archaeological Resources Protection Act of 1979, as amended (16 U.S.C. 470a, 470cc and 470ee)	Requires permits for the excavation or removal of Federally administered archaeological resources, encourages increased cooperation among Federal agencies and private individuals, provides stringent criminal and civil penalties for violations, and requires Federal agencies to identify important resources vulnerable to looting and to develop a tracking system for violations.
Architectural Barriers Act (ABA) of 1968 (42 U.S.C. 4151 et seq).	Requires access to facilities designed, built, altered, or leased with Federal funds.
Atomic Energy Act of 1952 (42 U.S.C. 2001f)	Provides for both the development and the regulation of the uses of nuclear materials and facilities in the United States by civilians, and for military use.
Bald Eagle Protection Act of 1940, as amended (16 U.S.C. 668-668d)	Provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds (including their parts, nests, or eggs).

Bankhead Jones Farm Tenant Act of 1937 (7 U.S.C. 1010 et seq.)	Authorizes management of acquired farm tenant lands, and construction and maintenance of range improvements. It directs the Secretary of Agriculture to develop a program of land conservation and utilization to adjust land use to help control soil erosion, conduct reforestation, preserve natural resources, develop and protect recreational facilities, protect watersheds, and protect public health and safety.
Carey Act of 1894, as amended (43 U.S.C. 641)	Authorizes and empowers the Secretary of the Interior, given Presidential approval and proper application, to donate, grant, and patent desert lands to a state for irrigation, reclamation, and occupation. Lands may be restored to the public domain if reclamation requirements are not satisfied within stated time limits.
Carlson-Foley Act of 1968 (42 U.S.C. 1241-1243)	Authorizes BLM to reimburse States for expenditures associated with coordinated control of noxious plants.
Clean Air Act (1970, 1977) (42 U.S.C. 1857)	In its early form (the 1967 Air Quality Act), guided states in controlling sources of air pollution according to a set of principles. As of the 1970, 1977, and 1990 amendments, states apply and administer detailed control requirements prescribed through federal regulations.
Clean Air Act of 1990 as amended (42 U.S.C. 7401, 7418, 7642)	Requires BLM to protect air quality, maintain Federal and State designated air quality standards, and abide by the requirements of the State implementation plans.
Clean Water Act of 1987 as amended (33 U.S.C. 1251)	Establishes objectives to restore and maintain the chemical, physical and biological integrity of the nation's water.
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 U.S.C. 9601-9673)	Provides for liability, risk assessment, compensation, emergency response, and cleanup (including the cleanup of inactive sites) for hazardous substances. Requires Federal agencies to report sites where hazardous wastes are or have been stored, treated, or disposed, and requires responsible parties, including Federal agencies, to clean-up releases of hazardous substances.
Condemnation Act of 1888, as amended (40 U.S.C. 257)	Authorizes officers of the government to procure real estate for the erection of a public building or for other public uses, through condemnation, under judicial process, whenever it is necessary or advantageous to the Government to do so.

Control of Pollution from Federal Facilities (33 U.S.C. 1323) 1970	Established that federal agencies shall be subject to all requirements and administrative authorities, processes, and sanctions respecting the control and abatement of water pollution in the same manner, and to the same extent as any nongovernmental entity, including the payment of reasonable service charges.
Declaration of Taking Act of 1931 (40 U.S.C. 258(a), (e))	Authorizes the United States to acquire an interest in land immediately upon the filing of a declaration of taking with a court and the deposit in the court of the estimated compensation stated in the declaration.
Department of the Interior and Related Agencies Appropriations Act, 1996 (P.L. 104-134)	Directs the Secretary of the Interior, acting through the Bureau of Land Management, to develop and implement a pilot recreation fee demonstration program to determine the feasibility of cost recovery for operation and maintenance of recreation areas and sites.
Desert Land Act of 1877 (43 U.S.C. 321-323)	Provides authority to reclaim arid and semi-arid public lands of the western States through individual effort and private capital.
Eagle Protection Act of 1962 (P.L. 87-884 (76 Stat. 1346))	Expanded and amended the Bald Eagle Protection Act of 1940 to include golden eagles.
Emergency Planning and Community Right-To-Know Act of 1986 (42 U.S.C. 11001-11050)	Requires the private sector to inventory chemicals and chemical products, to report those in excess of threshold planning quantities, to inventory emergency response equipment, to provide annual reports and support to local and State emergency response organizations, and to maintain a liaison with the local and state emergency response organizations and the public.
Emergency Wetlands Resources Act of 1986 (P.L. 99-645)	Removed a prior prohibition on the purchase of wetlands with Land and Water Conservation Fund monies. Transferred monies to the Migratory Bird Conservation Fund through import duties and entrance fees at National Wildlife Refuges. Provided for planning, mapping and inventory of wetlands in the United States; and reports to Congress on wetlands loss and the contribution of federal programs to wetlands loss.
Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)	Directs Federal agencies to ensure that their actions do not jeopardize threatened and endangered species, and that through their authority they help bring about the recovery of these species.

Engle Act of February 28, 1958 (43 U.S.C. 156)	Provides that withdrawals for the Department of Defense for more than 5,000 acres shall be made by Congress.
Executive Order, Public Water Reserve No. 107, April 17, 1926	Reserves springs and waterholes on unsurveyed public lands for public use.
Executive Order 11514, Protection and Enhancement of Environmental Quality, March 5, 1970 (35 FR 4247)	Refines implementation of the National Environmental Policy Act of 1969, by directing the federal government to provide leadership in protecting and enhancing the quality of the Nation's environment to sustain and enrich human life, and to initiate measures needed to direct their policies, plans and programs so as to meet national environmental goals.
Executive Order 11593 of May 13, 1971, Protection and Enhancement of the Cultural Environment (36 FR 8921)	Directs Federal agencies to locate, inventory, nominate, and protect Federally owned cultural resources eligible for the National Register of Historic Places, and to ensure that their plans and programs contribute to preservation and enhancement of non- Federally owned resources.
Executive Order 11644, Use of Off-Road Vehicles on Public Lands, February 8, 1972 (37 FR 2877)	Establishes policies and provides for procedures for controlling or directing use of off-road vehicles on public lands, with the goal of protecting resources, promoting the safety of all users, and minimizing conflicts among the various uses.
Executive Order 11987, Exotic Organisms, May 24, 1977 (42 FR 26949)	Directs federal agencies to restrict the introduction of exotic species into natural ecosystems on public lands, to encourage other entities to prevent such introduction, and to restrict federal programs, funds, and authorities from exporting native species for introduction into natural ecosystems outside of the United States.
Executive Order 11988, Floodplain Management, May 24, 1977 (42 FR 26951)	Provides for the restoration and preservation of national and beneficial floodplain values, and enhancement of the natural and beneficial values of wetlands in carrying out programs effecting land use.
Executive Order 11989, Off-road vehicles, May 24, 1977 (42 FR 26959)	Clarifies agency authority to define zones of use for off-road vehicles on public lands.
Executive Order 11990, Protection of Wetlands, May 25, 1977 (42 FR 26961)	Directs that wetland and riparian habitats on the public lands be identified, protected, enhanced, and managed.

Executive Order 12088, Federal Compliance with Pollution Control Standards October 17, 1978 (43 FR 47707)	Sets the requirements for standards applicability, agency coordination, and limits on exemptions from standards.
Executive Order 12548, Grazing fees, February 14, 1986 (51 FR 5985)	Provides for establishment of appropriate fees for the grazing of domestic live-stock on public rangelands. Directs that the fee shall not be less than $1.35 per animal unit month.
Executive Order 12898, Environmental Justice, February 11, 1994 (59 FR 7629)	Requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
Executive Order 12962, Recreational Fisheries, June 7, 1995 (60 FR 30769)	Directs all Federal agencies to enhance recreational fish species and provide increased recreational fishing opportunities.
Executive Order 13007, Providing for American Indian and Alaska Native Religious Freedom and Sacred Land Protections, May 24, 1996 (61 FR 26771)	Directs federal agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites.
Executive Order 13084, Consultation and Coordination with Indian Tribal Governments, May 14, 1998 (63 FR 27655)	Provides for consultation with Indian tribal governments in developing regulatory policies that would significantly or uniquely affect Indian tribal communities, increasing flexibility for Indian tribal waivers, and use of consensul mechanisms where appropriate for developing regulations on issues related to tribal self-government, trust resources, or treaty and other rights.
Executive Order 13112, Invasive Species, February 3, 1999 (64 FR 6183)	Directs federal agencies to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species cause.
Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, January 10, 2001 (66 FR 3853)	Directs agencies within the Executive Branch to take certain actions to further implement the Migratory Bird Treaty Act (MBTA), with the goal of promoting the conservation of migratory bird populations.

Executive Order 13195, Trails for America in the 21st Century, January 18, 2001 (66 FR 7391)	Directs federal agencies to protect, connect, promote, and assist trails of all types throughout the United States to the extent permitted by law and where practicable, and in cooperation with Tribes, States, local governments, and interested groups.
Federal Cave Resource Protection Act of 1988 (16 U.S.C. 4301)	Provides for the protection of caves on lands under the jurisdiction of the Secretary, and the Secretary of Agriculture. Establishes terms and conditions for use permits, and penalties for violations.
Federal Insecticide, Fungicide, and Rodenticide Act of 1975 (7 U.S.C. 136 et. Seq.)	Establishes an extensive regulatory system for controlling the sale, distribution and application of pesticides.
Federal Land Policy and Management Act of 1976, as amended (43 U.S.C. 1701 et seq.)	Outlines functions of the BLM Directorate, provides for administration of public lands through the BLM, provides for management of the public lands on a multiple use basis, and requires land-use planning including public involvement and continuing inventory of resources. The act establishes as public policy that, in general, the public lands will remain in Federal ownership, and also authorizes: • acquisition of land or interests in lands consistent with the mission of the Department and land use plans; • permanent appropriation of road use fees collected from commercial road users, to be used for road maintenance; • collection of service charges, damages, and contributions and use of funds for specified purposes; • protection of resource values; • preservation of certain lands in their natural condition; • compliance with pollution control laws; • delineation of boundaries in which the Federal government has right, title, or interest; • review of land classifications in land use planning; and modification or termination of land classifications when consistent with land use plans; • sale of lands if the sale meets certain disposal criteria;

- issuance, modification, or revocation of withdrawals;
- review of certain withdrawals by October 1991;
- exchange or conveyance of public lands if in the public interest; • outdoor recreation and human occupancy and use;
- management of the use, occupancy, and development of the public lands through leases and permits;
- designation of Federal personnel to carry out law enforcement responsibilities;
- determination of the suitability of public lands for rights-of-way purposes (other than oil and gas pipelines) and specification of the boundaries of each right-of-way;
- recordation of mining claims and reception of evidence of annual assessment work.

Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901-2911)	Authorizes financial and technical assistance to the States for the development, revision, and implementation of conservation plans and programs for nongame fish and wildlife.
Fish and Wildlife Coordination Act of 1958 (16 USC 661 et seq)	Provides for wildlife conservation to be given equal consideration and coordination with other features of water resource development.
Federal Land Transaction Facilitation Act of 2000 (43 U.S.C. 2301)	Allows the Bureau of Land Management to retain receipts from land sales and to use them to cover administrative costs and acquire properties to improve the nation's land management pattern.
Federal Noxious Weed Act of 1974, as amended (7 U.S.C. 2814)	Provides for the designation of a lead office and a person trained in the management of undesirable plants; establishment and funding of an undesirable plant management program; completion and implementation of cooperative agreements with State agencies; and establishment of integrated management systems to control undesirable plant species.
Federal Onshore Oil and Gas Leasing Reform Act of 1987 (30 U.S.C. 226, et seq.)	Establishes a new oil and gas leasing system, and changes certain operational procedures for onshore Federal lands.
Federal Power Act of 1920, as amended (16 U.S.C. 818)	Allows other uses of Federal waterpower withdrawals with Federal Energy Regulatory Commission approval.

General Allotment Act (or Dawes Act) of 1887, as amended (24 U.S.C. 388-391)	Called for the allocation of a parcel of land to all members of an Indian tribe, based on the theory that Indians would be become more quickly assimilated if they were owners of a parcel of land and encouraged to pursue civilized agricultural pursuits as opposed to traditional means of existing by hunting, fishing and gathering.
General Mining Law of 1872, as amended (30 U.S.C. 22, et seq.)	Provides for locating and patenting mining claims where a discovery has been made for locatable minerals on public lands in specified States, mostly in the western United States.
Geothermal Steam Act of 1970 (30 U.S.C. 1001)	Authorizes the Secretary to issue leases for the development of geothermal resources.
Geothermal Steam Act Amendments of 1988	Lists significant thermal features within the National Park System requiring protection, provides for lease extensions and continuation of leases beyond their primary terms, and requires periodic review of cooperative or unit plans of development.
Highway Safety Act of 1966, as amended (23 U.S.C. 401-403)	Requires the federal government to encourage and assist each of the States in the establishment of a highway safety system.
Historic Sites Act of 1935 (16 U.S.C. 461)	Declares national policy to identify and preserve historic sites, buildings, objects, and antiquities of national significance, providing a foundation for the National Register of Historic Places.
Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460 et seq.)	Provides for the establishment of the Land and Water Conservation Fund (LWCF), special BLM accounts in the Treasury, the collection and disposition of recreation fees, the authorization for appropriation of recreation fee receipts, and other purposes. Authorizes planning, acquisition, and development of needed land and water areas and facilities.
Materials Act of 1947, as amended (30 U.S.C. 601-604 et seq.)	Provides for the sale of common variety materials for personal, commercial, or industrial uses and for free use for local, State, and Federal governmental entities.
Migratory Bird Conservation Act of 1929, as amended (16 U.S.C. 715) and treaties pertaining thereto	Provides for habitat protection and enhancement of protected migratory birds.

Mineral Leasing Act of 1920, as amended, (30 U.S.C. 181, et seq.)

Provides for leasing of coal, phosphate, sodium, potassium, oil, gas, oil shale, native asphalt, solid and semi-solid bitumen, bituminous rock, and gilsonite on lands containing such deposits owned by the United States, including those in national forests, but excluding those within the national petroleum and oil shale reserves. It preserves the right of pre-1920 oil shale mining claims to be patented, mandates a broad spectrum of requirements for lease management, and authorizes the Secretary to determine suitability of public lands for oil and gas pipeline rights-of-way.

Mineral Leasing Act for Acquired Lands of 1947 (30 U.S.C. 351-359)

Provides for the leasing of coal, phosphate, sodium, potassium, oil, gas, oil shale, and sulfur which are owned or acquired by the United States and which are within the lands acquired by the United States, with the consent of the head of the agency having jurisdiction over the lands containing such deposits. It provides that all mineral leasing receipts derived from leases under this act shall be paid into the same funds or accounts in the Treasury and shall be distributed in the same manner as prescribed for other receipts from the lands affected by the lease. The intention is that this act shall not affect the distribution of receipts pursuant to legislation applicable to such lands.

Mining and Minerals Policy Act of 1970, (30 U.S.C. 21a) (30 U.S.C. 1601, et seq.)

Establishes policy of fostering development of economically stable mining and minerals industries, their orderly and economic development, and studying methods for disposal of waste and reclamation.

National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 et seq.)

Requires the preparation of environmental impact statements for Federal projects which may have a significant effect on the environment. It requires systematic, interdisciplinary planning to ensure the integrated use of the natural and social sciences and the environmental design arts in making decisions about major Federal actions that may have a significant effect on the environment.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470)

Expands protection of historic and archaeological properties to include those of national, State and local significance. It also directs Federal agencies to consider the effects of proposed actions on properties eligible for or included in the National Register of Historic Places.

National Parks and Recreation Act of 1978 (16 U.S.C. 1242-1243)	Establishes a number of national historic trails which cross public lands.
National Trails System Act of 1968, as amended (16 U.S.C. 1241-1249)	Establishes a national trails system and requires that Federal rights in abandoned railroads be retained for trail or recreation purposes, or sold with the receipts to be deposited in the LWCF.
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001)	Requires agencies to inventory archaeological and ethnological collections in their possession or control (which includes non-federal museums) for human remains, associated funerary objects, sacred objects, and objects of cultural patrimony; identify them geographically and culturally; and notify appropriate tribes within 5 years.
Nuclear Waste Policy Act of 1982 (42 U.S.C. 10101 et seq.)	Established a plan for the safe handling, storage, and disposal of the nation's spent nuclear fuel and high-level radioactive waste, and a program of research, development, and demonstration regarding the disposal of spent nuclear fuel and high-level radioactive waste.
Occupational Health and Safety Act of 1970 (29 U.S.C. 651 et seq.)	Assures safe and healthful working conditions for working men and women by providing for standards; enforcement; assistance to states in their efforts; and research, information, education, and training in the field of occupational safety and health.
Pollution Prevention Act of 1990 (42 U.S.C. 13101-13109)	Requires and encourages prevention and reduction of waste streams and other pollution through minimization, process change, and recycling. Encourages and requires development of new technology and markets to meet the objectives.
Protection Act of September 20, 1922 (16 U.S.C. 594)	Authorizes the Secretary of the Interior to protect and preserve, from fire, disease, or the ravages of beetles, or other insects, timber owned by the United States upon the public lands, national parks, national monuments, Indian reservations, or other lands under the jurisdiction of the Department of the Interior owned by the United States.
Public Rangelands Improvement Act of 1978 (43 U.S.C. 1901-1908)	Provides for the improvement of range conditions to assure that rangelands become as productive as feasible for watershed protection, livestock grazing, wildlife habitat, and other rangeland values. The act also authorizes: • research on wild horse and burro population dynamics, and facilitates the humane adoption or disposal of excess wild free roaming horses and burros, and

	• appropriation of $10 million or 50% of all moneys received as grazing gees, whichever is greater, notwithstanding the amount of fees collected.
Reciprocal Fire Protection Act of May 27, 1955, as amended (42 U.S.C. 1856)	Authorizes agencies that provide fire protection for any property of the United States to enter into reciprocal agreements with other fire organizations to provide mutual aid for fire protection.
Recreation and Public Purposes (R&PP) Act of 1926, as amended (43 U.S.C. 869)	Authorizes the Secretary to classify public lands for lease or sale for recreation or public purposes. The R&PP Amendment Act of 1988 provides that suitable public lands may be made available for use as solid waste disposal sites, in a manner that will protect the United States against unforeseen liability.
Rehabilitation Act of 1973, Section 504 (29 U.S.C 791)	Requires federal agencies to ensure that federally assisted or federally conducted programming is accessible to people with disabilities. Access needs of people with visual impairments, hearing impairments and learning impairments must also be considered.
Reservoir Salvage Act of 1960 (16 U.S.C. 469), as amended by the Archaeological and Historic Preservation Act of 1974	Provides for the preservation of historical and archeological data (including relics and specimens) that might otherwise be irreparably lost or destroyed as the result of flooding or terrain alteration for any project, including dam construction, undertaken or licensed by an agency of the United States.
Resource Conservation and Recovery Act as amended by Federal Facility Compliance Act of 1992 (42 U.S.C. 6901-6992)	Authorizes EPA to manage, by regulation, hazardous wastes on active disposal operations. Waives sovereign immunity for Federal agencies with respect to all Federal, State, and local solid and hazardous waste laws and regulations. Makes Federal agencies subject to civil and administrative penalties for violations, and to cost assessments for the administration of the enforcement.
Rivers and Harbors Act of 1899 (33 U.S.C. 403 10)	Prohibits obstructing, building structures outside of established harbor lines, and altering the course, location, condition or capacity of waters of the United States, except under certain specified circumstances or permits.
Safe Drinking Water Act Amendments of 1977 (42 U.S.C. 201)	Requires compliance with all Federal, State, or local statutes for safe drinking water.

Sikes Act (or the Act of September 15, 1960), as amended (16 U.S.C. 670 et seq.)	Provides for cooperation by the Departments of the Interior and Defense with State agencies in planning, development and maintenance of fish and wildlife resources on military reservations throughout the United States. Authorizes conservation and rehabilitation programs on BLM and other lands (as of the 1974 law).
Soil Conservation and Domestic Allotment Act of 1935, as amended (Pub. L. 74-46)	Designed to support farm income by making soil-conservation and soil-building payments to participating farmers.
Soil Info. Assistance for Community Planning and Resource Development Act of 1996 (42 U.S.C. 3271 *et seq*.)	Directed that the USDA soil survey program of the United States should be conducted so that soil surveys would be available to meet needs of the States and other public agencies in connection with community planning and resource development.
Soil and Water Resources Conservation Act of 1977 (16 U.S.C. 2001)	Provides for conservation, protection and enhancement of soil, water, and related resources.
Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)	Provides that lands may be declared unsuitable for surface coal mining where significant adverse impacts could result to certain wildlife species.
Taylor Grazing Act of 1934 (43 U.S.C. 315), as amended by the Act of August 28, 1937 (43 U.S.C. 1181d)	Authorizes the establishment of grazing districts, regulation and administration of grazing on the public lands, and improvement of the public rangelands. It also authorizes the Secretary to accept contributions for the administration, protection, and improvement of grazing lands, and establishment of a trust fund to be used for these purposes.
Timber Access Road Act of 1955 (P.L. 84-171)	Provides the Secretary of the Interior with the basic authority to acquire timber access roads and rights-of-way.
Toxic Substances Control Act of 1976 (15 U.S.C. 2601 et seq.)	Provides for EPA to restrict, limit, or otherwise control the use and distribution of chemicals that present an unreasonable risk of injury to health or the environment, with the goal of preventing the discharge of such chemicals into the environment.
Transportation Safety Act of 1974, Hazardous materials Transportation Act amendments of 1976 and 1990 (49 U.S.C. 1801 et seq).	Empowers the U.S. Department of Transportation to regulate the transportation of hazardous materials by rail, aircraft, vessel, and public highway.

Uniform Federal Accessibility Standards(UFAS) (49 FR 31528)	The standards used to enforce the Architectural Barriers Act of 1968.
Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1971 (42 U.S.C. 4601)	Provides policy for federal acquisition of lands and interests in lands, and ensures the fair and equitable treatment of persons whose real property is acquired or who are displaced as a result of a Federal or Federally-assisted project.
Uranium Mill Tailings Radiation Control Act of 1978, as amended (42 U.S.C. 2014 et seq.)	Provides for a program of assessment and remedial action at inactive mill tailings sites; to regulate mill tailings during uranium or thorium ore processing at active mill operations; and to stabilize and control tailings after operations in a manner that is safe, environmentally sound, and minimizes or eliminates radiation health hazards to the public.
Water Resources Planning Act (42 U.S.C. 1962)	Encourages the conservation, development, and utilization of water and related resources of the United States on a comprehensive and coordinated basis by the federal government, states, localities, and private enterprise.
Water Quality Act of 1987, as amended from the Federal Water Pollution Control Act of 1977 (33 U.S.C. 1251)	Reauthorized the Water Pollution Control Act (or Clean Water Act) of 1972 and strengthened pollution control standards.
Wild and Scenic Rivers Act of 1968, as amended (16 U.S.C. 1271 et seq.)	Provides for the development and management of certain rivers. Authorizes the Secretary to exchange or dispose of suitable Federally-owned property for non-Federal property within the authorized boundaries of any Federally-administered component of the National Wild and Scenic Rivers System.
Wild Free Roaming Horse and Burro Act of 1971, as amended by the Public Rangelands Improvement Act of 1978 (16 U.S.C. 1331-1340)	Provides for the management, protection and control of wild horses and burros on public lands and authorizes "adoption" of wild horses and burros by private individuals.
Wilderness Act of 1964 (16 U.S.C. 1131 et seq.)	Provides for the designation and preservation of wilderness areas.

APPENDIX C

GUIDELINES/TECHNIQUES/PRACTICES

INTRODUCTION

This appendix provides a general summary of management guidelines, techniques, and practices that when applied with other management actions applicable to public lands resources and resource uses would aid in achieving desired outcomes or conditions. These are considered tools available to the public lands manager to reduce adverse environmental effects and are by no means considered to be a comprehensive list. These are examples of the types of management guidelines, techniques, and practices that are typically used and could be applied which are compiled from many sources. Any number of these could be applied as necessary to make progress towards or to achieve a desired outcome or condition. The term “best management practice” can be considered a synonym for management guidelines, techniques, and practices and has been defined in the glossary as “Innovative, dynamic, and improved environmental protection practices/strategies applied to mining, forestry, oil and gas development, road construction, grazing and other land uses to ensure activities are conducted in an environmentally responsible manner.” Best management practices (BMPs) is often used by land managers to imply a practice that has been specifically developed to mitigate impacts. The term is also used in regulatory definitions related to non-point water quality management contained in Clean Water Act regulations (40CFR130.2), State of Idaho Water Quality Standards (IDAPA 58.01.02), and BLM Idaho Standards for Rangeland Health. This water quality term will be explained more fully in the soil and water resources section below.

While the overall vision embraces the use of these management guidelines, techniques, and practices to reduce/minimize emissions and impacts, they all are not to be considered a land use plan decision unless specifically identified as being a mandatory action in a particular alternative of this DEIS. Specific reference to these management guidelines, techniques, and practices are found in Chapter 2 in the following actions: Action CA-GE-2.1.1, Action CA-AQ-1.2.1, Action CA-SW-1.1.1, Action CA-SW- 2.1.1, Action CA-VE-1.1.1, Action CA-WF-1.2.1, Action CA-FO-1.1.5, Action CA-FO-2.1.4, Action AA-ME-2.3.1, Action B-LR-6.1.1, Action B-LR-6.1.9, Action C-LR-6.1.1, Action C-LR-6.1.10, Action D-LR-6.1.1, and Action D-LR-6.1.9.

These management guidelines, techniques, and practices are considered dynamic and may be updated or modified without a plan amendment if they are not identified as mandatory land use plan decisions. Management guidelines, techniques, and practices used in site specific situations could be incorporated into the proposed action or used as mitigation measures to reduce impacts and analyzed through the NEPA process.

The following management guidelines, techniques, and practices are identified by resources and resource uses. In this appendix, the duplication or similarity of these management guidelines, techniques, and practices is quite possible and can be applied to a variety of situations. Even though these management guidelines, techniques, and practices may be identified for specific situations/actions (e.g. wind energy right-of-ways, livestock grazing, forestry, or road construction) it should not be inferred that these management guidelines, techniques, and practices can only be applied to those specific situations.

RESOURCES:

AIR QUALITY:

Fugitive Dust

To control fugitive dust emissions practices have been developed for the following (non-inclusive) fugitive dust generating sources:

- Unpaved haul roads;
- Stockpiles.

Although directed at the rock crushing industry in particular, these practices may be applicable to mining and mineral processing, sand and gravel operations and others as well.

Fugitive dust control methods for unpaved haul roads include:

- Limit vehicle traffic on unpaved haul roads;
- Limit vehicle speeds on unpaved haul roads. If a speed limit is imposed, post signs along the haul road route, clearly indicating the speed limit. Place signs so they are visible to vehicles entering and leaving the site of operations;
- Apply water to the surface of the unpaved haul road. Control runoff so it does not saturate the surface of the unpaved haul road and cause trackout[1]. If runoff is not or cannot be controlled, try applying gravel to the surface of the unpaved haul road over an area sufficient to control trackout;
- Apply gravel to the surface of the unpaved haul road; and
- Apply an environmentally safe chemical soil stabilizer or chemical dust suppressant to the surface of the unpaved haul road.

Fugitive dust control methods for stockpiles include:

- Limit the height of the stockpiles;
- Limit the disturbance of the stockpiles; and
- Apply water to the surface of the stockpile.

SOILS AND WATER RESOURCES:

Soil Erosion

- Determine the best locations and design for roads, the slope of roads, and the approach to stream crossings through proper planning.
- Designate buffer or streamside management zones where normally the buffer zone is a minimum of 50 feet on either side of any perennial stream.
- Do not locate roads/trails parallel to streams. Where roads must cross streams, cross perpendicularly and then the roads/trails must immediately exit the buffer zone.
- Appropriate improvements must be placed at stream crossings to keep vehicles/equipment out of the stream flow. Place culverts at stream crossings to prevent direct sedimentation of streams.
- Place water-bars on roads/trails at regular intervals to break the flow of water.
- Place broad-based dips, rolling dips, water turnouts, and develop outslopes to provide drainage on less steep roads.
- Maintain adequate ground cover, litter, and canopy to maintain or improve infiltration and soil condition.
- Plant materials established on sites should be adapted to site conditions and be appropriate for the intended site use.
- A permit under section 404 of the Clean Water Act will be obtained for any filling of Waters of the United States.

Water Quality

When the term "Best Management Practice" is used in reference to water or erosion it generally is referring to minimizing water quality impacts through practices that have been developed by many agencies and specifically adopted by the State of Idaho through Water Quality Standards. In Idaho, the BLM is required to comply with State water quality regulations (CFR40.130.12, E.O. 112088, MOU ID-291 and appendices, Idaho Standards for Rangeland Health, Standard 7 - Water Quality). Specifically, the best management practices that are approved under State of Idaho Water Quality standards include: Rules pertaining to the Idaho Forest Practices Act (IDAPA 20.02.01); rules pertaining to Solid Waste Management (IDAPA 58.01.06); Exploration and Surface Mining (IDAPA 20.03.02); Dredge and Placer Mining Operations (IDAPA 20.03.01); Idaho Agriculture Pollution Abatement Plan; and those implemented through TMDLs.

[1] Trackout: the deposition of mud, dirt, or similar debris onto the surface of a paved road from tires and/or undercarriage of any vehicle associated with the operations of a facility.

The BLM will coordinate monitoring activities with the Department of Environmental Quality related to the effectiveness of BMPs (MOU ID-291) and will recognize additional BMPs as they are developed.

The Idaho water quality standards also include an antidegradation statement which states "The existing water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected."

The following documents are incorporated as potential best management practices, some of which are recognized as adopted BMPs in the State of Idaho Water Quality Regulations:

Bureau of Land Management. Draft Environmental Impact Statement Smoky Canyon Mine Panels F and G. Appendix C – Best Management Practices for Erosion, Sedimentation and Selenium control at the Smoky Canyon Mine Panels F and G.
http://www.id.blm.gov/planning/scmdeis/Appendices/Appendix2C.pdf

Idaho Department of Environmental Quality (IDEQ). 2005. Stormwater: Catalog or Stormwater BMPs for Idaho Cities and Counties.
http://www.deq.state.id.us/water/data_reports/storm_water/catalog/old_version/stormwater_catalog.pdf

Idaho Department of Environmental Quality (IDEQ). 2003. Idaho Agricultural Pollution Abatement Plan.
http://www.scc.state.id.us/PDF/AgPlan.pdf

Idaho Department of Environmental Quality. 2000. Protecting Drinking Water Sources in Idaho.
http://www.deq.idaho.gov/water/data_reports/source_water/drinking_water_protection_guidance.pdf

Idaho Department of Environmental Quality. 1999. Idaho Source Water Assessment Plan.
http://www.deq.idaho.gov/water/data_reports/source_water/swa_plan_1999.pdf
[individual assessments for communities can be found at:
http://www.deq.idaho.gov/water/SWAReports/InternetQuery.cfm

Idaho Department of Lands (IDL). 1992. Best Management Practices for Mining in Idaho, Boise, Idaho.
http://www.idl.idaho.gov/bureau/Minerals/bmp_manual1992/bmp_index.htm

Idaho Department of Lands (IDL). 2000. Cumulative Watershed Effects Process for Idaho. Idaho Forest Practices Act. http://www.idl.idaho.gov/bureau/ForestAssist/CWE-Combined.pdf

Idaho Forest Products Commission (IFPC). 2005. BMPs Forestry for Idaho Forest Stewardship Guidelines for Water Quality. http://www.idahoforests.org/bmp.htm

Idaho Mining Association (IMA). 2000a. Existing Best Management Practices at Operating Mines, southeast Idaho Phosphate Resource Area Selenium Project. Idaho Mining Association (IMA). 2000b. Best Management Practice Guidance Manual for Active and Future Mines.

State of Idaho, IDAPA 20.02.01. Rules Pertaining to the Idaho Forest Practices Act.
http://adm.idaho.gov/adminrules/rules/idapa20/0201.pdf

State of Idaho, IDAPA 37.03.07, Stream Channel Alteration Rules
http://www.adm.idaho.gov/adminrules/rules/idapa37/0307.pdf

Idaho Technology Transfer Center. 2005. BMP Handbook. Best Management Practices for Idaho Rural Road Maintenance. University of Idaho, Moscow, Idaho.
http://www.webs1.uidaho.edu/idahot2/BMP%20working%20drafts/BMP_Handbook_HR.pdf

Total Maximum Daily Load (TMDLs)
TMDL assessments, load plans, and implementation plans will be incorporated into the RMP as they are developed. The current plans include: Bear River/Malad River, American Falls, Blackfoot River, and

Portneuf River.
http://www.deq.idaho.gov/water/data_reports/surface_water/tmdls/sba_tmdl_master_list.cfm

Watershed Management Planning

- Avoid, where possible, the long- and short-term adverse impacts to water quality associated with the occupancy and modification of floodplains.
- Avoid destruction of wetlands.
- Prevent contamination from accidental spills.
- Ensure activities conducted under Special Use Permits are protective of source waters.
- Conduct water quality monitoring to determine the effects of land management activities on the beneficial uses of water, and to ensure the health and safety of water users.
- Minimize the amount of erosion and sedimentation at developed sites.
- Take active measures, if necessary, to avoid any activity within 300 yards of a spring used as a source of drinking water.

VEGETATION:

Weed Prevention

- Check body, undercarriage of off-road vehicles, and other equipment for plant material and clean before leaving weed infested areas.
- Ensure that weed prevention is considered in project activities regardless of discipline.
- Minimize the creation of sites suitable for weed establishment.
- Re-establish vegetation on all disturbed soil from construction, reconstruction, and maintenance activities.
- Monitor site(s) for weeds after soil disturbing activities and treat as needed.
- Buy only noxious weed free seed and conduct required seed testing before use.
- Provide weed identification training for field going employees.
- Inspect gravel pits and fill sources to identify weed-free sources.
- Keep main travel corridors free of noxious weeds to prevent spread
- Sign recreation sites for weed awareness and weed prevention techniques.
- Mitigate and reduce weed spread during prescribed fire activities which includes inventory of weeds prior to burning. Treat high risk areas before burning and pre- and post-treat high risk weed infestations.
- Ensure revegetation efforts are effective.
- Track weeds which may affect known populations of BLM sensitive plants. Work with weed coordinator and take potential control measures if necessary.
- Use weed free straw or mulch in revegetation activities.

Vegetation Treatment

Vegetation treatment, which includes the use of chemicals, would be conducted under the Record of Decision for Vegetation Treatment on BLM Lands in Thirteen Western States (1991) until the document is replaced. Specifically, the following steps and minimum practices would be taken for vegetation treatments:

- "The method of treatment to be used shall be determined by several factors such as environmental impacts, effectiveness of practices in meeting objectives, human health, safety, cost effectiveness project longevity, and technology available. Each proposed project will be reviewed prior to treatment by completing a project(s) specific environmental analysis." p. 3
- "During site specific analysis and preliminary planning of weed management and vegetation treatment a field survey will be completed prior to proposed treatment." p. 9
- "If herbicides are proposed for use, buffer strips will be provided adjacent to dwellings, domestic water sources, agriculture land, streams, lakes, and ponds. A minimum buffer strip 100 feet wide will be a

provided for aerial application, 25 feet for vehicle application and 10 feet for hand application. Any deviations must be in accordance with the label for the herbicide. Herbicides will be wiped on individual plants within 10 feet of water where application is critical." p. 10

- "When prescribed fire is used, unburned buffers will be left along streams where practical." p. 10

WILDLAND FIRE MANAGEMENT:

Cultural Resources Protection Practices

- Manually reduce fuels on vulnerable sites/features; dispose of debris away from cultural features.
- Use low intensity backing fire in areas near historic features
- Saturate ground/grass adjacent to vulnerable structures with water, foam, or gel before burning
- Pre-burn site(s) at lower intensity than planned for surrounding areas.
- Limit fire intensity and duration over vulnerable sites
- Use a fast-moving, higher intensity fire over lithic scatters, where rock materials are vulnerable to longer-duration heating
- Create fire breaks near or around sites.
- Wrap structures in fire proof materials or use retardant/foam to protect structures.
- Flush cut and cover stumps with dirt, foam, or retardant, where subsurface cultural resources could be affected
- Identify and reduce hazard trees next to structures
- Cover rock art or wrap carved trees, dendroglyphs, and other such features in fire retardant fabric
- Limb carved trees to reduce ladder fuels
- Minimize fuels and smoke near rock art
- Cover fuels near rock art with foam, water, or retardant, avoiding the rock art.

Fire Management

- Avoid spraying fire retardant in or near drinking water streams, if practicable.
- During fire suppression efforts, avoid watershed damage in excess of that which would be caused by the fire itself.
- Avoid heavy equipment operation on fragile soils and steep slopes when possible.
- Project fires should use a Resource Advisor and watershed specialists to advise the Incident Commander on resource values during the suppression effort.
- Stabilize all areas that have had their erosion potential significantly increased, or their drainage pattern altered by wildfires or by suppression related activities. Treatments include, but are not limited to:
    - installing water bars and other drainage diversions in fire roads, firelines, and other cleared areas;
    - seeding, planting and fertilizing to provide vegetative cover;
    - spreading slash or mulch to protect bare soil;
    - repairing damaged road drainage facilities;
    - clearing stream channels of structures or debris that is deposited by suppression activities;
    - log erosion barriers (contour-felled and anchored trees)
    - channel stabilization structures
    - trash racks above road drainage structures
    - debris retention structures

- Provide for water quality protection in formulating prescribed fire prescriptions. Prescription elements include fire weather, slope, aspect, soil moisture, and fuel moisture. These elements influence the fire intensity and thus have a direct effect of whether or not a desired ground cover remains after burning, and whether or not a water repellent layer is formed. The amount of remaining ground cover and extensiveness of water repellant soil can significantly affect erosion rates.

- Maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients, and debris from entering water bodies during prescribed fires. Some of the techniques used to prevent water quality degradation include:
  - maintaining the integrity of the Stream Management Unit or streamcourse
  - planning prescribed fires with intensities that will not result in soils becoming hydrophobic

RESOURCE USES:

FORESTRY:

Timber Harvesting

Soil Protection - Select for each harvesting operation the logging method and type of equipment adapted to the given slope, landscape and soil properties in order to minimize soil erosion.

- Ground based skidding shall not be conducted if it will cause rutting, deep soil disturbance, or accelerated erosion. On slopes exceeding forty-five percent (45%) gradient and which are immediately adjacent to a Class I or II stream, ground based skidding shall not be conducted except with an approved variance.
- Limit the grade of constructed skid trails on geologically unstable, saturated, or highly erodible or easily compacted soils to a maximum of thirty percent (30%).
- In accordance with appropriate silvicultural prescriptions, skid trails shall be kept to the minimum feasible width and number. Tractors used for skidding shall be limited to the size appropriate for the job.
- Uphill cable yarding is preferred. Where downhill yarding is used, reasonable care shall be taken to lift the leading end of the log to minimize downhill movement of slash and soils.

Location of Landings, Skid Trails, and Fire Trails - Locate landings, skid trails, and fire trails on stable areas to prevent the risk of material entering streams.

- All new or reconstructed landings, skid trails, and fire trails shall be located on stable areas outside the appropriate stream protection zones. Locate fire and skid trails where sidecasting is held to a minimum.
- Minimize the size of a landing to that necessary for safe economical operation
- To prevent landslides, fill material used in landing construction shall be free of loose stumps and excessive accumulations of slash. On slopes where sidecasting is necessary, landings shall be stabilized by use of seeding, compaction, riprapping, benching, mulching or other suitable means.

Drainage Systems - For each landing, skid trail or fire trail a drainage system shall be provided and maintained that will control the dispersal of surface water to minimize erosion.

- Stabilize skid trails and fire trails whenever they are subject to erosion, by water barring, cross draining, outsloping, scarifying, seeding or other suitable means. This work shall be kept current to prevent erosion prior to fall and spring runoff.
- Reshape landings as needed to facilitate drainage prior to fall and spring runoff. Stabilize all landings by establishing ground cover or by some other means within one (1) year after harvesting is completed.

Treatment of Waste Materials - All debris, overburden, and other waste material associated with harvesting shall be left or placed in such a manner as to prevent their entry by erosion, high water, or other means into streams

- Wherever possible trees shall be felled, bucked, and limbed in such a manner that the tree or any part thereof will fall away from any Class I streams. Continuously remove slash that enters Class I streams as a result of harvesting operations. Continuously remove other debris that enters Class I streams as a result of harvesting operations whenever there is a potential for stream blockage or if the stream has the ability for transporting such debris. Place removed material five (5) feet slope distance above the ordinary high water mark.

- Remove slash and other debris that enters Class II streams whenever there is a potential for stream blockage or if the stream has the ability for transporting the debris immediately following skidding and place removed material above the ordinary high water mark.
- Deposit waste material from construction or maintenance of landings and skid and fire trails in geologically stable locations outside of the appropriate Stream Protection Zone.

Stream Protection - During and after forest practice operations, stream beds and streamside vegetation shall be protected to leave them in the most natural condition as possible to maintain water quality and aquatic habitat.

- Lakes require an approved site specific riparian management prescription prior to conducting forest practices within the stream protection zone.
- Ground based skidding in or through streams shall not be permitted. When streams must be crossed, adequate temporary structures to carry stream flow shall be installed. Cross the stream at right angles to its channel if at all possible. Remove all temporary crossings immediately after use and, where applicable, water bar the ends of the skid trails.
- Operation of ground based equipment shall not be allowed within the Stream Protection Zone except at approaches to stream crossings.
- When cable yarding is necessary, across or inside the Stream Protection Zones it shall be done in such a manner as to minimize stream bank vegetation and channel disturbance.
- Provide for large organic debris (LOD), shading, soil stabilization, wildlife cover and water filtering effects of vegetation along streams.
    - Leave hardwood trees, shrubs, grasses, and rocks wherever they afford shade over a stream or maintain the integrity of the soil near a stream. (10-14-75).
    - Leave seventy-five percent (75%) of the current shade over the Class I streams. (7-1-96).
    - Carefully remove timber from the Stream Protection Zone in such a way that shading and filtering effects are not destroyed. (7-1-96).
    - Standing trees, including conifers, hardwoods and snags will be left within fifty (50) feet of the ordinary high water mark on each side of all Class I streams, and within thirty (30) feet on each side of those Class II streams that require thirty (30) feet stream protection zones, in the following minimum numbers per one thousand (1000) feet of stream: Minimum Standing Trees Per One Thousand (1000) Feet Required (each side).
    - Snags will be counted as standing trees in each diameter class if snag height exceeds one and one-half (1 ½) times the distance between the snag and the stream's ordinary high water mark. Not more than fifty percent (50%) of any class may consist of snags. (7-1-96).
    - As an alternative to the standing tree and shade requirements, the operator may notify the BLM authorized officer that a site specific riparian management prescription is requested. The BLM and operator may jointly develop a plan upon consideration of stream characteristics and the need for large organic debris, stream shading and wildlife cover which will meet the objective of these rules. (3-13-90).
    - Where the opposite side of the stream does not currently meet the minimum standing tree requirements of the table, the BLM and the operator should consider a site specific riparian prescription that meets the large organic debris needs of the stream. (3-13-90).
    - Stream width shall be measured as average between ordinary high water marks.

Maintenance of Productivity and Related Values - Harvesting practices will first be designed to assure the continuous growing and harvesting of forest tree species by suitable economic means and also to protect soil, air, water, and wildlife resources.

- Where major scenic attractions, highways, recreation areas or other high-use areas are located within or traverse forest land, give special consideration to scenic values by prompt cleanup and regeneration.
- Give special consideration to preserving any critical wildlife or aquatic habitat. Wherever practical, preserve fruit, nut, and berry producing trees and shrubs.

- Avoid conducting operations along bogs, swamps, wet meadows, springs, seeps, wet draws or other sources where the presence of water is indicated, protect soil and vegetation from disturbance which would cause adverse affects on water quality, quantity and wildlife and aquatic habitat.
- Whenever practical, plan clear cutting operations so that adequate wildlife escape cover is available within one-quarter (¼) mile.

Road Construction, Reconstruction and Maintenance - Road specifications and plans shall be consistent with good safety practices. Plan each road to the minimum use standards adapted to the terrain and soil materials to minimize disturbances and damage to forest productivity, water quality, fish, and wildlife habitat.

- Plan transportation networks to avoid road construction within stream protection zones, except at approaches to stream crossings. Leave or reestablish areas of vegetation between roads and streams.
- Roads shall be no wider than necessary to safely accommodate the anticipated use. Minimize cut and fill volumes by aligning the road to fit the natural terrain features as closely as possible. Adequately compact fill material and dispose of excess material on geologically stable sites.
- Plan roads to drain naturally by out-sloping or in-sloping with cross-drainage and by grade changes where possible. Plan dips, water bars, cross-drainage, or subsurface drainage on roads when necessary.
- Relief culverts and roadside ditches shall be planned whenever reliance upon natural drainage would not protect the running surface, cut slopes or fill slopes. Plan culvert installations to prevent erosion of the fill by properly sizing, bedding and compacting. Plan drainage structures to achieve minimum direct discharge of sediment into streams.
- The following rule applies to installations of new culverts and re-installations during road reconstructions or reinstallations caused by flood or other catastrophic events. Culverts used for temporary crossings are exempt from the fifty (50) year design requirement, but they must be removed immediately after they are no longer needed and before the spring run-off period.
    - Culvert installations on fish bearing streams must provide for fish passage.
    - Design culverts for stream crossings to carry the fifty (50) year peak flow using engineering methods acceptable to the BLM or determine culvert size by using the culvert sizing tables below. The minimum size culvert required for stream crossings shall not be less than eighteen (18) inches in diameter, with the exception of that area of the Snake River drainage upstream from the mouth of the Malad River, including the Bear River basin, where the minimum size shall be fifteen (15) inches.
    - Relief culverts, and those used for seeps, springs, wet areas, and draws shall not be less than twelve (12) inches in diameter for permanent installations.

Culvert Sizing Table - The culvert sizing table will be used for the area of the state south of the Salmon River and outside the South Fork Salmon River drainage. It was developed to carry the fifty (50) year peak flow at a headwater-to-diameter ratio of one (1).

Culvert Sizing Table.

Watershed Area (acres)	Required Culvert Diameter (inches)	Culvert Capacity (cubic feet/second)
Less than 72	18	6
73-150	24	12
151-270	30	20
271-460	36	32
461-720	42	46
721-1025	48	65
1026-1450	54	89
1451-1870	60[1]	112
1871-2415	66	142
2416-3355	72	176
3356-5335	84	260
5336-7410	96	370
7411-9565	108	500
9566-11780	120[2]	675

[1]Strongly consider having culverts larger than sixty (60) inches designed, or consider alternative structures, such as bridges, mitered culverts, arches, etc.
[2]Culverts larger than one hundred twenty (120) inches must be designed; consider alternative structures. # See exception for southeast Idaho in Subsection 040.02.ii. of this rule. (4-5-00)

- Stream crossings, including fords, shall be a minimum in number and planned and installed in compliance with the Stream Channel Protection Act, Title 42, Chapter 38, Idaho Code, and with culvert sizing requirements of Subsection 040.02.e.
- Avoid reconstruction or reuse of existing roads located in stream protection zones, except for approaches to stream crossings, unless it will result in the least long-term impact on site productivity, water quality, and fish and wildlife habitat. Reconstruction or reuse of existing roads in stream protection zones will require a variance.

Road Construction - Construct or reconstruct roads in a manner to prevent debris, overburden, and other material from entering streams.

- Roads shall be constructed in compliance with the planning guidelines of Subsection 040.02. of the Idaho Forest Practices Act.
- Clear all debris generated during construction or maintenance which potentially interferes with drainage or water quality. Deposit excess material and slash on geologically stable sites outside the stream protection zones
- Where exposed material (road surface, cut slopes or fill slopes, borrow pits, waste piles, etc.) is potentially erodible and where sediments would enter streams, stabilize prior to fall or spring runoff by seeding, compacting, rocking, riprapping, benching, mulching or other suitable means.
- In the construction of road fills, compact the material to reduce the entry of water, minimize erosion, and settling of fill material. Minimize the amount of snow, ice, or frozen soil buried in embankments. No significant amount of woody material shall be incorporated into fills. Available slash and debris may be utilized as a filter windrow along the toe of the fill, but must meet the requirements of the Idaho Forestry Act and Fire Hazard Reduction Laws, Title 38, Chapters 1 and 4, Idaho Code.

- During and following operations on out-sloped roads, retain out-slope drainage and remove berms on the outside edge except those intentionally constructed for protection of road grade fills.
- Provide for drainage of quarries to prevent sediment from entering streams.
- Construct cross drains and relief culverts to minimize erosion of embankments. Installation of erosion control devices should be concurrent with road construction. Use riprap, vegetative matter, downspouts and similar devices to minimize erosion of the fill. Install drainage structures or cross drain incomplete roads which are subject to erosion prior to fall or spring runoff. Install relief culverts with a minimum grade of one percent (1%).
- Earthwork or material hauling shall be postponed during wet periods if, as a result, erodible material would enter streams.
    - Cut slopes shall be reconstructed to minimize sloughing of material into road surfaces or ditch lines. Remove or stabilize material subject to sloughing concurrent with the construction operation.
- Roads constructed on slopes greater than sixty percent (60%) in unstable or erodible soils shall be full benched without fill slope disposal. At stream and draw crossings keep fills to a minimum. A variance is required if a full bench is not used.

Road Maintenance - Conduct regular preventive maintenance operations to minimize disturbance and damage to forest productivity, water quality, and fish and wildlife habitat

- Place all debris or slide material associated with road maintenance in a manner to prevent their entry into streams.
- Repair slumps, slides, and other erosion sources causing stream sedimentation to minimize sediment delivery.
- <u>Active roads</u> - a forest road being used for hauling forest products, rock and other road building materials. The following maintenance shall be conducted on such roads.
    - Culverts and ditches shall be kept functional.
    - During and upon completion of seasonal operations, the road surface shall be crowned, out-sloped, in-sloped or cross-ditched, and berms removed from the outside edge except those intentionally constructed for protection of fills.
    - The road surface shall be maintained as necessary to minimize erosion of the subgrade and to provide proper drainage.
    - Hauling shall be postponed during wet periods if necessary to minimize sediment delivery to streams.
    - If road surface stabilizing materials are used, apply them in such a manner as to prevent their entry into streams.
- <u>Inactive roads</u> - a forest road no longer used for commercial hauling but maintained for access (e.g., for fire control, forest management activities, recreational use, and occasional or incidental use for minor forest products harvesting). The following maintenance shall be conducted on inactive roads.
    - Following termination of active use, ditches and culverts shall be cleared and the road surface shall be crowned, out-sloped or in-sloped, water barred or otherwise left in a condition to minimize erosion. Drainage structures shall be maintained thereafter as needed.
    - The roads may be permanently or seasonally blocked to vehicular traffic.
- <u>Long-term Inactive Roads</u> - a road not intended to be used again in the near future but will likely be used again at some point in the future. No subsequent maintenance of a long-term inactive road is required after the following procedures are completed:
    - The road is left in a condition suitable to control erosion by out-sloping, water barring, seeding, or other suitable methods.
    - The road is blocked to vehicular traffic.
    - The BLM may require the removal of bridges, culverts, ditches and unstable fills. Any bridges or culverts left in place shall be maintained by the landowner.
- <u>Permanently Abandoned Roads</u> - a road not intended to be used again. All drainage structures must be removed and roadway sections treated so that erosion and landsliding are minimized.
    - Drainage structures shall be removed and stream gradients restored to their natural slope.
    - The road prism shall be treated to break up compacted areas.

- Fill slopes of roads within stream protection zones shall be pulled back to a stable configuration unless long-term stability has already been achieved.
- Unstable sidehill fills shall be pulled back to a stable configuration.
- Ditch line erosion shall be controlled by cross-ditching, outsloping, or regrading to eliminate ditches.
- All bare earth areas created by regrading, ripping, and drainage removal shall be stabilized by seeding, mulching, armoring, or other suitable means.

Winter Operations - Due to risk of erosion and damage from roads and constructed skid trails inherent in winter logging, at minimum the following shall apply:

- Roads to be used for winter operations must have adequate surface and cross drainage installed prior to winter operations. Drain winter roads by installing rolling dips, driveable cross ditches, open top culverts, outsloping, or by other suitable means.
- During winter operations, roads will be maintained as needed to keep the road surface drained during thaws or break up. This may include active maintenance of existing drainage structures, opening of drainage holes in snow berms and installation of additional cross drainage on road surfaces by ripping, placement of native material or other suitable means.

Chemicals and Petroleum Products

Petroleum Products - Petroleum storage containers with capacities of more than two hundred (200) gallons, stationary or mobile, will be located no closer than one hundred (100) feet from any stream, water course, lake, or area of open water. Dikes, berms or embankments will be constructed to contain at least one hundred ten percent (110%) of the volume of petroleum products stored within the tanks. Diked areas will be sufficiently impervious and of adequate capacity to contain spilled petroleum products. In the event any leakage or spillage enters any stream, water course, lake, or area of open water, the operator will immediately notify the BLM authorized officer.

- Transferring petroleum products. During fueling operations or petroleum product transfer to other containers, there shall be a person attending such operations at all times. Fueling operations should not take place where, if spillage occurs, the fuel will enter streams, lakes or other areas of open water.
- Equipment and containers used for transportation, storage or transfer of petroleum products shall be maintained in a leakproof condition. If the BLM determines there is evidence of petroleum product leakage or spillage, the use of such equipment shall be suspended until the deficiency has been corrected.
- Waste resulting from logging operations, such as crankcase oil, filters, grease, oil containers, or other nonbiodegradable waste shall be removed from the operating area and disposed of properly.

Licensing

- Any person applying, mixing or loading pesticides shall comply with the licensing requirements of Idaho Pesticide Law and IDAPA 02.03.03, “Rules Governing Pesticide and Chemigation Use and Application”.

Maintenance of Equipment

- Equipment used for transportation, storage or application of chemicals shall be maintained in leakproof condition. If there is evidence of chemical leakage, the BLM authorized officer shall have the authority to suspend the further use of such equipment until the deficiency has been corrected.
- The storage of pesticide shall also be conducted in accordance with the requirements Rules of the Idaho Pesticide Law and IDAPA 02.03.03, “Rules Governing Pesticide and Chemical Use and Application”.

Mixing

- When water is used in mixing chemicals:
  - o Provide an air gap or reservoir between the water source and the mixing tank.
  - o Use uncontaminated tanks, pumps, hoses and screens to handle and transfer mix water for utilization in pesticide operations.
- Mixing and landing areas:
  - o Mix chemicals and clean tanks and equipment only where spills will not enter any water source or streams.
  - o Landing areas shall be located where spilled chemicals will not enter any water source or stream.
  - o Rinsate and wash water should be recovered and used for make-up water, be applied to the target area, or disposed of according to state and federal laws.

Aerial Application

- With the exception of pesticides approved for aquatic use and applied according to labeled directions, when applying pesticide leave at least one (1) swath width (minimum one hundred (100) feet) untreated on each side of all Class I streams, flowing Class II streams and other areas of open water. When applying pelletized fertilizer, leave a minimum of fifty (50) feet untreated on each side of all Class I streams, flowing Class II streams, and other areas of open water
- Use a bucket or spray device capable of immediate shutoff.
- Shut off chemical application during turns and over open water.
- Aerial application of pesticides shall also be conducted according to the Idaho Pesticide Law and IDAPA 02.03.03, "Rules Governing Pesticide and Chemical Use and Application".

Ground Application with Power Equipment

- With exception of pesticides approved for aquatic use and applied according to labeled directions, when applying pesticide, leave at least twenty-five (25) feet untreated on each side of all Class I streams, flowing Class II streams and areas of open water.
- When applying fertilizer, leave at least ten (10) feet untreated on each side of all streams and areas of open water.

Hand Application

- Apply only to specific targets; such as, a stump, burrow, bait, or trap
- Keep chemicals out of all water sources or streams.

Limitations on Applications

- Chemicals shall be applied in accordance with all limitations and instructions printed on the product registration labels and supplemental labels.
- Do not exceed allowable rates.
- Prevent direct entry of chemicals into any water source or stream.

Daily Records of Chemical Applications

- When pesticides are applied on forest land, the operator shall maintain a daily record of spray operations which includes:
  - o Date and time of day of application.
  - o Name and address of owner of property treated.
  - o Purpose of the application (control of vegetation, control of Douglas-fir tussock moth, etc.).

  - Contractor's name and pilot's name when applied aerially. Contractor's name or applicator's name for ground application.
  - Location of project (section, township, range and county).
  - Air temperature (hourly).
  - Wind velocity and direction (hourly).
  - Pesticides used including trade or brand name, EPA product registration number, mixture, application rate, carrier used and total amounts applied.
- Whenever fertilizers or soil amendments are applied, the operator shall maintain a daily record of such application which includes Subsection 060.10 and the name of the fertilizer or soil amendment and application rate.
- The records required in Subsection 060.10 shall be maintained in compliance with the record-keeping requirements of IDAPA 02.03.03, "Rules Governing Pesticide and Chemigation Use and Application".
- All records required in Subsection 060.10 shall be retained for three (3) years.

Container Disposal

- Chemical containers shall be cleaned and removed from the forest and disposed of in a manner approved in accordance with applicable local, state and federal regulations; or removed for reuse in a manner consistent with label directions and applicable regulations of a state or local health department. Open burning of containers is prohibited.

Spills

- Spills shall be reported and appropriate cleanup action taken in accordance with applicable state and federal laws and rules and regulations.
- All chemical accidents and spills shall be reported immediately to the BLM authorized officer.
- If chemical is spilled, appropriate procedures shall be taken immediately to control the spill source and contain the released material.
- It is the applicator's responsibility to collect, remove and dispose of the spilled material in accordance with applicable local, state and federal rules and regulations and in an approved manner.

Misapplications

- Whenever chemicals are applied to the wrong site or pesticides are applied outside of the directions on the product label, it is the responsibility of the applicator to report these misapplications immediately to the BLM authorized officer.

Prescribed Fire

To maintain air quality and protect public health the following practices are recommended:

- Slash and large woody debris piles should be compact and free of stumps, soil, snow, and non-woody organic material.
- Piles should be fully cured, dried at least two (2) months, prior to ignition. Piles should be at least partially covered with a water resistant material so they can be ignited after enough precipitation to lower the fire danger.
- Broadcast burns should be conducted within a prescription that minimizes adverse effects on air quality.

LANDS AND REALTY:

The following practices regarding Site Monitoring and Testing, Plan of Development Preparation, Construction, Operation and Decommissioning are related to wind energy right-of-ways.

SITE MONITORING AND TESTING

- The area disturbed by installation of meteorological towers (i.e., footprint) shall be kept to a minimum.
- Existing roads shall be used to the maximum extent feasible. If new roads are necessary, they shall be designed and constructed to the appropriate standard.
- Installation of towers shall be scheduled to avoid disruption of wildlife reproductive activities or other important behaviors.
- Meteorological towers installed for site monitoring and testing shall be inspected periodically for structural integrity.

PLAN OF DEVELOPMENT PREPARATION (GENERAL)

- The BLM and operators shall contact appropriate agencies, property owners, and other stakeholders early in the planning process to identify potentially sensitive land uses and issues, rules that govern wind energy development locally, and land use concerns specific to the region.
- The Federal Aviation Administration (FAA)-required notice of proposed construction shall be made as early as possible to identify any air safety measures that would be required.
- The project shall be planned to utilize existing roads and utility corridors to the maximum extent feasible, and to minimize the number and length/size of new roads, lay-down areas, and borrow areas.
- A monitoring program shall be developed to ensure that environmental conditions are monitored during the construction, operation, and decommissioning phases. The monitoring program requirements, including adaptive management strategies, shall be established at the project level to ensure that potential adverse impacts of wind energy development are mitigated. The monitoring program shall identify the monitoring requirements for each environmental resource present at the site, establish metrics against which monitoring observations can be measured, identify potential mitigation measures, and establish protocols for incorporating monitoring observations and additional mitigation measures into standard operating procedures and BMPs.
- "Good housekeeping" procedures shall be developed to ensure that during operation the site will be kept clean of debris, garbage, fugitive trash or waste, and graffiti; to prohibit scrap heaps and dumps; and to minimize storage yards.

Wildlife and Other Ecological Resources

- Operators shall review existing information on species and habitats in the vicinity of the project area to identify potential concerns.
- Operators shall conduct surveys for federal and/or state-protected species and other species of concern (including special status plant and animal species) within the project area and design the project to avoid (if possible), minimize, or mitigate impacts to these resources.
- Operators shall identify important, sensitive, or unique habitats in the vicinity of the project and design the project to avoid (if possible), minimize, or mitigate impacts to these habitats (e.g., locate the turbines, roads, and ancillary facilities in the least environmentally sensitive areas; i.e., away from riparian habitats, streams, wetlands, drainages, or critical wildlife habitats).
- The BLM will prohibit the disturbance of any population of federal listed plant species.
- Operators shall evaluate avian and bat use of the project area and design the project to minimize or mitigate the potential for bird and bat strikes (e.g., development shall not occur in riparian habitats and wetlands). Scientifically rigorous avian and bat use surveys shall be conducted; the amount and extent of ecological baseline data required shall be determined on a project basis.
- Turbines shall be configured to avoid landscape features known to attract raptors, if site studies show that placing turbines there would pose a significant risk to raptors.

- Operators shall determine the presence of bat colonies and avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies; in known migration corridors; or in known flight paths between colonies and feeding areas.
- Operators shall determine the presence of active raptor nests (i.e., raptor nests used during the breeding season). Measures to reduce raptor use at a project site (e.g., minimize road cuts, maintain either no vegetation or nonattractive plant species around the turbines) shall be considered.
- A habitat restoration plan shall be developed to avoid (if possible), minimize, or mitigate negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. The plan shall identify revegetation, soil stabilization, and erosion reduction measures that shall be implemented to ensure that all temporary use areas are restored. The plan shall require that restoration occur as soon as possible after completion of activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- Procedures shall be developed to mitigate potential impacts to special status species. Such measures could include avoidance, relocation of project facilities or lay-down areas, and/or relocation of biota.
- Facilities shall be designed to discourage their use as perching or nesting substrates by birds. For example, power lines and poles shall be configured to minimize raptor electrocutions and discourage raptor and raven nesting and perching.

Visual Resources

- Turbine arrays and turbine design shall be integrated with the surrounding landscape. Design elements to be addressed include visual uniformity, use of tubular towers, proportion and color of turbines, nonreflective paints, and prohibition of commercial messages on turbines.
- Other site design elements shall be integrated with the surrounding landscape. Elements to address include minimizing the profile of the ancillary structures, burial of cables, prohibition of commercial symbols, and lighting. Regarding lighting, efforts shall be made to minimize the need for and amount of lighting on ancillary structures.

Roads

- An access road siting and management plan shall be prepared incorporating existing BLM standards regarding road design, construction, and maintenance such as those described in the BLM 9113 Manual (BLM 1985) and the *Surface Operating Standards for Oil and Gas Exploration and Development* (RMRCC 1989) (i.e., the Gold Book).

Ground Transportation

- A transportation plan shall be developed, particularly for the transport of turbine components, main assembly cranes, and other large pieces of equipment. The plan shall consider specific object sizes, weights, origin, destination, and unique handling requirements and shall evaluate alternative transportation approaches. In addition, the process to be used to comply with unique state requirements and to obtain all necessary permits shall be clearly identified.
- A traffic management plan shall be prepared for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan shall incorporate measures such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configuration.

Noise

- Proponents of a wind energy development project shall take measurements to assess the existing background noise levels at a given site and compare them with the anticipated noise levels associated with the proposed project.

Noxious Weeds and Pesticides

- Operators shall develop a plan for control of noxious weeds and invasive species, which could occur as a result of new surface disturbance activities at the site. The plan shall address monitoring, education of personnel on weed identification, the manner in which weeds spread, and methods for treating infestations. The use of certified weed-free mulching shall be required. If trucks and construction equipment are arriving from locations with known invasive vegetation problems, a controlled inspection and cleaning area shall be established to visually inspect construction equipment arriving at the project area and to remove and collect seeds that may be adhering to tires and other equipment surfaces.
- If pesticides are used on the site, an integrated pest management plan shall be developed to ensure that applications would be conducted within the framework of BLM and DOI policies and entail only the use of EPA-registered pesticides. Pesticide use shall be limited to nonpersistent, immobile pesticides and shall only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.

Cultural/Historic Resources

- The presence of archaeological sites and historic properties in the area of potential effect shall be determined on the basis of a records search of recorded sites and properties in the area and/or, depending on the extent and reliability of existing information, an archaeological survey. Archaeological sites and historic properties present in the area of potential effect shall be reviewed to determine whether they meet the criteria of eligibility for listing on the *National Register of Historic Places* (NRHP).
- When any rights-of-way application includes remnants of a National Historic Trail, is located within the viewshed of a National Historic Trail's designated centerline, or includes or is within the viewshed of a trail eligible for listing on the NRHP, the operator shall evaluate the potential visual impacts to the trail associated with the proposed project and identify appropriate mitigation measures for inclusion as stipulations in the POD.
- If cultural resources are present at the site, or if areas with a high potential to contain cultural material have been identified, a cultural resources management plan (CRMP) shall be developed. This plan shall address mitigation activities to be taken for cultural resources found at the site. Avoidance of the area is always the preferred mitigation option. Other mitigation options include archaeological survey and excavation (as warranted) and monitoring. If an area exhibits a high potential, but no artifacts were observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area. A report shall be prepared documenting these activities. The CRMP also shall (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land.

Paleontological Resources

- If paleontological resources are present at the site, or if areas with a high potential to contain paleontological material have been identified, a paleontological resources management plan shall be developed. This plan shall include a mitigation plan for collection of the fossils; mitigation could include avoidance, removal of fossils, or monitoring. If an area exhibits a high potential but no fossils were observed during survey, monitoring by a qualified paleontologist could be required during all excavation and earthmoving in the sensitive area. A report shall be prepared documenting these activities. The paleontological resources management plan also shall (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of fossils on public land.

Hazardous Materials and Waste Management

- Operators shall develop a hazardous materials management plan addressing storage, use, transportation, and disposal of each hazardous material anticipated to be used at the site. The plan shall identify all hazardous materials that would be used, stored, or transported at the site. It shall establish inspection procedures, storage requirements, storage quantity limits, inventory control, non-hazardous product substitutes, and disposition of excess materials. The plan shall also identify requirements for notices to federal and local emergency response authorities and include emergency response plans.
- Operators shall develop a waste management plan identifying the waste streams that are expected to be generated at the site and addressing hazardous waste determination procedures, waste storage locations, waste-specific management and disposal requirements, inspection procedures, and waste minimization procedures. This plan shall address all solid and liquid wastes that may be generated at the site.
- Operators shall develop a spill prevention and response plan identifying where hazardous materials and wastes are stored on site, spill prevention measures to be implemented, training requirements, appropriate spill response actions for each material or waste, the locations of spill response kits on site, a procedure for ensuring that the spill response kits are adequately stocked at all times, and procedures for making timely notifications to authorities.

Storm Water

- Operators shall develop a storm water management plan for the site to ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion.

Human Health and Safety

- A safety assessment shall be conducted to describe potential safety issues and the means that would be taken to mitigate them, including issues such as site access, construction, safe work practices, security, heavy equipment transportation, traffic management, emergency procedures, and fire control.
- A health and safety program shall be developed to protect both workers and the general public during construction, operation, and decommissioning of a wind energy project. Regarding occupational health and safety, the program shall identify all applicable federal and state occupational safety standards; establish safe work practices for each task (e.g., requirements for personal protective equipment and safety harnesses; Occupational Safety and Health Administration [OSHA] standard practices for safe use of explosives and blasting agents; and measures for reducing occupational electric and magnetic fields [EMF] exposures); establish fire safety evacuation procedures; and define safety performance standards (e.g., electrical system standards and lightning protection standards). The program shall include a training program to identify hazard training requirements for workers for each task and establish procedures for providing required training to all workers. Documentation of training and a mechanism for reporting serious accidents to appropriate agencies shall be established.
- Regarding public health and safety, the health and safety program shall establish a safety zone or setback for wind turbine generators from residences and occupied buildings, roads, rights-of-ways, and other public access areas that is sufficient to prevent accidents resulting from the operation of wind turbine generators. It shall identify requirements for temporary fencing

around staging areas, storage yards, and excavations during construction or decommissioning activities. It shall also identify measures to be taken during the operation phase to limit public access to hazardous facilities (e.g., permanent fencing would be installed only around electrical substations, and turbine tower access doors would be locked).

- Operators shall consult with local planning authorities regarding increased traffic during the construction phase, including an assessment of the number of vehicles per day, their size, and type. Specific issues of concern (e.g., location of school bus routes and stops) shall be identified and addressed in the traffic management plan.
- If operation of the wind turbines is expected to cause significant adverse impacts to nearby residences and occupied buildings from shadow flicker, low-frequency sound, or EMF, site-specific recommendations for addressing these concerns shall be incorporated into the project design (e.g., establishing a sufficient setback from turbines).
- The project shall be planned to minimize electromagnetic interference (EMI) (e.g., impacts to radar, microwave, television, and radio transmissions) and comply with Federal Communications Commission [FCC] regulations. Signal strength studies shall be conducted when proposed locations have the potential to impact transmissions. Potential interference with public safety communication systems (e.g., radio traffic related to emergency activities) shall be avoided.
- The project shall be planned to comply with FAA regulations, including lighting regulations, and to avoid potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.
- Operators shall develop a fire management strategy to implement measures to minimize the potential for a human-caused fire.

CONSTRUCTION (GENERAL)

- All control and mitigation measures established for the project in the POD and the resource-specific management plans that are part of the POD shall be maintained and implemented throughout the construction phase, as appropriate.
- The area disturbed by construction and operation of a wind energy development project (i.e., footprint) shall be kept to a minimum.
- The number and size/length of roads, temporary fences, lay-down areas, and borrow areas shall be minimized.
- All electrical collector lines shall be buried in a manner that minimizes additional surface disturbance (e.g., along roads or other paths of surface disturbance). Overhead lines may be used in cases where burial of lines would result in further habitat disturbance.
- Operators shall identify unstable slopes and local factors that can induce slope instability (such as groundwater conditions, precipitation, earthquake activities, slope angles, and the dip angles of geologic strata). Operators also shall avoid creating excessive slopes during excavation and blasting operations. Special construction techniques shall be used where applicable in areas of steep slopes, erodible soil, and stream channel crossings.
- Erosion controls practices such as jute netting, silt fences, and check dams shall be applied near disturbed areas.

Wildlife

- Guy wires on permanent meteorological towers shall be avoided, however, may be necessary on temporary meteorological towers installed during site monitoring and testing.
- In accordance with the habitat restoration plan, restoration shall be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- All construction employees shall be instructed to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. In addition, pets shall not be permitted on site during construction.

Visual Resources

- Operators shall reduce visual impacts during construction by minimizing areas of surface disturbance, controlling erosion, using dust suppression techniques, and restoring exposed soils as closely as possible to their original contour and vegetation.

Roads

- Existing roads shall be used, but only if in safe and environmentally sound locations. If new roads are necessary, they shall be designed and constructed to the appropriate standard and be no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Excessive grades on roads, road embankments, ditches, and drainages shall be avoided, especially in areas with erodible soils. Special construction techniques shall be used, where applicable. Abandoned roads and roads that are no longer needed shall be re-contoured and revegetated.
- Access roads and on-site roads shall be surfaced with aggregate materials, wherever appropriate.
- Access roads shall be located to follow natural contours and minimize side hill cuts.
- Roads shall be located away from drainage bottoms and avoid wetlands, if practicable.
- Roads shall be designed so that changes to surface water runoff are avoided and erosion is not initiated.
- Access roads shall be located to minimize stream crossings. All structures crossing streams shall be located and constructed so that they do not decrease channel stability or increase water velocity. Operators shall obtain all applicable federal and state permits.
- Existing drainage systems shall not be altered, especially in sensitive areas such as erodible soils or steep slopes. Potential soil erosion shall be controlled at culvert outlets with appropriate structures. Catch basins, roadway ditches, and culverts shall be cleaned and maintained regularly.

Ground Transportation

- Project personnel and contractors shall be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure safe and efficient traffic flow and to reduce wildlife collisions and disturbance and airborne dust.
- Traffic shall be restricted to the roads developed for the project. Use of other unimproved roads shall be restricted to emergency situations.
- Signs shall be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimize impacts on local commuters, consideration shall be given to limiting construction vehicles traveling on public roadways during the morning and late afternoon commute time.

Air Emissions

- Dust abatement techniques shall be used on unpaved, unvegetated surfaces to minimize airborne dust.
- Speed limits (e.g., 25 mph [40 km/h]) shall be posted and enforced to reduce airborne fugitive dust.
- Construction materials and stockpiled soils shall be covered if they are a source of fugitive dust.
- Dust abatement techniques shall be used before and during surface clearing, excavation, or blasting activities.

Excavation and Blasting Activities

- Operators shall gain a clear understanding of the local hydrogeology. Areas of groundwater discharge and recharge and their potential relationships with surface water bodies shall be identified.
- Operators shall avoid creating hydrologic conduits between two aquifers during foundation excavation and other activities.
- Foundations and trenches shall be backfilled with originally excavated material as much as possible. Excess excavation materials shall be disposed of only in approved areas or, if suitable, stockpiled for use in reclamation activities.
- Borrow material shall be obtained only from authorized and permitted sites. Existing sites shall be used in preference to new sites.
- Explosives shall be used only within specified times and at specified distances from sensitive wildlife or streams and lakes, as established by the BLM or other federal and state agencies.

Noise

- Noisy construction activities (including blasting) shall be limited to the least noise-sensitive times of day (i.e., daytime only between 7 a.m. and 10 p.m.) and weekdays.
- All equipment shall have sound-control devices no less effective than those provided on the original equipment. All construction equipment used shall be adequately muffled and maintained.
- All stationary construction equipment (i.e., compressors and generators) shall be located as far as practicable from nearby residences.
- If blasting or other noisy activities are required during the construction period, nearby residents shall be notified in advance.

Hazardous Materials and Waste Management

- Secondary containment shall be provided for all on-site hazardous materials and waste storage, including fuel. In particular, fuel storage (for construction vehicles and equipment) shall be a temporary activity occurring only for as long as is needed to support construction activities.
- Wastes shall be properly containerized and removed periodically for disposal at appropriate off-site permitted disposal facilities.
- In the event of an accidental release to the environment, the operator shall document the event, including a root cause analysis, appropriate corrective actions taken, and a characterization of the resulting environmental or health and safety impacts. Documentation of the event shall be provided to the BLM authorized officer and other federal and state agencies, as required.
- Any wastewater generated in association with temporary, portable sanitary facilities shall be periodically removed by a licensed hauler and introduced into an existing municipal sewage treatment facility. Temporary, portable sanitary facilities provided for construction crews shall be adequate to support expected on-site personnel and shall be removed at completion of construction activities.

Public Health and Safety

- Temporary fencing shall be installed around staging areas, storage yards, and excavations during construction to limit public access.

OPERATION (GENERAL)

- Inoperative turbines shall be repaired, replaced, or removed in a timely manner. Requirements to do so shall be incorporated into the due diligence provisions of the rights-of-way authorization. Operators will be required to demonstrate due diligence in the repair, replacement, or removal of turbines; failure to do so could result in termination of the rights-of-way authorization.

Wildlife

- Observations of potential wildlife problems, including wildlife mortality, shall be reported to the BLM authorized officer immediately.

Ground Transportation

- Ongoing ground transportation planning shall be conducted to evaluate road use, minimize traffic volume, and ensure that roads are maintained adequately to minimize associated impacts.

Monitoring Program

- Site monitoring protocols defined in the POD shall be implemented. These will incorporate monitoring program observations and additional mitigation measures into standard operating procedures and BMPs to minimize future environmental impacts.
- Results of monitoring program efforts shall be provided to the BLM authorized officer.

Public Health and Safety

- Permanent fencing shall be installed and maintained around electrical substations, and turbine tower access doors shall be locked to limit public access.
- In the event an installed wind energy development project results in EMI, the operator shall work with the owner of the impacted communications system to resolve the problem. Additional warning information may also need to be conveyed to aircraft with onboard radar systems so that echoes from wind turbines can be quickly recognized.

DECOMMISSIONING (GENERAL)

- Prior to the termination of the rights-of-way authorization, a decommissioning plan shall be developed and approved by the BLM. The decommissioning plan shall include a site reclamation plan and monitoring program.
- All management plans, BMPs, and stipulations developed for the construction phase shall be applied to similar activities during the decommissioning phase.
- All turbines and ancillary structures shall be removed from the site.
- Topsoil from all decommissioning activities shall be salvaged and reapplied during final reclamation.
- All areas of disturbed soil shall be reclaimed using weed-free native shrubs, grasses, and forbs.
- The vegetation cover, composition, and diversity shall be restored to values commensurate with the ecological setting.

LIVESTOCK GRAZING:

Guidelines for Livestock Grazing Management

- Use grazing management practices and/or facilities to maintain or promote significant progress toward adequate amounts of ground cover (determined on an ecological site basis) to support infiltration, maintain soil moisture storage, and stabilize soils.
- Locate livestock management facilities away from riparian areas wherever they conflict with achieving or maintaining riparian-wetland functions.
- Use grazing management practices and/or facilities to maintain or promote soil conditions that support water infiltration, plant vigor, and permeability rates and minimize soil compaction appropriate to site potential.

- Implement grazing management practices that provide periodic rest or deferment during critical growth stages to allow sufficient re-growth to achieve and maintain healthy, properly functioning conditions, including good plant vigor and adequate vegetative cover appropriate to site potential.
- Maintain or promote grazing management practices that provide sufficient residual vegetation to improve, restore, or maintain healthy riparian-wetland functions and structure for energy dissipation, sediment capture, ground water recharge, streambank stability, and wildlife habitat appropriate to site potential.
- The development of springs, seeps, or other projects affecting water and associated resources shall be designed to protect the ecological functions, wildlife habitat, and significant cultural and historical/archaeological/paleontological values associated with the water source.
- Apply grazing management practices to maintain, promote, or progress toward appropriate stream channel and streambank morphology and functions. Adverse impacts due to livestock grazing will be addressed.
- Apply grazing management practices that maintain or promote the interaction of the hydrologic cycle, nutrient cycle, and energy flow that will support the appropriate types and amounts of soil organisms, plants, and animals appropriate to soil type, climate, and landform.
- Apply grazing management practices to maintain adequate plant vigor for seed production, seed dispersal, and seedling survival of desired species relative to soil type, climate, and landform.
- Implement grazing management practices and/or facilities that provide for complying with the Idaho Water Quality Standards.
- Use grazing management practices developed in recovery plans, conservation agreements, and Endangered Species Act, Section 7 consultations to maintain or improve habitat for federally listed threatened, endangered, and sensitive plants and animals.
- Apply grazing management practices and/or facilities that maintain or promote the physical and biological conditions necessary to sustain native plant populations and wildlife habitats in native plant communities.
- On areas seeded predominantly with non-native plants, use grazing management practices to maintain or promote the physical and biological conditions to achieve healthy rangelands.
- Where native communities exist, the conversion to exotic communities after disturbance will be minimized. Native species are emphasized for rehabilitating disturbed rangelands. Evaluate whether native plants are adapted, available, and able to compete with weeds or seeded exotics.
- Use non-native plant species for rehabilitation only in those situations where:
    - Native species are not readily available in sufficient quantities;
    - Native plant species cannot maintain or achieve the standards; or
    - Non-native plant species provide for management and protection of native rangelands.
    - Include a diversity of appropriate grasses, forbs, and shrubs in rehabilitation efforts.
- On burned areas, allow natural regeneration when it is determined that populations of native perennial shrubs, grasses, and forbs are sufficient to revegetate the site. Rest burned or rehabilitated areas to allow recovery or establishment of perennial plant species.
- Carefully consider the effects of new management facilities (e.g., water developments, fences) on healthy and properly functioning rangelands prior to implementation.
- Use grazing management practices, where feasible, for wildfire control and to reduce the spread of targeted undesirable plants (e.g., cheatgrass, medusa head, wildrye, and noxious weeds) while enhancing vigor and abundance of desirable native or seeded species.
- Employ grazing management practices that promote natural forest regeneration and protect reforestation projects until the Idaho Forest Practices Act requirements for timber stand replacement are met.
- Design management fences to minimize adverse impacts, such as habitat fragmentation, to maintain habitat integrity and connectivity for native plants and animals.
- Manage the timing and intensity of grazing to:
    - enhance, or at a minimum, prevent the degradation of, riparian vegetation
    - enhance infiltration of surface water into the ground
    - ensure stream banks are protected
- Within source water protection areas, sheep grazing is preferable over cattle because sheep tend to graze in upland areas while cattle tend to spend time in the streams.

- Manage livestock numbers and season of use to maintain and protect soil and water resources.
- Construct fences or other barriers to keep livestock out of sensitive areas where loss of vegetative cover, soil compaction, or riparian impairment could adversely impact water quality.

MINERALS AND ENERGY:

These are examples of BMPs that can be put into practice to reduce impacts from various aspects associated with mining activities (e.g., control of erosion, sedimentation, and selenium mobilization as well as development of haul/access roads). Due to the variability among physical mining environments, any one BMP cannot be universally implemented. Good engineering practices dictate that BMPs be selected and implemented "as applicable," with respect to site conditions. General descriptions of BMPs identified herein have been published either by the EPA, IDL, Idaho Mining Association (IMA), or USFS and are considered to be effective when properly applied.

Overburden Fill Grading

- Final grading should be completed as soon as possible following overburden disposal. During reclamation, the fill slopes should graded at a maximum 3h:1v (horizontal: vertical) slope to reduce surface water run-off velocity.

Haul Road Run-Off Controls

- Haul roads should be graded away from fill slopes, or crowned, so that concentrated flow is not allowed to run along or across and erode the road. Berms shall be maintained to prevent run-off. Other controls such as appropriately located rolling dips, water bars, and water deflectors could be used to reduce erosion of the road surface or road base.

Construction of Fills for Roads and Facilities

- Fills, road or parking areas should be constructed of chert or other non-seleniferous material and designed with stable slopes. Slopes with topsoil should have temporary vegetation.

Concurrent Reclamation

- Reclamation of disturbed areas that are no longer needed for active mining operations should be conducted concurrent with other mining operations.

Soil Salvage and Reuse

- Salvaging topsoil and vegetation growth medium from disturbed areas prior to mining is important for the long-term reclamation success of these areas. Topsoil should be removed and either is hauled direct to regraded surfaces ready to receive topsoil or is placed in topsoil stockpiles for temporary storage.

Soil Stabilization

- Stable reclaimed areas are promoted through the use of stabilization techniques such as: placement of soil on slopes that are 3h:1v or less; scarifying soil surfaces to reduce run-off; seedbed preparation to enhance the germination rate of seeds; incorporation of fertilizer, mulch, and other methods to enhance successful growth of vegetation and/or direct run-on water.

Capping Seleniferous Overburden

- Reclamation techniques seek to cover seleniferous overburden with a minimum of four feet of low-seleniferous chert. Topsoil would then be spread on top of the chert layer to complete the cap/cover.

Pit Backfilling

- Pit backfilling and subsequent revegetation helps restore areas to stable and productive post-mining uses. Pit backfilling would allow these areas to be re-vegetated and support the desired post-mining land use.

Riprap and Gabions

- Chert riprap can be placed in areas subject to erosion, such as below culverts, drainage outlets and ditches thereby reducing erosion and sedimentation. Gabion walls made of chert could also be selectively used to protect road fills from erosion by flowing water.

Run-on Collection/Runoff Control (Control of Surface Water)

- Directing clean run-on water over disturbed areas may be necessary at some times. Using materials with a low permeability to line corridors will keep water from infiltrating into the unconsolidated material. Velocity reducing structures will help reduce the sediment in the water and should prevent gullies and rills from forming.
- Clean run-on water could be directed across an overburden area or backfill using corridors designed to handle the peak flow generated from a 100 year 24 hr storm event, and with velocities between 1.5 fps and 4.0 fps. These corridors should be constructed with a compacted layer of alluvium of a "geosynthetic liner. Velocity reducing/silt reducing structures should be constructed on appropriate intervals based on the runoff area, slope aspect, and peak flow on the overburden area or backfill.

Sediment Controls

- Construction of sediment traps, silt fences, catch basins and sediment settling ponds reduce the velocity of flowing water and allow sediment in water to settle out in a controlled manner. To the extent possible, these features are located off areas of seleniferous overburden.
- Sediment ponds are designed to contain the runoff and sediment from the 100-year, 24-hour storm event. Maintenance of the ponds would be done to provide the design capacity for sediment and water at all times. Management of these controls includes periodic repairs and cleaning to remove sediment and restore capacity or functionality.

Seeding and Revegetation (Reclamation and Revegetation)

- Revegetation of disturbed slopes reduces run-off quantity and velocity that would otherwise contribute to runoff volumes. As soon as practicable, disturbed areas would be graded, topsoiled and reseeded with techniques and acceptable seed mix.

Range Management

- Livestock grazing in reclaimed areas should be controlled until the reclaimed areas have become stabilized and are deemed ready for grazing.

Perennial and Ephemeral Drainage Channels

- Avoiding placement of mine overburden in perennial drainage channels reduces infiltration of stream flow into the overburden. Permanent placement of seleniferous overburden material in perennial channels should be avoided, but crossing drainages with temporary road fills is required to access mining areas. These crossings would be built from chert and designed so they can be reshaped during reclamation to resemble the surrounding area.

- Avoidance of ephemeral and intermittent drainage channels in the location of seleniferous overburden disposal sites reduces the effects of infiltration on the overburden. Mine panels and their external overburden disposal sites that are located on drainage divides can avoid most ephemeral drainage channels. Ephemeral channels that cross the proposed mine disturbance would be collected and diverted in ditches around the active mining area. Permanent placement of seleniferous overburden material in ephemeral drainages should also be avoided to the extent practicable. Road crossings should be built from non-seleniferous material and designed so they can be reshaped to resemble and blend with the surrounding area.

Characterization and Selective Handling of Seleniferous Overburden

- Rex Chert (including limestone) has been demonstrated to be essentially non-seleniferous. Seleniferous overburden should be placed in approved pit backfills and external dumps and then capped or covered with non-seleniferous materials.

Control of Groundwater Impacts

- Covering natural seeps and springs with overburden will be avoided to eliminate introduction of water into seleniferous material from the natural seeps and or springs. Overburden final slopes will be graded to promote runoff and avoid ponding to reduce infiltration from precipitation and snowmelt. Runoff and sediment control facilities will be located off overburden fills to the extent feasible to reduce infiltration of collected water into seleniferous overburden.
- South-and west-facing slope aspects will be incorporated into final overburden fill slopes as much as possible to enhance evapotranspiration and reduce infiltration of meteoric water. Topsoil and vegetation will be re-established on overburden disposal areas to enhance evapotranspiration.
- Runoff from haul road drainage ditches onto external seleniferous overburden fills will be avoided to the extant possible. Stockpiled areas of snow will be controlled and placed in areas to reduce infiltration or mixing of snow or snow melt into/with external overburden to the extent practicable. Seleniferous overburden will be mined and disposed of in a timely manner to reduce exposure of this material to surface weathering and oxidation - the process that liberates soluble selenium compounds. Overburden will be characterized to determine selenium containing (seleniferous) lithologic units that can generate problematic leachate or promote bio-accumulation in vegetation growing on this Overburden. Overburden from these lithologic units will be selectively handled to reduce its exposure to surface environments. Surface area of seleniferous overburden fills and disposal areas will be reduced by design to the extent practicable to limit the amount of water infiltration and potential release of hazardous materials. Seleniferous overburden fills will be capped or covered with chert or limestone and topsoil to reduce exposure of the overburden to vegetation roots, and to protect them these piles from erosion, and to promote evapotranspiration from the pile.

Overburden Caps and Covers

- To reduce the exposure of seleniferous overburden to the surface environment use topsoil and low selenium chert or limestone as a cover. Cher refers to overburden with a low selenium concentration and can include chert, cherty limestone, and limestone. Chert of sufficient depth and with a coarse texture would deter deep root penetration into underlying seleniferous overburden, thus reducing bioaccumulation in reclamation vegetation. Separation and isolation of vegetation roots from the seleniferous overburden would be accomplished by the thick chert and topsoil cap. Rooting depths for the grass and forb vegetation mix proposed for use in reclamation of mine sites are typically up to about 4 feet, which is less than the thickness of the chert and topsoil cap/cover.
- Proposed cap/covers would control erosion by covering all seleniferous overburden on the tops of the overburden fills with at least 4 feet of chert material resistant to weathering and erosion and approximately 1 to 2 feet of topsoil over the chert for a total cover thickness of 5 to 6 feet. All areas of

chert/topsoil covers would also be re-vegetated to further protect the reclaimed surface from erosion and to provide enhanced evapotranspiration.

- Infiltration of precipitation and snow melt into the seleniferous overburden shales would be reduced by a number of features including: 1) producing a final grade on reclaimed surfaces to shed runoff instead of letting it pond and infiltrate; 2) establishing a perennial native vegetation cover which would consume soil moisture during the growing season; and 3) providing adequate thickness of topsoil and chert subsoil to retain quantities of annual precipitation that falls on the cap/cover, A large portion of this retained precipitation would be available for plants to remove through evapotranspiration during the growing season.

Permanent Drainage Channels over Overburden

- Where drainage channels must be permanently routed over overburden fills such channels should be designed to be stable without damage for the peak flow from the 100-year, 24-hour storm on top of snowmelt. To prevent seepage into underlying seleniferous overburden, a clay liner should be installed under the channel or the overburden directly underlying the channel bottom and for a distance of 50 feet on either side of the channel should consist of chert or other non-seleniferous overburden. The channel surface should be protected from erosion with chert riprap.

Air Quality

- Dust from drilling activities will be controlled with dust collectors mounted on the drill rigs or with water or drilling fluid. Fugitive dust from traffic on unpaved haul and access roads will be controlled with dust suppressant water applied by water trucks. Dust suppressing chemicals such as magnesium chloride and calcium chloride could also be used on roads as deemed necessary.

Soil

- Available and suitable topsoil resources in areas for proposed actions will be described with baseline surveys. Suitable topsoil and growth medium would be salvaged during pre-stripping from proposed disturbed areas for use in reclamation following completion of the disturbance.
- Soil that is salvaged would either be transported directly to areas being reclaimed or would be temporarily stockpiled. Soil stockpiles would be protected from erosion by seeding and establishment of a short-term vegetation cover. Soil stockpiles would be built with as little compaction as possible and located out of traffic areas to minimize compaction from equipment.
- Reclamation of disturbed areas which are no longer required for active mining operations would be conducted concurrent with other mining operations. Soil that is applied to reclaimed areas would be applied to a thickness of 1 to 3 feet, and topsoil would be re-spread to the maximum thickness allowed by the availability of salvaged topsoil. Topsoil will be re-spread with minimal compaction and protected from erosion through revegetation.

Vegetation

- Non-commercial timber, brush and slash would be stockpiled for use as runoff and sediment control brush barriers along the downhill margins of disturbed areas.
- Small brush and slash would be incorporated into the topsoil when it is salvaged. Revegetation of disturbed areas would be conducted during reclamation activities by seeding and planting with approved vegetation species mix. Seeding of the approved reclamation seed mix would proceed no later than the first fall after a regraded area is covered with topsoil.
- In order to control and prevent the spread of noxious weeds, vehicles would be cleaned prior to entering the project area for the first time. Revegetation would be conducted to stabilize disturbed surfaces with perennial vegetation communities and restore the land use for multiple use management.

Surface Water

- Drainage and diversion channels would be constructed to divert run-on water around disturbance areas and collect runoff from disturbed areas to route it to settling ponds and other sediment control features.
- Runoff from disturbed areas would be directed to sediment ponds or silt traps to contain any sediment in the runoff water. Sediment ponds would be designed for the runoff from the 100- year, 24-hour storm event in the control area, plus a snow melt event. They would be located outside and off of seleniferous overburden fills.
- Erosion of channels and rills would be controlled by use of erosion control blankets, vegetation, mulch, chert, or limestone riprap or gabions filled with chert or limestone. Culverts would be properly sized and designed for water flow and fish passage and installed for road crossings of various waterways. Snow removal would be practiced to prevent the soil contained in the removed snow from being released outside of the runoff control area and to reduce man-made entrainment of snow in external overburden fills or waste dumps, to the extent practicable.
- Perennial and significant intermittent drainages would be avoided in location of overburden disposal areas to the extent possible. Drainage channels that are routed over overburden would be designed to reduce infiltration of channel flow into underlying seleniferous overburden.
- Fills for road and parking area surfaces would be constructed of chert or limestone and would be designed with slopes and temporary vegetation, as applicable, to stabilize slopes and reduce generation of sediment in the runoff from these areas.
- Seleniferous overburden would be placed in approved fills and capped with chert and topsoil. The bottom layer of seleniferous overburden fills would be constructed to reduce the potential for formation of overburden seeps. Low permeability layers of soil or shale in foundations of external overburden disposal area slopes would be modified or removed to avoid the perching of water leading to the formation of overburden seeps.

Wetlands

- Disturbance of these areas would be minimized through design efforts to avoid wetlands whenever possible. Wetland disturbances would be permitted and mitigated, and/or restored as directed by the United States Army Corps of Engineers (USACE). Runoff from planned disturbances up-gradient of wetlands and riparian areas would be controlled to reduce transport of sediment and other contaminants into the wetlands and riparian areas.

Wildlife and Fisheries/Aquatics

- Construction in stream channels would be planned in advance to occur during low flows, and the channels and banks would be stabilized against erosion as part of the initial construction. Culverts in stream channels that are known fisheries would be designed for the passage of migrating fish. Pipes (bypass pipes left in place or installed independently) would also be placed for passage of amphibians in known and/or suspected amphibian habitat areas.

Management of Hazardous Materials

- Management of hazardous materials, hazardous wastes, and petroleum products will be in accordance with applicable federal and state requirements.

RECREATION

Recreation Sites

- Sanitation facilities (ranging from pit toilets to treatment plants) will be planned, located, designed, constructed, operated, inspected, and maintained to minimize possibilities of water contamination. All activities related to location, design, inspection, operation, and maintenance will be performed by trained, qualified personnel.

- Refuse disposal will be managed to protect surface and subsurface soil and water resources from contamination by nutrients, bacteria, and chemicals.
- Prohibit discharges and disposal of human and animal waste, petroleum products, and other hazardous substances in or near streams in recreation areas.
- Educate the public to conduct their activities in ways that will not degrade water quality.
- Avoid degradation of water quality by locating pack and riding stock facilities at safe locations away from springs, streams, lakes, wet meadows, and other surface waters.

PESTICIDES/FERTILIZERS

Pesticides

- Only use U.S. EPA registered pesticides and comply with all label directions for use.
- Ensure proper transportation, handling and application according to the label.
- Do not apply during or right before significant weather events, such as heavy rainfall, which will cause runoff of pesticides.
- Store pesticides according to label directions so that spills and loss are prevented.
- Mix and load pesticides on impermeable surfaces where any accidental spills would not enter surface waters or potentially impact drinking water supplies.
- Contain and clean up spills immediately; report spills to appropriate regulatory agency.
- Dispose of containers properly; recycle if possible.
- Notify downstream water systems so the appropriate operational changes can be made prior to spraying to utilize appropriate filtration or switch to ground water sources.
- Consider alternatives to pesticide and herbicide use including biological controls, prescribed fire, mechanical treatments, and silvicultural management systems which minimize or eliminate the need for chemical use (un-even aged management, single and group tree selection, etc.).

Fertilizers

- Apply fertilizers at appropriate agronomic rates so that no ground water pollution will occur below the root zone.
- Do not apply fertilizer during or right before significant weather events, such as heavy rainfall, which will cause runoff of pesticides
- Storage and loading areas should be located where accidental spills will not enter surface waters and should not be located near wellheads.
- Follow label directions for storage, mixing, and disposal
- Prevent fertilizers from entering streams with drinking water intakes.
- Contain and clean up all spills immediately; report to appropriate regulatory agency

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APPENDIX D

SEASONAL RESTRICTIONS FOR IDENTIFIED WILDLIFE HABITAT AREAS AND RAPTORS

Species	Animal Activity	Area Affected	Seasonal Restriction
Raptors	Nesting, rearing	Buffer zone varies with topography and vegetation, see following table for basic guides.	Dates vary by species, see following table.
Big Game	Winter range	Winter range as mapped.	Snowmobiles would be restricted to existing roads from 11/15 to 4/30.
	Calving/fawning	Where known or discovered.	Motorized vehicles would be restricted to existing roads from 5/15 to 6/30.
Greater sage-grouse, Sharp-tailed Grouse	Leks	0.6 mi. from lek	3/1 to 5/31
	Nesting and brood rearing	1.5 mi. from lek	4/30 to 6/30
	Winter range	Where mapped or found.	12/15 to 3/1
Gray wolf	Denning, rendezvous site	One mile	Apr 1 - June 30 until 6 or more breeding pairs established or de-listed
Utah Valvata Snail	All life activities	Suitable habitat	yearlong
Neo-tropical migrant birds	Utilize latest accepted guidelines.		
Riparian Areas[1]		No closer than 150 feet either side of fish-bearing streams	yearlong
		No closer than 100 feet either side non-fish-bearing streams	yearlong
		50 feet either side seasonal streams	yearlong

[1] Stream crossings, if necessary, would be designed to minimize adverse impacts to soils, water quality and riparian vegetation per **Actions CA-SW-2.1.4** and **CA-VE-1.1.4.**

Raptor Seasonal and Spatial Buffers Restrictions

Species	Seasonal Buffer[2]	Spatial Buffer
Bald eagle	2/1 – 8/15	½ mile
Bald eagle winter roosts	11/15 – 4/15	½ mile
Golden eagle	2/1 – 8/15	½ mile
Red-tailed hawk	3/15 – 8/15	½ mile
Ferruginous hawk	3/15 – 8/1	½ mile
Swainson's hawk	3/1 – 8/15	½ mile
Peregrine falcon	3/1 – 8/31	½ mile
Prairie falcon	4/1 – 8/31	½ mile
Kestrel	4/1 – 8/15	¼ mile
Goshawk	4/1 – 8/15	½ mile
Cooper's hawk	4/1 – 8/15	½ mile
Sharp-shinned hawk	4/1 – 8/15	½ mile
Harrier	4/1 – 8/15	½ mile
Great horned owl	12/1 – 8/1	¼ mile
Long-eared owl	3/1 – 8/1	¼ mile
Short-eared owl	3/1 – 8/1	¼ mile
Saw-whet owl	3/1 – 8/1	¼ mile
Screech owl	3/1 – 8/1	¼ mile
Burrowing owl	3/1 – 8/1	¼ mile
Osprey	4/1 – 8/31	½ mile
Turkey vulture	5/1 – 8/15	½ mile

[2] On an annual basis, if young of the year birds fledge, the restrictions may be waived or adjusted per **Action CA-FW-1.1.9**. Site specific assessments might also change the restrictions.

APPENDIX E

MATRIX OF CUTTHROAT TROUT OBJECTIVES FOR YELLOWSTONE AND BONNEVILLE TROUT

INTRODCTION

This appendix describes how various components of cutthroat trout habitat would be managed within the Pocatello Field Office area to achieve desired aquatic and riparian conditions as outlined in A Framework for Incorporating The Aquatic and Riparian Habitat Component of the Interior Columbia Basin Strategy into BLM and Forest Service Plan Revisions **(**July 2004**)**.

Habitat components described in this appendix include habitat, water quality, life history diversity and isolation, flow/hydrology, and watershed condition. In addition to guidance provided in this cutthroat matrix, cutthroat management is addressed in the various alternatives. Examples of alternative actions that address cutthroat management include:

- Action A-SS-1.2.4
- Action A-SS-1.2.8
- Action AA-ME-2.2.2
- Action B-SS-1.2.6
- Action B-SS-1.2.8
- Action C-SS-1.2.10
- Action C-SS-1.2.11
- Action D-SS-1.2.4
- Action D-SS-1.2.8

APPENDIX E
MATRIX OF CUTTHROAT (YELLOWSTONE AND BONNEVILLE) TROUT OBJECTIVES

Objectives	Habitat Indicators: Importance of Indicator	Functioning Properly	Functioning At Risk	Functioning At An Unacceptable Risk
HABITAT ELEMENTS	**Pools:** Pools provide important habitat throughout all salmonid life stages. The frequency and size of pools is dependent on stream size and channel type. Pool quality is a measure of channel complexity and consists of size in relation to the average stream width, maximum depth and in-channel and over-hanging cover. **(6,7,11,13,15,17)**	25-50% of the stream reach in pool habitat with >50% of the pools in Class 1, 2, 3. Small Stream (5-20 ft in width) A channel type= 10-25 pools/mi B channel type = 40-60 pools/mi C channel type = 50-100 pools/mi Medium Stream (25-50 ft in width) B channel type = 10-20 pools/mi C channel type = 12-40 pools/mi Large Stream (over 50 ft) B & C channel types = 5-15 pools/mi	10-25% of the stream reach in pool habitat with 25-50% of the pools in Class 1, 2, 3 Small Streams(5-20 ft in width) A channel type=5-10 pools/mi B channel type=20-40 pools/mi C channel type=25-50 pools/mi Medium stream(25-50 ft in width) B channel type=5-10 pools/mi C channel type=6-12 pools/mi Large Stream (over 50 ft in width) B & C channel types=2-5 pools/mi	<10% of the stream reach in pool habitat with most in Classes 4 & 5 Small Streams(5-20 ft in width) A channel type=<5 pools/mi B channel type=<20 pools/mi C channel type=<25 pools/mi Medium stream(25-50 ft in width) B channel type=<5 pools/mi C channel type=<6 pools/mi Large streams (over 50 ft in width) B & C channel types=<2 pools/mi
	Large Pools: The number of large, deep pools with abundant in-channel and over-hanging cover are extremely important for over- winter habitat and for base-flow habitat conditions, especially during extended drought conditions. In the winter, salmonid habitat selection is shifted to areas with low water velocities to minimize energy expenditure (i.e. cutthroat trout avoid riffles and select for deep runs and pools, especially those with ground water influence). Pool cover is provided by boulders, woody debris, root wads, aquatic vegetation, depth with surface turbulence, under-cut banks and over-hanging vegetation. **(6,7,11,13,15,17)**	10-15% of the pools present in the stream reach in Class 1: pool length or width greater than the average stream width; >2 ft deep; and over ½ of the pool area has abundant cover. <u>Expected Maximum Pool Depth</u> Small Streams (2-20 ft in width) A channel type= 0.5-1.5 ft B channel type= 0.9-2.3 ft C channel type= 1.6-2.6 ft Medium streams (25-50 ft) B channel type= 2.9-3.4 ft C channel type= 3.0-3.9 ft Large stream (over 50 ft in width) B channel type= <3 ft C channel type= <4 ft	5-10% of the pools present in the stream reach are in Class 1 but most of the depths are in the medium range within the expected maximum depth.	<5% of the pools present in the stream reach are in Class 1 and most of the depths are at or below the lower end of the expected maxim depth range.

Objectives	Habitat Indicators: Importance of Indicator	Functioning Properly	Functioning At Risk	Functioning At An Unacceptable Risk
	Habitat Complexity/Channel Structure: Yellowstone cutthroat trout density and biomass are directly related to the amount of habitat complexity and channel structure. The more homogeneous a stream channel is, the greater the chance that a required habitat component is insufficient or missing for a life history stage. Habitat complexity consists of an equitable distribution of habitat types throughout the stream reach: pools, riffles, runs, pocket water, interstitial cobble spaces, spawning gravels, undercut banks and escape cover. Channel structure such as boulders, large woody debris, aquatic vegetation, root wads, aquatic vegetation and overhanging vegetation are essential in the development of stream channel habitat complexity. **(2,5.6,17)**	Habitat complexity and the pool:riffle:run ratio is appropriate for the channel type of the stream in question. Channel structure is very heterogeneous. Habitat for all Yellowstone cutthroat trout life history stages is present and is relatively abundant.	One or more of the habitat complexity components are moderately reduced but the habitat is still relatively heterogeneous. Habitat for all life history stages is still present but moderately reduced.	One or more of the habitat complexity components is greatly reduced or missing. Habitat for one or more Yellowstone cutthroat trout life history stages is greatly reduced or missing. Channel structure is relatively homogeneous.
	Spawning Gravel: Redd density correlates directly with abundance of spawning gravel. Spawning gravel diameter ranges from 0.1 to 3 inches. Excessive fine sediment in the spawning gravel lowers embryo and fry survival. **(2,5,9,15,17)**	Abundant spawning gravel present in patches of at least 2.5 to 3 square feet or greater. <12% fines (<0.8 mm) in the gravel.	Abundant to moderate amounts of spawning gravel present in patches of a least 2.5 to 3 square feet 12-17% fines in the gravel.	Low amounts of spawning gravel present in patches generally smaller than 2.5 square feet.
	Rearing Habitat: The literature indicates that high sediment levels in cutthroat trout redds leads to reduced embryo and fry survival but in many cases does not always limit recruitment. In many cases, cutthroat populations are not typically limited by reduced spawning success but that recruitment is frequently limited by available rearing habitat, again a measure of habitat complexity. Cutthroat rearing habitat consists of areas of low velocity, high channel complexity, abundant overhead cover and a free matrix of large cobble with abundant interstitial spaces. Cutthroat young frequently use the cobble interstitial spaces for cover and it is	High channel complexity resulting in abundant micro-habitats for Yellowstone cutthroat trout rearing. Clean, free matrix cobble present with abundant interstitial spaces available. Cobble embeddedness 0 to ¼.	A moderate reduction in channel complexity and associated micro-habitats for cutthroat raring. Moderate increase in cobble embeddedness to ¼ to ½..	A very homogeneous channel lacking habitat and cover complexity in the form of boulder, large woody debris, aquatic vegetation, undercut banks etc. Cobble embeddedness is high, > 1/2 of large cobble embedded with fine sediment.

Objectives	Habitat Indicators: Importance of Indicator	Functioning Properly	Functioning At Risk	Functioning At An Unacceptable Risk
	extremely important as over winter habitat to escape predation and the effects of anchor and frazzle ice. **(2,5,9,15,17)**			
WATER QUALITY	**Water Temperature:** Maximum daily water temperature has a greater effect on Yellowstone cutthroat trout growth, productivity and survival than do minimum temperatures. **(2,5,15,17)**	The 7-day maximum moving average in a stream reach falls within the optimal range for the following Yellowstone cutthroat life history stages. Spawning and incubation: 6-17 C Optimal embryo development 8-10 C Juvenile : 11-21 C with 15 C optimal Adult: 0-22 C with 9-15 C optimal	The 7-day maximum moving average water temperature in the stream reach is at or near the limits of the temperature range for a given life history stage.	The 7-day maximum moving average water temperature significantly outside the temperature range for a given life history stage.
	Chemical Contamination/Nutrients	Low levels of chemical contamination from agriculture, mining or other sources, no excess nutrients and no CWA 303(d) designated stream segments. No affect on Yellowstone cutthroat trout productivity.	Moderate levels of chemical contamination from agriculture, mining or other source, some excess nutrient levels (moderate algal blooms), and one 303(d) designate stream reach. Minor impacts to Yellowstone cutthroat trout productivity.	High levels of chemical contamination from agriculture, mining or other sources, excessive nutrient levels resulting in heavy algal or periphyton blooms, and more than one CWA 303(d) designated reach.
LIFE HISTORY DIVERSITY AND ISOLATION	**Connectivity/Barriers:** Watershed connectivity is extremely important for the persistence and genetic integrity of a Yellowstone cutthroat trout population. For a healthy cutthroat population, connectivity should be available among at least five subpopulations of at least 1-2000 individuals within a sub basin at the 5th level HUC or at the 4th level HUC for simple sub basins. Small population sizes often associated with isolated and fragmented habitat greatly increases the extinction risk. The loss of connectivity and immigration among populations may	Natural or man-made barriers not present in the watershed or if present in the watershed allow upstream and /or downstream fish passage at all flows	Natural or man-made barriers are present in the watershed and do not allow upstream and/or downstream fish passage at base flows	Natural or man-made barriers are present in the watershed and do not allow upstream and/or downstream fish passage over a large range of flows

Objectives	Habitat Indicators: Importance of Indicator	Functioning Properly	Functioning At Risk	Functioning At An Unacceptable Risk
	substantially shorten the time to extinction. The more spatially restricted a population becomes, the greater the chance that a required habitat component is insufficient or missing for a life history stage. Lack of connectivity may reduce the number of genetically diverse breeding individuals which may be insufficient to allow the population to persist in to the distant future. **(4,5,15,17)**			
	Habitat Size (Space): For long term population viability and persistence, Yellowstone cutthroat trout require a minimum stream length to maintain adequate habitat availability for all its life history forms and stages. Approximately 8 kilometers (5 miles) are needed to maintain a viable cutthroat population with a high fish abundance (<0.3 fish/meter or 480 fish/mile). Approximately 25 kilometers (15 miles) are needed to maintain a viable cutthroat population with a low fish abundance (> 0.1 fish/ meter or 160 fish/mile). **(8)**	Greater than five miles of stream area available in high density cutthroat population reaches. Greater than 15 miles of stream are available in low density cutthroat population reaches.	At least 5 miles of stream area are available in high density cutthroat trout population reaches. At least 15 miles of stream are available in low density cutthroat population reaches.	Substantially less than 5 miles of stream available in high density cutthroat population reaches. Substantially less than 15 miles of stream are available in low density cutthroat population reaches
FLOW/ HYDROLOGY	**Changes in Peak and Base Flow:** Recent studies suggest that Yellowstone cutthroat trout populations do best with a normal, late May –early June hydrograph with relatively steep ascending and descending limbs and a relatively high peak (i.e. a relatively large difference between the peak and base flows (high maximum: minimum discharge ratio. **(7,15,16)**	Watershed hydrograph indicates that the timing, magnitude and duration of peak and base flow are comparable to an undisturbed watershed of similar size, geology and geography. High maximum: minimum discharge ratio.	Watershed hydrograph shows some evidence that the timing, magnitude and duration of peak and base flows are moderately altered but the hydrologic processes are still adequate to maintain functional channel conditions and cutthroat habitat condition. Moderate maximum:minimum discharge ratio.	Watershed hydrograph shows pronounced changes in the timing, magnitude and duration of peak and base flows. Hydrologic processes are greatly reduced and channel characteristics and associated cutthroat trout habitat condition are greatly affected. Low maximum:minimum discharge ratio.
WATERSHED CONDITION	Functional Condition: Riparian/wetland areas are functioning properly when adequate vegetation, land form, and/or large woody debris is present to dissipate energy	Riparian/wetland areas are functioning properly. Adequate vegetation, land form, and/or large woody debris is present to dissipate	Riparian/wetland area is in functional condition but an existing soil, water or vegetation attribute makes the area susceptible to	Riparian/wetland areas are non-functional and clearly are not providing adequate vegetation, land form or woody debris to dissipate

Objectives	Habitat Indicators: Importance of Indicator	Functioning Properly	Functioning At Risk	Functioning At An Unacceptable Risk
	associated with high water flows, reducing erosion and improving water quality and fishery habitat. A healthy riparian zone filters sediment and captures bedload, aids in streambank and floodplain development, improves flood-water retention, stabilizes streambanks, increases biodiversity and improves channel characteristics to provide the habitat and water depth, duration and temperature necessary for good fish production. A proper functioning riparian zone is a result of the interaction among geology, soil, water, vegetation and animals. **(14)**	energy associated with high water.	degradation.	stream energy associated with high stream flows.
	Riparian Conservation Areas: Widths of the Habitat Conservation Areas that are adequate to protect streams from non-channelized sediment inputs should be sufficient to provide other riparian functions, including delivery of organic matter and woody debris, stream shading, and bank stability. **(12)** RCA buffer width necessary to avoid delivery of non-channelized sediment to streams by slope gradient: % Slope — RCA buffer width (ft.) <5% — 115 6-10 — 165 11-15 — 210 16-20 — 250 21-25 — 300 26-30 — 325 31-40 — 350 41-50 — 400 51-60 — 430 >60 — 450	RCA buffer width is equal to or greater than the estimated width for the given adjacent slope gradient. Management activities are not retarding the attainment of Riparian Management Objectives. No facilities in the RCA.	RCA is slightly reduced from the estimate width for the given adjacent slope gradient Management activities may be slowing the attainment of Riparian Management Objectives. No facilities in the RCA.	RCA is greatly reduced from the estimated width for the given adjacent slope gradient. Management activities are moderate to heavy and facilities are present in the RCA.

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APPENDIX F

LAND IDENTIFIED FOR DISPOSAL UNDER THE AUTHORITY OF THE FEDERAL LAND TRANSACTION FACILITATION ACT

Boise Meridian

T.1 S., R. 38 E.

S4, Lot 3	53 ac.
S3, Lot 3	52 ac.
S3, SW¼SE¼	40 ac.
S10, NW¼NE¼	40 ac.
S15, W½NW¼	40 ac.
S13, S½NE ¼, SE¼, E½SW¼	320 ac.
S24, NE¼NW¼	40 ac.
S32, NE¼SW¼	40 ac.

T. 1 S., R. 39 E.

S8, SW¼NE¼, NW¼SE¼	80 ac.
S9, SW¼SE¼	40 ac.
S10, N½SW¼	80 ac.
S11, N½SE¼, NE¼SW¼	120 ac.
S22, SW¼NW¼, N½SW¼	120 ac.

T. 2 S., R. 38 E.

S14, SW¼NW¼	40 ac.
S21, NW¼SE¼	40 ac.
S22, N½SW¼	80 ac.

T. 2 S., R. 39 E.

S11, E½NW ¼	80 ac.

T. 2 S., R. 40 E.

S7, NE¼SE¼, NE¼SW¼	80 ac.
S3, Lot 4	40 ac.
S3, SE¼SW¼	40 ac.
S14, NE¼NW¼	40 ac

T. 2 S., R. 41 E.

S6, SW¼NE¼	40 ac.
S7, SW¼SE¼	40 ac.
S18, Lot 1	27 ac.

T. 3 S., R. 39 E.

S25, NW¼NW¼	40 ac.
S27, SE¼NE¼	40 ac.
S30, E½NW¼	80 ac.

T. 3 S., R. 40 E.

S17	640 ac.
S20, W½NE¼, NW¼, SW¼	400 ac.
S26, SE¼NE¼	40 ac.
S26, NE¼SW¼	40 ac.
S28 SW¼SW¼	40 ac.
S33, NW¼NW¼	40 ac.
S33, NE¼SW¼	40 ac.

T. 4 S., R. 40 E.

S4, SW¼NE¼	40 ac.
S4, E½SE¼	80 ac.
S9, E½SE¼	80 ac.

T. 4 S., R. 41 E.

S28, NW¼, NW¼, SW¼	200 ac.
S29, SW¼NW¼, NW¼SW¼	80 ac.
S30, SE¼NE¼	40 ac.
S32, N½NE¼	80 ac.
S33, E½NE¼, NW¼NW¼	120 ac.

T. 4 S., R. 42 E.

S30, SW¼SE¼, SE¼SW¼	80 ac.
S31, E½NW¼,	80 ac.

T. 5 S., R. 39 E.

S4, E½SE¼	80 ac.
S4, E½SW¼	80 ac.
S9, NE¼, E½SE¼	240 ac.
S27, SW¼SW¼	40 ac.
S28, S½SE¼	80 ac.
S28, E½SW¼	80 ac.
S28, SE¼NW¼	40 ac.
S30, SW¼SE¼, SE¼SW¼	80 ac.
S30, Lot 3	39 ac.
S32, W½NW¼	80 ac.
S33, NE¼, N½SE¼, NE¼SW¼, W½NW¼	400 ac.
S34, S½NE¼, NW¼NE¼, SE¼SW½, NW¼	600 ac.

T. 5 S., R. 41 E.
S29, NW¼SW¼ 40 ac.
S31, S½NE¼, W½SW¼, 240 ac.
S32, W½NW¼, W½SW¼ 160 ac.

T. 5 S., R. 42 E.
S28 640 ac.
S33, E½, N½NW¼ 400 ac.

T. 6 S., R. 39 E.
S2, S½SE¼, S½SW¼, NW¼SW¼ 200 ac.
S3, S½NE¼, E½SE¼, Lot 2 200 ac.
S12, N½, SE¼, E½SW ¼ 560 ac.
S13, NE¼, NE¼NW ¼ 200 ac.
S24, NE¼SW¼ 40 ac.

T. 6 S., R. 42 E.
S1, S½NE¼ 80 ac.

T. 6 S., R. 43 E.
S6, Lot 5 41 ac.

T. 7 S., R. 42 E.
S14, SE¼NE¼ 40 ac.
S14, SW¼NW¼ 40 ac.

T. 7 S., R. 43 E.
S29, NE¼NW¼ 40 ac.

T. 8 S., R. 39E.
S19, Lot 1 20 ac.

T. 8 S., R. 46 E.
S3, SE¼SE¼ 40 ac.
S10, NE¼NE¼ 40 ac.
S14, Lot 1 51 ac.

T. 9 S., R. 39 E.
S22, SE¼NW¼ 40 ac.
S22, NE¼SE¼ 40 ac.
S23, NW¼SW¼ 40 ac.
S26, NW¼NE¼, W½SE¼ 120 ac.
S35, E ½ 320 ac.

T. 10 S., R. 40 E.
S20, NE¼SW¼ 40 ac.
S29, E½SE¼ 80 ac.
S31, Lot 2 41 ac.
S31, Lot 4 42 ac.
S31, SE¼SE¼ 40 ac.
S32, SW¼SW¼ 40 ac.

T. 10 S., R. 43 E.
S34, SW¼SE¼ 40 ac.

T. 11 S., R. 39 E.
S1, Lot 1 23 ac.

T. 11 S., R. 40 E.
S6, SE¼NW¼ 40 ac.
S29, N½NE¼ 80 ac.

T. 11 S., R. 43 E.
S3, Lot 4 41 ac.
S14, E½SW¼ 80 ac.
S20, NE¼NW¼ 40 ac.
S27, NE¼SE¼ 40 ac.
S33, SW¼NW¼ 40 ac.

T. 12 S., R. 38 E.
S13, Lot 4 37 ac.

T. 12 S., R. 40 E.
S3, Lot 3 41 ac.
S9, NW¼NW¼ 40 ac.

T. 12 S., R. 40 E.
S17, SE¼SE¼ 40 ac.
S20, E½NE¼ 80 ac.
S20, NW¼NW¼ 40 ac.
S21, SW¼NW¼ 40 ac.
S22, SW¼NW¼ 40 ac.
S23, W½SW¼ 80 ac.
S26, N½NW¼ 80 ac.
S27, E½NE¼ 80 ac.
S32, S½NE¼ 80 ac.

T. 12 S., R. 44 E.
S23, S½SE¼ 80 ac.

T. 12 S., R. 46 E.
S4, Lot 4 37 ac.

T. 13 S., R. 39 E.
S11, N½SE¼, SW¼SE¼, SW¼ 280 ac.
S12, NW¼SW¼ 40 ac.
S14, SW¼NE¼ 40 ac.

T. 13 S., R. 40 E.
S1, NE¼SW¼ 40 ac.
S1, SW¼SW¼ 40 ac.
S2, SE¼SE¼ 40 ac.
S22, NE¼NW¼ 40 ac.
S27, SE¼NW¼ 40 ac.

T. 13 S., R. 41 E.
S5, SE¼SW¼ 40 ac.
S17, NW¼NW¼ 40 ac.
S20, SE¼NE¼, NE¼SE¼ 80 ac.
S28, NW¼SW¼ 40 ac.

T. 13 S., R. 44 E.
S18, SW¼SE¼ 40 ac.
S34, SW¼SW¼ 40 ac.

T. 13 S., R. 45 E.
S21, NE¼NE¼ 40 ac.
S22, NW¼NW¼ 40 ac.

T. 13 S., R. 46 E.
S5, SW¼NE¼ 40 ac.

T. 14 S., R. 38 E.
S25, S½SE¼ 80 ac.

T. 14 S., R. 43 E.
S18 Lot 3 64 ac.
S27, N½NW¼ 80 ac.

T. 14 S., R. 45 E.
S19, SE¼SE¼ 40 ac.
S20, SW ¼ SW ¼ 40 ac.

T. 14 S., R. 46 E.
S17, NW¼SW¼ 40 ac.
S19, Lot 2 40 ac.
S19, Lot 3 39 ac.
S 20, SW¼NW¼ 40 ac.

T. 14 S., R. 46 E.
S31, NW¼NE¼ 40 ac.
S31, NW¼SE¼ 40 ac.

T. 15 S., R. 38 E.
S27, S½SW¼, NW¼SW¼,
SW¼, NW¼ 160 ac.
S28, NE¼NW¼ 40 ac.
S30, Lot 1 35 ac.
S34, N½NW¼ 80 ac.
S34, W½SW¼ 80 ac.

T. 15 S., R 40 E.,
S14, SE¼SW¼ 40 ac.
S15, SW¼NE¼, W½SE¼ 120 ac.
S15, W½SW¼ 80 ac.
S21, SE¼SE¼ 40 ac.
S22, N½NE¼ 80 ac.
S28, NE¼NE¼ 40 ac.

T. 15 S., R. 41 E.
S19, NE¼ 160 ac.
S31, S½NW¼NE¼ 20 ac.

T. 15 S., R. 43 E.
S3, W½SW¼, SW¼NW¼ 120 ac.
S4, SE¼NE¼ 40 ac.

T. 15 S., R. 46 E.
S27, SE¼SE¼ 40 ac.

T. 16 S., R. 40 E.
S2, SW¼ 160 ac.
S12, NW¼NE¼ 40 ac.
S12, NE¼SE¼ 40 ac.
S19, NE¼NW¼ 40 ac.
S25, NE¼NE¼ 40 ac.

T. 16 S., R. 43 E.
S10, SE¼NW¼, NE¼SW¼ 80 ac.

T. 16 S., R. 45 E.
S12, E½SE¼ 80 ac.

T. 16 S., R. 46 E.
S20, NW¼NW¼ 40 ac.

Acres rounded to the nearest whole number.

APPENDIX G

ROAD AND TRAIL LOCATIONS IDENTIFIED FOR PUBLIC ACCESS ACQUISITION

Location	Legal Description	Miles	Coordination Needs
Morgan Bridge	T4S R39E S19	0.1	Bingham County
Stump Creek	T7S R46E S22	0.5	Caribou County
Taylor Mountain	T1S R39E S7	2.5	Bingham County
Blackrock Canyon	T7S R35E S14	0.5	Bannock County
Moonlight Mountain	T6S R36E S30	0.5	Shoshone-Bannock Tribes, Bannock County
Caddy Canyon	T7S R35E S14	1.5	Bannock County
King Creek	T7S R38E S16	1.8	USFS, Caribou County
Crystal Creek	T8S R34E S30	0.8	USFS, Power County
Bell Marsh Creek	T8S R36E S34	2	USFS, Bannock County
Smith Canyon	T8S R38E S10	0.3	Caribou County
S. Fish Creek	T9S R38E S22	0.3	Bannock County
Garden Creek	T10S R35E S4	1	Bannock County
Browns Canyon	T6S R44E S29	2	USFS, Caribou County
Cottonwood Creek	T12S R40E S34	1.5	Franklin County
Beaver Basin	T10S R39E S22	0.3	Caribou County
Wallentine	T8S R44E S31	1	Caribou County
Harkness Canyon	T9S R37E S9	2	USFS, Bannock County
E. Bob Smith	T9S R37E S13	1.5	USFS, Bannock County
Outlaw Creek	T6S R34E S32	1.5	USFS, Bannock County
Jacobs Canyon	T15S R43E S28	0.5	Bear Lake County
Cheatback Canyon	T11S R41E S4	0.5	Caribou County
Upper Miles Canyon	T13S R43E S17	0.3	Bear Lake County
Bear Hollow	T13S R45E S18	2.5	USFS, Bear Lake County
Oregon Trail	T13S R45E S32	4.5	Bear Lake County
Cottonwood/Lost	T9S R36E S20	2	USFS, Bannock County
Soda Point	T9S R41E S7	0.05	Caribou County
Co-op Creek	T11S R43E S32	2	Bear Lake County
Blackfoot River Narrows	T7S R42E S11	1	Caribou County
2 ½ Mile Canyon	T5S R35E S30	0.5	Bannock County
Oneida Narrows	T14S R40E S21	9.0	BOR, Franklin County
Total miles = 44.5			

APPENDIX H

FLUID MINERALS LEASING, TERMS AND STIPULATIONS

This Appendix is divided into the following four sections:

Section I	**-** explains the fluid mineral leasing process and lease stipulations,
Section II	**-** BLM Form 3100-11, Standard Oil and Gas Lease with Terms and Conditions, and Standard Geothermal Resources Lease with Terms and Conditions, BLM Form3200-24,
Section III	**-** Fluid mineral lease stipulations (#1 through #12) and Special Administration Stipulations (#7 through #12) for leases, and
Section IV	**-** Definitions.

SECTION I - The Fluid Mineral Leasing Process and Stipulations for the Pocatello Field Office

Fluid minerals leases, including oil and gas and geothermal resources, fall into two categories, competitive and noncompetitive. Issuance of fluid mineral leases represents a commitment of resources that could have indirect impacts because such a lease confers on the lessee a right to future exploration and development of geothermal or oil and gas resources.

The leasing process proposed in the Pocatello RMP was prepared in accordance with Executive Order (EO) 13212 (May 18, 2001), which states, "…agencies shall expedite their review of permits or take other actions necessary to accelerate the completion of [energy-related projects] while maintaining safety, public health, and environmental protections. The agencies shall take such actions to the extent permitted by law and regulation and where appropriate."

Fluid mineral leasing allocation decisions are made at the planning stage. The EIS associated with the Pocatello RMP is intended to meet the NEPA requirements in support of leasing decisions. A determination of adequacy of the NEPA document is required for all lease applications. Preparation of another NEPA document, plan amendment or additional activity planning is not normally required prior to issuance of an oil and gas or a geothermal lease, except as discussed below.

Additional NEPA documentation would be needed prior to leasing if there if significant new circumstances or information bearing on the environmental consequences of leasing not within the broad scope analyzed previously in the Pocatello RMP/EIS. In this case, additional NEPA analysis would be completed.

The next phase of Bureau NEPA analysis occurs when the lessee or the operator submits an application for exploration or development. When permit applications are submitted, site-specific NEPA impact analyses, as appropriate, are conducted to provide another tier of environmental protection through the development of conditions of approval to be included in the approved permits. This phased process is consistent with current policy and regulations (e.g., H-1624-1 Planning for Fluid Mineral Resources, rel. 1-1583; chapter 1, B.2. Resource Management Planning Tier; 43 CFR 10.5-3(a); Onshore Order No.1, III.G.5; 43 CFR 3162.5-1(a)) and these longstanding Bureau practices remain unchanged.

The current PFO process for considering leasing and appropriate stipulations is contained in the original Pocatello RMP (1987) and a related oil and gas leasing environmental assessment (1988). Modification of this process was not identified during public scoping as a "need for change". However, the current process is proposed to be slightly modified to comply with the above executive order and other current BLM policy and guidance as explained below. A major change is the inclusion of geothermal resources leasing into the existing stipulation determination process used for leasing oil and gas.

Oil and Gas Competitive Leasing – As a result of the Oil and Gas Reform Act of 1987, all lands available for oil and gas leasing are initially leased by competitive sale. Unsold leases are made available through a noncompetitive process.

The BLM's Idaho State Office has the primary responsibility to identify and compile lists of land parcels for competitive sale every 90 days. For parcels whose surface is administered by a surface managing agency other than the BLM, the parcel description is sent to the surface managing agency for surface stipulations and that agency's concurrence to the lease.

On lands administered by the BLM, field offices verify leasing availability, recommend any deletions or additions to the list, and specify stipulations (**Section III, Stipulations 1 through 12**) to protect surface resources and other special conditions as appropriate. In the geothermal resources and oil and gas standard lease forms (**Section II**) Term #6 covers provisions for developing future conditions of approval to protect the environment if drilling or other surface disturbing activities are proposed for the lease.

At least 45 days before offering lands within the PFO for lease, a notice is posted in the field office. This notice includes the terms or modified terms of each lease and a narrative or legal description of the lease parcel being offered.

Leases are awarded as a result of oral auction provided the minimum bid is no less than $2.00 per acre. Competitive leases are issued for a period of 5 years, and for so long thereafter as there is production in paying quantities. The royalty is a flat rate of 12.5 percent of the value or the amount of production removed or sold from the lease. Prior to production, a payment of rental of not less than $1.50 per acre is required. Specific details on regulations and requirements for leasing oil and gas can be found at 43 CFR Subpart 3120.

Oil and Gas Noncompetitive Leasing – All lease parcels that are not awarded as a result of the competitive process are made available for noncompetitive offers for a two year period. Offers are normally allowed the day after the oral auction and awarding of a lease parcel is considered, in part, on the date and time of filing.

Noncompetitive leases are issued for a primary term of ten years and are subject to yearly rental payment or payment of a royalty at a rate of 12.5 percent in amount or value of the production removed or sold form the lease. Specific details on regulations and requirements for leasing oil and gas can be found at 43 CFR Subpart 3110.

<u>Geothermal Resources Leasing</u> - Competitive leasing for these resources is considered within land areas known to contain geothermal resources called Known Geothermal Resource Areas (KGRA). No KGRAs are presently delineated within the PFO. Because of this, geothermal resources are currently leased on a non-competitive basis.

Prospective geothermal lessees make application to the Idaho State Office. Upon due consideration, including NEPA analysis, a lease may be issued. The royalty is set at a rate of 10 percent for steam, heat, or energy; and at 5 percent for byproducts. Prior to production, a payment of rental is required in the amount of $1.00 per acre for noncompetitive leases and $2.00 for competitive leases.

A geothermal lease typically grants the lessee access to geothermal resources in the lease area for a period of 10 years. The terms of the lease require the lessee to show a certain level of diligence toward developing the geothermal resources within the lease area or the lease may be terminated. Once an area is developed for productive use of geothermal energy, the lease allows the lessee use of the resource for 40 years, with a right of renewal for another 40 years. Specific details on regulations and requirements for leasing geothermal resources can be found at 43 CFR Subpart 3200.

<u>Lease Terms and Stipulations for Fluid Mineral Leases</u> - Leases for fluid minerals issued by BLM contain standard terms that regulate general conduct of operations. The standard oil & gas and geothermal leases are found in **Section II**. This RMP/EIS assesses the effects of issuing fluid mineral leases subject to the standard lease terms and application of stipulations 1 through 12 (**Section III**).

The standard fluid minerals lease is used to provide an overall framework for regulation of operations. This framework is built upon by adding stipulations to the lease and, later if operations are proposed, by adding site appropriate Conditions of Approval that implement the intent of Section 6 in the lease (**Section II**). Section 6 of the standard Geothermal Resources Lease reads similarly (**Section II**).

Lease Stipulations are conditions of lease issuance that provide protection for other resource values or land uses by establishing authority for substantial delay or site changes or the denial of operations within the terms of the lease contract. The authorized officer has the authority to relocate, control timing, and impose other mitigation measures under Section 6 of the Standard Lease Form. Lease stipulations clarify the Bureau’s intent to protect known resources or resource values. The lease stipulations identified in **Section III** are part of the alternatives considered for in this RMP/EIS.

Stipulations, 1 through 12 (**Section III**) are added, as necessary, to the lease document at the time of issuance if it is determined that resource conflicts exist which cannot be adequately managed under the BLM standard lease terms (**Section II**). Stipulations are conditions, promises, or demands that better define the intent and limits of lease terms. Stipulations are made part of a lease when the environmental and/or planning record demonstrates the necessity for additional restrictions not contained in the general lease terms. Stipulations place specific limits on lease rights based on potential conflicts between lease development and various other resources.

Lease stipulations control the occupancy of the land surface and season of use. A timing stipulation is used to prohibit activity during specified periods of the year to protect such things as critical wildlife habitat. A controlled use stipulation is used to protect such things as live waters, historical trails, steep slopes, etc. This is accomplished by setting a buffer zone between lease operations and protected resources or specifying restrictions on erodible soils or steep slopes. The No Surface Occupancy Stipulation is applied when it is important to prohibit all occupancy and use on all or portions of a lease, and has been developed for use when other stipulations are determined to be insufficient or inadequate to protect other resources. The extent of the No Surface Occupancy is described by legal subdivision.

Stipulations (1 through 12) (**Section III**) have been considered for inclusion as appropriate in all oil and gas leases that have been issued after approval of the original Pocatello RMP (1988) and related oil and gas leasing environmental assessment (1988). The stipulations would also be considered as appropriate (resource protection needs) for any future fluid minerals leases (including geothermal leases) that are issued in the Pocatello Field Office. The stipulations contain general restrictions regarding occupancy of the land, allowable seasons of use, control of surface uses, and special administration requirements (stipulations that accommodate needs of another government agency or organization). Lessees can then use the stipulations as a guide and incorporate them into the design of any future operations plan.

These stipulations include a waiver or exception that can be considered by the Authorized Officer if the stipulation is later found not necessary to accomplish the desired resource protection. It is the intent that need and effectiveness of stipulation restrictions placed in fluid mineral leases can be reassessed at the time that operations are proposed on the lease. Stipulations that are not accomplishing the desired resource protection would be changed to achieve the desired resource protection, using the exception, waiver, or modification criteria. Clarifying changes can be made to the wording of stipulations as long as there is no substantial change to the protection provided by the mitigation. This reassessment would be accomplished using NEPA. The exception, waiver, or modification criteria are explained below.

It is important to note that these leasing stipulations do not address many necessary site specific mitigation measures needed for approval of an environmentally sound operations plan. These additional protection and mitigation measures are developed and applied during BLM's review and approval of individual Applications for Permit to Drill (APDs), rights-of-way, sundry notices, etc. The measures are developed and assessed in a site specific NEPA document and are made conditions of approval of any subsequent operational approvals (see the Permitting Operations section below).

A lease "notice" may be attached to a lease at the time of lease issuance to notify the lessee of potential future mitigation requirements that may become part of a future operations plan approval. The notice conveys information to assist the lessee in submitting an acceptable plan of operation, or to assist in the administration of leases. A notice may be used to disclose situations or conditions that may be known to affect lease operations. A lease notice does not involve new restrictions or a requirement like a stipulation does. The PFO does not have a lease notice to attach to fluid mineral leases at this time. If significant interest in leasing develops, a notice might be developed to better inform lessees of additional potential restrictions and requirements that might be required if operations are conducted under the lease.

<u>Permitting Operations on a Fluid Minerals Lease</u> - Leasing fluid mineral resources does not confer on the lessee the right to conduct any ground disturbing activities related to exploring for or developing the resources until a subsequent environmental analysis of the actual proposed operations for the site is conducted. There are various stages of fluid minerals resource development within a lease, such as exploration, development, production, and reclamation/closeout. These activities all require additional BLM authorization. All proposed drilling or production operations for fluid minerals production proposed to be conducted on an existing lease must be approved before surface disturbance is allowed. Surface disturbance is proposed in APDs, ROWs, and Sundry Notices. During BLM NEPA review of these applications, site specific appropriate mitigation/environmental protection measures are developed and approved prior to conducting ground disturbing activities.

This sequential approval process (leasing, operations plan approval, etc.) allows BLM to consider application of restrictions at the appropriate action level. Restrictions are formulated at the proper stage when site specific information is available. This ensures that restrictions are not applied prematurely to avoid "potential" effects that might unnecessarily identify areas as being off-limits to leasing.

Fluid mineral operations and Reasonable Foreseeable Development Scenarios for oil and gas and geothermal resources within the Pocatello Field Office are described in **Section V**.

<u>Stipulation Exception, Waiver, Modification Criteria</u> - Lease stipulations are developed, considering the values of other resources and resource uses, to protect these resource values and resource uses from conflicts with fluid minerals exploration, development, and production activities, to the degree possible. They are not intended to eliminate all potential conflicts.

A fluid minerals lease authorizes BLM to restrict activities, in compliance with the terms of the lease. The enforcement of lease stipulations on all proposed activities is not an obligation or requirement. Such enforcement is not always necessary to protect the resources for which the stipulations were designed. The use of appropriate discretion, on a case-by-case basis, in enforcing lease stipulations is the responsibility of the BLM.

An exception, waiver, or modification to lease stipulations may be approved, for a site-specific proposal, based on an analysis of the proposal and the need for the lease stipulation to be applied to the proposed activity. A lease stipulation waiver is a permanent exemption to a lease stipulation. A lease stipulation exception is a one-time exemption to a lease stipulation; exceptions are determined on a case-by-case basis. A lease stipulation modification is a change to the provisions of a lease stipulation either temporarily or for the term of the lease.

The record must show that circumstances or relative resource values have changed or the lessee must demonstrate the operations can be conducted without causing unacceptable impacts, and that less restrictive stipulations will protect the public interest. Exceptions, waivers, or modifications to stipulations that do not comply with the RMP must be disallowed. Alternatively, BLM would have to amend the RMP. If the authorized officer determines, prior to lease issuance, that a stipulation involves an issue of major concern, modification or waiver of the stipulation is subject to public review (see 43 CFR 3101.1-4).

If a stipulation is not needed to protect the resource for which it was designed (in a particular case), the stipulation may not be enforced because the restriction serves no purpose in and of itself. As described in the next section under Denial of Activity on a lease, the inability of a leaseholder or operator to conduct operations under the terms or stipulation of the lease may be criteria for denial of a particular proposal. This can happen if a lease stipulation is needed to protect the resource for which it was designed. In this case, an exception to the lease stipulation would not be approved and the proposal would be denied or modified.

Three examples of lease stipulations and conditions under which exceptions may be approved are provided below. They serve as examples of the rationale used in reviewing requests for exceptions to lease stipulations.

Example 1 - A lease stipulation was placed on a lease to protect elk winter range. The stipulation is applicable to an APD under review identifies elk winter range avoidance from November 15 through April 15. The land use plan may indicate a waiver could be granted if it was determined elk no longer use the area for winter range. An exception could be granted if a mild winter was occurring and the long-term weather forecast was for continuation of this trend. A modification could be granted if it was determined the elk have changed their migration patterns and are not entering the area until mid-December, thus justifying a change in the start of the seasonal constraint to December 15.

Example 2 - A stipulation to preclude surface occupancy on slopes greater than 30 percent is placed on a lease to prevent soil erosion and to facilitate reclamation. When a proposal is submitted, the lessee/operator also submits a plan of operations or development which demonstrates how construction on slopes greater than 30 percent would be accomplished without unacceptable soil erosion and stability problems, safety concerns, etc. In this case, enforcement of the lease stipulation would require the lessee/operator to seek another alternative which may be less acceptable for other reasons.

It would delay the approval of an action which is otherwise acceptable. In some cases, there may be no alternative which would provide slopes less than 30 percent. In these instances, an exception may be approved.

> **Example 3 -** A stipulation may be added to a lease to prevent surface occupancy within a certain distance from live water to protect water quality and fishery resources. When applying this stipulation to site-specific proposals, topography is also an important consideration. If intervening terrain serves to prevent impacts to the water resource, construction or occupancy may be allowed closer than the distance cited in the lease stipulation without adverse impacts to the water resource. Thus, if a lessee/operator can demonstrate in the application that water and fishery resources would not be affected by the proposal, an exception may be approved.

The level of analysis and documentation associated with the approval of an exception may vary. Generally, an exception would be approved if it can be demonstrated that the impacts of a proposed action can be acceptably mitigated such that the resource values of concern can be protected, or the impacts would be similar whether or not an exception were approved.

<u>Denial of Activity on a Lease</u> - Leases are issued with language granting the "exclusive right" to drill for extract, produce, and utilize the fluid mineral resources together with the right to build and maintain necessary improvements. The rights granted are subject to applicable laws, the terms, conditions, and the stipulations attached to the lease.

The right to drill and develop somewhere within the leasehold cannot be denied by the Secretary of the Interior (or BLM). This limitation is based upon the fact that valid leases have been issued which specifically g rant the lessee (or his designated operator) the *"right to drill for, ...extract, remove and dispose of all oil and gas deposits"* in the leased lands subject to the terms and conditions of the respective leases. Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions can be imposed on the lease terms (see *Cooper Valley Machinery Works, In*c. v*s. Andrus*, 474 F. Supp. 189, 191; D.D.C. 1973; 653 F. 2nd 595; D.D.C. 1981; *Natural Resources Defense Council vs. Berland*, 458 F. Supp. 925, 937; D.D.C. 1978), but the secretary can not deny development of the lease.

The Tenth Circuit Court of Appeals in *Sierra Club vs. Peterson* (717 F. 2nd 1409, 1983) found that "*on land leased without a No Surface Occupancy stipulation, the Department cannot deny the permit to drill...once the land is leased the Department no longer has the authority to preclude surface disturbing activity even if the environmental impact of such activity is significant. The Department can only impose mitigation measures upon a lessee who pursues surface disturbing exploration and/or drilling activities*". The court goes on to say "*...notwithstanding the assurance that a later site-specific environmental analysis will be made, in issuing these leases the Department has made an irrevocable commitment to allow some surface disturbing activities, including drilling and road building*".

This was clarified somewhat in Instruction Memorandum 92-67 issued by the Director, Bureau of Land Management on December 3, 1992 which states that *"...Because all oil and gas activities are subject to FLPMA, mitigation required to protect public lands from unnecessary and undue degradation is consistent with the lease rights granted. The caveat, however, is that...unnecessary and undue degradation implies that there is also necessary and due degradation"*. As a matter of policy, any mitigation measures *"...which would render a proposed* *operation uneconomic or technically unfeasible is not considered to be consistent with a lessee's rights and cannot be required absent a lease stipulation, unless it is determined that such mitigation is required to prevent unnecessary and undue degradation of public lands or resources..."*. To deny all activity would thus constitute a "taking" of the Operators right to conduct exploration activities on the subject federal leases.

As the court held in *Union Oil Company of California vs. Morton*, *"Congress itself can order leases forfeited, subject to payment of compensations. But without Congressional authorization, the Secretary of the executive branch in general has no intrinsic power of condemnation"*.

By law, the Secretary of the Interior only has authority to deny all activity upon the lease under the following circumstances:

1. If there were no acceptable means of mitigating significant adverse impacts to the stipulated surface resource values, then this may trigger a denial of an APD or operations plan and require the consideration and analysis of another alternative(s). Effectively, exception(s) to one or more of the lease stipulations would not be approved. Since operations could not be conducted within the requirements of the lease (including compliance with the lease stipulations), the activity would not be allowed.

2. If the U.S. Fish and Wildlife Service concluded that a site-specific proposed action and alternatives would be likely to jeopardize the continued existence of any endangered or threatened plant or animal species, a site specific proposal may be denied in whole or in part.

The Secretary could suspend the lease pursuant to Section 39 of the Mineral Leasing Act pending consideration by Congress of a grant of authority to preclude drilling and provide compensation to the lessees.

Once a lease has been issued, the conditions under which denial of a proposal for site-specific exploration or development are constrained by the administrative level at which the authority exists to deny activity upon the lease. The Secretary of the Interior, because of applicable lease and unit provisions has limited authority. Congress, on the other hand, has complete authority. The following table illustrates the authority of the Secretary of the Interior with regard to potentially applicable lease stipulations. The items shown under Rationale for Denial serve only as examples. Other lease stipulations may be used in the same manner. Note that the authority for denial in the case of threatened or endangered species is different than for the other examples shown.

The authority for Congress to deny activity has been shown only for the entire lease because the Secretary has the authority to deny development on a portion of the lease. If Congress decides to deny activity on the lease, the denial would likely have to be accompanied by a buy back of lease rights. The cost of such a buy back would be determined, in part, by the fluid minerals present on the lease. If little is known about these resources, the buy back process may be complicated beyond a decision to appropriate public funds needed for the buy back.

Denial Authority	Rationale for Denial	Portion of the Lease	Entire Lease
Secretary of the Interior	Unstable/highly erodible soils	Yes	No
	Slopes 30 percent or greater	Yes	No
	Critical Wildlife habitat	Yes	No
	Buffer Zones	Yes	No
	Endangered or Threatened Species (Plants or Animals)	Yes	Yes
	Significant environmental impacts	Yes	No
Congress	Significant environmental impacts	Yes	Yes

All decisions to approve or disapprove either an application or a plan are subject to appeal, either by the proponent or by affected interests. An appropriate level of public scoping, to include contacting affected interests, will be done as part of the NEPA review. Decisions to approve an application or plan generally include mitigating measures as conditions of environmental clearance or permit approval in order to minimize adverse impacts to other resources.

SECTION II – Fluid Mineral Lease Forms With Terms and Conditions

Form 3100-11
(October 1992)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial No.

OFFER TO LEASE AND LEASE FOR OIL AND GAS

The undersigned *(reverse)* offers to lease all or any of the lands in Item 2 that are available for lease pursuant to the Mineral Leasing Act of 1920, as amended and supplemented (30 U.S.C. 181 et seq.), the Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351-359), the Attorney General's Opinion of April 2, 1941 (40 Op. Atty. Gen. 41), or the

READ INSTRUCTIONS BEFORE COMPLETING

1. Name
Street
City, State, Zip Code

2. This application/offer/lease is for: *(Check only One)* ☐ PUBLIC DOMAIN LANDS ☐ ACQUIRED LANDS (percent U.S. interest ______________)

Surface managing agency if other than BLM: ______________ Unit/project ______________

Legal description of land requested: *Parcel No.: ______________ * Sale Date (m/d/y): ___/___/___

*SEE ITEM 2 IN INSTRUCTIONS BELOW PRIOR TO COMPLETING PARCEL NUMBER AND SALE DATE.

T. R. Meridian State County

Total acres applied for ______________

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

DO NOT WRITE BELOW THIS LINE

3. Land included in lease:

T. R. Meridian State County

Total acres in lease ______________
Rental retained $ ______________

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

NOTE: This lease is issued to the high bidder pursuant to his/her duly executed bid or nomination form submitted under 43 CFR 3120 and is subject to the provisions of that bid or nomination and those specified on this form.

Type and primary term of lease:
☐ Noncompetitive lease (ten years)
☐ Competitive lease (ten years)
☐ Other ______________

THE UNITED STATES OF AMERICA

by ______________
(Signing Officer)

______________ ______________
(Title) (Date)

EFFECTIVE DATE OF LEASE ______________

(Continued on reverse)

4. (a) Undersigned certifies that (1) offeror is a citizen of the United States; an association of such citizens; a municipality; or a corporation organized under the laws of the United States or of any State or Territory thereof; (2) all parties holding an interest in the offer are in compliance with 43 CFR 3100 and the leasing authorities; (3) offeror's chargeable interests, direct and indirect, in each public domain and acquired lands separately in the same State, do not exceed 246,080 acres in oil and gas leases (of which up to 200,000 acres may be in oil and gas options), or 300,000 acres in leases in each leasing District in Alaska of which up to 200,000 acres may be in options, (4) offeror is not considered a minor under the laws of the State in which the lands covered by this offer are located; (5) offeror is in compliance with qualifications concerning Federal coal lease holdings provided in sec. 2(a)(2)(A) of the Mineral Leasing Act, (6) offeror is in compliance with reclamation requirements for all Federal oil and gas lease holdings as required by sec. 17(g) of the Mineral Leasing Act; and (7) offeror is not in violation of sec. 41 of the Act.

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

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

Duly executed this ____________ day of ______________________________ 20 ________ ______________________________
(Signature of Lessee or Attorney-in-fact)

LEASE TERMS

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

(a) Noncompetitive lease, $1.50 for the first 5 years; thereafter $2.00;
(b) Competitive lease, $1.50, for the first 5 years; thereafter $2.00;
(c) Other, see attachment, or
as specified in regulations at the time this lease is issued.

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

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

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

(a) Noncompetitive lease, 12 1/2 %;
(b) Competitive lease, 12 1/2 %;
(c) Other, see attachment; or
as specified in regulations at the time this lease is issued.

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

Minimum royalty in lieu of rental of not less than the rental which otherwise would be required for that lease year shall be payable at the end of each lease year beginning on or after a discovery in paying quantities. This minimum royalty may be waived, suspended, or reduced, and the above royalty rates may be reduced, for all or portions of this lease if the Secretary determines that such action is necessary to encourage the greatest ultimate recovery of the leased resources, or is otherwise justified.

An interest charge shall be assessed on late royalty payments or underpayments in accordance with the Federal Oil and Gas Royalty Management Act of 1982 (FOGRMA) (30 U.S.C. 1701). Lessee shall be liable for royalty payments on oil and gas lost or wasted from a lease site when such loss or waste is due to negligence on the part of the operator, or due to the failure to comply with any rule, regulation, order, or citation issued under FOGRMA or the leasing authority.

Sec. 3. Bonds - A bond shall be filed and maintained for lease operations as required under regulations.

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

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

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

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

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

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

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

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

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

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

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

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

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

Sec. 13. Proceedings in case of default - If lessee fails to comply with any provisions of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation unless or until the leasehold contains a well capable of production of oil or gas in paying quantities, or the lease is committed to an approved cooperative or unit plan or communitization agreement which contains a well capable of production of unitized substances in paying quantities. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time. Lessee shall be subject to applicable provisions and penalties of FOGRMA (30 U.S.C. 1701).

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

Form 3100-11 (10/92) (page 2)

INSTRUCTIONS

A. General:

1. The front of this form is to be completed only by parties filing for a noncompetitive lease. The BLM will complete front of form for all other types of leases.

2. Entries **must** be typed or printed plainly in ink. Offeror **must** sign Item 4 in ink.

3. An original and two copies of this offer **must** be prepared and filed in the proper BLM State Office. See regulations at 43 CFR 1821.2-1 for office locations.

4. If more space is needed, additional sheets **must** be attached to **each** copy of the form submitted.

B. Special:

Item 1- Enter offeror's name and billing address.

Item 2 - Identify the mineral status and, if acquired lands, percentage of Federal ownership of applied for minerals. Indicate the agency controlling the surface of the land and the name of the unit or project which the land is a part. The same offer may not include both Public Domain and Acquired lands. Offeror also may provide other information that will assist in establishing title for minerals. The description of land **must** conform to 43 CFR 3110. A single parcel number and Sale Date shall be the only acceptable description during the period from the first day following the end of a competitive process until the end of that same month, using the parcel number on the List of Lands Available for Competitive Nominations or the Notice of Competitive Lease Sale, whichever is appropriate.

Payments: The amount remitted **must** include the filing fee and the first year's rental at the rate of $1.50 per acre or fraction thereof. The full rental based on the total acreage applied for **must** accompany an offer even if the mineral interest of the United States is less than 100 percent. The filing fee will be retained as a service charge even if the offer is completely rejected or withdrawn. To protect priority, it is important that the rental submitted be sufficient to cover all the land requested. If the land requested includes lots or irregular quarter-quarter sections, the exact area of which is not known to the offeror, rental should be submitted on the basis of each such lot or quarter-quarter section containing 40 acres. If the offer is withdrawn or rejected in whole or in part before a lease issues, the rental remitted for the parts withdrawn or rejected will be returned.

Item 3 - This space will be completed by the United States.

PAPERWORK REDUCTION ACT STATEMENT

The Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.) requires us to inform you that:

1. This information is being collected pursuant to the law.

2. This information will be used to create and maintain a record of oil and gas lease activity.

3. Response to this request is required to obtain a benefit.

NOTICE

The Privacy Act of 1974 and the regulations in 43 CFR 2.48(d) provide that you be furnished the following information in connection with information required by this oil and gas lease offer.

AUTHORITY: 30 U.S.C. 181 et seq.; 30 U.S.C. 351-359

PRINCIPAL PURPOSE: The information is to be used to process oil and gas offers and leases.

ROUTINE USES:

(1) The adjudication of the lessee's rights to the land or resources.

(2) Documentation for public information in support of notations made on status records for the management, disposal, and use of public lands and resources.

(3) Transfer to appropriate Federal agencies when consent or concurrence is required prior to granting a right in public lands or resources.

(4)(5) Information from the record and/or the record will be transferred to appropriate Federal, State, local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecutions.

EFFECT OF NOT PROVIDING INFORMATION - If all the information is not provided, the offer may be rejected. See regulations at 43 CFR 3100.

Form 3100-11 (10/92) (page 3)

Form 3200-24
November 2001)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OFFER TO LEASE AND LEASE FOR GEOTHERMAL RESOURCES

Serial No.

The undersigned (see page 2) offers to lease all or any of the lands in item 2 that are available for lease pursuant to the Geothermal Steam Act of 1970 (30 U.S.C. 1001-1025).

Read Instructions Before Completing

1. Name

Street

City, State, Zip Code

2. Surface managing agency if other than BLM: ______________________ Unit/Project ______________________

Legal description of land requested (segregate by public domain and acquired lands):

T. R. Meridian State County

Total acres applied for ______________

Percent U.S. interest ______________

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

DO NOT WRITE BELOW THIS LINE

3. Land included in lease:

T. R. Meridian State County

Total acres in lease ______________

Rental retained $______________

In accordance with the above offer, or the previously submitted competitive bid, this lease is issued granting the exclusive right to drill for, extract, produce, remove, utilize, sell, and dispose of all the geothermal resources in the lands described in item 3 together with the right to build and maintain necessary improvements thereupon, for a primary term of 10 years. Rights granted are subject to applicable laws, the terms, conditions, and attached stipulations of this lease, the Secretary of the Interior's regulations and formal orders in effect as of lease issuance and, when not inconsistent with lease rights granted or specific provisions of this lease, regulations and formal orders hereafter promulgated.

THE UNITED STATES OF AMERICA

Type of lease:

- ☐ Noncompetitive
- ☐ Competitive
- ☐ Other ______________________

by ______________________ (Signing Officer)

______________________ (Title) ______________ (Date)

EFFECTIVE DATE OF LEASE ______________________

(Continued on page 2)

4. (a) Undersigned certifies that:
   (1) Offeror is a citizen of the United States; an association of such citizens: a municipality; or a corporation organized under the laws of the United States, any State or the District of Columbia; (2) All parties holding an interest in the offer are in compliance with 43 CFR 3200 and the authorizing Act; (3) Offeror's chargeable interests, direct and indirect, do not exceed that allowed under the Act; and (4) Offeror is not considered a minor under the laws of the State in which the lands covered by this offer are located.
   (b) Undersigned agrees that signature to this offer constitutes acceptance of this lease, including all terms, conditions and stipulations of which offeror has been given notice, and any amendment or separate lease that may cover any land described in this offer open to lease application at the time this offer was filed but omitted for any reason from this lease. The offeror further agrees that this offer cannot be withdrawn, either in whole or part, unless the withdrawal is received by the BLM State Office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has been signed on behalf of the United States.

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

Duly executed this ________ day of ______________________________, 20_____. ____
(Signature or Lessee or Attorney-in-fact)

LEASE TERMS

Sec. 1. Rentals—Rentals shall be paid to proper office of lessor in advance of each lease year until there is production in commercial quantities from the leased lands. Annual rental rates per acre or fraction thereof are: $1 for noncompetitive leases and $2 for competitive leases.

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

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

Sec. 2. Royalties—Royalties shall be paid to proper office of lessor. Royalties shall be computed in accordance with regulations and orders. Royalty rates on production are: 10 percent for steam, heat, or energy; 5 percent for byproducts; and 5 percent for demineralized water.

Lessor reserves the right to establish reasonable minimum values on production after giving lessee notice and an opportunity to be heard. Royalties shall be due and payable on the last day of the month following the month in which production occurred.

A minimum royalty shall be due for any lease year beginning on or after the commencement of production in commercial quantities in which royalty payments aggregate less than $2 per acre. Lessee shall pay such difference at the end of lease year. This minimum royalty may be waived, suspended, or reduced, and the above royalty rates may be reduced for all or portions of this lease if the Secretary determines that such action is necessary to encourage the greatest ultimate recovery of the leased resources, or is otherwise justified.

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

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

Sec. 5. Documents, evidence, and inspection—Lessee shall file with proper office of lessor, not later than (30) days, after effective date thereof, any contract or evidence of other arrangement for the sale or disposal of production. At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing amounts and quality of all products removed and sold, proceeds therefrom, and amount used for production purposes or unavoidably lost. Lessee may be required to provide plats and schematic diagrams showing development work and improvements, and reports with respect to parties in interest, expenditures, and depreciation costs.

In the form prescribed by lessor, lessee shall keep a daily drilling record, a log, and complete information on well surveys and tests and keep a record of subsurface investigations and furnish copies to lessor when required. Lessee shall keep open at all reasonable times for inspection by any authorized officer of lessor, the leased premises and all wells, improvements, machinery, and fixtures thereon, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or in the leased lands. Lessee shall maintain copies of all contracts, sales agreements, accounting records, and documentation such as billings, invoices, or similar documentation that support costs claimed as manufacturing, preparation, and/or transportation costs. All such records shall be maintained in lessee's accounting offices for future audit by lessor. Lessee shall maintain required records for 6 years after they are generated or, if an audit or investigation is underway, until released of the obligation to maintain such records by lessor.

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

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

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

Sec. 7. Production of byproducts—If the production, use, or conversion of geothermal resources from these leased lands is susceptible of producing a valuable byproduct or byproducts, including commercially demineralized water for beneficial uses in accordance with applicable State water laws, lessor may require substantial beneficial production or use thereof by lessee.

Sec. 8. Damages to property—Lessee shall pay lessor for damage to lessor's improvements, and shall save and hold lessor harmless from all claims for damage or harm to persons or property as a result of lease operations.

Sec. 9. Protection of diverse interests and equal opportunity—Lessee shall maintain a safe working environment in accordance with standard industry practices and take measures necessary to protect the health and safety of the public. Lessor reserves the right to ensure that production is sold at reasonable prices and to prevent monopoly.

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

Sec. 10. Transfer of lease interests and relinquishment of lease—As required by regulations, lessee shall file with lessor, any assignment or other transfer of an interest in this lease. Lessee may relinquish this lease or any legal subdivision by filing in the proper office a written relinquishment, which shall be effective as of the date of filing, subject to the continued obligation of the lessee and surety to pay all accrued rentals and royalties.

Sec. 11. Delivery of premises—At such time as all or portions of this lease are returned to lessor, lessee shall place all wells in condition for suspension or abandonment, reclaim the land as specified by lessor, and within a reasonable period of time, remove equipment and improvements not deemed necessary by lessor for preservation of producible wells or continued protection of the environment.

Sec. 12. Proceedings in case of default—If lessee fails to comply with any provisions of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation in accordance with the Act. However, if this lease includes land known to contain a well capable of production in commercial quantities, it may be cancelled only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor or any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Whenever the lessee fails to comply in a timely manner with any of the provisions of the Act, this lease, the regulations, or formal orders, and immediate action is required, the Lessor may enter on the leased lands and take measures deemed necessary to correct the failure at the expense of the Lessee.

Sec. 13. Heirs and successors-in-interest—Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

(Form 3200-24, page 2)

Instructions

A. General

1. Items 1 and 2 need to be completed only by parties filing for a noncompetitive lease. The BLM will complete front of form for all other types of leases.
2. Entries must be typed or printed plainly in ink. Offeror must sign form (item 4) in ink.
3. An original and two copies of this offer must be prepared and filed in the proper BLM State office. See regulations at 43 CFR 1821.2-1 for office locations.
4. If more space is needed, addditional sheets must be attached to each copy of the form submitted.

B. Special:

Item 1—Enter offeror name and billing address.

Item 2—Indicate the agency controlling the surface use of the land and the name of the unit or project of which the land is a part. Offeror may also provide other information that will assist in establishing title for minerals. The description of land must conform to 43 CFR 3203.4. Total acres applied for must not exceed that allowed by regulations.

Payments: The amount remitted must include the filing fee and the first year's rental at the rate of $1 per acre or fraction thereof. The full rental based on the total acreage applied for must accompany an offer even if the mineral interest of the United States is less than 100 percent. The filing fee will be retained as a service charge even if the offer is completely rejected or withdrawn. To protect priority, it is important that the rental submitted be sufficient to cover all the land requested. If the land requested includes lots or irregular quarter-quarter sections, the exact area of which is not known to the offeror, rental should be submitted on the basis of each such lot or quarter-quarter section containing 40 acres. If the offer is withdrawn or rejected in whole or in part before a lease issues, the rental remitted for the parts withdrawn or rejected will be returned.

Item 3—This space will be completed by the United States.

PAPERWORK REDUCTION ACT STATEMENT

1. This information is being collected pursuant to the law (43 CFR 3200).
2. This information will be used to create and maintain a record of geothermal lease activity.
3. Response to this request is required to obtain a benefit.

NOTICE

The Privacy Act of 1974 and the regulation in 43 CFR 2.48(d) provide that you be furnished the following information in connection with information required by this geothermal lease application.

AUTHORITY: 30 U.S.C. et. seq.

PRINCIPAL PURPOSE—The information is to be used to process geothermal lease applications.

ROUTINE USES:

(1) The adjudication of the lessee's rights to the land or resources.

(2) Documentation for public information in support of notations made on land status records for the management, disposal, and use of public lands and resources.

(3) Transfer to appropriate Federal agencies when concurrence is required prior to granting a right in public lands or resources.

(4)(5) Information from the record and/or the record will be transferred to appropriate Federal, State, local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecutions.

EFFECT OF NOT PROVIDING INFORMATION — If all the information is not provided, the offer may be rejected. See regulations at 43 CFR 3200.

SECTION III - Fluid Mineral Lease Stipulations

In addition to the requirements set forth in the terms of the oil & gas or geothermal lease, the following are the special stipulations that are attached as applicable (subject resource or facility is present on the leased lands and merits protection):

STIPULATION 1. All of the lands in the following legal subdivisions are included in (recreation or special area, etc.) Therefore, no occupancy or disturbance of the surface of the land described is authorized. The lessee, however, may exploit the oil and gas resources by directional drilling from sites outside the area.

For the purpose of: (explanation in the individual lease**)**

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes.

[**Explanation -** This stipulation is applicable to those lands requiring a high degree of protection from surface disturbance that are identified in Figure 2-4 (Areas of No Surface Occupancy). These lands include: Areas of Critical Environmental Concern (ACECs), BLM Research Natural Areas (RNAs), Public Water Reserves, wetlands, lands within the Bear River Narrows Water Power Project, lands in the Fort Hall Indian Irrigation Project, Recreation and Public Purposes Leases/Patents, etc.]

STIPULATION 2. No (*insert:* occupancy or other surface disturbance *–or-* drilling or storage facilities) will be allowed within
(_____) feet of the (road, trail, river, creek, canal, feature etc.**) This distance may be modified when specifically approved in writing by the Authorized Officer of the Bureau of Land Management.**

For the purpose of: (explanation in the individual lease**)**

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes.

[**Explanation -** This stipulation is applied in the following areas with the related buffer zones:
- Within 500’ from live water.
- Within 100 feet of known portions of historical trails and highways.
- Within 300 feet of developed recreational areas, National Register Historical Sites, and cultural sites.
- Within 500 feet of the high water mark of the ______ (reservoir or lake).]

STIPULATION 3. No occupancy or other surface disturbance will be allowed on slopes in excess of 30 percent or in excess of 20 percent on extremely erodible or slumping soils, without written approval of the Authorized Officer of the BLM.

For the purpose of: (explanation in the individual lease**)**

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes.

[**Explanation -** This stipulation is applied to leases which contain areas with the mentioned slopes. Upon receiving a request to occupy slopes in excess of those identified in the stipulation, a search for high erosion potential soil surface mapping units listed in the Pocatello RMP Appendix sections would be conducted. Soil mapping units and soils listed as having high erosion potential would be restricted and alternate locations for roads or drill pads would be required.]

STIPULATION 4. In order to protect important seasonal wildlife habitat, exploration drilling and other development activity will be restricted during the period from _____ to _____. Appropriate modifications to imposed restrictions will be made for the maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the Authorized Officer of the BLM.

This stipulation is applicable during the following periods:

[**Explanation -** Attach closures below as appropriate.]

Animal Activity	Seasonal Restriction
Big game wintering areas.	11/15 - 04/30
Big game calving and fawning areas.	05/15 - 06/30
Sharp-tailed & Sage grouse leks.	03/01 - 05/31
Sharp-tailed & Sage grouse winter range.	12/15/ - 03/01
Sharp-tailed & Sage grouse nesting & brood rearing areas.	04/30 - 06/30
Gray wolf denning and rendezvous sites.	04/01 - 06/30
TES raptor nesting or roosting areas.	See Appendix D - Permitted Activity Seasonal Restrictions

For the purpose of: (explanation in the individual lease**)**

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes.

STIPULATION 5. Exploration or development operations for oil and gas conducted under this lease shall be planned so as to prevent unreasonable interference with the present or future exploration of phosphates or phosphate rock and associated or related minerals. Prior to conducting such operations under this lease, the lessee shall consult with, or otherwise advise the phosphate lessee or permittee of his proposed plans and obtain the phosphate lessees' or permittees' comments on the proposed operations. Evidence of such consultation and any comments resulting there from shall be submitted to the Authorized Office of the BLM, with the submission of proposed plans of operations involving exploration for, or development of, oil and gas.

[**Explanation -** This stipulation is applied to leases which cover lands already under phosphate lease or phosphate prospecting permit.]

STIPULATION 6.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

POWER SITE STIPULATION

The lessee or permittee hereby agrees:

(a) If any of the land covered by this lease or permit was, on the date the lease or permit application or offer was filed, within a power site classification, reservation, or project on which an application for license or preliminary permit is pending before the Federal Power Commission or on which an effective license or preliminary permit had been issued by the Federal Power Act, or on which an authorized power project (other than one owned or operated by the Federal Government) had been constructed, the United States, its permittees or licensees shall have the prior right to use such land for purposes of power development so applied for, licensed, permitted, or authorized and no compensation shall accrue to the mineral lessee or permittee for loss of prospective profits or for damages to improvements or workings, or for any additional expense caused the mineral lessee as a result of the taking of said land for power development purposes. It is agreed, however, that where the mineral lessee or permittee can make adjustments of his improvements to avoid undue interference with power development, he will be permitted to do so at his own expense. Furthermore, occupancy and use of the land by the mineral lessee or permittee shall be subject to such reasonable conditions with respect to the use of the land as may be prescribed by the Federal Power Commission for the protection of any improvements and workings constructed thereon for power development.

(b) If any of the land covered by this lease or permit is on the date of the lease or permit within a power site classification or reservation which is not governed by the preceding paragraph, the lease or permit is subject to the express condition that operations under it shall be so conducted as not to interfere with the administration and use of the land for power site purposes to a greater extent than may be determined by the Secretary of the Interior to be necessary for the most beneficial use of the land. In any case, it is agreed that where the mineral lessee or permittee can make adjustments to avoid undue interference with power development, he will be permitted to do so at his own expense.

Form 3730-1
(December 1975)
(formerly 3500-1

Special Administration Stipulations (#7 through #12):

May be applied as appropriate/necessary where the surface overlying the mineral estate managed by BLM is managed by other government agencies.

STIPULATION 7. Lessee shall be liable for any damage or claims against the Fort Hall Irrigation Project or Bureau of Indian Affairs resulting from actions taken by the lessee. This includes, but is not limited to, crop damage, injuries to livestock and destruction of property.

[**Explanation -** This stipulation applies to those lands which lie within the Fort Hall Indian Irrigation Project and is referred to as the Bureau of Indian Affairs stipulation.]

STIPULATION 8. Negotiated by special agreement with the Bureau of Reclamation.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

LEASE STIPULATIONS
BUREAU OF RECLAMATION

The lessee agrees to maintain, if required by the lessor during the period of this lease, including any extension thereof, an additional bond with qualified sureties in such sum as the lessor, if it considers that the bond required under Section 2 (a) is insufficient, may at any time require:

a) to pay for damages sustained by any reclamation homestead entryman to his crops or improvements caused by drilling or other operations of the lessee, such damages to include the reimbursement of the entryman by the lessee, when he used or occupies the land of any homestead entryman, for all construction and operation and maintenance charges becoming due during such use or occupation upon any portion of the land so used and occupied;
b) to pay any damage caused to any reclamation project or water supply thereof by the lessee's failure to comply fully with the requirements of this lease; and
c) to recompense any nonmineral applicant, entryman, purchaser under the Act of May 16, 1930 (46 Stat. 367), or patentee for all damages to crops or to tangible improvements caused by drilling or other prospecting operations, where any of the lands covered by this lease are embraced in any non-mineral application, entry, or patent under rights initiated prior to the date of this lease, with a reservation of the oil deposits, to the United States pursuant to the Act of July 17, 1914 (38 Stat. 509).

As to any lands covered by this lease within the area of any Government reclamation project, or in proximity thereto, the lessee shall take such precautions as required by the Secretary to prevent any injury to the lands susceptible to irrigation under such project or to the water supply thereof; *provided* that drilling is prohibited on any constructed works or right-of-way of the Bureau of Reclamation, and *provided, further*, that there is reserved to the lessor, its successors and assigns, the superior and prior right at all times to construct, operate, and maintain dams, dikes, reservoirs, canals, wasteways, laterals, ditches, telephone and telegraph lines, electric transmission lines, roadways, appurtenant irrigation structures, and reclamation works, in which construction, operation, and maintenance, the lessor, its successors and assigns, shall have the right to use any or all of the lands herein described without making compensation therefore, and shall not be responsible for any damage from the presence of water thereon or on account of ordinary, extraordinary, unexpected or unprecedented floods. That nothing shall be done under this lease to increase the cost of, or interfere in any manner with, the construction, operation, and maintenance of such works. It is agreed by the lessee that, if the construction of any or all of said dams, dikes, reservoirs, canals, wasteways, laterals, ditches, telephone or telegraph lines, electric transmission lines, roadways, appurtenant irrigation structures or reclamation works across, over, or upon said lands should be made more expensive by reason of the existence of the improvements and workings of the lessee thereon, said additional expense is to be estimated by the Secretary of the Interior, whose estimate is to be final and binding upon the parties hereto, and that within thirty (30) days after demand is made upon the lessee for payment of any such sums, the lessee will make payment thereof to the United States, or its successors, constructing such dams, dikes, reservoirs, canals, wasteways, laterals, ditches, telephone and telegraph lines, electric transmission lines, roadways, appurtenant irrigation structures, or reclamation works, across, over, or upon said lands; *provided, however*, that subject to advance written approval by the United States, the location and course of any improvements or works and appurtenances may be changed by the lessee; *provided further*, that the reservations, agreements, and conditions contained in the within lease shall be and remain applicable notwithstanding any change in the location or course of said improvements or works of lessee. The lessee further agrees that the United States, its officers, agents, and employees, and its successors and assigns shall not be held liable for any damage to the improvements or workings of the lessee resulting from the construction, operation, and maintenance of any of the works hereinabove enumerated. Nothing in this paragraph shall be construed as in any manner limiting other reservations in favor of the United States contained in this lease.

THE LESSEE FURTHER AGREES That there is reserved to the lessor, its successors and assigns, the prior right to use any of the lands herein leased, to construct, operated, and maintain dams, dikes, reservoirs, canals, wasteways, laterals, ditches, telephone and telegraph lines, electric transmission lines, roadways, or appurtenant irrigation structures, and also the right to remove construction materials there from, without any payment made by the lessor or its successors fro such right, with the agreement on the part of the lessee that if the construction of any or all of such dams, dikes, reservoirs, canals, wasteways, laterals, ditches telephone and telegraph lines, electric transmission lines, roadways, or appurtenant irrigation structures across, over, or upon said lands or the removal of construction materials there from, should be made more expensive by reason of the existence of improvements or workings of the lessee thereon, such additional expense is to be estimated by the Secretary of the Interior, whose estimate is to be final and binding upon the parties hereto, and that within (30) days after demand is made upon the lessee for payment of any such sums, the lessee will make payment thereof to the United States or its successors constructing such dams, dikes, reservoirs, canals, wasteways, laterals, ditches, telephone and telegraph lines, electric transmission lines, roadways, or appurtenant irrigation structures across, over, or upon said lands or removing construction materials there from. The lessee further agrees that the lessor, its officers, agents, and employees and its successors and assigns shall not be held liable for any damage to the improvements or workings of the lessee resulting from the construction, operation, and maintenance of any of any of the works herein above enumerated. Nothing contained in this paragraph shall be construed as in any manner limiting other reservation in favor of the lessor contained in this lease.

Form 3109-1
(December 1972)
(formerly 3103-1_

____
(Signature of Lessee)

STIPULATION 9. Negotiated by special agreement with the Bureau of Reclamation.

Serial No.______________________

NO SURFACE OCCUPANCY STIPULATION
BUREAU OF RECLAMATION

There shall be no occupancy or other activity on the surface of Bureau of Reclamation withdrawn lands in the following areas covered by this lease. However, the lessee may employ directional drilling to develop the oil and gas resources under these areas, provided that such drilling or other works will not disturb the surface area or otherwise interfere with their use by the surface management agency.

a) The area within 500 feet on either side of the centerline of any and all roads and/or highways.

b) The area within 200 feet on either side of the centerline of any and all designated trails.

c) The area within 500 feet of the normal high waterline of any and all streams, lakes, ponds, and reservoirs.

d) The area within 500 feet of irrigation works, buildings, or other service facilities.

Surface occupancy within the above designated buffer zones may be allowed with written approval by the Bureau of Reclamation depending on the findings of an onsite specific inspection.
The above stipulation is hereby accepted.

______________________________	______________________________
Date	Lessee

STIPULATION 10.

Serial No.________________________

BUREAU OF RECLAMATION

SPECIAL STIPULATION

RIGHT TO DEVELOP DAMS AND RESERVOIRS

There is reserved to the United States the right to develop dams and reservoirs on the lands described in this lease, and the lessee at its sole cost and expense, and without compensation from the United States, shall remove or conform any and all facilities constructed or existing pursuant to this lease, which are determined by the United States to interfere with the construction, operation, maintenance, or development of such dams and reservoirs, and appurtenant facilities of the United States. If the lessee fails to remove or conform its facilities within 6 months after receiving notice from the United States to do so, such facilities may, at the option of the United States, be removed by it and the lessee shall be liable for costs incurred by the United States in such removal.

The above stipulation is hereby accepted.

_________________________________ ____

Date Lessee

STIPULATION 11.

Serial No.____________________________

BUREAU OF RECLAMATION

SPECIAL STIPULATION

There is reserved to the United States the right to raise the water level of the Snake River by development of dams and reservoirs therein and the lessee at its sole cost and expense, and without compensation from the United States, shall remove or conform any and all facilities constructed or existing pursuant to this lease, which are determined by the United States to interfere with the construction, operation, maintenance, or development of such dams and reservoirs, and appurtenant facilities of the United States. If the lessee fails to remove or conform its facilities within 6 months after receiving notice from the United States to do so, such facilities may, at the option of the United States, be removed by it and the lessee shall be liable for costs incurred by the United States in such removal.

The above stipulation is hereby accepted.

____________________________________ ____________________________________

Date Lessee

STIPULATION 12.

To insure against the contamination of the waters of the ____ Reservoir, __________________________________Project, State of ________________________, the lessee agrees that the following further conditions shall apply to all drilling and operations on lands covered by this lease, which lie within the flowage or drainage area of the _____________________Reservoir, as such area is defined by the Bureau of Reclamation:

1) The drilling sites for any and all wells shall be approved by the Superintendent, Bureau of Reclamation, __________________________Project, __________________ before drilling begins. Sites for the construction of pipeline rights-of-way or other authorized facilities shall also be approved by the Superintendent before construction begins.

2) All drilling or operation methods or equipment shall, before their employment, be inspected and approved by the Superintendent of the ___________________________ Project,___________________________________, and by the Supervisor of the U. S. Geological Survey having jurisdiction over the area.

SECTION IV - Definitions

Conditions of Approval (COA) - Conditions or provisions (requirements) under which an operations plans such as an Application for a Permit to Drill or a Sundry Notice is approved.

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

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

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

No Surface Occupancy (NSO) - Use or occupancy of the land surface for fluid mineral exploration or development is prohibited to protect identified resource values. The NSO stipulation includes stipulations that may have been worded as “No Surface Use/Occupancy,” “No Surface Disturbance,” “Conditional NSO,” and “Surface Disturbance or Surface Occupancy Restriction (by location).”

Stipulation - A provision that modifies standard lease rights and are attached as needed to a Term within a lease and made a part of the lease.

Term - Conditions contained within the specific lease form.

Timing Limitation (Seasonal Restriction) - Prohibits surface use during specified time periods to protect identified resource values. This stipulation does not apply to the operation and maintenance of production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be in sufficient.

Waiver - Permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

APPENDIX I

SUMMARY OF THE AREA WIDE INVESTIGATION OF PHOSPHATE MINE CONTAMINATION AND FINAL RISK MANAGEMENT PLAN

MINE RECLAMATION STANDARDS FOR CONTAMINANTS IN ENVIRONMENTAL MEDIA

Interim standards for levels of contaminants, such as selenium and cadmium, in reclamation vegetation and water have been developed and applied at all Southeast Idaho phosphate mines approved by BLM since 2000. The standards have been interim because mine approvals were granted during and prior to completion of interagency investigations of phosphate mine contamination and assessment of the appropriate allowable contaminant levels. BLM set interim standards in anticipation of developing long-term, standards in concert with remediation of contamination at historic phosphate mining operations via CERCLA. It was anticipated that a final standard for phosphate mine sites in Southeast Idaho would be developed by the interagency land management agencies after additional study and public comment (see Records of Decision for Dry Valley Mine - South Extension, North Rasmussen Ridge Mine, and the Smoky Canyon Mine, Panels B and C).

As part of the plan for CERCLA investigation and clean-up of historic southeast Idaho phosphate mine sites, the Idaho Department of Environmental Quality, along with BLM, Forest Service, Environmental Protection Agency, Bureau of Indian Affairs, U.S. Fish and Wildlife Service, Idaho Department of Lands, and the Shoshone Bannock Tribes completed the *Area Wide Risk Management Plan: Removal Action Goals and Objectives, and Action Levels for Addressing Releases and Impacts from Historic Phosphate Mining Operations in Southeast Idaho* (AWRMP) in February 2004. The AWRMP contains a list of applicable or relevant and appropriate requirements (ARAR's) regarding allowable amounts of contamination in vegetation, soil, and water. Numerical Remedial Action Levels (RALs) were taken from the ARARs and are set as standards for mine site remediation activities.

The agencies involved with preparation of the AWRMP have concurred with the list of ARARS. The ARARS will be used as a basis to set the maximum allowable contamination and the scope of remediation activities at impacted phosphate mine sites. The RALs will be used to assist in determining the extent of reclamation activities necessary and the point where sites can be released for post mining land use that is free of hazardous contamination.

BLM proposes to use the vegetation, ground and surface water RALs developed for CERCLA remediation of Southeast Idaho phosphate mines as standards in the Pocatello Resource Management Plan (RMP) that must be met by phosphate mine operators upon completion of reclamation activities (see Chapter 2, Action AA-ME-2.3.8). Vegetation and water are the primary exposure pathways for environmental receptors such as wildlife and domestic livestock. Unpolluted water is critical in providing suitable aquatic habitat. It is vital that vegetation and water at or near phosphate mines do not contain hazardous levels of selenium, cadmium, and other contaminants. Soil and sediment ARARS serve as helpful guidelines in designing reclamation that will meet vegetation and water standards, but BLM does not want to limit the ability of operators to consider all soil resources in designing and completing suitable revegetation and reclamation that will meet the final vegetation and water standards.

MINE CONTAMINATION AND INVESTIGATION BACKGROUND

Selenium and other contaminants are present in waste rock, or overburden that is removed during phosphate mining. Waste rock piles or waste rock used during reclamation can be a source of selenium and other metals, to nearby streams, reclamation vegetation, and groundwater.

In 1996 several cases of selenium toxicity were found in horses and sheep that were grazing in areas adjacent to, or down stream from historic phosphate mines. These events caused public health and ecological health concerns. In response to these concerns the primary mine operators in the region in conjunction with the Idaho Mining Association (IMA) formed an "*ad hoc*" organization to voluntarily investigate and address any mining related environmental and public health issues associated with phosphate mining activities. An Interagency/Phosphate Selenium Working Group (SeWG) consisting of participants from various federal and state agencies along with representatives from the Shoshone Bannock Tribes was also established to collaborate on these efforts.

In July 2000 the Idaho Department of Environmental Quality (IDEQ) was formally assigned the role of "Lead Agency" for the Selenium Area Wide Investigation (AWI). The focus of the Area Wide Investigation is a 2500 square mile area referred to as the Southeast Idaho Phosphate Mining Resource Area (Resource Area). This region contains 15 major open pit phosphate mines previously owned and/or currently operated by members of the IMA. The area also contains 14 older and historic "orphaned" mine sites, which are primarily of underground design and are under independent review by an Interagency Technical Group and will be addressed following subsequent analysis of sampling data from these sites.

The Area Wide Investigation has indicated the presence of selenium and other mine related metals at elevated levels in the Resource Area as a result of phosphate mining activities. Area Wide risk assessments were conducted to evaluate baseline risks to human receptors and to assess the potential for population-level risks to ecological receptors in the region. Subsequent mine-specific investigations are being conducted under regulatory oversight to comprehensively identify and control localized sources, releases and exposures at each mine site, and to select and implement any necessary remedial or removal activities that may be necessary to clean up these areas. Mine specific clean up activities will be coordinated by authorized State and Federal agencies using removal or remedial action processes consistent with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP).

RISK MANAGEMENT PLAN AND APPLICABLE REQUIREMENTS

The Final Area Wide Risk Management Plan (AWRMP) was completed in February 2004. The AWRMP was developed as a discretionary guidance document to assist the CERCLA Lead and Support Agency representatives in their decision making responsibilities regarding release of hazardous substances from mining activities in the South East Idaho Phosphate Mining Resource

Area. This document provides removal action goals, objectives, and action levels that are intended to assist in identifying site-specific areas of concern. Additionally the document contains a glossary of technical terms, and a list of common acronyms; and a preliminary list of applicable or relevant and appropriate requirements (ARAR's) for subsequent mine specific removal or remedial actions.

Based on the available analytical data and current knowledge of the source areas, metals and metalloids are the contaminants of potential concern (COPCs) and Selenium is the primary COPC and has been identified as the primary hazard driver for the area wide investigation. Although Se is the primary COPC it is not the only element that will be sampled and analyzed in each site specific investigation, and based on recommendations in the AWRMP, at the minimum, the following COPCs will be sampled and analyzed:

- Cadmium Cd
- Chromium Cr
- Nickel Ni
- Selenium Se
- Vanadium V
- Zinc Zn

The AWRMP contains four removal action goals and a number of removal action objectives intended to achieve compliance with existing environmental objectives to either achieve compliance with existing ARAR's or to address areas that IDEQ has concluded present unacceptable risks based on ecological subpopulation exposures. The removal action goals are as follows:

1. Protect Southeast Idaho's Surface Water Resources.
2. Protect Wildlife Habitat and Ecological Resources in Southeast Idaho.
3. Maintain and Protect Multiple Beneficial Uses of the Southeast Idaho Phosphate Mining Resource Area.
4. Protect Southeast Idaho's Ground Water Resources.

The IDEQ established regulatory-based removal action levels for all primary media regulated under existing chemical specific ARAR's. The regulatory-based remedial action levels (RALs) affect regulated surface and ground water media.

Numerous surface water features are present in the resource area. Under the Idaho State water quality rules and the Clean Water Act (CWA), many of these features are regulated differently depending on their contribution to the waters of the United States and designated beneficial uses.

The following table provides the removal action levels that are intended to be applied to "regulated surface waters" (waters of the United States regulated under the Clean Water Act or other State water quality laws). Regulated waters exceeding these action levels must be addressed during the EE/CA or RI/FS phase of the removal or remedial action process respectively.

Regulated Surface Waters[1]:

REMEDIAL ACTION LEVEL FOR CLEAN WATER ACT REGULATED SURFACE WATER[3, 4]

Constituent	Action Level (ug/L)	Basis
Selenium, Total Recoverable	5.0	40 CFR 131.35/IDAPA[5] 58.01.02
Cadmium[1]	1.0	40 CFR 131.35/IDAPA 58.01.02
Chromium, Total[2]	74.0	40 CFR 131.35/IDAPA 58.01.02[2]
Nickel[1]	160.0	40 CFR 131.35/IDAPA 58.01.02
Vanadium, dissolved	20.0	Tier II Secondary Chronic Benchmarks
Zinc[1]	100.0	40 CFR 131.35/IDAPA 58.01.02

Units of mg/kg are equivalent to parts per million, µg/kg are parts per billion, dw is dry weight.
1 Dissolved with hardness adjustment required.
2 Assumes 6 to 1 partitioning of Cr III to CR VI. Please note, the surface water criteria for chromium as changed in 2005. Total Chromium has been replaced with Chromium (III) and Chromium (VI).
3 Based on cold water biota criteria, alternate criterion may be applicable (see IDAPA); remedial actions may be triggered at lower concentrations if confirmed degradation trends are observed.
4 Waters of the United States e.g., flowing streams, natural lakes/ponds.
5 Idaho Administrative Procedure Act (Idaho Code)

Regulatory-based groundwater removal action levels are as follows:

REMEDIAL ACTION LEVEL FOR GROUNDWATER (TOTAL RECOVERABLE) [1]

Constituent (Unfiltered)	Action Level (ug/L)	Basis
Selenium	50	IDAPA 58.01.11
Cadmium	5	IDAPA 58.01.11
Chromium	100	IDAPA 58.01.11
Nickel	730	Human Health Tap Water Criteria
Vanadium	260	Human Health Tap Water Criteria
Zinc	5000	IDAPA 58.01.11 (Secondary Standard)

1 Selected constituents are shown, the Idaho Groundwater Protection Rule (IDAPA 58.01.11) directs the full constituent list and action levels. Based on drinking water MCLs/human health exposure levels; remedial actions may be triggered at lower concentrations if confirmed degradation trends are observed.

Ground water removal action levels are based on existing chemical specific ARAR's intended to protect human health and future groundwater resources. These levels represent Maximum Contaminant Levels (MCL's) or secondary standards for drinking water, or the human health tap water criteria depending on the constituent. Groundwater concentrations exceeding these action levels are to be addressed during the CERCLA Engineering Evaluation and Cost Analysis (EE/CA) or Remedial Investigation and Feasibility Study (RI/FS) phase of the removal or remedial action process respectively.

Some media do not have chemical specific ARAR's and in the absence of ARAR's the IDEQ has developed risk-based removal action levels, and each lead agency is expected to utilize these

[1] Waters of the United States e.g., flowing streams, natural lakes/ponds.

action levels where these media are present. Action levels are intended to protect sensitive receptors in the following areas: Non-regulated surface water, sediment, soils and vegetation.

Non Regulated Surface Waters (e.g. isolated man-made ponds, mine pit lakes, seeps, springs):

REMEDIAL ACTION LEVEL FOR SURFACE WATERS NOT SUBJECT TO CLEAN WATER ACT BIOTA STANDARDS[1]

Constituent	Action Level (mg/L)	Basis
Selenium:		
Transitory wildlife drinking water use	0.201	½ NOAEL Single Media Estimate for Sensitive Species
Domestic animal drinking water use	0.050	Veterinarian Advisory Level for Domestic Animals.
Riparian habitat use	0.005	Assumed protective level for waterfowl/amphibians.
Cadmium	0.245	½ NOAEL[2] Single Media Estimate for Sensitive Species
Chromium	8.7	½ NOAEL Single Media Estimate for Sensitive Species
Nickel	0.614	½ NOAEL Single Media Estimate for Sensitive Species
Vanadium	0.972	½ NOAEL Single Media Estimate for Sensitive Species
Zinc	43.4	½ NOAEL Single Media Estimate for Sensitive Species

[1] Based on subpopulation risks in impacted areas from avian/terrestrial surface water ingestion.
[2] No Observed Adverse Effects Level (US EPA)

EPA. 1997a. Health Effects Assessment Summary Tables (HEAST): Annual update, FY 1997. National Center For environmental Assessment (NCEA) office of research and Development and Office of Emergency and Remedial Response. Washington, D.C.

EPA 1997b. Ecological Risk Assessment Guidance for Superfund: Process For Designing and Conducting Ecological Risk Assessments. Office of Solid Waste and Emergency Response. Washington, D.C. EPA/540/R-97/006-PB97-963211. Interim Final.

EPA. 2004c. Interacted Risk Information System (IRIS) On-line Toxicity Data Base on-line URL http://epa.gov/iriswebp/iris/index.html

Sediments:

For sediment two scenarios were assumed: Protection of aquatic life in regulated waters and protection of terrestrial receptors in non-regulated waters:

Regulated area sediment removal action levels:

REMEDIAL ACTION LEVEL FOR SEDIMENTS SUPPORTING AQUATIC LIFE[1]

Constituent	Action Level (mg/kg dry weight)	Basis
Selenium	2.6 (2.5)	Max BG (Reported EC10 for freshwater birds and fish)
Cadmium	5.1 (3.53)	Max BG (NOAA Probable Effects Level Benchmark)
Chromium	100.0 (90.0)	Max BG (NOAA Probable Effects Level Benchmark)
Nickel	44 (23)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)
Vanadium	72 (36.4)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)
Zinc	210 (202)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)

[1] Based on published benchmarks for aquatic life effects or maximum Area Wide Investigation background concentrations.

Non Regulated area sediment removal action levels:

REMEDIAL ACTION LEVEL FOR SEDIMENTS NOT SUPPORTING AQUATIC LIFE[1]		
Constituent	**Action Level (mg/kg dw)**	**Probabilistic Risk Calculations**
Selenium	7.5 (2.6)	½ NOAEL Single Media Estimate for Sensitive Species (Max BG)
Cadmium	9.2 (5.1)	½ NOAEL Single Media Estimate for Sensitive Species (Max BG)
Chromium	187 (100)	½ NOAEL Single Media Estimate for Sensitive Species (Max BG)
Nickel	44 (23)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)
Vanadium	72 (36.4)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)
Zinc	210 (202)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)

[1] Based on subpopulation risks in impacted areas from avian/terrestrial ingestion of forage.

Soils:

Soil action levels do not apply to surface materials used on "waste rock dumps" or overburden disposal areas that were permitted as waste disposal facilities. The riparian and fluvial soil removal action levels apply to surface soils in wetlands, runoff/flood deposition areas, and along the periphery or regulated waters. Exceedances of the action levels require the surface soil exposures and associated risks be addressed during the EE/CA or RI/FS actives.

Riparian/fluvial soil removal action levels:

REMEDIAL ACTION LEVEL FOR SOILS (RIPARIAN/FLUVIAL)[1]		
Constituent	**Action Level (mg/kg dw)**	**Basis**
Selenium	5.2 (3.3)	½ NOAEL Single Media Estimate for Sensitive Species (Max BG)
Cadmium	14 (5.6)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)
Chromium	130 (40.7)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)
Nickel	47 (15.9)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)
Vanadium	100 (25.1)	Max BG (½ NOAEL Single Media Estimate for Sensitive Species)
Zinc	738 (660)	½ NOAEL Single Media Estimate for Sensitive Species (Max BG)

[1]Based on published soil benchmarks or maximum Area Wide Investigation background concentration for riparian or upland soils.

Vegetation:

The vegetation removal action level for selenium is based on the Land Management Agencies' recommendation goal for unrestricted grazing use upon the completion of mining activities. The action levels apply to all vegetated areas, including wetlands, riparian zones, and reclaimed areas from historic mining activities. To demonstrate attainment of this action level the mine operator must achieve a mean selenium vegetation concentration of 5 mg/kg dry weight or less using a statistically acceptable ppm dry weight.

Remedial Action Level for Vegetation[1]		
Constituent	**Action Level (mg/kg dry weight)**	**Basis**
Selenium	5.0	NOAEL HQ=10, SUF=0.5; Herbivorous Birds and Mammals (Max BG)
Cadmium	4.2 (3.7)	NOAEL HQ=10, SUF=0.5; Herbivorous Birds and Mammals (Max BG)
Chromium	30.6 (9.9)	NOAEL HQ=10, SUF=0.5; Herbivorous Birds and Mammals (Max BG)
Nickel	35.5 (4.3)	NOAEL HQ=10, SUF=0.5; Herbivorous Birds and Mammals (Max BG)
Vanadium	55.9 (5.5)	NOAEL HQ=10, SUF=0.5; Herbivorous Birds and Mammals (Max BG)
Zinc	615 (140)	NOAEL HQ=10, SUF=0.5; Herbivorous Birds and Mammals (Max BG)

[1] Based on subpopulation risks in impacted areas from avian/terrestrial ingestion of forage or maximum Area Wide Investigation background level.

<u>Proposed Selenium Action Levels</u>:

Selenium has been identified as the primary hazard driver, and is the major focus of regional remediation or removal activities. The following action levels are proposed for each of the designated media exhibiting elevated levels of selenium.

Media of Concern or Targeted Action	**Units**	**Background**		**Impacted Areas[1]**			**Se Action Levels**
		Mean	**Max**	**Mean**	**Max**	**Median**	
CWA-Regulated Surface Water	ug/L	NA	1.6	9.2	1140	1.3	5
Non-Regulated Surface Water	ug/L	-	-	251	2200	255	201
Groundwater	ug/L	-	-	-	-	-	50
Sediments (regulated areas/ aquatic life)	mg/kg dw	1.2	2.6	12.5	188	3.4	2.6
Sediments (terrestrial exposure)	mg/kg dw	-	-	-	-	-	7.5
Riparian/Upland Soils	mg/kg dw	1.01	3.3	10.49	150	1.7	5.2
Vegetation	mg/kg dw	0.24	0.75	7.72	39	2.5	5.0

[1] Sampling at Southeast Idaho Phosphate Mining sites and downstream watersheds related to Area-Wide Investigation (AWI), 2004.

Source: Department of Environmental Quality, State of Idaho. *Selenium Area Wide Investigation, Southeast Idaho Phosphate Mining Resource Area; Area Wide Risk Management Plan: Removal Action Goals and Objectives, and Action Levels for Addressing Releases and Impacts from Historic Phosphate Mining Operations in Southeast Idaho*, DEQ #WST.RMIN.SEAW.6005.67068, February 2004.

APPENDIX J

METHODOLOGY AND ASSUMPTIONS FOR VEGETATION MODELING, FIRE REGIME CONDITION CLASS AND LAND HEALTH CONDITION

BACKGROUND:

Vegetation types across the landscape are constantly influenced and shaped by a variety of factors such as human activities, wildland fire, insects, disease and weather. The interaction of these factors is complex and the combined effects can be difficult to predict over long periods of time. Predicting how these factors affect vegetation structure and composition is an important part of the planning process.

INTRODUCTION:

This Appendix is divided into four sections. Section I describes the methodology, assumptions and baseline data used to predict changes in Biophysical Setting[1] (BpS) classes[2] for each vegetation type by alternative at 10 and 30 years based upon proposed footprint treatment levels and succession. Treatment levels would be applied in the first 10 years of implementation of the plan. Section II describes the methodology for determining the Fire Regime Condition Class using the modeled results from the predicted changes in the Biophysical Setting classes for each vegetation type by alternative. Section III describes the concept of Land Health Condition (LHC) and how LHC was assigned to each of the vegetation types by alternative. Section IV contains the six draft BpS descriptions for each vegetation type.

The vegetation types described for the planning area (Chapter 3) correspond with the six draft BpS descriptions as follows: Inter-Mountain Basin Big Sagebrush Steppe (Low-Elevation Shrub), Inter-Mountain Basins Montane Sagebrush Steppe (Mid-Elevation Shrub), Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland (Mountain Shrub), Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (Aspen/Aspen-Conifer Mix and Dry Conifer), Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (Wet Cold Conifer), and Great Basin Pinyon-Juniper Woodland (Natural Juniper)..

1 Biophysical settings (BpS) are the primary environmental settings used in determining a landscape's natural fire regime(s) and fire regime condition class (FRCC). These settings incorporate both classification (taxonomic) and map unit concepts. The taxonomic units of these classifications can be considered biophysical classes. The BpS models used and described in this Appendix are draft. Final BpS models approved by the LANDFIRE project could be different from those draft models described in this Appendix.

2 Class - The box model vegetation-fuel class within each BpS description, based upon successional (seral) stage, composition, and structure." As defined in Hann, Wendel, Havlina, Doug, Shlisky, Ayn, et al. 2003. Interagency and The Nature Conservancy fire regime condition class website. USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management [frcc.gov].

SECTION I - BIOPHYSICAL SETTING CLASS MODEL

Methodology:

A spreadsheet was used to perform the calculations necessary to simulate the movement of acres from one BpS class to another. This movement of acres through successive BpS classes is a result of applying the proposed footprint treatment levels (**Table 1**.) and accounting for succession rates for each vegetation type.

Two separate groups of calculations were performed in the spreadsheet for each vegetation type, by alternative. The first group of calculations simulated the application of treatment levels for the initial 10 year period in which treatments would be applied to specific BpS classes and the simulation of succession for acres not treated. The second group of calculations simulated the combined effects of treatments and succession 20 years after treatment implementation.

Table 1. Footprint treatment levels by vegetation type by alternative.

Vegetation Type	ALT- A	ALT-B	ALT-C	ALT-D
Low-Elevation Shrub	0.0	18,950	0.0	9500
Mid-Elevation Shrub	0.0	25,400	16,650	64,000
Mountain Shrub	0.0	16,500	16,600	15,000
Perennial Grass/Seeding	0.0	50,200	1300	53,300
Natural Juniper	0.0	0.0	0.0	0.0
Aspen/Dry Conifer Group	3,400	13,200	20,000	20,000
Wet/Cold Conifer	0.0	0.0	70	70
Riparian	0.0	0.0	100	100
Other/Vegetated Lava	0.0	0.0	200	200

The goal of this modeled analysis is to predict and demonstrate the change in current BpS classes at 10 and 30 years for individual vegetation types by alternative based solely upon the footprint treatment levels and succession by alternative.

Assumptions and Baseline Information:

It is difficult to predict how the BpS classes may change due to the interaction of complex factors. This model describes how BpS classes of the individual vegetation types would change as a result of applying proposed treatment levels by alternative as described in Chapter 2. The identification of assumptions is integral to developing the spreadsheet calculations to predict changes in the BpS classes. General assumptions were developed and applied to all vegetation types. In addition, specific assumptions were developed for each individual vegetation type. These assumptions were developed based upon the team's professional judgment and knowledge of the vegetation types within the planning area.

General Assumptions:

The following assumptions were applied to all vegetation types:

- The number of years required for each BpS class to move to the next BpS class is identified in the BpS description for each vegetation type.

- The proposed treatments are the only disturbances incorporated into this modeled analysis of succession and BpS class change. Other activities and disturbances such as off-highway vehicle use, wildland fire, grazing, forest management and mining are assumed to have no effect on succession or BpS classes in this analysis.
- The acreages in each BpS class are equally distributed in each year.
- The proposed treatments are implemented in the first 10 years and are the only disturbance considered in this model.
- The initial 10 year period is the result of both the proposed treatment levels and succession on untreated acres.
- In the initial 10 year period, treatment acres which move to a different BpS class are applied to year 1 of that BpS class and are not considered in the subsequent succession calculation.
- In the initial 10 year period, when calculating succession only the untreated acres are moved to a different BpS class.
- The 20 year period following the initial 10 year treatment and succession period is the result of only succession and are displayed as Year 30.
- For the 20 year period, the calculation of succession is based upon 20 yrs/x where x equals the length of time (years) necessary for vegetation in that particular BpS class to naturally move to the next BpS class.

Specific Assumptions and Baseline Data by Individual Vegetation Types:

The information used to develop spreadsheet calculations for the 10 and 20 year periods for each individual vegetation type is described below:

<u>BpS Class Years -</u> Time described in years for each BpS class to naturally move to the next BpS class. For example, Class A=25 yrs, Class B=15 yrs, Class C> 40 yrs where Class A, B, and C refer to a vegetation class in particular BpS description. Each BpS description contains this information.

<u>Succession Multipliers -</u> These were determined for each BpS class based upon the initial 10 year treatment and succession period and the 20 year succession period. Multipliers were calculated by dividing the 10 and 20 year period by the years per BpS class for each vegetation type. For example:

BpS class	10 year period	20 year period
Class A	10 yrs / 25 yrs = 0.4	20 yrs / 25 yrs = 0.8
Class B	10 yrs / 15 yrs= 0.67	20 yrs / 15 yrs = 1.33

<u>Percent of BpS class Acres Treated By Alternative -</u> This identifies, by alternative, the particular BpS class to which the treatment is applied.

<u>Acres Treated by Alternative -</u> This identifies, by alternative, the number of acres treated by BpS class.

Succession Following Treatment - This identifies how the treatment would affect the BpS class(s) and what percent would remain or move to another BpS class, by alternative.

Treatment Types - This describes the type of treatments applied to each BpS class.

Current BpS Class Acres - **Table 2** identifies current BpS class acres used in the spreadsheet model calculations for each alternative. Acres were assigned to each BpS Class by staff specialists (range, fire ecology, wildlife, botany) by: 1) using the best available vegetation condition data (Malad Management Framework Plan 1981 and Pocatello Resource Management Plan 1988) and 2) reviewing and agreeing on Map Zone 18 BpS descriptions for respective vegetation types in the planning area. This agreement on assignment of acres to each BpS class by vegetation type was based upon discussion by staff specialists, specialist's knowledge of current vegetation conditions within the Field Office, professional judgment and ultimately the consensus of staff specialists.

Table 2. Current BpS Class Acres By Vegetation Type.

Vegetation Type	Class A	Class B	Class C	Class D	Class E	Uncharacteristic
Low-Elevation Shrub (Inclusive of Perennial Grass/ Seedings)	74,100	28,600	0.0	N/A	N/A	42,100
Mid-Elevation Shrub (inclusive of Encroached Juniper)	27,700	40,500	38,300	4,500	6,800	35,500
Mountain Shrub	0.0	187,100	N/A	N/A	N/A	N/A
Natural Juniper	0.0	0.0	0.0	0.0	14,400	N/A
Aspen/Dry Conifer	500	500	33,100	6,400	49,800	N/A
Wet/Cold Conifer	0.0	0.0	0.0	700	N/A	N/A

Acres rounded to nearest 100 acres. The number of BpS classes varies by vegetation type. N/A indicates no BpS class for that particular vegetation type. Uncharacteristic acres are considered to be those acres that do not occur within the natural regime (Hann, Wendel, et al. 2003[3]).

[3] Hann, Wendel, Havlina, Doug, Shlisky, Ayn, et al. 2003. Interagency and The Nature Conservancy fire regime condition class website. USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management [frcc.gov].

<u>Low-Elevation Shrub</u>:

BpS Class Years:

- 60 years (Class A = 20 yrs, Class B = 40 yrs, Class C > 60yrs)

Succession Multipliers:

- 10 Year Treatment/Succession
  - Class A use 10/20 = 0.5
  - Class B use 10/40 = 0.25
- 20 year Succession
  - Class A use 20/20 = 1.0
  - Class B use 20/40 = 0.5

Percent of BpS Class Acres Treated By Alternative:

BpS class	ALT A	ALT B	ALT C	ALT D
Class A	--	47%	--	28%
Class B	--	--	--	--
Class C	--	--	--	--
Uncharacteristic	--	82%	3%	100%

Acres Treated by Alternative:

BpS class	ALT A	ALT B	ALT C	ALT D
Class A	--	34,575	--	20,700
Class B	--	--	--	--
Class C	--	--	--	--
Uncharacteristic	--	34,575	1,300	42,100
Total Tx Acres	--	69,150	1,300	62,800

Succession Following Treatment:

Alternative B:
- Uncharacteristic class treated results in 100% moving to Class A.
- Class A treated results in 100% staying in Class A.

Alternative C:
- Uncharacteristic class treated results in 100% moving to Class A.

Alternative D:
- Uncharacteristic class treated results in 100% moving to Class A.

Treatment Types:
- Prescribed Fire (Rx)
- Seeding
- Chemical

Note: The uncharacteristic 42,100 acres identified in this vegetation type are areas previously farmed/homesteaded and subsequently seeded to Crested wheatgrass.

Mid-Elevation Shrub:

BpS Class Years:
- 180 years (Class A = 12 yrs, Class B = 38 yrs, Class C = 80 yrs, Class D = 50 yrs, Class E > 180 yrs)

Succession Multipliers:
- 10 Year Treatment/Succession
  - Class A use 10/12 = 0.83
  - Class B use 10/38 = 0.26
  - Class C use 10/80 = 0.125
  - Class D use 10/50 = 0.2
- 20 year Succession Window
  - Class A use 20/12 = 1.6
  - Class B use 20/38 = 0.53
  - Class C use 20/80 = 0.25
  - Class D use 20/50 = 0.4

Percent of BpS Classes Treated By Alternative:

BpS Class	ALT A	ALT B	ALT C	ALT D
Class A	--	--	--	--
Class B	--	--	--	--
Class C	--	--	--	45%
Class D	--	57%	100%	100%
Class E	--	37%	100%	100%
Uncharacteristic	--	57%	15%	100%

Acres Treated by Alternative:

BpS Class	ALT A	ALT B	ALT C	ALT D
Class A	--	--	--	--
Class B	--	--	--	--
Class C	--	--	--	17,200
Class D	--	2,550	4,500	4,500
Class E	--	2,550	6,800	6,800
Uncharacteristic	-	20,300	5,350	35,500
Total Tx Acres	--	25,400	16,650	64,000

Succession Following Treatment:

<u>Alternative B</u>:
- Class D treated results in 100% of acres moving to class B
- Class E treated results in 100% of acres moving to class B
- Uncharacteristic Class treated results in 100% of acres moving to class B

<u>Alternative C</u>:
- Class D treated results in 100% of acres moving to class B
- Class E treated results in 100% of acres moving to class B
- Uncharacteristic Class treated results in 100% of acres moving to class B

<u>Alternative D</u>:
- Class C treated results in 100% of acres moving to class B
- Class D treated results in 100% of acres moving to class B
- Class E treated results in 100% of acres moving to class B
- Uncharacteristic Class treated results in 100% of acres moving to class B

Treatment Types:
- Prescribed Fire (Rx)
- Seeding
- Mechanical
- Chemical

Note: From satellite imagery it is not possible to distinguish between natural occurring juniper and encroached juniper. The Juniper vegetation type as described in this document is a combination of both natural and encroached Juniper. The encroached Juniper generally occurs in the Mid-Elevation Shrub type. For the purpose of modeling changes in BpS classes resulting from treatment, encroached Juniper acreages have been combined with the Mid-Elevation Shrub acreages. Encroached juniper acres were distributed in the following Mid-Elevation shrub classes: Class D = 4,500 acres and Class E = 6,800 acres.

<u>Mountain Shrub</u>:

BpS Class Years:
- 2 years (Class A = 2 yrs, Class B > 2 yrs)

Succession Multipliers:
- 10 Year Treatment/Succession
  - Class A use 10/2 = 5
- 20 year Succession
  - Class A use 20/2 = 10

Percent of BpS Classes Treated By Alternative:

BpS Class	ALT A	ALT B	ALT C	ALT D
Class A	--	--	--	--
Class B	--	9%	9%	8%

Acres Treated by Alternative:

BpS Class	ALT A	ALT B	ALT C	ALT D
Class A	**--**	**--**	**--**	**--**
Class B	**--**	16,500	16,600	15,000
Total T_x Acres	--	16,500	16,600	15,000

Succession Following Treatment:

Alternatives B, C and D:

- Class B treated results in 100% of acres moving to class A.

Treatment Types:

- Prescribed Fire (Rx)
- Chemical
- Seeding

Perennial Grass/Seedings:

For the purpose of modeling changes, acres for the Perennial Grass/Seedings vegetation types are included in the Low-Elevation Shrub type. This includes 64,600 acres of the Perennial Grass vegetation type and 42,100 acres of the Seedings vegetation type.

Natural Juniper:

BpS Class Years:

- 300 years (class A = 10 yrs, class B = 20 yrs, Class C = 70 yrs, Class D = 200 yrs, Class E > 300 yrs)

Succession Multipliers:

- All Juniper is in Class E, additional time will not change the BpS Class.

Percent of BpS Classes Treated By Alternative:

- No treatments applied to natural occurring Juniper.

Acres Treated by Alternative:

- No treatments applied to natural occurring Juniper.

Succession Following Treatment:

- No treatments applied to natural occurring Juniper.
- Only succession of acres analyzed over the 10 and 20 year period.

Treatment Types:

- None

Note: For the purpose of modeling changes in Natural Juniper only the 14,400 acres of natural occurring Juniper were used in the spreadsheet calculations.

Aspen/Aspen Conifer Mix:

Length of BpS Class (Years):
- 180 years (Class A = 10 yrs, Class B = 30 yrs, Class C = 40 yrs, Class D = 100 yrs, Class E > 180 yrs)

Succession Multipliers:
- 10 Year Treatment/Succession
  - Class A use 10/10 = 1
  - Class B use 10/30 = 0.33
  - Class C use 10/40 = 0.25
  - Class D use 10/100 = 0.1
- 20 year Succession
  - Class A use 20/10 = 2
  - Class B use 20/30 = 0.67
  - Class C use 20/40 = 0.5
  - Class D use 20/100 = 0.2

Percent of BpS Classes Treated By Alternative:

BpS Class	ALT A	ALT B	ALT C	ALT D
Class A	--	--	--	--
Class B	--	--	--	--
Class C	5%	20%	--	--
Class D	--	--	--	--
Class E	4%	13%	40%	40%

Acres Treated by Alternative:

BpS	ALT A	ALT B	ALT C	ALT D
Class A	--	--	--	--
Class B	--	--	--	--
Class C	1,600	6,600	--	--
Class D	--	--	--	--
Class E	1,800	6,600	20,000	20,000
Total T_x Acres	3,400	13,200	20,000	20,000

Succession Following Treatment:

Alternatives A:
- Class C treated results in 100% of acres moving to Class A.
- Class E treated results in 50% of acres moving to Class D and 50% to Class C.

Alternatives B:
- Class C treated results in 100% of acres moving to Class A
- Class E treated results in 100% of acres moving to Class D

Alternative C:

- Class E treated results in 100% of acres moving to Class A

Alternative D:

- Class E treated results in 80% of acres moving to Class D.
- Class E treated results in 20% of acres remaining in Class E.

Treatment Types:

- Mechanical - selective on Douglas fir.
- Prescribed Fire

Dry Conifer:

For the purpose of modeling changes, the Dry Conifer vegetation type (49,800 acres) was combined with the Aspen/Aspen Conifer Mix vegetation type.

Wet Cold Conifer:

Length of BpS classes (Years):

- 200 years (Class A = 40 yrs, Class B = 80 yrs, class C = 80 yrs, Class D > 200 yrs)

Succession Multipliers:

- 10 Year Treatment/Succession
  - Class A use 10/40 = 0.25
  - Class B use 10/80 = 0.125
  - Class C use 10/80 = 0.125
- 20 year Succession
  - Class A use 20/40 = 0.5
  - Class B use 20/80 = 0.25
  - Class C use 20/80 = 0.25

Percent of BpS Classes Treated By Alternative:

BpS Class	ALT A	ALT B	ALT C	ALT D
Class A	--	--	--	--
Class B	--	--	--	--
Class C	--	--	--	--
Class D	--	--	100%	100%

Acres Treated by Alternative:

BpS Class	ALT A	ALT B	ALT C	ALT D
Class A	**--**	**--**	**--**	**--**
Class B	**--**	**--**	**--**	**--**
Class C	**--**	**--**	**--**	--
Class D	**--**	**--**	70	70
Total T_x Acres	--	--	70	70

Succession Following Treatment:

Alternatives C and D:

- Class D treated results in 100% of acres staying in Class D.

Treatment Types:

- Mechanical - selective on Douglas fir.

Model Calculations and Results:

The goal of this modeled analysis is to display the change in the current BpS Classes at 10 and 30 years for each vegetation type by alternative due to the proposed treatment levels and succession.

Table 3 displays sample results of the analysis for the Low-Elevation Shrub vegetation type by alternative.

For illustrative purposes, **Figure 1** shows how treatment and succession acres for **Alternative C** of the Low-Elevation Shrub vegetation type move into and out of the BpS Classes based upon the assumptions and spreadsheet calculations at 10 and 30 years.

In Alternative C, only 1,300 acres are treated in the Uncharacteristic Class during the first 10 years. These treated acres are then assumed to move to Class A.

In **Figure 1**, the solid line/arrow shows the initial 10 year period calculations and movement of acres due to treatment and succession. The double line shows the 20 year period calculations and movement of acres through succession.

Table 3. Sample analysis results showing change in BpS classes for the Low-Elevation Shrub vegetation type for alternatives at 10 and 30 year intervals.

BpS Class	Current Acres	Treatment (Tx) Acres	10 Years	30 Years
Alternative A				
Class A	74,100	0.0	37,100	0.0
Class B	28,600	0.0	56,200	65,200
Class C	0.0	0.0	9,400	37,500
Uncharacteristic	42,100	0.0	42,100	42,100
Alternative B				
Class A	74,100	34,575	88,900	0.0
Class B	28,600	0.0	41,200	109,500
Class C	0.0	0.0	7,200	27,800
Uncharacteristic	42,100	34,575	7,500	7,500
Alternative C				
Class A	74,100	0.0	38,400	0.0
Class B	28,600	0.0	58,500	67,600
Class C	0.0	0.0	7,200	36,400
Uncharacteristic	42,100	1,300	40,800	40,800
Alternative D				
Class A	74,100	20,700	79,200	0.0
Class B	28,600	0.0	56,200	107,300
Class C	0.0	0.0	9,400	37,500
Uncharacteristic	42,100	42,100	0.0	0.0

Acres are rounded to the nearest 100 acres.

Figure 1. Sample Calculations and Results for Low-Elevation Shrub example, Alternative C at 10 and 30 years.

Class A		Row Identifier	Calculations By Row
74,100	Existing Class A acres, 0.0 yrs	R1	
0	Acres treated Class A, 10 yrs	R2	
1,300	Treatment ac from Uncharacteristic Class, 10 yrs.	R3	R23
37,050	Succession ac moved to Class B, 10 yrs	R4	R1*(.5)
38,350	Acres remaining after Tx and Succession, 10 yrs	R5	R3+R4
-38,350	Succession ac moved to Class B, 20 yrs.	R6	R5*(1)
0	Acres in Class A, 30 yrs.	R7	R5+R6

Class B			
28,600	Existing Class B acres, 0.0 yrs	R8	
0	Acres treated Class B, 10 yrs	R9	
37,050	Succession ac from Class A, 10 yrs	R10	R4
-7,150	Succession ac move to Class C, 10 yrs	R11	R8*(.25)
58,500	Acres remaining after Tx and Succession, 10 yrs	R12	R8+R9+R10+R11
38,350	Succession ac from Class A, 20 yrs.	R13	R6
-29,250	Succession ac moved to Class C, 20 yrs.	R14	R12*(.5)
67,600	Acres in Class B, 30 yrs.	R15	R12+R13+R14

Class C			
0	Existing Class C acres, 0.0 yrs.	R16	
0	Acres treated, Class C, 10 yrs.	R17	
7,150	Succession ac from Class B, 10 yrs.	R18	R10
7,150	Acres remaining after Tx and Succession, 10 yrs.	R19	R16+R17+R18
29,250	Succession ac from Class B, 20 yrs.	R20	R14
36,400	Acres in Class C, 30 yrs.	R21	R19+R20

Uncharacteristic			
42,100	Existing Uncharacteristic Class acres, 0.0 yrs	R22	
1,300	Tx ac moved to Class A, 10 yrs	R23	
40,800	Acres remaining after Tx and Succession, 10 yrs	R24	R22+R23
40,800	Acres in Uncharacteristic Class, 30 yrs	R25	R24

SECTION II – FIRE REGIME CONDITON CLASS

Fire Regime Condition Class[4]:

Fire regime condition classes (FRCC 1, 2 and 3) measure the degree of departure from reference conditions, possibly resulting in changes to key ecosystem components, such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances, such as insect and disease mortality, grazing, and drought. Possible causes of this departure include (but are not limited to) fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, and introduced insects and disease (Schmidt and others 2002).

The three fire regime condition classes are based on no or low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the reference conditions (Hann and Bunnell 2001; Hardy and others 2001; Schmidt and others 2002). **Table 4** presents the FRCC class descriptions. This central tendency is a composite estimate of the reference condition[5] vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances.

Table 4. FRCC class descriptions.

Class	Description
1	Fire regimes are within the natural or historical range and risk of losing key ecosystem components is low. Vegetation attributes (composition and structure) are intact and functioning.
2	Fire regimes have been moderately altered. Risk of losing key ecosystem components is moderate. Fire frequencies may have departed by one or more return intervals (either increased or decreased). This may result in moderate changes in fire and vegetation attributes.
3	Fire regimes have been substantially altered. Risk of losing key ecosystem components is high. Fire frequencies may have departed by multiple return intervals. This may result in dramatic changes in fire size, fire intensity and severity, and landscape patterns. Vegetation attributes have been substantially altered.

Characteristic vegetation and fuel conditions are considered to be those that occurred within the natural fire regime, such as those found in FRCC 1 (low departure). Uncharacteristic conditions are considered to be those that did not occur within the natural regime, such as are often found in FRCC 2 and 3 (moderate to high departure). These include (but are not limited to): invasive species (weeds and insects), diseases, “high graded” forest composition and structure (in which, for example, large fire-tolerant trees have been removed and small fire-intolerant trees have been left within a frequent surface fire regime), or repeated annual grazing that reduces grassy fuels across relatively large areas to levels that will not carry a surface fire.

[4] Interagency Fire Regime Condition Class Guidebook, Version 1.2 (May 2005).
[5] Reference conditions are defined as the composition of landscape vegetation and disturbance attributes that, to the best of collective expert knowledge, can sustain current native ecological systems and reduce future hazards to native diversity – reference conditions should reflect characteristics that can be restored. These conditions are the baseline for determining departure from the natural or historical range. Reference conditions are determined by experts through synthesis of expert knowledge, published literature, and historical information using standardized computer modeling tools and processes.

In order to determine departure and assign fire regime condition class, reference condition characteristics have been identified and descriptions developed for the western U.S., eastern U.S., and Alaska concerning vegetation-fuel class composition, fire frequency, and fire severity for the biophysical settings (BpS's) (formerly potential natural vegetation groups or PNVGs) used in the coarse-scale analysis by Schmidt and others (2002). The reference condition characteristic for each BpS is found in each BpS's description document. Description documents are comprehensive summaries of each BpS. These values were developed through Vegetation Dynamics Development Tool (VDDT) modeling, literature review, field visits, and communication with regional experts.

Biophysical Settings

Biophysical settings (BpS's) are the primary environmental settings used in determining a landscape's natural fire regime(s) and fire regime condition class (FRCC). These settings incorporate both classification (taxonomic) and map unit concepts. Ecosystems can be classified based on a single attribute—vegetation, soils, or geomorphology, for example, or they can be classified based on integrated attributes, such as ecological types (Winthers and others 2004), ecological sites (NRCS 2003), or ecological systems (Comer and others 2003). The taxonomic units of these classifications can be considered biophysical classes. When these classes are mapped in organized, repeating map units, they become biophysical units.

These units are land delineations based on the geographic area, physical setting, and vegetation community that can occupy the setting. Physical characteristics include climate, geology, geomorphology, and soils. Vegetation includes the area's native species and associated successional stages – determined according to our best understanding of the historical or natural range of variation, including disturbances. In addition to these attributes, each biophysical setting also features characteristic ecological processes of fire frequency and severity and therefore provides a cogent, robust foundation for determining fire regime and fire regime condition class.

Vegetation as a Proxy for Biophysical Setting

Although biophysical settings represent the collective, integrated attributes of an environment, vegetation can be used as a proxy to describe them. The BpS is typically identified by vegetation indicating the mix of fire severity and frequency across the landscape. For example, grand fir is often associated with a mixed-severity fire regime, and ponderosa pine with a frequent, low intensity fire regime. However, it should be clearly understood that, for the purpose of assessing fire regime and fuel conditions, vegetation is a practical surrogate for the BpS but not a concise classification of vegetation or ecologically-integrated map units.

Vegetation for both forests and rangelands can be defined in existing, potential, and historical terms and can be classified and mapped at all scales (they are not limited to local plant associations).

Existing vegetation is the plant cover, or floristic composition and vegetation structure, occurring currently at a given location (Brohman and Bryant 2005). Existing vegetation's departure from that of the reference conditions is used to calculate FRCC.

Inclusion of disturbance in defining the vegetation component of the BpS is critical for FRCC determination since condition class is based on an estimate of departure from the reference condition of vegetation states and their interrelationships with fire frequency, fire severity, and other disturbances across landscapes. FRCC methodology therefore employs the concept of potential natural vegetation defined as that limited by disturbance, not climate.

Historical vegetation is the vegetation that existed during the reference period prior to Euro-American settlement and that was often affected by Native American burning. The starting point of Euro-American settlement varies throughout the United States, from the early 1600s in coastal Virginia and New England to the late 1700s in the Appalachians to the late 1800s throughout much of the Northern Rockies and the Pacific Northwest. For this reason, the length of the reference period for describing historical vegetation varies according to geographic location.

Figure 2. Completed "Simple 7" worksheet for Low-Elevation Shrub vegetation type, Alternative C at 10 years.

"Simple 7" Training Form - Fire Regime Condition Class (FRCC)

LOW ELEVATION SHRUB ALTERNATIVE C @ 10 YEARS
Project Code *(Field 2)* ________ Project Number *(3)* ______ Project Char. Date *(4)* ________
Project Name *(6)* ________________ Size *(7)* 144,800 Units *(8)*: acres / hectares
Lat *(10)* ________________ Long *(11)* ________________ Datum *(15)* ________

Stratum *(21)* ______ Date *(24)* ________ BpS *(25)*: ____________ Stratum Comp *(41)* _____%
Stratum Lat *(43)* ____________ Stratum Long *(44)* ____________ Stratum Datum *(48)* ______

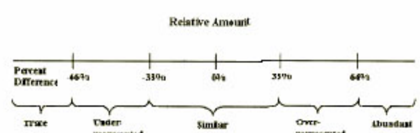
Fire Frequency-Severity	Reference *(51 & 53)*	Current *(52 & 54)*	Sim ([smaller/larger]*100)	Dep (100-Sim)
Fire Frequency (yrs) Sim = (smaller/larger)*100	81 yrs	67 yrs	83%	17
Fire Severity Sim = (smaller/larger)*100	89 yrs	100 yrs	89%	11
Fire Frequency-Severity Condition = (Frequency Dep + Severity Dep) / 2 *(87)*				(28/2)=14
Fire Frequency-Severity Condition Class (0-33 = 1; 34-66 = 2; 67-100 = 3) *(88)*				1

Vegetation-Fuel *(62)*	Reference % *(72)*	Current % *(73)*	Similarity (lower of Ref or Cur) *(77)*	Difference *(79)* if (cur<ref) diff = ((cur-ref)/ref)*100 if (cur ≥ref) diff = ((cur-ref)/cur)*100	Relative Amount[1] *(80)*	Stand Condition Class[2] *(82)*
A – Early	20	26	20	−23	S	1
B – Mid Closed	50	40	40	−20	S	1
C – Mid Open	30	5	5	−83	T	1
D – Late Open						
E – Late Closed						
U – Uncharacteristic	0	28	0	100 %	abundant	3
Sum	100	100	65			
Departure = (100%-Sum Similarity) *(83)*						35
Vegetation-Fuel Condition Class (0-33 = 1; 34-66 = 2; 67-100 = 3) *(84)*						2

Stratum Fire Regime Condition Class *(89)* = Higher of Vegetation-Fuel *(84)* or Frequency-Severity *(88)*	2

Comments ________________________________

[1]Amount based on Difference
T – TRACE (<or=-66% departure)
U –UNDER REPRESENTED (>-66% and <or= -33% departure)
S - SIMILAR (> -33% and < +33% departure)
O – OVER REPRESENTED (>or= +33% and <+66% departure)
A - ABUNDANT (>or= +66% departure or > 0% uncharacteristic classes)



[2] Determine Stand Condition Class (1, 2, or 3) Using the Following Rules:
If VFC Relative Amount (f80) is T, U or S enter 1 for Condition Class 1.
If VFC Relative Amount (f80) is O enter 2 for Condition Class 2.
If VFC Relative Amount (f80) is A enter 3 for Condition Class 3.

LHC-A = 71%
LHC-B = 0%
LHC-C = 29%

(#) = Field number corresponding to the FRCC Worksheet and Software.

FRCC Methodology and Determination:

The "Simple 7" worksheet (**Figure 2.**) was used to determine the overall FRCC for each individual vegetation type. FRCC determinations were made for both 10 and 30 years. FRCC determinations at 10 years are a result of implementation of proposed footprint treatment levels and succession while results at 30 years account for 20 years of succession following proposed footprint treatment levels.

Fire Frequency-Severity data (**Reference (51&53)** entered on the worksheet is based upon BpS descriptions, expert knowledge of modeler, and literature documented in the BpS descriptions.

Current Fire Frequency-Severity (52&54)) data for this analysis were determined using actual large fire history data (32 years), as well as local expertise. Fire rotation was calculated to determine the current fire frequency using 32 years of actual fire history data. "Natural" Fire Rotation is defined as the average number of years required in nature to burn over and reproduce an area equal to the total area under consideration (Heinselman 1973). The "natural" fire rotation for each vegetation type was obtained from BpS descriptions (Fire Frequency-Severity). "Natural" fire rotation, as well as **reference** fire frequency-severity, represent the historic (pre-European man) fire rotation for each vegetation cover type and also define the desired fire rotation to which current and alternative fire rotations are compared. For analysis of the alternatives, the "area under consideration" was determined to be the total acres of a given vegetation cover type within the Pocatello Field Office area. Mechanical treatments were assumed to have similar effects on a vegetation community as fire. An equation was used to arrive at current fire rotation as follows:

$$\textbf{Fire Rotation} = \frac{\textbf{(Total Time Period)}}{\textbf{(Proportion of Area Burned and Treated in Time Period)}}$$

where:

(**Total Time Period)** is described as either:

1. Current fire rotation, which is 32 years past fire history data, or

2. An Alternative's fire rotation by vegetation cover type, which is length of long-term effects analysis (30 years into the future).

and

(Proportion of Area Burned and Treated in Time Period) is described as:

The number of acres burned by wildland fire, using the Wildland Fire Reduction Ratio, where appropriate, as described below, and treated (restoration and/or rehabilitation) within a vegetation cover type divided by the total number of acres within that vegetation cover type.

The fire rotation for each alternative, as well as the current fire rotation, was calculated using the total acres within a vegetation cover type and the acres burned in that vegetation cover type during the period 1972-2002. Second, the desired fire rotation was determined with the assumption that the desired rotation should be approximately equal to the historic rotation. Third, each alternative's fire rotation by vegetation cover type was determined by running levels of treatment and estimated wildland fire acres through the fire rotation equation. Fourth, the current and alternative fire rotations by vegetation cover type were used in the FRCC "simple seven" work sheet, reflecting "current" **fire frequency**. Current **fire severity** was estimated using local expertise that have observed, monitored and rehabilitated wildland fires occurring over the past 30 years.

BpS descriptions provide the **Reference % (72)** information for the **Vegetation-Fuel (62)** component. Vegetation modeling results, acres (**Table 3.**), were converted to percentages and entered in the **"Current % (73)"** column for each BpS class. The remaining columns were completed based upon ***Interagency Fire Regime Condition Class Guidebook, Version 1.2*** **(May 2005)** instructions. **Stand Condition Class (82)** was determined based upon guidance identified on the worksheet (**Figure 2.**) The **Stratum Fire Regime Condition Class (84)** determination is made based upon the higher numerical value of either the **Fire Frequency-Severity Condition Class (88)** or the **Vegetation-Fuel Condition Class (84)**.

As illustrated in **Figure 2**, the **Stratum Fire Regime Condition Class** for the Low-Elevation Shrub vegetation type, Alternative C at 10 years is **2**. This is because the **Vegetation-Fuel Condition Class** rating of **2** is higher than the **Fire Frequency-Severity** rating of **1**. This **Stratum Fire Regime Condition Class** rating by vegetation type forms the basis of the Wildland Fire Management (WF) analysis in Chapter 4 of the DEIS.

Specific Assumptions and Baseline Data by Individual Vegetation Types:

This section describes specific assumptions made per vegetation type regarding either Fire Frequency-Severity or Vegetation-Fuel.

<u>Low-Elevation Shrub/Mid-Elevation</u>:

For current vegetation-fuel class, “uncharacteristic” vegetation included crested wheatgrass seedings and heavily utilized/grazed/burned areas where land health assessments and surveys indicate the presence of noxious weeds and/or cheatgrass.

Current fire severity of 100% is based on observed fire effects, as well as the fact that, for all alternatives (at 10 years and 30 years) >90% of the vegetation is in a flammable grass dominated state (BPS Classes A or B).

Fire severity was reduced to 90% for alternatives where “uncharacteristic” vegetation is targeted for treatment, assuming flammability would be reduced with the elimination of cheatgrass and the re-introduction of perennial grasses.

<u>Aspen/Conifer</u>:

Current fire severity based on percentages of acres in most flammable stages of succession, BpS classes “D” and “E”.

<u>Natural Juniper:</u>

Current fire frequency was based on the average age of the overstory trees as per forester and plot data as 32 years of fire history data was not adequate to estimate current fire rotation give the long fire return interval of natural juniper (>200 years).

Wet Cold Conifer:

Current fire frequency was based on the average age of the overstory trees as per forester and plot data as 32 years of fire history data was not adequate to estimate current fire rotation give the long fire return interval of wet/cold conifer (>200 years).

SECTION III – LAND HEALTH CONDITION

Land Health Condition:

In order to describe both the current and desired future conditions of the various vegetation types on public lands from the perspective of resource specialists (e.g. range, wildlife and fire ecologists) and which the public can easily understand, a common term to describe the desired future ecological condition (health) was developed. This term, Land Health Condition (LHC), is simply defined by the presence or absence of ecological components necessary for a healthy ecosystem.

Currently range, wildlife, forestry and fire/fuels management programs use terminology that is unique to the respective programs in describing current or future desired vegetative conditions. The use of such terminology makes it difficult for the public to understand or picture what the vegetative landscape is suppose to look like. For example, range and wildlife programs use terminology associated with ecological site inventory (ESI) based on plant species composition by weight and canopy or basal cover of vegetation. The forestry and fire/fuels management programs use terminology associated with fire regime condition class (FRCC). The terms associated with these various methods all describe and measure attributes (ecological components) of vegetative health.

However, if one looks at the landscape in a broad sense, these attributes are quite similar. The common theme is to have proper functioning ecosystems by having the necessary ecological components (e.g. appropriate species diversity, vegetative structure, composition and canopy cover) to ensure proper hydrologic function, nutrient cycling, energy flow and properly functioning riparian areas. The *Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management* (August 1997) provides a detailed description of these desired ecological components and land health standards.

In land use planning efforts, NEPA requires analysis of environmental impacts resulting from the development of various alternatives. In order to analyze and describe the impacts of and differences between the various alternative management actions for range, wildlife, forestry and fire/fuels management, objectives for vegetation and fire management in this planning effort have been written based upon the "Land Health Condition" concept. LHC is the common denominator used to describe the future desired vegetative landscape. LHC classes (A, B, and C) are defined by the presence or absence of the ecological components necessary for a healthy ecosystem.

LHC definitions along with the comparison of indicators of land health and FRCC descriptors are described in **Table 5**. As shown in **Table 5**, similar key ecological components (attributes) for LHC and FRCC are grouped as follows: LHC-A - FRCC 1, LHC-B - FRCC 2, and LHC-C - FRCC 3.

Table 5. Land Health Condition Indicators and Fire Regime Condition Class Descriptors Relationship.

Land Health Condition	Definition	KEY ECOLOGICAL COMPONENTS	
		Land Health Indicators[1]	**Fire Regime Condition Class[2] Descriptions**
LHC-A	All key ecological components are present as identified in land health standards and defined by FRCC 1.	Appropriate amount and distribution of ground cover, including litter. Native plant communities are maintained or improved to ensure proper functioning of ecological processes. Diversity of native plant species. Minimal erosion. Proper functioning riparian areas. Noxious weeds absent or not increasing.	**(FRCC 1)** Area is within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances. Vegetation attributes (species composition, structure, and pattern) are intact and functioning within the natural range.
LHC-B	Some or all key ecological components are present as identified in land health standards and defined by FRCC 2.	Indicators identify a lack of or insufficiency of a portion of the ecological components/processes described for LHC-A. Appropriate amount and distribution of ground cover, including litter. Increase of less desirable plant species as a dominant feature. Lack of native plant species diversity. Key attributes of the riparian areas such as vegetation, bank stability, water temperature are declining. Establishment of invasive species.	**(FRCC 2)** Moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances. Fire regimes have been moderately altered from their natural (historical) range. Risk of losing some of the dominant native grass, forbs and shrubs is moderate Populations of non-native invasive species may have increased, increasing risk of expansion from future fire disturbance.
LHC-C	Key ecological components are absent as identified in land health standards and defined by FRCC 3.	Indicators identify an absence of key ecological components/processes shown in LHC-A. Appropriate amount and distribution of ground cover, including litter. Less desirable plant species are a dominant feature. Absence of native plant species diversity. Key attributes of the riparian areas such as vegetation, bank stability, water temperature are absent. Establishment or dominance of invasive species.	**(FRCC 3)** High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances. Fire regimes have been substantially altered from their natural (historical) range. Risk of losing some of the dominant native grass, forbs and shrubs is high. Vegetation attributes have been substantially altered from their natural range. Invasive species may be common and in some cases the dominant species on the landscape.

[1] Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management, August 1997.
[2] Hann, W.J., Bunnell, D.L. 2001. Fire and land management planning and implementation across multiple scales. Int. J. Wildland Fire. 10:389-403

Land Health Condition and Fire Regime Condition Class Relationship:

As described previously, **LHC** can be defined by ecological components necessary for healthy ecosystems. More specifically, land health indicators focus on the vegetative components of the ecosystem. For example, such indicators describe/quantify the amount and distribution of litter and ground cover; presence or absence of noxious weeds; and diversity of species as well as species composition and structure. These indicators are also used to describe the vegetation-fuels condition component in FRCC determinations (**Section II**). Thus the similarity of the land health indicators with the vegetation-fuels condition component FRCC determination provides a suitable cross walk from FRCC to LHC as shown in **Table 5**.

LHC is determined based upon the **Stand Condition Class (82)** (**Figure 2**) which represents the BpS class vegetation-fuel component FRCC rating. For example, the **LHC** for the Low-Elevation Shrub, Alternative C at 10 years (**Figure 3**) is determined using the data in columns **Current % (73)** and **Stand Condition Class (82)**. The percents of all BpS classes, column **(73)** with the same FRCC value (1, 2, or 3) in column **(82)** are summed together. In **Figure 3**, BpS classes A, B and C (**26%+40%+5%**) having an FRCC value of 1 is summed, equaling 71%. No BpS classes have an FRCC value of 2 and the Uncharacteristic class with an FRCC value of 3 is summed, equaling 28%.

Figure 3. LHC determination for Low-Elevation Shrub, Alternative C at 10 years using **Stand Condition Class** information from the Vegetation-Fuel section from the "Simple 7" worksheet[6].

Vegetation-Fuel *(62)*	Reference % *(72)*	Current % *(73)*	Similarity (lower of Ref or Cur) *(77)*	Difference *(79)* if (cur<ref) diff = ((cur-ref)/ref)*100 if (cur ≥ref) diff = ((cur-ref)/cur)*100	Relative Amount[1] *(80)*	Stand Condition Class[2] *(82)*
A – Early	20	26	20	–23	S	1
B – Mid Closed	50	40	40	–20	S	1
C – Mid Open	30	5	5	–83	T	1
D – Late Open						
E – Late Closed						
U – Uncharacteristic	0	28	0	100 %	abundant	3
Sum	100	100	65			
Departure = (100%-Sum Similarity) *(83)*						35
Vegetation-Fuel Condition Class (0-33 = 1; 34-66 = 2; 67-100 = 3) *(84)*						2

Table 6 identifies the **LHC** based upon the **Stand Condition Class** and **Current %** for the Low-Elevation Shrub vegetation type, Alternative C at 10 years. This resulting **Land Health Condition** by vegetation type forms the basis of the Vegetation (VE) analysis in Chapter 4 of the DEIS.

Table 6. LHC for the Low-Elevation Shrub vegetation type, Alternative C at 10 years.

Land Health Condition	Percent
-A	71.0
-B	0.0
-C	28.0

Total percent may not sum exactly to 100% due to rounding error.

[6] Interagency Fire Regime Condition Class Guidebook, Version 1.2, May 2005

SECTION IV – BIOPHYSICAL SETTING DESCRIPTIONS

This section contains the six complete **draft** BpS descriptions that best represent the 11 vegetation types described for the planning area. These BpS descriptions are: **Inter-Mountain Basin Big Sagebrush Steppe** (Low-Elevation Shrub, Perennial Grass, Seedings), **Inter-Mountain Basins Montane Sagebrush Steppe** (Mid-Elevation Shrub, Encroached Juniper), **Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland** (Mountain Shrub), **Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland** (Aspen/Aspen-Conifer Mix and Dry Conifer), **Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland** (Wet Cold Conifer), and **Great Basin Pinyon-Juniper Woodland** (Juniper-Natural Occurring).

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1125 **Inter-Mountain Basins Big Sagebrush Steppe**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/19/2005

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Modeler 2			**Reviewer**		
Modeler 3			**Reviewer**		
			FRCC		

Vegetation Type

Shrubland

Dominant Species

ARTR
AGSP
STTH2
POSA1

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Map Zones

16
12
17
18
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

This widespread matrix-forming ecological system occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming and is found at slightly higher elevations farther south.

Biophysical Site Description

Sagebrush steppe is found in continental, semi-arid climate with highly variable annual precipitation greater than 7" to 12" (~180 to 300 mm) (McArthur 2000) and in some locations up to 14" precipitation zone. Common on foothills, undulating terraces, slopes, and plateaus, but also in basins and valley bottoms. Soil depths range from shallow to moderately deep, well-drained with an effective rooting depth of less than 40 inches (~ 1 m). NRCS Range Sites: Loamy 8-10" and 10-12" precipitation zones, and shallow loam 10-14" precipitation zones.

Vegetation Description

This shrub-steppe is dominated by perennial grasses and forbs (>25% cover) with Artemisia tridentata ssp tridentata, Artemisia tridentata ssp wyomingensis, and/or Purshia tridentata dominating or codominating the open to moderately dense (10-40% cover) shrub layer. In southern Idaho and northern Utah, Artemisia tridentata ssp wyomingensis dominates large landscape. Atriplex confertifolia, Chrysothamnus viscidiflorus, Ericameria nauseosa, or Tetradymia spp may be common especially in disturbed stands. Associated graminoids include Achnatherum hymenoides, Elymus lanceolatus ssp. Lanceolatus, Festuca idahoensis, Festuca campestris, Koeleria macrantha, Poa secunda, and Pseudoroegneria spicata. Common

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forbs are Phlox hoodii, Arenaria spp., Crepis spp., Erigeron spp., Eriogonum spp., Lomatium spp., and Astragalus spp. Areas with deeper soils more commonly support Artemisia tridentata ssp tridentata but have largely been converted for other land uses.

The sagebrush steppe landscape is a mosaic of shrub-dominated and herbaceous-dominated phases (West 2000). Forbs have low diversity but are important for wildlife, including the Greater Sage Grouse. Species diversity is lower in Wyoming big sagebrush communities than in other big sagebrush types (FEIS). Wyoming big sagebrush communities are critical habitat for Greater Sage Grouse and other sagebrush obligate species.

Disturbance Description

Historically, fire was the principal disturbance within this vegetation type; other disturbances included insects (e.g., moths and grasshoppers that eat leaves, moth larval grubs that eat roots; return interval of 75 years), periods of drought and wet cycles and shifts in climate (return interval of 100 yrs). Intervals between natural wildfires varied between 25 years (northern Yellowstone National Park [Houston 1973], cited in West 2000) and 100+ years (West 2000). West (1983) and Miller and Eddelman (2000) cite mean FRI <100 years for replacement fire. FEIS cites fire return interval ranges between 10 to 70 years with mean of 40 years for Wyoming sagebrush steppe. Studies cited in FEIS may underestimate FRIs or not hold up to scrutiny (Welch and Criddle 2003). It was assumed that dominant fires were stand replacement (mean FRIs of 75-94 years) due to the continuity of fine fuels typical of steppe ecosystems, however it is not uncommon to observe >50% bare ground cover in modern range sites that experience little livestock grazing (Jon Bates, personal communication, 5/31/05). Mixed severity (25-75% of area inside burn perimeter topkilled) played a minor role during mid-development. Assuming a MFI of 75 years (from the total fire probability), the mean FRI of mixed severity fire was 20% of fires, thus a mean FRI of 375 years, during mid-development. Re-establishment following fire is from seed germination and establishment. Establishment is dependent upon soil seedbank and/or proximity of seed sources, fire size and continuity, and climatic conditions.

Adjacency or Identification Concerns

BPS 1125 represents the dominant sagebrush type in MZ 18, however this type may be confused with BPS 1080 (Inter-Mountain Basins Big Sagebrush Shrubland) on the transition of the Great Basin and Columbia Plateau.

The NatureServe description of BPS 1125 includes different species of sagebrush and steppe ecosystems that are structurally and ecologically different such as Artemisia tridentata ssp tridentata and Artemisia tridentata ssp wyomingensis. We highly recommend that, at least, Artemisia tridentata ssp tridentata, which is a taller shrub found in drainages and deeper soils, be separated from the other shrubs. Ultimately, the two sagebrush species should be modeled separately. Artemisia tripartita ssp tripartita is not part of this system in Nevada because it is generally associated with frigid soils (thus more typically mountain big sagebrush) under snow pockets. Bitterbrush is not found in a large area of northcentral Nevada on the more alkaline soils of Pleistocene Lake Lahontan.

Wyoming big sagebrush is known to hybridize with other subspecies of the big sagebrush complex; i.e., basin big sagebrush (A. tridentata ssp tridentata) and mountain big sagebrush (A. tridentata ssp vaseyana) (Freeman et al. 1991, McArthur et al. 1998). Across ecotones, populations of Wyoming big sagebrush probably intergrade with basin big sagebrush and mountain big sagebrush. Soils and elevation may help determine which species is present.

Invasion of cheatgrass has transformed this ecological system into large areas of uncharacteristic annual grasslands and shrublands with understories where anuual grasses replaced perennial grasses. Medusahead,

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another exotic annual grass, is also becoming an issue in finer textured soils.

Scale Description

Sources of Scale Data	☐ Literature	☑ Local Data	☐ Expert Estimate

Sagebrush steppe covers vast landscapes >10,000 acres with inclusions of low sagebrush and basin big sagebrush. Historic disturbance (fire) likely ranged from small (< 10 ac) to large (> 10,000 acres) depending on conditions, surface wind speed, time since last ignition, and fuel loading. An average patch size of 250 acres was assumed.

Issues/Problems

West (2000) cites wide range in FRI (25 to +100 years). West (1983) and Miller and Eddelman (2000) recommend a FRI of <100 yrs for replacement fire. FEIS gives 10 to 70 range (40 yr average) (but see Welch and Criddle 2003). Current scientific opinion (Mike Pellant, BLM Range Ecologist on the Great Basin Restoration Initiative) puts the natural fire return interval at about 100 years (confirmed by Stephen Bunting and Dave Pyke). Given uncertainties and opinions of reviewers, a MFI of 75 years was chosen. Without this shorter MFI and differences in fire behavior, there would be no difference between Wyoming sagebrush steppe from the Snake River Plain and Wyoming big sagebrush semi-desert from central Nevada, Utah, and eastern California. Because replacement fire is by far dominant over mixed severity fire, a FRG IV was selected to the recommendation of reviewers.

Comments

BPS 1125 was based on the model from MZ 12 and 17 (developed by Mike Zielinski, mike_zielinski@nv.blm.gov and Louis Provencher, lprovencher@tnc.org) and accepted with no changes by Eric Limbach. Reviewer Jon Bates made several corrections. 1) Bare ground cover can reach 50-60% in Wyoming sagebrush steppe in good condition. The assumption of replacement fire only is based on continuous fuels, therefore it is possible that mixed severity fire was more frequent than assumed by the model with bare ground reaching 50-60% in some areas. This observation was not incorporated into the model although it already includes mixed severity fire. 2) Medusahead was added to the list of exotic species changing steppe composition in the western part of the BPS. 3) The more significant corrections were about the cover classes. Line-intercept, point-intercept, and Daubenmire plots in Idaho, northern Nevada, and Oregon showed that Wyoming big sagebrush sites in good condition have an average cover of 12%, with 25% being infrequent and considered very high. The same sites sampled with wildlife sampling methods centered on Greater Sage-grouse nest locations showed a doubling of sagebrush cover due simply to the method. Therefore, the cover breaks for reduced for class B and C: 6-15% and 15-30% (25% would be preferable based on data). Previous cover was 5-25% and 20-35% for these classes.

BPS 1125 for MZs 12 and 17 was obtained by slightly modifiying the description of BPS 1125 for MZ 16 developed by Don Major (dmajor@tnc.org). BPS 1125 for MZ 16 is completely based on R2SBWYse developed by Eric Limbach (eric_limbach@blm.gov) for Wyoming big sagebrush steppe and reviewed by Krista Waid-Gollnick/Sarah Heidi (krista_waid@blm.gov, Stanley Kitchen (skitchen@fs.fed.edu), Michael Zielinski (mike_zielinski@nv.blm.gov), Jolie Pollet (jpollet@blm.gov), and Gary Back (gback@srk.com).

Vegetation Classes

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Class A **20 %**

Early1 PostRep

Description

Perennial grasses and/or forbs dominate where woody shrub canopy has been top killed / removed by wildfire. Shrub cover <6%. (~ 0 to 19 years). Replacement fire every 120 years on average. Succession to class B after 20 years, although in reality this age will vary greatly.

Dominant Species* and Canopy Position

AGSP	Upper
STTH2	Upper
POSA1	Upper
ARTR	Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	5 %
Height	Shrub Dwarf <0.5m	Shrub Short 0.5-0.9m
Tree Size Class	None	

- [x] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Vegetation is primarily herbaceous (>25 cover) with a few scattered shrubs accounting for < 5% cover.

Class B **50 %**

Mid1 Open

Description

Shrubs dominate (5-15% cover) with diverse perennial grass and forb understory (20 to 60 years). MFI is 75 years with 80% replacement fire (mean FRI of 94 years) and 20% mixed severity fire (mean FRI of 375 years). Mixed severity fire, insect/disease (return interval of 75 years), and weather related stress (return interval of 100 yrs) maintains vegetation in class B. Succession to class C after 40 years.

Dominant Species* and Canopy Position

AGSP	Lower
STTH2	Lower
ARTR	Upper
POSA1	Lower

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	6 %	15 %
Height	Shrub Dwarf <0.5m	Shrub Medium 1.0-2.9m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C **30 %**

Late1 Closed

Description

Mature shrub canopy >15% cover with proportional reduction in understory productivity as canopy cover increases. The mean FRI for replacement fire is 75 years. Insect/diseases (return interval of 75 years), and weather related stress (return interval of 100 yrs) thin the shrub canopy, causing a transition to class B. Succession from class C to C.

Dominant Species* and Canopy Position

ARTR	Upper
AGSP	Lower
STTH2	Lower
POSA1	Lower

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	16 %	30 %
Height	Shrub Dwarf <0.5m	Shrub Medium 1.0-2.9m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class D 0 %

Late1 Open

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height		
Tree Size Class	None	

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Fuel Model

Class E 0 %

Late1 Open

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	%
Height		
Tree Size Class	None	

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Fuel Model

Disturbances

Fire Regime Group:** 4

Historical Fire Size (acres)

Avg 250
Min 10
Max 10000

Sources of Fire Regime Data

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	92	30	120	0.01087	89
Mixed	714	120	500	0.00140	11
Surface					
All Fires	81			0.01228	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- ☑ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

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LANDFIRE Biophysical Setting Model

***Biophysical Setting:* 1126** **Inter-Mountain Basins Montane Sagebrush Steppe**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/31/2005

Modeler 1	John Bates	jon.bates@oregonstate.edu	**Reviewer**	
Modeler 2			**Reviewer**	
Modeler 3			**Reviewer**	
			FRCC	

Vegetation Type

Shrubland

Dominant Species

ARTR
PUTR2
SYOR
ARAR

General Model Sources

☑ Literature
☐ Local Data
☑ Expert Estimate

Map Zones

12
17
16
18
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

Montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies, and within the mountains of Nevada, western Utah, southeast Wyoming, and southern Idaho.

Biophysical Site Description

This ecological system occurs in many of the western United States, usually at middle elevations (1000-2500 m). Within the Great Basin mapping zone, elevation ranges from 1370 m in Idaho to 3200 m in the White Mountains of California (Winward and Tisdale 1977, Blaisdell et al. 1982, Cronquist et al. 1994, Miller and Eddleman 2000). The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25 to 90 cm/year (Mueggler and Stewart 1980, Tart 1996). Much of this precipitation falls as snow. Temperatures are continental with large annual and diurnal variation. In general this system shows an affinity for mild topography, fine soils, and some source of subsurface moisture. Soils have well developed dark organic surface horizons (Hironaka et al. 1983, Tart 1996) and generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; soils often have a substantial volume of coarse fragments, and are derived from a variety of parent materials. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. However, at the high ends of its precipitation and elevation ranges mountain big sagebrush occurs

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on shallow and/or rocky soils. All aspects are represented, but the higher elevation occurrences may be restricted to south- or west-facing slopes.

At lower elevations, mountain big sagebrush occurs on upper fan piedmonts, where it typically intermixes with Wyoming big sagebrush on north facing slopes. On mountain sideslopes at this elevation, it occurs on north-facing slopes and where pinyon and juniper is present, it is usually on south-facing slopes with pinyon and juniper generally increasing on north-facing slopes within the sagebrush community. At mid-level elevations, mountain sagebrush begins to move into more southerly slopes intermingling with black sagebrush and low sagebrush and with mountain mahogany occurring on north-facing slopes. With continued elevation, curlleaf mountain mahogany generally crowds it out. Mountain big sagebrush then occupies drier sites at higher elevations.

Vegetation Description

Vegetation types within this ecological system are usually less than 1.5 m tall and dominated by Artemisia tridentata ssp vaseyana, Artemisia cana ssp viscidula, or Artemisia tridentata ssp spiciformis. A variety of other shrubs can be found in some occurrences, but these are seldom dominant. They include Artemisia rigida, Artemisia arbuscula, Ericameria nauseosa, Chrysothamnus viscidiflorus, Ephedra viscidiflorus, Symphoricarpos oreophilus, Purshia tridentata, Peraphyllum ramosissimum, Ribes cereum, and Amelanchier alnifolia. The canopy cover is usually between 20-80%. The herbaceous layer is usually well represented, but bare ground may be common in particularly arid or disturbed occurrences. Graminoids that can be abundant include Festuca idahoensis, Festuca thurberi, Festuca ovina, Elymus elymoides, Deschampsia caespitosa, Danthonia intermedia, Danthonia parryi, Stipa spp., Pascopyrum smithii, Bromus carinatus, Elymus trachycaulus, Koeleria macrantha, Pseudoroegneria spicata, Bromus anomalus, Achnatherum therburianum, Poa fendleriana, or Poa secunda. Forbs are often numerous and an important indicator of health. Forb species may include Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus, and Eriogonum, Balsamorhiza sagittata, Achillea millefolium, Antennaria rosea, and Eriogonum umbellatum, Fragaria virginiana, Artemisia ludoviciana, Hymenoxys hoopesii (= Helenium hoopesii), Hydrophyllum capitatum, etc. Mueggler and Stewart (1980), Hironaka et al. (1983), and Tart (1996) described several of these types. This ecological system is critical summer habitat for Greater Sage Grouse. Moreover, resprouting bitterbrush in mountain big sagebrush types is potentially important to wildlife during early stand development.

Disturbance Description

Mean fire return intervals in and recovery times of mountain big sagebrush are subjects of lively debate in recent years (Welch and Criddle 2003). Mountain big sagebrush communities were historically subject to stand replacing fires with a mean return interval ranging from 40+ years at the Wyoming big sagebrush ecotone, and up to 80 years in areas with a higher proportion of low sagebrush in the landscape (Crawford et al. 2004, Johnson 2000, Miller et al. 1994, Burkhardt and Tisdale 1969 and 1976, Houston 1973, Miller and Rose 1995, Miller et al. 2000). Under pre-settlement conditions mosaic burns generally exceeded 75% topkill due to the relatively continuous herbaceous layer. Therefore, replacement fire with a mean FRI of 40-80 years was adopted here. Brown (1982) reported that fire ignition and spread in big sagebrush is largely (90%) a function of herbaceous cover and wind speed where ground cover exceeds 50%. These communities were also subject to periodic mortality due to insects, disease, rodent outbreaks, drought, and winterkill (Anderson and Inouye 2001, Winward 2004). Periodic mortality events may result in either stand-replacement or patchy die-off depending on the spatial extent and distribution of these generally rare (50 to 100 years) events.

Recovery rates for shrub canopy cover vary widely in this type, depending post fire weather conditions, sagebrush seed-bank survival, abundance of resprouting shrubs (e.g., snowberry, bitterbrush), and size and severity of the burn. Mountain big sagebrush typically reaches 5% canopy cover in 8 to 14 years. This may

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take as little as 4 years under favorable conditions and longer than 25 years in unfavorable situations (Pedersen et al. 2003, Miller unpublished data). Mountain big sagebrush typically reaches 25% canopy cover in about 25 years, but this may take as few as nine years or longer than 40 years (Winward 1991, Pedersen et al. 2003, Miller unpublished data). Mountain snowberry and resprouting forms of bitterbrush may return to pre-burn cover values in a few years. Bitterbrush plants less than fifty years old are more likely to resprout than older plants (Simon 1990).

Adjacency or Identification Concerns

BPS 1126 includes a high elevation low sagebrush component, which can be important. BPS 1124 (Columbia Plateau Low Sagebrush Steppe) represent this higher elevation low sagebrush type. Therefore, 1126 and 1124 may often be intermingled and difficult to determine whether or not low sagebrush is a component of BPS 1126 or 1124.

The NatureServe description does not distinguish between mountain big sagebrush that can be invaded by conifers at mid to high elevations (i.e., within the tolerance of pinyon and juniper) and mountain sagebrush steppe that is too high elevation for pinyon to encroach. The ability for pinyon to invade has a large effect on predicted HRV and management.

This type may be adjacent to forests dominated by aspen, Douglas-fir, limber pine, and bristlecone pine. It also occurs adjacent to pinyon-juniper woodlands. The ecological system, where adjacent to conifers, is readily invaded by conifers (Douglas-fir, sub-alpine fir, whitebark pine, limber pine, pinyon-pine, juniper spp.) in the absence of historic fire regimes (Miller and Rose 1999). This type probably served as an ignition source for adjacent aspen stands. Mountain big sagebrush is commonly found adjacent to or intermingled with low sagebrush and mountain shrublands.

Uncharacteristic conditions in this type include herbaceous canopy cover less than 40% and dominance of the herbaceous layer by mulesears (Wyethia amplexcaulis) on clayey soils.

At lower elevational limits on southern exposures there is a high potential for cheatgrass invasion/occupancy where the native herbaceous layer is depleted. This post-settlement, uncharacteristic condition is not considered here.

Scale Description

Sources of Scale Data ☑ Literature ☐ Local Data ☑ Expert Estimate

This type occupies areas ranging in size from 10's to 10,000's of acres. Disturbance patch size can also range from from 10's to 1,000's of acres. The distribution of past burns was assumed to consist of many small patches in the landscape.

Issues/Problems

If conifers are not adjacent to this system, such as in the Tuscarora range, Santa Rose range, and similar regions, use a three-box model with the following percentages per box: 20% A, 45% B, 35% C.

Comments

Jon Bates (jon.bates@oregonstate.edu) made minor changes in accepting BPS 1126 for MZ 18 from MZ 12 and 17: 1) Editorial changes were made to the biophysical descrition. 2) Hydrophyllum was added to the species list for vegetation description. 3) Under disturbance, wind speed was added as an important factor increasing fire spread. 4) Max fire size was increased to 30,000 acres from 10,000 acres based on recent fires in mountain ranges in good condition in southeastern Oregon. 5) Average fire size was increased to 500 from 100 acres.

BPS 1126 for MZ 12 and 17 was developed by Gary Medlyn (Gary_medlyn@nv.blm.gov) and Crystal

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Kolden (ckolden@gmail.com) based on BPS 1126big from LF Maping Zone 16. BPS 1126big is essentially PNVG R2SBMTwc (mountain big sagebrush with potential for conifer invasion) developed by Don Major (dmajor@tnc.org), Alan R. Sands (asands@tnc.org), David Tart (dtart@fs.fed.us), and Steven Bunting (sbunting@uidaho.edu). R2SBMTwc was itself based on R2SBMT developed by David Tart. R2SBMtwc was revised by Louis Provencher (lprovencher@tnc.org) following critical reviews by Stanley Kitchen (skitchen@fs.fed.us), Michele Slaton (mslaton@fs.fed.us), Peter Weisberg (pweisberg@cabnr.unr.edu), Mike Zielinski (mike_zielinski@nv.blm.gov), and Gary Back (gback@srk.com).

Reviewers and modelers of R2SBMT and R2SBMTwc had very differents opinions on the range of mean FRIs and mountain big sagebrush recovery times (see Welch and Criddle 2003). It is increasingly agreed upon that a MFI of 20 years, which used to be the accepted norm, is simply too frequent to sustain populations of Greater Sage-grouse and mountain big sagebrush ecosystems whose recovery time varies from 10-70 years. Reviewers consistently suggested longer FRIs and recovery times. The revised model is a compromise with longer recovery times and FRIs. Modeler and reviewers also disagreed on the choice of FRG: II (modeler) vs. IV (reviewers). For Map zones 12 and 17, modelers place this system in Fire Regime Group IV.

The first three development classes chosen for this PNVG correspond to the early, mid-, and late seral stages familiar to range ecologists. The two classes with conifer invasion (classes D and E) approximately correspond to Miller and Tausch's (2001) phases 2 and 3 of pinyon and juniper invasion into shrublands.

Vegetation Classes

Class A 20%

Early1 PostRep

Description

Herbaceous vegetation is the dominant lifeform. Herbaceous cover is variable but typically >50% (50-80%). Shrub cover is 0 to 5%. Replacement fire occurs every 80 years on average. Succession to class B after 12 years.

Dominant Species* and Canopy Position

PSSP6	Upper
FEID	Upper
SYOR2	Lower
ARTRV	Lower

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	5 %
Height	Herb Short <0.5m	Herb Medium 0.5-0.9m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Dominant vegetation is herbaceous (50-80% cover) with scattered shrubs.

Class B 50%

Mid1 Open

Description

Shrub cover 6-25%. Mountain big sagebrush cover up to 20%. Herbaceous cover is typically >50%. Initiation of conifer seedling establishment. Replacemenfire mean FRI is 40 years. Succession to class C after 38 years.

Dominant Species* and Canopy Position

ARTRV	Upper
PUTR2	Upper
CONIF	Lower
SYMPH	Lower

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Structure Data (for upper layer lifeform)

	Min	Max
Cover	6 %	25 %
Height	Shrub Short 0.5-0.9m	Shrub Tall >3.0 m
Tree Size Class	Seedling <4.5ft	

☑ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Herbaceous cover is the dominant lifeform with canopy >50%. Shrub cover is 6-25% and the upper lifeform.

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Fuel Model 1

Class C **15 %**

Mid1 Open

Description

Shrubs are the dominant lifeform. Shrub cover 26-45+%. Herbaceous cover is typically <50%. Conifer (juniper, pinyon-juniper, ponderosa pine, or white fir) cover <10%. Insects and disease every 75 yrs on average will thin the stand and cause a transition to class B. Replacement fire occurs every 50 years on average. In the absence of fire for 80 years, vegetation will transition to class D. Otherwise, succession keeps vegetation in class C.

Dominant Species* and Canopy Position

ARTRV Upper
PUTR2 Upper
SYMPH Low-Mid
CONIF Mid-Upper

Upper Layer Lifeform

☐ Herbaceous
☑ Shrub
☐ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	26 %	45 %
Height		
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class D **10 %**

Late1 Open

Description

Conifers are the upper lifeform (juniper, pinyon-juniper, ponderosa pine, limber pine, or white fir). Conifer cover is 11- 25%. Shrub cover generally decreasing but remains between 26-40%. Herbaceous cover <30%. The mean FRI of replacement fire is 50 years. Insects/diseases thin the sagebrush, but not the conifers, every 75 years on average, without causing a transition to other classes. Succession is from C to D after 50 years.

Dominant Species* and Canopy Position

CONIF Upper
ARTRV Mid-Upper
PUTR2 Mid-Upper
SYMPH Low-Mid

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	25 %
Height	Tree Regen <5m	Tree Regen <5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☑ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Shrub cover generally decreasing but remains between 26-40% Conifers cover 11-25%.

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class E 5 %

Late1 Closed

Description

Conifers are the dominant lifeform (juniper, pinyon-juniper, ponderosa pine, limber pine, or white fir). Conifer cover 26-80% (pinyon-juniper 36-80%(Miller and Tausch 2000), juniper 26-40% (Miller and Rose 1999), white fir 26-80%). Shrub cover 0-20%. Herbaceous cover <20%. The mean FRI for replacement fire is longer than in previous states (75 yrs). Conifers are susceptible to insects/diseases that cause diebacks (transition to class D) every 75 years on average. Succession from class E to E.

Dominant Species* and Canopy Position

CONIF	Upper
ARTRV	Mid-Upper
PUTR2	Mid-Upper
SYMPH	Mid-Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 6

Structure Data (for upper layer lifeform)

	Min	Max
Cover	26 %	80 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Pole 5-9" DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Disturbances

Fire Regime Group:** 4

Historical Fire Size (acres)

Avg 500
Min 10
Max 30000

Sources of Fire Regime Data

- [x] Literature
- [ ] Local Data
- [x] Expert Estimate

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	49	15	100	0.02041	100
Mixed					
Surface					
All Fires	49			0.02043	

Fire Intervals (FI):
Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

LANDFIRE Biophysical Setting Model

***Biophysical Setting:* 1106** — **Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/10/2005

Modeler 1	Steve Rust	srust@idfg.idaho.gov	**Reviewer**
Modeler 2	Don Major	dmajor@tnc.org	**Reviewer**
Modeler 3			**Reviewer**
			FRCC

Vegetation Type

Upland Shrubland

Map Zones

18
0
0
0
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Dominant Species

PRVI
PREM
ACGL
PHMA
SYOR
FEID
CARU
CAGE

General Model Sources

☐ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

This BPS is found in the lower montane and foothill regions of the Columbia River Basin, Northern Great Basin and Northern Rocky Mountains. This system occupies steep canyon and mountain slopes.

Biophysical Site Description

In MZ18 this system is found at elevations ranging from 1500 to 2400 m (5000 to 8000 ft). This system likely occurs in all canyon/foothill locations within MZ18. Soils range from well developed loess to colluvial residuum to talus garlands. This system occurs on all aspects, with larger stands represented on northern and eastern aspects. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand, and secondarily is limited by the length of the growing season or low temperatures.

Vegetation Description

These are upland shrublands dominated by deciduous shrubs. Common shrubs include Acer glabrum, Amelanchier alnifolia, Prunus virginiana, Prunus emarginatum, Rosa woodsii, Spiraea betulifolium, Physocarpus malvaceus, and Symphoricarpos oreophilus. The herbaceous layers may be lush and diverse. Common graminoids may include Bromus carinatus, Calamagrostis rubescens, Carex siccata (= Carex foenea), Carex geyeri, Carex rossii, Elymus glaucus, Elymus trachycaulus, Festuca idahoensis. Associated forbs may include Achillea millefolium, Eucephalus engelmannii (= Aster engelmannii), Delphinium spp.,

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Geranium viscosissimum, and Lupinus argenteus.

Disturbance Description

Disturbance types include fire and soil slips. Fire types include replacement, mixed, and surface fire.

Adjacency or Identification Concerns

In MZ18, Intermountain Basins Montane Saggebrush Steppe is adjacent on downslope, hotter drier slopes. Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest is adjacent upslope or on cooler wetter sites.

Scale Description

Sources of Scale Data ☐ Literature ☐ Local Data ☑ Expert Estimate

Large patch size (100-1000's of acres). Patch configuration dependent on physiography of ridge and slope terrain.

Issues/Problems

May be difficult to differentiate the early seral Class (A) of the Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (BPS 1045).

Comments

BPS 1106 was adapted/modified from BPS1011 MZ17&12. It is not Aspen related, but topographic/edaphic conditions represent similar conditions to 1106.
Reviewers:
Kathy Geyer-Hayes
Al Winword (R4 Ecologist)
Dave Tart

Vegetation Classes

Class A 5%

Early1 PostRep

Description

Post-replacement fire this BPS is dominated by grass and forbs. Replacement fire (mean FRI = 150) infrequent and typically related to amount/volume of standing dead/down necromass from previous replacement fire. Succession to class B after 2 yrs.

Dominant Species* and Canopy Position

FEID	Upper
CARU	Upper
CAGE	Upper
SYOR2	Low-Mid

Upper Layer Lifeform

☑ Herbaceous
☐ Shrub
☐ Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	95 %
Height	Herb Short <0.5m	Herb Medium 0.5-0.9m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class B **95 %**

Mid1 Closed

Description

Shrub canopy initially dominated by lower and faster growing medium-tall rhizomatous shrubs (e.g., Symphoricarpos oreophilus and Physocarpus malvaceus). With further development in this class, tall shrubs (e.g., Acer glabrum, Amelanchier alnifolia, Prunus virginiana, Prunus emarginatum) co-dominate. Canopy cover >50%. Replacement fire occurs every 100 yrs on average. Mixed severity fire (average FRI of 75 yrs) maintains this class.

Dominant Species* and Canopy Position

SYOR2 Upper
PHMA Upper
PRVI Upper
AMAL Upper

Upper Layer Lifeform

☐ Herbaceous
☑ Shrub
☐ Tree

Fuel Model

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	95 %
Height	Shrub Short 0.5-0.9m	Shrub Medium 1.0-2.9m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C **0 %**

Late1 Closed

Description

Dominant Species* and Canopy Position

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class D **0 %**

Late1 Open

Description

Dominant Species* and Canopy Position

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height		
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class E **0 %**

Late1 Closed

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	0 %
Height		
Tree Size Class	None	

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Fuel Model

Disturbances

Fire Regime Group:** 3

Historical Fire Size (acres)

Avg 40
Min 5
Max 100

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	80	50	300	0.0125	56
Mixed	100	20	60	0.01	44
Surface					
All Fires	44			0.02251	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

References

Help!

?? SRM Pub on Range Types

Johnson and Simon. 1987.

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

LANDFIRE Biophysical Setting Model

Biophysical Setting: **1061** **Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/19/2005

Modeler 1	Krista Waid-Gollnick	krista_waid@blm.gov	**Reviewer**	Jon Bates	jon.bates@oregonstate.edu
Modeler 2	Sarah Heide	sarah_heide@blm.gov	**Reviewer**		
Modeler 3			**Reviewer FRCC**		

Vegetation Type

Forested

Dominant Species

POTR
ABCO
ABLA
PSME
PIFL2

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Map Zones

12
17
18
0
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

This ecological system occurs on montane slopes and plateaus in Utah, western Colorado, northern Arizona, eastern Nevada, southern Idaho and western Wyoming. Elevations range from 1700 to 2800 m (5600-9200 feet.).

Biophysical Site Description

Occurrences are typically on gentle to steep slopes on any aspect but are often found on clay-rich soils in intermontane valleys. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials but most typically occur on sedimentary rocks. In the northern portion of MZ18, this system occurs throughout the area on north, northeast, and southwest aspects with shallow soils.

Vegetation Description

The tree canopy is composed of a mix of deciduous and coniferous species, codominated by Populus tremuloides and conifers, including Abies concolor, Abies lasiocarpa, Picea engelmannii, Pinus flexilis, Juniperus occidentalis (southwestern Idaho), Pseudotsuga menzesii, and Pinus ponderosa. As the occurrences age, Populus tremuloides is slowly reduced until the conifer species become dominant. Common shrubs include Amelanchier alnifolia, Prunus virginiana, Symphoricarpos oreophilus, Juniperus communis, Paxistima myrsinites, Rosa woodsii, Spiraea betulifolia, symphoricarpos albus, or Mahonia

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

repens. Herbaceous species include Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Poa spp., Achnatherum nelsonii, Melica bulbosa, and Achnatherum, Hesperostipa, Nassella, and/or Piptochaetium spp. (= Stipa spp.), Achillea millefolium, Arnica cordifolia, Asteraceae spp., Erigeron spp., Galium boreale, Geranium viscosissimum, Lathyrus spp., Lupinus argenteus, Mertensia arizonica, Mertensia lanceolata, Maianthemum stellatum, Osmorhiza berteroi (= Osmorhiza chilensis), and Thalictrum fendleri.

Disturbance Description

This is a strongly fire adapted community, more so than BPS 1011 (Rocky Mountains Aspen Woodland and Forest), with FRIs varying for mixed severity fire with the encroachment of conifers. It is important to understand that aspen is considered a fire-proof vegetation type that does not burn during the normal lightining season, yet evidence of fire scars and historical studies show that native burning was the only source of fire that occurred mostly during the spring and fall. BPS 1061 has elements of Fire Regime Groups II, III, and IV. Mean FRI for replacement fire is every 60 years on average in most development classes. Replacement fire is absent during early development (as for stable aspen, BPS 1011) and has a mean FRI of 100 years between 80 and 100 years in the open condition. The FRI of mixed severity fire increases from 40 years in stands <100 years to 60 years in stand >100 years with conifer encroachment.

Under pre-settlement conditions, disease and insect mortality did not appear to have major effects, however older aspen stands would be susceptible to outbreaks every 200 years on average. We assumed that 20% of outbreaks resulted in heavy insect/disease stand-replacing events (average return interval 1000 yrs), whereas 80% of outbreaks would thin older trees >40 yrs (average return interval 250 yrs). Older conifers (>100 years) would experience insect/disease outbreaks every 300 years on average.

Some sites are prone to snowslides, mudslides and rotational slumping. Flooding may also operate in these systems.

Adjacency or Identification Concerns

If conifers are not present in the landscape, or represent <25% relative cover, the stable aspen model (BPS 1011; Rocky Mountain Aspen Woodland and Forest) should be considered, especially in the southwestern portion of MZ 18. If Aspen is absent, refer to 1051 or 1052.

This type is more highly threatened by conifer replacement than stable aspen. Most occurrences at present represent a late-seral stage of aspen changing to a pure conifer occurrence. Nearly a hundred years of fire suppression and livestock grazing have converted much of the pure aspen occurrences to the present-day aspen-conifer forest and woodland ecological system.

Scale Description

Sources of Scale Data ☑ Literature ☑ Local Data ☑ Expert Estimate

This type occurs in a landscape mosaic from moderate (10 acres) to large sized patches (1000 acres).

Issues/Problems

In the western Rocky Mountains, Baker (1925) studied closely the pre-settlement period for aspen and noted fire scars on older trees. Bartos and Campbell (1998) support these findings. We interpreted ground fires that scarred trees, probably started by Native Americans, as mixed severity fire that also promoted abundant suckering. In the presence of conifer fuels, these would be killed and aspen suckering promoted.

In previous models from the Rapid Assessment (e.g., R2ASMClw), experts and modelers expressed different views about the frequency of all fires, citing FRIs longer than those noted by Baker (1925). The FRIs used here were a compromise between longer FRIs proposed by reviewers and the maximum FRI of Baker (1925).

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Comments

BPS 1061 for MZ 12 and 17 was accepted with model and database revisions for MZ 18 by K. Waid and S. Heide. The most important revisions were to increased the mean FRIs for mixed severity and replacement fires, respectively to 40 years (from 20 years) and 100 years (from 60 years). These changes had a large effect of the HRV, resulting in 10% more conifer dominance. Comments by Jon Bates (reviewer) were minor: 1) Species were added to reflect the western range of this system. 2) The description of aspen height was increased in the description of class A because aspen can easily reach 12' tall after 3-4 years in the Owyhee mountains of southern Idaho. Therefore, max height was changed from 6' to 12' (this applies to class B also). 3) Average fire size was increased to 50 from 10 acres. 4) Finally, the reviewer commented on the age of conifer invasion that would prevent the recovery of aspen - assumed rare in the pre-settlement condition.

BPS 1061 for MZ 12 and 17 was developed by Julia Richardson (jhrichardson@fs.fed.us) and Louis Provencher (lprovencher@tnc.org) and is a compromise among R2ASMClw (aspen-mixed conifers low-mid elevation) from the Rapid Assessment, BPS 1011 for MZ 12 and 17, and BPS 1061 for MZ 16. BPS 1061 for MZ 12 and 17 is approximately split into the age classes of R2ASMClw. The FRIs of replacement fire from BPS 1011 were used (60 years). For mixed severity fire, the mean FRIs followed closely BPS 1061 for MZ 16, except that 20 years was used instead of 13 years during periods of conifer encroachment. R2ASMClw was developed by Linda Chappell (lchappell@fs.fed.us), Bob Campbell (rbcampbell@fs.fed.us), and Cheri Howell (chowell02@fs.fed.us), and reviewed by Krista Gollnick-Wade/Sarah Heidi (Krista_Waid@blm.gov), Charles E. Kay (ckay@hass.usu.edu), and Wayne D. Shepperd (wshepperd@fs.fed.us). BPS 1061 for MZ 16 was developed by Linda Chappell, Robert Campbell, Stanley Kitchen (skitchen@fs.fed.us), Beth Corbin (ecorbin@fs.fed.us), and Charles Kay.

As this type has a fairly short fire return interval compared to other aspen types, it should be noted that aspen can act as a tall shrub. Bradley, et al. (1992) state that Loope & Gruell estimated a fire frequency of 25 to 100 years for a Douglas-fir forest with seral aspen in Grand Teton National Park (p39). They later state that fire frequencies of 100 to 300 years appear to be appropriate for maintaining most seral aspen stands. In the Fontenelle Creek, Wyoming draininage, the mean fire-free interval was estimated to be 40 years. Fires in this area burned in a mosaic pattern of severities, from stand-replacement to low fires that scarred but did not kill the relatively thin-barked lodgepole pine on the site (p46).

Aspen stands tend to remain dense througout most of their life-span, hence the open stand description was not used unless it described conifer coverage during initial encroachment. While not dependent upon disturbance to regenerate, aspen was adapted to a diverse array of disturbances.

Under current conditions, herbivory can significantly effect stand succession. Kay (1997, 2001a, b, c) found the impacts of burning on aspen stands were overshadowed by the impacts of herbivory. In the reference state the density of ungulates was low due to efficient Native American hunting, so the impacts of ungulates were low. Herbivory was therefore not included in the model.

Vegetation Classes

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class A **10 %**

Early1 PostRep

Description

Grass/forb and aspen suckers <12' tall. Generally, this is expected to occur 1-3 years post-disturbance. Fire is absent. Succession to class B after 10 years.

Dominant Species* and Canopy Position

POTR5 Upper
SYOR2 Middle
RIBES Middle

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 5

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	99 %
Height	Tree Regen <5m	Tree Regen <5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class B **35 %**

Mid1 Closed

Description

Aspen saplings over 12' tall dominate. Canopy cover is highly variable. Replacement fire occurs every 60 yrs on average. Mixed severity fire (average FRI of 40 yrs) does not change the successional age of these stands, although this fire consumes litter and woody debris and may stimulate suckering. Succession to class C after 30 years.

Dominant Species* and Canopy Position

POTR Upper
SYOR2 Low-Mid
RIBES Low-Mid

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	99 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Pole 5-9" DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C **25 %**

Mid2 Closed

Description

Aspen trees 5 - 16" DBH. Canopy cover is highly variable. Conifer seedlings and saplings may be present. Replacement fire occurs every 60 years on average. Mixed severity fire (mean FRI of 40 yrs), while thining some trees, promotes suckering and maintains vegetation in this class. Insect/diseases outbreaks occur every 200 years on average with 80% of times causing stand thinning (transition to class B) and 20% of times causing stand replacement (transition to class A). Conifer encroachment causes a

Dominant Species* and Canopy Position

POTR Upper
SYOR2 Middle
RIBES Middle

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	99 %
Height	Tree Regen <5m	Tree Medium 10-24m
Tree Size Class	Pole 5-9" DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

---

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

succession to class D after 40 years.

Class D **20 %**

Late1 Open

Description

Aspen and conifer co-dominate. 60% aspen overstory. Conifers which escape fire, or are the more fire resistant species, will likely cause the progressive suppression of aspen. Mixed severity fire keeps this stand open, kills young conifers, and maintains aspen: every 40 yrs. Replacement fire is every 100 years on average. In the absence of any fire for 100 years, the stand will become closed with conifers (transition to class E).

Dominant Species* and Canopy Position

POTR	Upper
ABCO	Mid-Upper
ABLA	Mid-Upper
PSME	Mid-Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	50 %	80 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E **10 %**

Late1 Closed

Description

Conifers dominate at 100+ years. Aspen over 16" DBH, uneven sizes of mixed conifer, and main overstory is conifers. Greater than 50% conifer in the overstory. FRI for replacement fire is every 60 years. Mixed severity fire (mean FRI of 20 years) causes a transition to class D. Insect/disease outbreaks will thin older conifers (transition to class D) every 300 years on average.

Dominant Species* and Canopy Position

PSME	Upper
ABLA	Upper
POTR	Mid-Upper
PIFL2	Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 10

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	50 %	80 %
Height	Tree Short 5-9m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Disturbances

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Fire Regime Group:** 2

Historical Fire Size (acres)

Avg 50
Min 1
Max 100

Sources of Fire Regime Data

- [x] Literature
- [x] Local Data
- [x] Expert Estimate

Fire Intervals	*Avg FI*	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	100	50	300	0.01	29
Mixed	40	10	50	0.025	71
Surface					
All Fires	29			0.03501	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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LANDFIRE Biophysical Setting Model

Biophysical Setting: **1055** **Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/9/2004

Modeler 1	Julia H. Richardson	jhrichardson@fs.fed.us	**Reviewer**
Modeler 2	Cheri Howell	chowell02@fs.fed.us	**Reviewer**
Modeler 3	Steve Rust	srust@idfg.idaho.gov	**Reviewer**
			FRCC

Vegetation Type

Forested

Dominant Species

ABLA
PIAL
PIFL2

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Map Zones

16
12
17
18
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

Subalpine forests the Great Basin (eastern California, Nevada, and Utah).

In MZ18 this type may occur in the few northernmost Basin and Range systems within this mapzone (e.g., Albion Mtns, Cassia Mtns, Jarbidge Mtns)

Biophysical Site Description

Dry-mesic fir forest are the matrix forests of the subalpine zone, with elevations ranging from 2100 to 3355 m (7,000-11,000 feet). Sites within this system are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches.

In MZ18 add snow persist as patches, summers are cool and dry.

Vegetation Description

Subalpine fir forests comprise a substantial part of this subalpine forest, acompanied by Pinus albicualis and/or Pinus flexilis. The amount of Pinus in stands (and species occurance) depends on moisture limitations, some stands can be quite droughty. Populus tremuloides stands are common on early seral

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moist sites. Abies lasiocarpus increases in importance or replaces Picea engelmannii with increasing distance from the region of Montana and Idaho where maritime air masses influence the climate. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. Abies lasiocarpus can rapidly recolonize and dominate burned sites, or can succeed other species such as Pinus albicaulis, flexilis or Populus tremuloides. Old growth characteristics in Abies Lasiocarpa forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags.

In MZ18 Abies lasiocarpa and Pinus contorta co-dominate. Pinus albicualis and/or Pinus flexilis may be occasionally present typically in drier sites. Populus tremuloides stands are common on early seral moist sites. Picea engelmannii may be present with variying abundance potentially increasing on cooler/moist sites (i.e., riparian). Xeric understory
species may include Juniperus communis, Linnaea borealis, Mahonia repens, Vaccinium scoparium, Calamagrostis rubescens, or Carex geyeri.

Disturbance Description

Fire Regime V. Primarily long-interval (e.g., 150-200 yr) stand replacement fires, with mixed severity fire (e.g., 1000 yr) occurring in open conditions. Disturbances also include insect/disease (every 100-150 years) and windthrow events than thin younger closed stands.

Moderately frequent high-severity fires result in a Lodgepole Pine dominated syste. Mixed-severity fires generally result in a mosaic consisting of subalpine fir patches (chance escapes) in a matrix of mixed species regeneration.

Adjacency or Identification Concerns

It is important not to confuse adjacent mountain sagebrush systems (BPS 1126 Inter-Mountain Basins Montane Sagebrush Steppe) with early development stages of this system. BPS 1056 may be imbedded in BPS 1055.

If aspen is present in large patches or if conifers are not coming in after ~30 years, the BPS is probably misclassified and one of the Aspen types should be examined (BpS 1011 or 1061).

In MZ18 this BPS adjacent to and upslope of BPS 1045 and adjacent and downslope of BPS 1046. Aspen patch size issue relevant (see above), further BPS 1011 likely present as patches within this BPS

Scale Description

Sources of Scale Data ☑ Literature ☐ Local Data ☑ Expert Estimate

Patch sizes vary but are mostly in the tens and hundreds of acres. There may be frequent small disturbances in the 10s of acres or less.

Issues/Problems

Comments

In MZ18 BPS 1055 was modified from zones 12 & 17 to account for species differences (conifer dominance- ABLA and understory shrub composition).
BPS 1055 for mapzones 12 &17 was modified from zone 16 to account for species differences (conifer dominance- ABLA). BPS for zone 16 was developed by Mark Loewen (mloewen@fs.fed.us), Doug Page (doug_page@blm.gov), Linda Chappell (lchappell@fs.fed.us), and Beth Corbin (ecorbin@fs.fed.us).
BPS 1055 for MZ 16 was based on modifications to R3SPFI on 2/24/05 by Pohl for LANDFIRE BPS modeling. The revised R3SFFI model was further modified on 3/3/05 in Cedar City and the late-development, open box deleted. Model and results for BPS 1055 and 1056 are identical.

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Vegetation Classes

Class A 35%

Early1 PostRep

Description

Early succession after moderately long- to long interval replacement fires. Within 40 years, conifers will replace herbaceous vegetation and shrubs (succession to class B). Occasionally, a lack of seed source of conifer may maintain this condition (modeled as competition/maintenance). The average FRI for replacement fire is 200 years.

Dominant Species* and Canopy Position

CARU	Lower
CAGE	Lower
ABLA	Upper
PICO	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	Tree Regen <5m	Tree Regen <5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class B 25%

Mid1 Closed

Description

Shade tolerant- and mixed conifer saplings to poles (>40% canopy cover). Abies lasiocarpus and Pinus contorta co-dominate, or Pinus contorta only. Replacement fire will cause a transition to class A every 200 yrs on average. Insects and disease may open up the canopy, causing a transition to Class C (approximately 0.7% of the class per year). Dog-hair conditions in this state may maintain the mid-development closed condition. Succession to Class D in 80 years.

Dominant Species* and Canopy Position

PICO	Upper
VASC	Upper
ABLA	Low-Mid

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 10

Structure Data (for upper layer lifeform)

	Min	Max
Cover	45 %	100 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class C **5 %**

Mid2 Open

Description

Primarily consists of moderately tolerant saplings to poles (1" - 6.9" dbh) and <50% canopy cover of fir, with pine often intermediate or suppressed. Replacement fire (mean FRI 200 years) will cause a transition to class A. Mixed severity fires (mean FRI 100 yrs) may occur on small portions of this class (approximately 0.1% per year or 0.001 in model) and maintain the mid-development open condition. Succession to Class D in 80 years.

Dominant Species* and Canopy Position

ABLA Upper
PICO Middle
VASC Low-Mid
ABLA Lower

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	45 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class D **35 %**

Late1 Closed

Description

Pole- and larger diameter moderately to shade tolerant conifer species (>50% canopy cover), in moderate to large size patches, all aspects. Fir dominates, pine (MZ18 PICO) is intermediate or suppressed/dying. This class will self-perpetuate via gap dynamics widfall, if no disturbances cause a transition. Replacement fire will cause a transition to class A every 150 year on average. Insects and disease will replace the stand every 100 years on average. (MZ18 add Mixed Fire (mean FRI 250) moves system to Class C

Dominant Species* and Canopy Position

ABLA Upper
PICO Mid-Upper
ABLA Middle
VASC Low-Mid

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 10

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	45 %	100 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E **0 %**

Late1 Closed

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class	None	

---

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [ ] Tree

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Fuel Model

Disturbances

Fire Regime Group:** 5

Historical Fire Size (acres)

Avg 100
Min 1
Max 1000

Sources of Fire Regime Data

- [x] Literature
- [x] Local Data
- [x] Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	175	40	60	0.00571	85
Mixed	1000	1000	1000	0.001	15
Surface					
All Fires	149			0.00672	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [x] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

LANDFIRE Biophysical Setting Model

Biophysical Setting: **1019** **Great Basin Pinyon-Juniper Woodland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/19/2005

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Modeler 2			**Reviewer**		
Modeler 3			**Reviewer**		
			FRCC		

Vegetation Type

Woodland

Dominant Species

PIMO
JUOS
CELE3
SYOR
HECO
BASA
ARTE
CELE3

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Map Zones

16
12
17
18
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

This ecological system occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada and in the southern portions of MZ 18 in Idaho.

Biophysical Site Description

System typically found at lower elevations ranging from 1600-2600 m. This type generally occurred on shallow rocky soils, or rock dominated sites that are protected from frequent fire (rocky ridges, steep slopes, broken topography, mesa tops). Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay.

Vegetation Description

Woodlands dominated by a mix of Pinus monophylla and Juniperus osteosperma, pure or nearly pure occurrences of Pinus monophylla, or woodlands dominated solely by Juniperus osteosperma comprise this system. Cercocarpus ledifolius is a common associate. Understory layers are variable. Associated species include shrubs such as Arctostaphylos patula, Artemisia arbuscula, Artemisia nova, Artemisia tridentata, Cercocarpus ledifolius, Cercocarpus intricatus, and bunch grasses Hesperostipa comata, Festuca idahoensis, Pseudoroegneria spicata, Leymus cinereus (= Elymus cinereus), and Poa fendleriana.

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Since disturbance was uncommon to rare in this ecological system and the overstory conifers may live for over 1000 years, patches were primarily composed of later development stages that did not occur as extensive woodlands, and that should be distinguished from shrubland ecological sites encroached by pinyon or juniper during the last 150 years. It is estimated that 400 years is required for old juniper woodland stands to develop (Romme et al. 2003). The age structure may vary from uneven to even aged. The overstory cover is normally less that 25%, although it can sometimes be higher (<40%) where pinyon occurs.

Disturbance Description

Uncertainty exists about the fire frequencies of this ecological system, especially since this ecological system groups different types of pinyon-juniper communities for different slopes, exposures, and elevations. Fire occurrence may be influenced by fires spreading from shrub and grassland dominated vegetation of lower and higher altitudinal zones. Replacement fires were uncommon to rare (average FRI of 100-1000 yrs) and occurred primarily during extreme fire behavior conditions. Mixed severity fire (average FRI of 100-500 yrs) was characterized as a mosaic of replacement and surface fires distributed through the patch at a fine scale (<0.1 acres). There is limited evidence for surface fires (Gruell 1994; Bauer and Weisberg, unpublished data), which likely occurred only in the more productive sites during years where understory grass (FEID) cover was high, providing adequate fuel. Although fire scars are only rarely found in pinyon-juniper of the Colorado Plateau and elsewhere (Baker and Shinneman 2004, Eisenhart 2004), ongoing studies in the central Great Basin are observing fire-scarred trees, suggesting that surface fires historically occurred at low frequency. Limited evidence to date suggests that while lightning ignitions in this biophysical setting may have been common, the resulting fires only rarely spread to affect more than a few trees (average FRI of 100 yrs).

Prolongued weather-related stress (drought mostly) and insects and tree pathogens are coupled disturbances that thin trees to varying degrees and kills small patches every 250-500 years on average, with greater frequency in more closed stands.

Vegetation in this typs is generally sparse with a lack of continuous fuels to carry fire. Early seral stages are dominated by grasses and forbs, but a fuel model 1 will oveestimate fire behavior so fire model 2 was used.

Adjacency or Identification Concerns

Inter-Mountain Basins Juniper Savanna (BPS 1115) is generally found at elevations below the physiological tolerance of Pinus monophylla.

In modern days, surrounding matrix vegetation has changed to young-mid aged woodlands that burn more intensely than the former sagebrush matrix. Also occuring under post-settlement management of woodlands (both fire exclusion and the reduction of grasses that would prevent woody establisment) is the uncharacteristic growth of younger trees amongst older trees. These canopy closures allow fires to crown and kill older trees (>200 years) that would normally not experience these fires in unproductive soils.

Two major issues, climate change and invasive plant species (especially cheatgrass and medusahead (on finer textured soils)), lead to non-equilibrial vegetation dynamics for this ecological system, making it difficult to categorize and usefully apply natural disturbance regimes. Sites with an important cheatgrass component in the understory experience greater fire frequency, and will respond differently to fire.

Scale Description

Sources of Scale Data ☑ Literature ☐ Local Data ☐ Expert Estimate

The most common disturbance in this type is very small-scale - either single-tree, or small groups. If the conditions are just right, then it will have replacement fires that burn stands up to 1000's of acres. This type may also have mixed-severity fires of 10-100's of acres.

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Issues/Problems

There is much uncertainty in model parameters, particularly the fire regime. Quantitative data are lacking and research is on-going. The literature for this ecological system's fire history is based on the chronologies from other pines species that are better fire recorders, growing under conditions that may not represent fire environments typical of infrequent-fire pinyon and juniper communities. For example, surface fire, which leaves scars on these other pine species (but not generally on fire-sensitive pinyon or juniper), has no effect on the dynamics of the model, although surface fire maintains the open structure of classes D and E by thinning younger trees.

Further study is needed to better elucidate the independent and interactive effects of fire, insects, pathogens, climate, grazing, and anthropogenic impacts on historical and current vegetation dynamics in the Great Basin Pinyon-Juniper Woodland type.

None of the current suite of 13 fuel models work for this BPS; fuel models 1, 2, & 6 will overestimate fire behavior.

Comments

BPS 1019 developed by Peter Weisberg (pweisberg@cabnr.unr.edu) for MZ 12 and 17 was accepted without changes by Krista Waid for MZ18; the database record was revised. Jon Bates (reviewer) made minor changes to the datbase of BPS 1019: 1) Included a comment about the growth of younger trees in fire-safe sites post-settlement (Adjacency/ID Concerns). 2) Added medusahead to cheatgrass has a threat for changing fire regimes. 3) Indicated that annual grasses and forbs in class A are native.

Note for MFL by L. Provencher: classes D (100-400 years) and E (400+ years) cannot be distinguished by cover or height. The main difference between these classes is DBH and the shape of tree crowns: rounder crowns for older trees.

BPS 1019 for MZ 12 and 17 was reviewed by Louis Provencher (lprovencher@tnc.org).

The model structure comes from the Rapid Assessment model for PNVG R2PIJU. However, fire return intervals were made considerably longer to fit the Great Basin context. Elements of the model for the Colorado Plateau Pinyon-Juniper Woodland and Shrubland (BPS 1016), which was developed by Bob Unnasch (bunnasch@tnc.org) for zone 16, were also incorporated. Insects/disease are incorporated in the model in both "patch mortality" and "woodland thinning" manifestations, and are intended to also represent associated drought mortality influences.

Vegetation Classes

Class A 5%

Early1 PostRep

Description

Initial post-fire community dominated by native annual grasses and forbs. Later stages of this class contain greater amounts of perennial grasses and forbs. Evidence of past fires (burnt stumps and charcoal) should be observed. Duration 10 years with

Dominant Species* and Canopy Position

ELEL5 Upper
BASA3 Upper
FEID Upper
HECO2 Upper

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	2 %	15 %
Height	Herb Short <0.5m	Herb Tall > 1m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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succession to class B, mid-development closed. Replacement fire occurs every 300 yrs on average, thus resetting to zero the succession clock.

Class B 5%

Mid1 Open

Description

Dominated by shrubs, perennial forbs and grasses. Tree seedlings starting to establish on favorable microsites. Total cover remains low due to shallow unproductive soil. Duration 20 years with succession to class C unless infrequent replacement fire (FRI of 200 yrs) returns the vegetation to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses, thus, in reality, succession age in class A after this type of fire would be older than 0 and less than 10. Mixed severity fire (average FRI of 200 yrs) thins the woody vegetation but does not change its succession age.

Dominant Species* and Canopy Position

ARTRV	Mid-Upper
ARTR	Mid-Upper
PIMO	Upper
JUOS	Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	20 %
Height	Shrub Short 0.5-0.9m	Shrub Medium 1.0-2.9m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C 20%

Mid2 Open

Description

Shrub and tree-dominated community with young juniper and pinyon seedlings becoming established. Duration 70 years with succession to class D unless replacement fire (average FRI of 250 yrs) causes a transition to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses, thus, in reality, succession age in class A after this type of fire would be older than 0 and less than 10. Mixed severity fire as in class B.

Dominant Species* and Canopy Position

pimo	Upper
juos	Upper
ARTEM	Middle
CELE	Middle

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	20 %
Height	Tree Regen <5m	Tree Regen <5m
Tree Size Class	Pole 5-9" DBH	

- [x] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Dominant lifeform is shrub. Shrub canopy cover is 10-20%. Height is < 0.5m.

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Mortality from insects, pathogens, and drought occurs at a rotation of approximately 500 yrs and cause a transtion to class B by killing older trees.

Class D **35 %**

Late1 Open

Description

Community dominated by young to mature juniper and pine of mixed age structure. Juniper and pinyon becoming competitive on site and beginning to affect understory composition. Duration 200 years with succession to class E unless replacement fire (average FRI of 1000 yrs) causes a transition to class A. Mixed severity is less frequent than in previous states (500 yrs). Surface fire (mean FRI of 500 yrs) is infrequent and does not change successional dynamics. Tree pathogens and insects such as pinyon Ips become more important for woodland dynamics occurring at a rotation of 250 yrs, including both patch mortality (500 yr rotation) and thinning of isolated individual trees (500 yr rotation).

Dominant Species* and Canopy Position

pimo	Upper
juos	Upper
CELE	Middle
ARTEM	Middle

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 6

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	40 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Large 21-33"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E **35 %**

Late2 Open

Description

Some sites dominated by widely spaced old juniper and pinyon, while elsewhere there are dense, old-growth stands with multiple layers. May have all-aged, multi-storied structure. Occasional shrubs with few grasses and forbs and often much rock. Understory depauperate and high amounts of bare ground present. Grasses present on microsites with deeper soils (>20 inches) with restricting

Dominant Species* and Canopy Position

pimo	Upper
juos	Upper
CELE	Mid-Upper
ARTEM	Lower

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 6

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	50 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Very Large >33"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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clay subsurface horizon may provide moderate cover. Potential maximum overstory coverage is greater in those stands with pinyon as compared to those with only juniper. Replacement fire and mixed severity fires are rare (average FRIs of 1000 and 500 yrs respectively). Surface fire occurs when especially dry years follow wet years (500 yr rotation) and will scar ancient trees. Tree pathogens and insects associated with drought conditions kill patches of trees (1000 yr rotation), with succession to class C, and individual trees (1000 yr rotation) with successoin to class D. Duration 800+ yrs.

Disturbances

Fire Regime Group:** 5

Historical Fire Size (acres)

Avg 10
Min 1
Max 5000

Sources of Fire Regime Data

- [x] Literature
- [x] Local Data
- [x] Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	525	10	1000	0.00190	32
Mixed	370	10	1000	0.00270	45
Surface	715	5	1000	0.0014	23
All Fires	166			0.00601	

Fire Intervals (FI):
Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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LANDFIRE Biophysical Setting Model

Biophysical Setting: 1125 Inter-Mountain Basins Big Sagebrush Steppe

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/19/2005

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Modeler 2			**Reviewer**		
Modeler 3			**Reviewer**		
			FRCC		

Vegetation Type

Shrubland

Dominant Species

ARTR
AGSP
STTH2
POSA1

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Map Zones

16
12
17
18
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

This widespread matrix-forming ecological system occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming and is found at slightly higher elevations farther south.

Biophysical Site Description

Sagebrush steppe is found in continental, semi-arid climate with highly variable annual precipitation greater than 7" to 12" (~180 to 300 mm) (McArthur 2000) and in some locations up to 14" precipitation zone. Common on foothills, undulating terraces, slopes, and plateaus, but also in basins and valley bottoms. Soil depths range from shallow to moderately deep, well-drained with an effective rooting depth of less than 40 inches (~ 1 m). NRCS Range Sites: Loamy 8-10" and 10-12" precipitation zones, and shallow loam 10-14" precipitation zones.

Vegetation Description

This shrub-steppe is dominated by perennial grasses and forbs (>25% cover) with Artemisia tridentata ssp tridentata, Artemisia tridentata ssp wyomingensis, and/or Purshia tridentata dominating or codominating the open to moderately dense (10-40% cover) shrub layer. In southern Idaho and northern Utah, Artemisia tridentata ssp wyomingensis dominates large landscape. Atriplex confertifolia, Chrysothamnus viscidiflorus, Ericameria nauseosa, or Tetradymia spp may be common especially in disturbed stands. Associated graminoids include Achnatherum hymenoides, Elymus lanceolatus ssp. Lanceolatus, Festuca idahoensis, Festuca campestris, Koeleria macrantha, Poa secunda, and Pseudoroegneria spicata. Common

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forbs are Phlox hoodii, Arenaria spp., Crepis spp., Erigeron spp., Eriogonum spp., Lomatium spp., and Astragalus spp. Areas with deeper soils more commonly support Artemisia tridentata ssp tridentata but have largely been converted for other land uses.

The sagebrush steppe landscape is a mosaic of shrub-dominated and herbaceous-dominated phases (West 2000). Forbs have low diversity but are important for wildlife, including the Greater Sage Grouse. Species diversity is lower in Wyoming big sagebrush communities than in other big sagebrush types (FEIS). Wyoming big sagebrush communities are critical habitat for Greater Sage Grouse and other sagebrush obligate species.

Disturbance Description

Historically, fire was the principal disturbance within this vegetation type; other disturbances included insects (e.g., moths and grasshoppers that eat leaves, moth larval grubs that eat roots; return interval of 75 years), periods of drought and wet cycles and shifts in climate (return interval of 100 yrs). Intervals between natural wildfires varied between 25 years (northern Yellowstone National Park [Houston 1973], cited in West 2000) and 100+ years (West 2000). West (1983) and Miller and Eddelman (2000) cite mean FRI <100 years for replacement fire. FEIS cites fire return interval ranges between 10 to 70 years with mean of 40 years for Wyoming sagebrush steppe. Studies cited in FEIS may underestimate FRIs or not hold up to scrutiny (Welch and Criddle 2003). It was assumed that dominant fires were stand replacement (mean FRIs of 75-94 years) due to the continuity of fine fuels typical of steppe ecosystems, however it is not uncommon to observe >50% bare ground cover in modern range sites that experience little livestock grazing (Jon Bates, personal communication, 5/31/05). Mixed severity (25-75% of area inside burn perimeter topkilled) played a minor role during mid-development. Assuming a MFI of 75 years (from the total fire probability), the mean FRI of mixed severity fire was 20% of fires, thus a mean FRI of 375 years, during mid-development. Re-establishment following fire is from seed germination and establishment. Establishment is dependent upon soil seedbank and/or proximity of seed sources, fire size and continuity, and climatic conditions.

Adjacency or Identification Concerns

BPS 1125 represents the dominant sagebrush type in MZ 18, however this type may be confused with BPS 1080 (Inter-Mountain Basins Big Sagebrush Shrubland) on the transition of the Great Basin and Columbia Plateau.

The NatureServe description of BPS 1125 includes different species of sagebrush and steppe ecosystems that are structurally and ecologically different such as Artemisia tridentata ssp tridentata and Artemisia tridentata ssp wyomingensis. We highly recommend that, at least, Artemisia tridentata ssp tridentata, which is a taller shrub found in drainages and deeper soils, be separated from the other shrubs. Ultimately, the two sagebrush species should be modeled separately. Artemisia tripartita ssp tripartita is not part of this system in Nevada because it is generally associated with frigid soils (thus more typically mountain big sagebrush) under snow pockets. Bitterbrush is not found in a large area of northcentral Nevada on the more alkaline soils of Pleistocene Lake Lahontan.

Wyoming big sagebrush is known to hybridize with other subspecies of the big sagebrush complex; i.e., basin big sagebrush (A. tridentata ssp tridentata) and mountain big sagebrush (A. tridentata ssp vaseyana) (Freeman et al. 1991, McArthur et al. 1998). Across ecotones, populations of Wyoming big sagebrush probably intergrade with basin big sagebrush and mountain big sagebrush. Soils and elevation may help determine which species is present.

Invasion of cheatgrass has transformed this ecological system into large areas of uncharacteristic annual grasslands and shrublands with understories where anuual grasses replaced perennial grasses. Medusahead, another exotic annual grass, is also becoming an issue in finer textured soils.

Scale Description

Sources of Scale Data ☐ Literature ☑ Local Data ☐ Expert Estimate

Sagebrush steppe covers vast landscapes >10,000 acres with inclusions of low sagebrush and basin big sagebrush. Historic disturbance (fire) likely ranged from small (< 10 ac) to large (> 10,000 acres) depending on conditions, surface wind speed, time since last ignition, and fuel loading. An average patch size of 250 acres was assumed.

Issues/Problems

West (2000) cites wide range in FRI (25 to +100 years). West (1983) and Miller and Eddelman (2000) recommend a FRI of <100 yrs for replacement fire. FEIS gives 10 to 70 range (40 yr average) (but see Welch and Criddle 2003). Current scientific opinion (Mike Pellant, BLM Range Ecologist on the Great Basin Restoration Initiative) puts the natural fire return interval at about 100 years (confirmed by Stephen Bunting and Dave Pyke). Given uncertainties and opinions of reviewers, a MFI of 75 years was chosen. Without this shorter MFI and differences in fire behavior, there would be no difference between Wyoming sagebrush steppe from the Snake River Plain and Wyoming big sagebrush semi-desert from central Nevada, Utah, and eastern California. Because replacement fire is by far dominant over mixed severity fire, a FRG IV was selected to the recommendation of reviewers.

Comments

BPS 1125 was based on the model from MZ 12 and 17 (developed by Mike Zielinski, mike_zielinski@nv.blm.gov and Louis Provencher, lprovencher@tnc.org) and accepted with no changes by Eric Limbach. Reviewer Jon Bates made several corrections. 1) Bare ground cover can reach 50-60% in Wyoming sagebrush steppe in good condition. The assumption of replacement fire only is based on continuous fuels, therefore it is possible that mixed severity fire was more frequent than assumed by the model with bare ground reaching 50-60% in some areas. This observation was not incorporated into the model although it already includes mixed severity fire. 2) Medusahead was added to the list of exotic species changing steppe composition in the western part of the BPS. 3) The more significant corrections were about the cover classes. Line-intercept, point-intercept, and Daubenmire plots in Idaho, northern Nevada, and Oregon showed that Wyoming big sagebrush sites in good condition have an average cover of 12%, with 25% being infrequent and considered very high. The same sites sampled with wildlife sampling methods centered on Greater Sage-grouse nest locations showed a doubling of sagebrush cover due simply to the method. Therefore, the cover breaks for reduced for class B and C: 6-15% and 15-30% (25% would be preferable based on data). Previous cover was 5-25% and 20-35% for these classes.

BPS 1125 for MZs 12 and 17 was obtained by slightly modifiying the description of BPS 1125 for MZ 16 developed by Don Major (dmajor@tnc.org). BPS 1125 for MZ 16 is completely based on R2SBWYse developed by Eric Limbach (eric_limbach@blm.gov) for Wyoming big sagebrush steppe and reviewed by Krista Waid-Gollnick/Sarah Heidi (krista_waid@blm.gov, Stanley Kitchen (skitchen@fs.fed.edu), Michael Zielinski (mike_zielinski@nv.blm.gov), Jolie Pollet (jpollet@blm.gov), and Gary Back (gback@srk.com).

Vegetation Classes

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class A **20 %**

Early1 PostRep

Description

Perennial grasses and/or forbs dominate where woody shrub canopy has been top killed / removed by wildfire. Shrub cover <6%. (~ 0 to 19 years). Replacement fire every 120 years on average. Succession to class B after 20 years, although in reality this age will vary greatly.

Dominant Species* and Canopy Position

AGSP	Upper
STTH2	Upper
POSA1	Upper
ARTR	Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	5 %
Height	Shrub Dwarf <0.5m	Shrub Short 0.5-0.9m
Tree Size Class	None	

- [x] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Vegetation is primarily herbaceous (>25 cover) with a few scattered shrubs accounting for < 5% cover.

Class B **50 %**

Mid1 Open

Description

Shrubs dominate (5-15% cover) with diverse perennial grass and forb understory (20 to 60 years). MFI is 75 years with 80% replacement fire (mean FRI of 94 years) and 20% mixed severity fire (mean FRI of 375 years). Mixed severity fire, insect/disease (return interval of 75 years), and weather related stress (return interval of 100 yrs) maintains vegetation in class B. Succession to class C after 40 years.

Dominant Species* and Canopy Position

AGSP	Lower
STTH2	Lower
ARTR	Upper
POSA1	Lower

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	6 %	15 %
Height	Shrub Dwarf <0.5m	Shrub Medium 1.0-2.9m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C **30 %**

Late1 Closed

Description

Mature shrub canopy >15% cover with proportional reduction in understory productivity as canopy cover increases. The mean FRI for replacement fire is 75 years. Insect/diseases (return interval of 75 years), and weather related stress (return interval of 100 yrs) thin the shrub canopy, causing a transition to class B. Succession from class C to C.

Dominant Species* and Canopy Position

ARTR	Upper
AGSP	Lower
STTH2	Lower
POSA1	Lower

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	16 %	30 %
Height	Shrub Dwarf <0.5m	Shrub Medium 1.0-2.9m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

---

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class D **0 %**

Late1 Open

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height		
Tree Size Class	None	

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [ ] Tree

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Fuel Model

Class E **0 %**

Late1 Open

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	%
Height		
Tree Size Class	None	

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [ ] Tree

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Fuel Model

Disturbances

Fire Regime Group:** 4

Historical Fire Size (acres)

Avg 250
Min 10
Max 10000

Sources of Fire Regime Data

- [x] Literature
- [x] Local Data
- [x] Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	92	30	120	0.01087	89
Mixed	714	120	500	0.00140	11
Surface					
All Fires	81			0.01228	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

LANDFIRE Biophysical Setting Model

***Biophysical Setting:* 1126** **Inter-Mountain Basins Montane Sagebrush Steppe**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/31/2005

Modeler 1	John Bates	jon.bates@oregonstate.edu	**Reviewer**	
Modeler 2			**Reviewer**	
Modeler 3			**Reviewer**	
			FRCC	

Vegetation Type

Shrubland

Dominant Species

ARTR
PUTR2
SYOR
ARAR

General Model Sources

☑ Literature
☐ Local Data
☑ Expert Estimate

Map Zones

12
17
16
18
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

Montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies, and within the mountains of Nevada, western Utah, southeast Wyoming, and southern Idaho.

Biophysical Site Description

This ecological system occurs in many of the western United States, usually at middle elevations (1000-2500 m). Within the Great Basin mapping zone, elevation ranges from 1370 m in Idaho to 3200 m in the White Mountains of California (Winward and Tisdale 1977, Blaisdell et al. 1982, Cronquist et al. 1994, Miller and Eddleman 2000). The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25 to 90 cm/year (Mueggler and Stewart 1980, Tart 1996). Much of this precipitation falls as snow. Temperatures are continental with large annual and diurnal variation. In general this system shows an affinity for mild topography, fine soils, and some source of subsurface moisture. Soils have well developed dark organic surface horizons (Hironaka et al. 1983, Tart 1996) and generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; soils often have a substantial volume of coarse fragments, and are derived from a variety of parent materials. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. However, at the high ends of its precipitation and elevation ranges mountain big sagebrush occurs

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on shallow and/or rocky soils. All aspects are represented, but the higher elevation occurrences may be restricted to south- or west-facing slopes.

At lower elevations, mountain big sagebrush occurs on upper fan piedmonts, where it typically intermixes with Wyoming big sagebrush on north facing slopes. On mountain sideslopes at this elevation, it occurs on north-facing slopes and where pinyon and juniper is present, it is usually on south-facing slopes with pinyon and juniper generally increasing on north-facing slopes within the sagebrush community. At mid-level elevations, mountain sagebrush begins to move into more southerly slopes intermingling with black sagebrush and low sagebrush and with mountain mahogany occurring on north-facing slopes. With continued elevation, curlleaf mountain mahogany generally crowds it out. Mountain big sagebrush then occupies drier sites at higher elevations.

Vegetation Description

Vegetation types within this ecological system are usually less than 1.5 m tall and dominated by Artemisia tridentata ssp vaseyana, Artemisia cana ssp viscidula, or Artemisia tridentata ssp spiciformis. A variety of other shrubs can be found in some occurrences, but these are seldom dominant. They include Artemisia rigida, Artemisia arbuscula, Ericameria nauseosa, Chrysothamnus viscidiflorus, Ephedra viscidiflorus, Symphoricarpos oreophilus, Purshia tridentata, Peraphyllum ramosissimum, Ribes cereum, and Amelanchier alnifolia. The canopy cover is usually between 20-80%. The herbaceous layer is usually well represented, but bare ground may be common in particularly arid or disturbed occurrences. Graminoids that can be abundant include Festuca idahoensis, Festuca thurberi, Festuca ovina, Elymus elymoides, Deschampsia caespitosa, Danthonia intermedia, Danthonia parryi, Stipa spp., Pascopyrum smithii, Bromus carinatus, Elymus trachycaulus, Koeleria macrantha, Pseudoroegneria spicata, Bromus anomalus, Achnatherum therburianum, Poa fendleriana, or Poa secunda. Forbs are often numerous and an important indicator of health. Forb species may include Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus, and Eriogonum, Balsamorhiza sagittata, Achillea millefolium, Antennaria rosea, and Eriogonum umbellatum, Fragaria virginiana, Artemisia ludoviciana, Hymenoxys hoopesii (= Helenium hoopesii), Hydrophyllum capitatum, etc. Mueggler and Stewart (1980), Hironaka et al. (1983), and Tart (1996) described several of these types. This ecological system is critical summer habitat for Greater Sage Grouse. Moreover, resprouting bitterbrush in mountain big sagebrush types is potentially important to wildlife during early stand development.

Disturbance Description

Mean fire return intervals in and recovery times of mountain big sagebrush are subjects of lively debate in recent years (Welch and Criddle 2003). Mountain big sagebrush communities were historically subject to stand replacing fires with a mean return interval ranging from 40+ years at the Wyoming big sagebrush ecotone, and up to 80 years in areas with a higher proportion of low sagebrush in the landscape (Crawford et al. 2004, Johnson 2000, Miller et al. 1994, Burkhardt and Tisdale 1969 and 1976, Houston 1973, Miller and Rose 1995, Miller et al. 2000). Under pre-settlement conditions mosaic burns generally exceeded 75% topkill due to the relatively continuous herbaceous layer. Therefore, replacement fire with a mean FRI of 40-80 years was adopted here. Brown (1982) reported that fire ignition and spread in big sagebrush is largely (90%) a function of herbaceous cover and wind speed where ground cover exceeds 50%. These communities were also subject to periodic mortality due to insects, disease, rodent outbreaks, drought, and winterkill (Anderson and Inouye 2001, Winward 2004). Periodic mortality events may result in either stand-replacement or patchy die-off depending on the spatial extent and distribution of these generally rare (50 to 100 years) events.

Recovery rates for shrub canopy cover vary widely in this type, depending post fire weather conditions, sagebrush seed-bank survival, abundance of resprouting shrubs (e.g., snowberry, bitterbrush), and size and severity of the burn. Mountain big sagebrush typically reaches 5% canopy cover in 8 to 14 years. This may

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take as little as 4 years under favorable conditions and longer than 25 years in unfavorable situations (Pedersen et al. 2003, Miller unpublished data). Mountain big sagebrush typically reaches 25% canopy cover in about 25 years, but this may take as few as nine years or longer than 40 years (Winward 1991, Pedersen et al. 2003, Miller unpublished data). Mountain snowberry and resprouting forms of bitterbrush may return to pre-burn cover values in a few years. Bitterbrush plants less than fifty years old are more likely to resprout than older plants (Simon 1990).

Adjacency or Identification Concerns

BPS 1126 includes a high elevation low sagebrush component, which can be important. BPS 1124 (Columbia Plateau Low Sagebrush Steppe) represent this higher elevation low sagebrush type. Therefore, 1126 and 1124 may often be intermingled and difficult to determine whether or not low sagebrush is a component of BPS 1126 or 1124.

The NatureServe description does not distinguish between mountain big sagebrush that can be invaded by conifers at mid to high elevations (i.e., within the tolerance of pinyon and juniper) and mountain sagebrush steppe that is too high elevation for pinyon to encroach. The ability for pinyon to invade has a large effect on predicted HRV and management.

This type may be adjacent to forests dominated by aspen, Douglas-fir, limber pine, and bristlecone pine. It also occurs adjacent to pinyon-juniper woodlands. The ecological system, where adjacent to conifers, is readily invaded by conifers (Douglas-fir, sub-alpine fir, whitebark pine, limber pine, pinyon-pine, juniper spp.) in the absence of historic fire regimes (Miller and Rose 1999). This type probably served as an ignition source for adjacent aspen stands. Mountain big sagebrush is commonly found adjacent to or intermingled with low sagebrush and mountain shrublands.

Uncharacteristic conditions in this type include herbaceous canopy cover less than 40% and dominance of the herbaceous layer by mulesears (Wyethia amplexcaulis) on clayey soils.

At lower elevational limits on southern exposures there is a high potential for cheatgrass invasion/occupancy where the native herbaceous layer is depleted. This post-settlement, uncharacteristic condition is not considered here.

Scale Description

Sources of Scale Data ☑ Literature ☐ Local Data ☑ Expert Estimate

This type occupies areas ranging in size from 10's to 10,000's of acres. Disturbance patch size can also range from from 10's to 1,000's of acres. The distribution of past burns was assumed to consist of many small patches in the landscape.

Issues/Problems

If conifers are not adjacent to this system, such as in the Tuscarora range, Santa Rose range, and similar regions, use a three-box model with the following percentages per box: 20% A, 45% B, 35% C.

Comments

Jon Bates (jon.bates@oregonstate.edu) made minor changes in accepting BPS 1126 for MZ 18 from MZ 12 and 17: 1) Editorial changes were made to the biophysical descrition. 2) Hydrophyllum was added to the species list for vegetation description. 3) Under disturbance, wind speed was added as an important factor increasing fire spread. 4) Max fire size was increased to 30,000 acres from 10,000 acres based on recent fires in mountain ranges in good condition in southeastern Oregon. 5) Average fire size was increased to 500 from 100 acres.

BPS 1126 for MZ 12 and 17 was developed by Gary Medlyn (Gary_medlyn@nv.blm.gov) and Crystal

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Kolden (ckolden@gmail.com) based on BPS 1126big from LF Maping Zone 16. BPS 1126big is essentially PNVG R2SBMTwc (mountain big sagebrush with potential for conifer invasion) developed by Don Major (dmajor@tnc.org), Alan R. Sands (asands@tnc.org), David Tart (dtart@fs.fed.us), and Steven Bunting (sbunting@uidaho.edu). R2SBMTwc was itself based on R2SBMT developed by David Tart. R2SBMtwc was revised by Louis Provencher (lprovencher@tnc.org) following critical reviews by Stanley Kitchen (skitchen@fs.fed.us), Michele Slaton (mslaton@fs.fed.us), Peter Weisberg (pweisberg@cabnr.unr.edu), Mike Zielinski (mike_zielinski@nv.blm.gov), and Gary Back (gback@srk.com).

Reviewers and modelers of R2SBMT and R2SBMTwc had very differents opinions on the range of mean FRIs and mountain big sagebrush recovery times (see Welch and Criddle 2003). It is increasingly agreed upon that a MFI of 20 years, which used to be the accepted norm, is simply too frequent to sustain populations of Greater Sage-grouse and mountain big sagebrush ecosystems whose recovery time varies from 10-70 years. Reviewers consistently suggested longer FRIs and recovery times. The revised model is a compromise with longer recovery times and FRIs. Modeler and reviewers also disagreed on the choice of FRG: II (modeler) vs. IV (reviewers). For Map zones 12 and 17, modelers place this system in Fire Regime Group IV.

The first three development classes chosen for this PNVG correspond to the early, mid-, and late seral stages familiar to range ecologists. The two classes with conifer invasion (classes D and E) approximately correspond to Miller and Tausch's (2001) phases 2 and 3 of pinyon and juniper invasion into shrublands.

Vegetation Classes

Class A 20 %

Early1 PostRep

Description

Herbaceous vegetation is the dominant lifeform. Herbaceous cover is variable but typically >50% (50-80%). Shrub cover is 0 to 5%. Replacement fire occurs every 80 years on average. Succession to class B after 12 years.

Dominant Species* and Canopy Position

PSSP6 Upper
FEID Upper
SYOR2 Lower
ARTRV Lower

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	5 %
Height	Herb Short <0.5m	Herb Medium 0.5-0.9m
Tree Size Class	None	

- [x] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Dominant vegetation is herbaceous (50-80% cover) with scattered shrubs.

Class B 50 %

Mid1 Open

Description

Shrub cover 6-25%. Mountain big sagebrush cover up to 20%. Herbaceous cover is typically >50%. Initiation of conifer seedling establishment. Replacemenfire mean FRI is 40 years. Succession to class C after 38 years.

Dominant Species* and Canopy Position

ARTRV Upper
PUTR2 Upper
CONIF Lower
SYMPH Lower

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Structure Data (for upper layer lifeform)

	Min	Max
Cover	6 %	25 %
Height	Shrub Short 0.5-0.9m	Shrub Tall >3.0 m
Tree Size Class	Seedling <4.5ft	

- [x] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Herbaceous cover is the dominant lifeform with canopy >50%. Shrub cover is 6-25% and the upper lifeform.

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Fuel Model 1

Class C 15%

Mid1 Open

Description

Shrubs are the dominant lifeform. Shrub cover 26-45+%. Herbaceous cover is typically <50%. Conifer (juniper, pinyon-juniper, ponderosa pine, or white fir) cover <10%. Insects and disease every 75 yrs on average will thin the stand and cause a transition to class B. Replacement fire occurs every 50 years on average. In the absence of fire for 80 years, vegetation will transition to class D. Otherwise, succession keeps vegetation in class C.

Dominant Species* and Canopy Position

ARTRV	Upper
PUTR2	Upper
SYMPH	Low-Mid
CONIF	Mid-Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	26 %	45 %
Height		
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class D 10%

Late1 Open

Description

Conifers are the upper lifeform (juniper, pinyon-juniper, ponderosa pine, limber pine, or white fir). Conifer cover is 11- 25%. Shrub cover generally decreasing but remains between 26-40%. Herbaceous cover <30%. The mean FRI of replacement fire is 50 years. Insects/diseases thin the sagebrush, but not the conifers, every 75 years on average, without causing a transition to other classes. Succession is from C to D after 50 years.

Dominant Species* and Canopy Position

CONIF	Upper
ARTRV	Mid-Upper
PUTR2	Mid-Upper
SYMPH	Low-Mid

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	25 %
Height	Tree Regen <5m	Tree Regen <5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☑ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Shrub cover generally decreasing but remains between 26-40% Conifers cover 11-25%.

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class E **5 %**

Late1 Closed

Description

Conifers are the dominant lifeform (juniper, pinyon-juniper, ponderosa pine, limber pine, or white fir). Conifer cover 26-80% (pinyon-juniper 36-80%(Miller and Tausch 2000), juniper 26-40% (Miller and Rose 1999), white fir 26-80%). Shrub cover 0-20%. Herbaceous cover <20%. The mean FRI for replacement fire is longer than in previous states (75 yrs). Conifers are susceptible to insects/diseases that cause diebacks (transition to class D) every 75 years on average. Succession from class E to E.

Dominant Species* and Canopy Position

CONIF Upper
ARTRV Mid-Upper
PUTR2 Mid-Upper
SYMPH Mid-Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 6

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	26 %	80 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Pole 5-9" DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Disturbances

Fire Regime Group:** 4

Historical Fire Size (acres)

Avg 500
Min 10
Max 30000

Sources of Fire Regime Data

- [x] Literature
- [ ] Local Data
- [x] Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	49	15	100	0.02041	100
Mixed					
Surface					
All Fires	49			0.02043	

Fire Intervals (FI):
Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

LANDFIRE Biophysical Setting Model

Biophysical Setting: **1106** **Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/10/2005

Modeler 1 Steve Rust	srust@idfg.idaho.gov	**Reviewer**	
Modeler 2 Don Major	dmajor@tnc.org	**Reviewer**	
Modeler 3		**Reviewer**	
		FRCC	

Vegetation Type

Upland Shrubland

Map Zones

18
0
0
0
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Dominant Species

PRVI
PREM
ACGL
PHMA
SYOR
FEID
CARU
CAGE

General Model Sources

☐ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

This BPS is found in the lower montane and foothill regions of the Columbia River Basin, Northern Great Basin and Northern Rocky Mountains. This system occupies steep canyon and mountain slopes.

Biophysical Site Description

In MZ18 this system is found at elevations ranging from 1500 to 2400 m (5000 to 8000 ft). This system likely occurs in all canyon/foothill locations within MZ18. Soils range from well developed loess to colluvial residuum to talus garlands. This system occurs on all aspects, with larger stands represented on northern and eastern aspects. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand, and secondarily is limited by the length of the growing season or low temperatures.

Vegetation Description

These are upland shrublands dominated by deciduous shrubs. Common shrubs include Acer glabrum, Amelanchier alnifolia, Prunus virginiana, Prunus emarginatum, Rosa woodsii, Spiraea betulifolium, Physocarpus malvaceus, and Symphoricarpos oreophilus. The herbaceous layers may be lush and diverse. Common graminoids may include Bromus carinatus, Calamagrostis rubescens, Carex siccata (= Carex foenea), Carex geyeri, Carex rossii, Elymus glaucus, Elymus trachycaulus, Festuca idahoensis. Associated forbs may include Achillea millefolium, Eucephalus engelmannii (= Aster engelmannii), Delphinium spp.,

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Geranium viscosissimum, and Lupinus argenteus.

Disturbance Description

Disturbance types include fire and soil slips. Fire types include replacement, mixed, and surface fire.

Adjacency or Identification Concerns

In MZ18, Intermountain Basins Montane Saggebrush Steppe is adjacent on downslope, hotter drier slopes. Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest is adjacent upslope or on cooler wetter sites.

Scale Description

Sources of Scale Data ☐ Literature ☐ Local Data ☑ Expert Estimate

Large patch size (100-1000's of acres). Patch configuration dependent on physiography of ridge and slope terrain.

Issues/Problems

May be difficult to differentiate the early seral Class (A) of the Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (BPS 1045).

Comments

BPS 1106 was adapted/modified from BPS1011 MZ17&12. It is not Aspen related, but topographic/edaphic conditions represent similar conditions to 1106.
Reviewers:
Kathy Geyer-Hayes
Al Winword (R4 Ecologist)
Dave Tart

Vegetation Classes

Class A 5%

Early1 PostRep

Description

Post-replacement fire this BPS is dominated by grass and forbs. Replacement fire (mean FRI = 150) infrequent and typically related to amount/volume of standing dead/down necromass from previous replacement fire. Succession to class B after 2 yrs.

Dominant Species* and Canopy Position

FEID	Upper
CARU	Upper
CAGE	Upper
SYOR2	Low-Mid

Upper Layer Lifeform

☑ Herbaceous
☐ Shrub
☐ Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5 %	95 %
Height	Herb Short <0.5m	Herb Medium 0.5-0.9m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class B **95 %**

Mid1 Closed

Description

Shrub canopy initially dominated by lower and faster growing medium-tall rhizomatous shrubs (e.g., Symphoricarpos oreophilus and Physocarpus malvaceus). With further development in this class, tall shrubs (e.g., Acer glabrum, Amelanchier alnifolia, Prunus virginiana, Prunus emarginatum) co-dominate. Canopy cover >50%. Replacement fire occurs every 100 yrs on average. Mixed severity fire (average FRI of 75 yrs) maintains this class.

Dominant Species* and Canopy Position

SYOR2 Upper
PHMA Upper
PRVI Upper
AMAL Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	50 %	95 %
Height	Shrub Short 0.5-0.9m	Shrub Medium 1.0-2.9m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C **0 %**

Late1 Closed

Description

Dominant Species* and Canopy Position

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class D **0 %**

Late1 Open

Description

Dominant Species* and Canopy Position

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class E **0 %**

Late1 Closed

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	0 %
Height		
Tree Size Class	None	

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Fuel Model

Disturbances

Fire Regime Group:** 3

Historical Fire Size (acres)

Avg 40
Min 5
Max 100

Sources of Fire Regime Data

☐ Literature
☐ Local Data
☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	80	50	300	0.0125	56
Mixed	100	20	60	0.01	44
Surface					
All Fires	44			0.02251	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

☐ Insects/Disease ☐ Native Grazing ☐ Other (optional 1)
☐ Wind/Weather/Stress ☐ Competition ☐ Other (optional 2)

References

Help!

?? SRM Pub on Range Types

Johnson and Simon. 1987.

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

LANDFIRE Biophysical Setting Model

Biophysical Setting: **1061** **Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/19/2005

Modeler 1	Krista Waid-Gollnick	krista_waid@blm.gov	**Reviewer**	Jon Bates jon.bates@oregonstate.edu
Modeler 2	Sarah Heide	sarah_heide@blm.gov	**Reviewer**	
Modeler 3			**Reviewer**	
			FRCC	

Vegetation Type

Forested

Dominant Species

POTR
ABCO
ABLA
PSME
PIFL2

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Map Zones

12
17
18
0
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

This ecological system occurs on montane slopes and plateaus in Utah, western Colorado, northern Arizona, eastern Nevada, southern Idaho and western Wyoming. Elevations range from 1700 to 2800 m (5600-9200 feet.).

Biophysical Site Description

Occurrences are typically on gentle to steep slopes on any aspect but are often found on clay-rich soils in intermontane valleys. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials but most typically occur on sedimentary rocks. In the northern portion of MZ18, this system occurs throughout the area on north, northeast, and southwest aspects with shallow soils.

Vegetation Description

The tree canopy is composed of a mix of deciduous and coniferous species, codominated by Populus tremuloides and conifers, including Abies concolor, Abies lasiocarpa, Picea engelmannii, Pinus flexilis, Juniperus occidentalis (southwestern Idaho), Pseudotsuga menzesii, and Pinus ponderosa. As the occurrences age, Populus tremuloides is slowly reduced until the conifer species become dominant. Common shrubs include Amelanchier alnifolia, Prunus virginiana, Symphoricarpos oreophilus, Juniperus communis, Paxistima myrsinites, Rosa woodsii, Spiraea betulifolia, symphoricarpos albus, or Mahonia

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

repens. Herbaceous species include Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Poa spp., Achnatherum nelsonii, Melica bulbosa, and Achnatherum, Hesperostipa, Nassella, and/or Piptochaetium spp. (= Stipa spp.), Achillea millefolium, Arnica cordifolia, Asteraceae spp., Erigeron spp., Galium boreale, Geranium viscosissimum, Lathyrus spp., Lupinus argenteus, Mertensia arizonica, Mertensia lanceolata, Maianthemum stellatum, Osmorhiza berteroi (= Osmorhiza chilensis), and Thalictrum fendleri.

Disturbance Description

This is a strongly fire adapted community, more so than BPS 1011 (Rocky Mountains Aspen Woodland and Forest), with FRIs varying for mixed severity fire with the encroachment of conifers. It is important to understand that aspen is considered a fire-proof vegetation type that does not burn during the normal lightining season, yet evidence of fire scars and historical studies show that native burning was the only source of fire that occurred mostly during the spring and fall. BPS 1061 has elements of Fire Regime Groups II, III, and IV. Mean FRI for replacement fire is every 60 years on average in most development classes. Replacement fire is absent during early development (as for stable aspen, BPS 1011) and has a mean FRI of 100 years between 80 and 100 years in the open condition. The FRI of mixed severity fire increases from 40 years in stands <100 years to 60 years in stand >100 years with conifer encroachment.

Under pre-settlement conditions, disease and insect mortality did not appear to have major effects, however older aspen stands would be susceptible to outbreaks every 200 years on average. We assumed that 20% of outbreaks resulted in heavy insect/disease stand-replacing events (average return interval 1000 yrs), whereas 80% of outbreaks would thin older trees >40 yrs (average return interval 250 yrs). Older conifers (>100 years) would experience insect/disease outbreaks every 300 years on average.

Some sites are prone to snowslides, mudslides and rotational slumping. Flooding may also operate in these systems.

Adjacency or Identification Concerns

If conifers are not present in the landscape, or represent <25% relative cover, the stable aspen model (BPS 1011; Rocky Mountain Aspen Woodland and Forest) should be considered, especially in the southwestern portion of MZ 18. If Aspen is absent, refer to 1051 or 1052.

This type is more highly threatened by conifer replacement than stable aspen. Most occurrences at present represent a late-seral stage of aspen changing to a pure conifer occurrence. Nearly a hundred years of fire suppression and livestock grazing have converted much of the pure aspen occurrences to the present-day aspen-conifer forest and woodland ecological system.

Scale Description

Sources of Scale Data ☑ Literature ☑ Local Data ☑ Expert Estimate

This type occurs in a landscape mosaic from moderate (10 acres) to large sized patches (1000 acres).

Issues/Problems

In the western Rocky Mountains, Baker (1925) studied closely the pre-settlement period for aspen and noted fire scars on older trees. Bartos and Campbell (1998) support these findings. We interpreted ground fires that scarred trees, probably started by Native Americans, as mixed severity fire that also promoted abundant suckering. In the presence of conifer fuels, these would be killed and aspen suckering promoted.

In previous models from the Rapid Assessment (e.g., R2ASMClw), experts and modelers expressed different views about the frequency of all fires, citing FRIs longer than those noted by Baker (1925). The FRIs used here were a compromise between longer FRIs proposed by reviewers and the maximum FRI of Baker (1925).

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Comments

BPS 1061 for MZ 12 and 17 was accepted with model and database revisions for MZ 18 by K. Waid and S. Heide. The most important revisions were to increased the mean FRIs for mixed severity and replacement fires, respectively to 40 years (from 20 years) and 100 years (from 60 years). These changes had a large effect of the HRV, resulting in 10% more conifer dominance. Comments by Jon Bates (reviewer) were minor: 1) Species were added to reflect the western range of this system. 2) The description of aspen height was increased in the description of class A because aspen can easily reach 12' tall after 3-4 years in the Owyhee mountains of southern Idaho. Therefore, max height was changed from 6' to 12' (this applies to class B also). 3) Average fire size was increased to 50 from 10 acres. 4) Finally, the reviewer commented on the age of conifer invasion that would prevent the recovery of aspen - assumed rare in the pre-settlement condition.

BPS 1061 for MZ 12 and 17 was developed by Julia Richardson (jhrichardson@fs.fed.us) and Louis Provencher (lprovencher@tnc.org) and is a compromise among R2ASMClw (aspen-mixed conifers low-mid elevation) from the Rapid Assessment, BPS 1011 for MZ 12 and 17, and BPS 1061 for MZ 16. BPS 1061 for MZ 12 and 17 is approximately split into the age classes of R2ASMClw. The FRIs of replacement fire from BPS 1011 were used (60 years). For mixed severity fire, the mean FRIs followed closely BPS 1061 for MZ 16, except that 20 years was used instead of 13 years during periods of conifer encroachment. R2ASMClw was developed by Linda Chappell (lchappell@fs.fed.us), Bob Campbell (rbcampbell@fs.fed.us), and Cheri Howell (chowell02@fs.fed.us), and reviewed by Krista Gollnick-Wade/Sarah Heidi (Krista_Waid@blm.gov), Charles E. Kay (ckay@hass.usu.edu), and Wayne D. Shepperd (wshepperd@fs.fed.us). BPS 1061 for MZ 16 was developed by Linda Chappell, Robert Campbell, Stanley Kitchen (skitchen@fs.fed.us), Beth Corbin (ecorbin@fs.fed.us), and Charles Kay.

As this type has a fairly short fire return interval compared to other aspen types, it should be noted that aspen can act as a tall shrub. Bradley, et al. (1992) state that Loope & Gruell estimated a fire frequency of 25 to 100 years for a Douglas-fir forest with seral aspen in Grand Teton National Park (p39). They later state that fire frequencies of 100 to 300 years appear to be appropriate for maintaining most seral aspen stands. In the Fontenelle Creek, Wyoming draininage, the mean fire-free interval was estimated to be 40 years. Fires in this area burned in a mosaic pattern of severities, from stand-replacement to low fires that scarred but did not kill the relatively thin-barked lodgepole pine on the site (p46).

Aspen stands tend to remain dense througout most of their life-span, hence the open stand description was not used unless it described conifer coverage during initial encroachment. While not dependent upon disturbance to regenerate, aspen was adapted to a diverse array of disturbances.

Under current conditions, herbivory can significantly effect stand succession. Kay (1997, 2001a, b, c) found the impacts of burning on aspen stands were overshadowed by the impacts of herbivory. In the reference state the density of ungulates was low due to efficient Native American hunting, so the impacts of ungulates were low. Herbivory was therefore not included in the model.

Vegetation Classes

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class A **10 %**

Early1 PostRep

Description

Grass/forb and aspen suckers <12' tall. Generally, this is expected to occur 1-3 years post-disturbance. Fire is absent. Succession to class B after 10 years.

Dominant Species* and Canopy Position

POTR5 Upper
SYOR2 Middle
RIBES Middle

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 5

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	99 %
Height	Tree Regen <5m	Tree Regen <5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class B **35 %**

Mid1 Closed

Description

Aspen saplings over 12' tall dominate. Canopy cover is highly variable. Replacement fire occurs every 60 yrs on average. Mixed severity fire (average FRI of 40 yrs) does not change the successional age of these stands, although this fire consumes litter and woody debris and may stimulate suckering. Succession to class C after 30 years.

Dominant Species* and Canopy Position

POTR Upper
SYOR2 Low-Mid
RIBES Low-Mid

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	99 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Pole 5-9" DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C **25 %**

Mid2 Closed

Description

Aspen trees 5 - 16" DBH. Canopy cover is highly variable. Conifer seedlings and saplings may be present. Replacement fire occurs every 60 years on average. Mixed severity fire (mean FRI of 40 yrs), while thining some trees, promotes suckering and maintains vegetation in this class. Insect/diseases outbreaks occur every 200 years on average with 80% of times causing stand thinning (transition to class B) and 20% of times causing stand replacement (transition to class A). Conifer encroachment causes a

Dominant Species* and Canopy Position

POTR Upper
SYOR2 Middle
RIBES Middle

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	99 %
Height	Tree Regen <5m	Tree Medium 10-24m
Tree Size Class	Pole 5-9" DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

succession to class D after 40 years.

Class D **20%**

Late1 Open

Description

Aspen and conifer co-dominate. 60% aspen overstory. Conifers which escape fire, or are the more fire resistant species, will likely cause the progressive suppression of aspen. Mixed severity fire keeps this stand open, kills young conifers, and maintains aspen: every 40 yrs. Replacement fire is every 100 years on average. In the absence of any fire for 100 years, the stand will become closed with conifers (transition to class E).

Dominant Species* and Canopy Position

POTR	Upper
ABCO	Mid-Upper
ABLA	Mid-Upper
PSME	Mid-Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	80 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E **10%**

Late1 Closed

Description

Conifers dominate at 100+ years. Aspen over 16" DBH, uneven sizes of mixed conifer, and main overstory is conifers. Greater than 50% conifer in the overstory. FRI for replacement fire is every 60 years. Mixed severity fire (mean FRI of 20 years) causes a transition to class D. Insect/disease outbreaks will thin older conifers (transition to class D) every 300 years on average.

Dominant Species* and Canopy Position

PSME	Upper
ABLA	Upper
POTR	Mid-Upper
PIFL2	Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 10

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	80 %
Height	Tree Short 5-9m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Disturbances

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Fire Regime Group:** 2

Historical Fire Size (acres)

Avg 50
Min 1
Max 100

Sources of Fire Regime Data

- [x] Literature
- [x] Local Data
- [x] Expert Estimate

Fire Intervals	*Avg FI*	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	100	50	300	0.01	29
Mixed	40	10	50	0.025	71
Surface					
All Fires	29			0.03501	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

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LANDFIRE Biophysical Setting Model

Biophysical Setting: **1055** **Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/9/2004

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			FRCC	

Vegetation Type

Forested

Dominant Species

ABLA
PIAL
PIFL2

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Map Zones

16
12
17
18
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

Subalpine forests the Great Basin (eastern California, Nevada, and Utah).

In MZ18 this type may occur in the few northernmost Basin and Range systems within this mapzone (e.g., Albion Mtns, Cassia Mtns, Jarbidge Mtns)

Biophysical Site Description

Dry-mesic fir forest are the matrix forests of the subalpine zone, with elevations ranging from 2100 to 3355 m (7,000-11,000 feet). Sites within this system are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches.

In MZ18 add snow persist as patches, summers are cool and dry.

Vegetation Description

Subalpine fir forests comprise a substantial part of this subalpine forest, acompanied by Pinus albicualis and/or Pinus flexilis. The amount of Pinus in stands (and species occurance) depends on moisture limitations, some stands can be quite droughty.   Populus tremuloides stands are common on early seral

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moist sites. Abies lasiocarpus increases in importance or replaces Picea engelmannii with increasing distance from the region of Montana and Idaho where maritime air masses influence the climate. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. Abies lasiocarpus can rapidly recolonize and dominate burned sites, or can succeed other species such as Pinus albicaulis, flexilis or Populus tremuloides. Old growth characteristics in Abies Lasiocarpa forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags.

In MZ18 Abies lasiocarpa and Pinus contorta co-dominate. Pinus albicualis and/or Pinus flexilis may be occasionally present typically in drier sites. Populus tremuloides stands are common on early seral moist sites. Picea engelmannii may be present with variying abundance potentially increasing on cooler/moist sites (i.e., riparian). Xeric understory
species may include Juniperus communis, Linnaea borealis, Mahonia repens, Vaccinium scoparium, Calamagrostis rubescens, or Carex geyeri.

Disturbance Description

Fire Regime V. Primarily long-interval (e.g., 150-200 yr) stand replacement fires, with mixed severity fire (e.g., 1000 yr) occurring in open conditions. Disturbances also include insect/disease (every 100-150 years) and windthrow events than thin younger closed stands.

Moderately frequent high-severity fires result in a Lodgepole Pine dominated syste. Mixed-severity fires generally result in a mosaic consisting of subalpine fir patches (chance escapes) in a matrix of mixed species regeneration.

Adjacency or Identification Concerns

It is important not to confuse adjacent mountain sagebrush systems (BPS 1126 Inter-Mountain Basins Montane Sagebrush Steppe) with early development stages of this system. BPS 1056 may be imbedded in BPS 1055.

If aspen is present in large patches or if conifers are not coming in after ~30 years, the BPS is probably misclassified and one of the Aspen types should be examined (BpS 1011 or 1061).

In MZ18 this BPS adjacent to and upslope of BPS 1045 and adjacent and downslope of BPS 1046. Aspen patch size issue relevant (see above), further BPS 1011 likely present as patches within this BPS

Scale Description

Sources of Scale Data ☑ Literature ☐ Local Data ☑ Expert Estimate

Patch sizes vary but are mostly in the tens and hundreds of acres. There may be frequent small disturbances in the 10s of acres or less.

Issues/Problems

Comments

In MZ18 BPS 1055 was modified from zones 12 & 17 to account for species differences (conifer dominance- ABLA and understory shrub composition).
BPS 1055 for mapzones 12 &17 was modified from zone 16 to account for species differences (conifer dominance- ABLA). BPS for zone 16 was developed by Mark Loewen (mloewen@fs.fed.us), Doug Page (doug_page@blm.gov), Linda Chappell (lchappell@fs.fed.us), and Beth Corbin (ecorbin@fs.fed.us).
BPS 1055 for MZ 16 was based on modifications to R3SPFI on 2/24/05 by Pohl for LANDFIRE BPS modeling. The revised R3SFFI model was further modified on 3/3/05 in Cedar City and the late-development, open box deleted. Model and results for BPS 1055 and 1056 are identical.

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Vegetation Classes

Class A 35%

Early1 PostRep

Description

Early succession after moderately long- to long interval replacement fires. Within 40 years, conifers will replace herbaceous vegetation and shrubs (succession to class B). Occasionally, a lack of seed source of conifer may maintain this condition (modeled as competition/maintenance). The average FRI for replacement fire is 200 years.

Dominant Species* and Canopy Position

CARU	Lower
CAGE	Lower
ABLA	Upper
PICO	Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	Tree Regen <5m	Tree Regen <5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class B 25%

Mid1 Closed

Description

Shade tolerant- and mixed conifer saplings to poles (>40% canopy cover). Abies lasiocarpus and Pinus contorta co-dominate, or Pinus contorta only. Replacement fire will cause a transition to class A every 200 yrs on average. Insects and disease may open up the canopy, causing a transition to Class C (approximately 0.7% of the class per year). Dog-hair conditions in this state may maintain the mid-development closed condition. Succession to Class D in 80 years.

Dominant Species* and Canopy Position

PICO	Upper
VASC	Upper
ABLA	Low-Mid

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 10

Structure Data (for upper layer lifeform)

	Min	Max
Cover	45 %	100 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class C 5 %

Mid2 Open

Description

Primarily consists of moderately tolerant saplings to poles (1" - 6.9" dbh) and <50% canopy cover of fir, with pine often intermediate or suppressed. Replacement fire (mean FRI 200 years) will cause a transition to class A. Mixed severity fires (mean FRI 100 yrs) may occur on small portions of this class (approximately 0.1% per year or 0.001 in model) and maintain the mid-development open condition. Succession to Class D in 80 years.

Dominant Species* and Canopy Position

ABLA	Upper
PICO	Middle
VASC	Low-Mid
ABLA	Lower

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	45 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class D 35 %

Late1 Closed

Description

Pole- and larger diameter moderately to shade tolerant conifer species (>50% canopy cover), in moderate to large size patches, all aspects. Fir dominates, pine (MZ18 PICO) is intermediate or suppressed/dying. This class will self-perpetuate via gap dynamics widfall, if no disturbances cause a transition. Replacement fire will cause a transition to class A every 150 year on average. Insects and disease will replace the stand every 100 years on average. (MZ18 add Mixed Fire (mean FRI 250) moves system to Class C

Dominant Species* and Canopy Position

ABLA	Upper
PICO	Mid-Upper
ABLA	Middle
VASC	Low-Mid

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 10

Structure Data (for upper layer lifeform)

	Min	Max
Cover	45 %	100 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E 0 %

Late1 Closed

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height		
Tree Size Class	None	

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Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Fuel Model

Disturbances

Fire Regime Group:** 5

Historical Fire Size (acres)

Avg 100
Min 1
Max 1000

Sources of Fire Regime Data

☑ Literature
☑ Local Data
☑ Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	175	150	200	0.00571	85
Mixed	1000	1000	1000	0.001	15
Surface					
All Fires	149			0.00672	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

☑ Insects/Disease
☑ Wind/Weather/Stress
☐ Native Grazing
☑ Competition
☐ Other (optional 1)
☐ Other (optional 2)

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

LANDFIRE Biophysical Setting Model

Biophysical Setting: **1019** **Great Basin Pinyon-Juniper Woodland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 5/19/2005

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Modeler 2			**Reviewer**		
Modeler 3			**Reviewer**		
			FRCC		

Vegetation Type

Woodland

Map Zones

16
12
17
18
0
0
0
0
0
0

Model Zones

☐ Alaska
☐ California
☑ Great Basin
☐ Great Lakes
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Dominant Species

PIMO
JUOS
CELE3
SYOR
HECO
BASA
ARTE
CELE3

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range

This ecological system occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada and in the southern portions of MZ 18 in Idaho.

Biophysical Site Description

System typically found at lower elevations ranging from 1600-2600 m. This type generally occurred on shallow rocky soils, or rock dominated sites that are protected from frequent fire (rocky ridges, steep slopes, broken topography, mesa tops). Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay.

Vegetation Description

Woodlands dominated by a mix of Pinus monophylla and Juniperus osteosperma, pure or nearly pure occurrences of Pinus monophylla, or woodlands dominated solely by Juniperus osteosperma comprise this system. Cercocarpus ledifolius is a common associate. Understory layers are variable. Associated species include shrubs such as Arctostaphylos patula, Artemisia arbuscula, Artemisia nova, Artemisia tridentata, Cercocarpus ledifolius, Cercocarpus intricatus, and bunch grasses Hesperostipa comata, Festuca idahoensis, Pseudoroegneria spicata, Leymus cinereus (= Elymus cinereus), and Poa fendleriana.

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Since disturbance was uncommon to rare in this ecological system and the overstory conifers may live for over 1000 years, patches were primarily composed of later development stages that did not occur as extensive woodlands, and that should be distinguished from shrubland ecological sites encroached by pinyon or juniper during the last 150 years. It is estimated that 400 years is required for old juniper woodland stands to develop (Romme et al. 2003). The age structure may vary from uneven to even aged. The overstory cover is normally less that 25%, although it can sometimes be higher (<40%) where pinyon occurs.

Disturbance Description

Uncertainty exists about the fire frequencies of this ecological system, especially since this ecological system groups different types of pinyon-juniper communities for different slopes, exposures, and elevations. Fire occurrence may be influenced by fires spreading from shrub and grassland dominated vegetation of lower and higher altitudinal zones. Replacement fires were uncommon to rare (average FRI of 100-1000 yrs) and occurred primarily during extreme fire behavior conditions. Mixed severity fire (average FRI of 100-500 yrs) was characterized as a mosaic of replacement and surface fires distributed through the patch at a fine scale (<0.1 acres). There is limited evidence for surface fires (Gruell 1994; Bauer and Weisberg, unpublished data), which likely occurred only in the more productive sites during years where understory grass (FEID) cover was high, providing adequate fuel. Although fire scars are only rarely found in pinyon-juniper of the Colorado Plateau and elsewhere (Baker and Shinneman 2004, Eisenhart 2004), ongoing studies in the central Great Basin are observing fire-scarred trees, suggesting that surface fires historically occurred at low frequency. Limited evidence to date suggests that while lightning ignitions in this biophysical setting may have been common, the resulting fires only rarely spread to affect more than a few trees (average FRI of 100 yrs).

Prolongued weather-related stress (drought mostly) and insects and tree pathogens are coupled disturbances that thin trees to varying degrees and kills small patches every 250-500 years on average, with greater frequency in more closed stands.

Vegetation in this typs is generally sparse with a lack of continuous fuels to carry fire. Early seral stages are dominated by grasses and forbs, but a fuel model 1 will oveestimate fire behavior so fire model 2 was used.

Adjacency or Identification Concerns

Inter-Mountain Basins Juniper Savanna (BPS 1115) is generally found at elevations below the physiological tolerance of Pinus monophylla.

In modern days, surrounding matrix vegetation has changed to young-mid aged woodlands that burn more intensely than the former sagebrush matrix. Also occuring under post-settlement management of woodlands (both fire exclusion and the reduction of grasses that would prevent woody establisment) is the uncharacteristic growth of younger trees amongst older trees. These canopy closures allow fires to crown and kill older trees (>200 years) that would normally not experience these fires in unproductive soils.

Two major issues, climate change and invasive plant species (especially cheatgrass and medusahead (on finer textured soils)), lead to non-equilibrial vegetation dynamics for this ecological system, making it difficult to categorize and usefully apply natural disturbance regimes. Sites with an important cheatgrass component in the understory experience greater fire frequency, and will respond differently to fire.

Scale Description

Sources of Scale Data ☑ Literature ☐ Local Data ☐ Expert Estimate

The most common disturbance in this type is very small-scale - either single-tree, or small groups. If the conditions are just right, then it will have replacement fires that burn stands up to 1000's of acres. This type may also have mixed-severity fires of 10-100's of acres.

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Issues/Problems

There is much uncertainty in model parameters, particularly the fire regime. Quantitative data are lacking and research is on-going. The literature for this ecological system's fire history is based on the chronologies from other pines species that are better fire recorders, growing under conditions that may not represent fire environments typical of infrequent-fire pinyon and juniper communities. For example, surface fire, which leaves scars on these other pine species (but not generally on fire-sensitive pinyon or juniper), has no effect on the dynamics of the model, although surface fire maintains the open structure of classes D and E by thinning younger trees.

Further study is needed to better elucidate the independent and interactive effects of fire, insects, pathogens, climate, grazing, and anthropogenic impacts on historical and current vegetation dynamics in the Great Basin Pinyon-Juniper Woodland type.

None of the current suite of 13 fuel models work for this BPS; fuel models 1, 2, & 6 will overestimate fire behavior.

Comments

BPS 1019 developed by Peter Weisberg (pweisberg@cabnr.unr.edu) for MZ 12 and 17 was accepted without changes by Krista Waid for MZ18; the database record was revised. Jon Bates (reviewer) made minor changes to the datbase of BPS 1019: 1) Included a comment about the growth of younger trees in fire-safe sites post-settlement (Adjacency/ID Concerns). 2) Added medusahead to cheatgrass has a threat for changing fire regimes. 3) Indicated that annual grasses and forbs in class A are native.

Note for MFL by L. Provencher: classes D (100-400 years) and E (400+ years) cannot be distinguished by cover or height. The main difference between these classes is DBH and the shape of tree crowns: rounder crowns for older trees.

BPS 1019 for MZ 12 and 17 was reviewed by Louis Provencher (lprovencher@tnc.org).

The model structure comes from the Rapid Assessment model for PNVG R2PIJU. However, fire return intervals were made considerably longer to fit the Great Basin context. Elements of the model for the Colorado Plateau Pinyon-Juniper Woodland and Shrubland (BPS 1016), which was developed by Bob Unnasch (bunnasch@tnc.org) for zone 16, were also incorporated. Insects/disease are incorporated in the model in both "patch mortality" and "woodland thinning" manifestations, and are intended to also represent associated drought mortality influences.

Vegetation Classes

Class A 5%

Early1 PostRep

Description

Initial post-fire community dominated by native annual grasses and forbs. Later stages of this class contain greater amounts of perennial grasses and forbs. Evidence of past fires (burnt stumps and charcoal) should be observed. Duration 10 years with

Dominant Species* and Canopy Position

ELEL5	Upper
BASA3	Upper
FEID	Upper
HECO2	Upper

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	2 %	15 %
Height	Herb Short <0.5m	Herb Tall > 1m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

succession to class B, mid-development closed. Replacement fire occurs every 300 yrs on average, thus resetting to zero the succession clock.

Class B 5%

Mid1 Open

Description

Dominated by shrubs, perennial forbs and grasses. Tree seedlings starting to establish on favorable microsites. Total cover remains low due to shallow unproductive soil. Duration 20 years with succession to class C unless infrequent replacement fire (FRI of 200 yrs) returns the vegetation to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses, thus, in reality, succession age in class A after this type of fire would be older than 0 and less than 10. Mixed severity fire (average FRI of 200 yrs) thins the woody vegetation but does not change its succession age.

Dominant Species* and Canopy Position

ARTRV Mid-Upper
ARTR Mid-Upper
PIMO Upper
JUOS Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	20 %
Height	Shrub Short 0.5-0.9m	Shrub Medium 1.0-2.9m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C 20%

Mid2 Open

Description

Shrub and tree-dominated community with young juniper and pinyon seedlings becoming established. Duration 70 years with succession to class D unless replacement fire (average FRI of 250 yrs) causes a transition to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses, thus, in reality, succession age in class A after this type of fire would be older than 0 and less than 10. Mixed severity fire as in class B.

Dominant Species* and Canopy Position

pimo Upper
juos Upper
ARTEM Middle
CELE Middle

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	20 %
Height	Tree Regen <5m	Tree Regen <5m
Tree Size Class	Pole 5-9" DBH	

- [x] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Dominant lifeform is shrub. Shrub canopy cover is 10-20%. Height is < 0.5m.

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Mortality from insects, pathogens, and drought occurs at a rotation of approximately 500 yrs and cause a transtion to class B by killing older trees.

Class D **35 %**

Late1 Open

Description

Community dominated by young to mature juniper and pine of mixed age structure. Juniper and pinyon becoming competitive on site and beginning to affect understory composition. Duration 200 years with succession to class E unless replacement fire (average FRI of 1000 yrs) causes a transition to class A. Mixed severity is less frequent than in previous states (500 yrs). Surface fire (mean FRI of 500 yrs) is infrequent and does not change successional dynamics. Tree pathogens and insects such as pinyon Ips become more important for woodland dynamics occurring at a rotation of 250 yrs, including both patch mortality (500 yr rotation) and thinning of isolated individual trees (500 yr rotation).

Dominant Species* and Canopy Position

pimo	Upper
juos	Upper
CELE	Middle
ARTEM	Middle

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 6

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	40 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Large 21-33"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E **35 %**

Late2 Open

Description

Some sites dominated by widely spaced old juniper and pinyon, while elsewhere there are dense, old-growth stands with multiple layers. May have all-aged, multi-storied structure. Occasional shrubs with few grasses and forbs and often much rock. Understory depauperate and high amounts of bare ground present. Grasses present on microsites with deeper soils (>20 inches) with restricting

Dominant Species* and Canopy Position

pimo	Upper
juos	Upper
CELE	Mid-Upper
ARTEM	Lower

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model 6

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	50 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Very Large >33"DBH	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

clay subsurface horizon may provide moderate cover. Potential maximum overstory coverage is greater in those stands with pinyon as compared to those with only juniper. Replacement fire and mixed severity fires are rare (average FRIs of 1000 and 500 yrs respectively). Surface fire occurs when especially dry years follow wet years (500 yr rotation) and will scar ancient trees. Tree pathogens and insects associated with drought conditions kill patches of trees (1000 yr rotation), with succession to class C, and individual trees (1000 yr rotation) with successoin to class D. Duration 800+ yrs.

Disturbances

Fire Regime Group:** 5

Historical Fire Size (acres)

Avg 10
Min 1
Max 5000

Sources of Fire Regime Data

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	525	10	1000	0.00190	32
Mixed	370	10	1000	0.00270	45
Surface	715	5	1000	0.0014	23
All Fires	166			0.00601	

Fire Intervals (FI):
Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

- ☑ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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APPENDIX K

NOMINATION OF AREAS OF ENVIRONMENTAL CONCERN[1]

Evaluation of Nominated Area of Critical Environmental Concern (ACEC) and or Research natural Area (RNA)

To be considered as a potential ACEC and analyzed in Resource Management Plan alternatives, an area must meet the criteria of relevance and importance established and defined in 43 CFR 1610.7-2. These criteria are further explained in BLM Manual Section 1613.1. The following notations apply to the RNA "Criteria Review Checklist" in this Appendix:

> **Relevance[2]** - An area meets the "relevance" criterion if it contains one or more of the following: a significant historic, cultural, or scenic value (including, but not limited to, rare or sensitive archeological resources and religious or cultural resources important to Native Americans); a fish or wildlife resource (including, but not limited to, habitat for endangered, sensitive, or threatened species, or habitat essential for maintaining species diversity); a natural process or system (including, but not limited to, endangered, threatened, or sensitive plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features; for the purposes of these amendments, an example of a process is cave formation, and an example of a system is a functioning cave environment or riparian area); or a natural hazard (including, but not limited to, areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs).
>
> > Yes - The area contains the value, resource, process, system, or hazard.
> >
> > No - The area does not contain the value, resource, process, system, or hazard.
>
> **Importance[3]** - The value, resource, system, process, or hazard must have substantial significance and values in order to satisfy the "importance" criterion. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:
>
> - Have more than locally significant qualities which give it special worth. Consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource;
> - Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change;

[1] Research natural areas (RNA) are a type of ACEC and are designated using the ACEC process.

- Has been recognized as warranting protection in order to satisfy National priority concerns or to carry out the mandates of FLPMA;
- Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare;
- Poses a significant threat to human life and safety or to property.

Yes - The value, resource, system, process, or hazard has substantial significance and values and meets one or more of the importance factors listed above.

No - The area contains the value, resource, system, process, or hazard, but the value, resource, system, process, or hazard is not substantially significant and does not meet the importance factors listed above.

N/A - The value, resource, system, process, or hazard is not found within the area.

Visual Resource Management (VRM) Classes:

Class I - The objective of this class is to maintain a landscape setting that appears unaltered by humans. Natural ecological changes and very limited management activity are allowed. Any contrast created within the characteristic landscape must not attract attention. It is applied to wilderness areas, some natural areas, wild portions of Wild and Scenic Rivers, and other similar situations where management activities are restricted.

Class II - The objective of this class is to design proposed alterations so as to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III - The objective of this class is to design proposed alterations so as to partially retain the existing character of the landscape. Contrasts to the basic elements *(form,* line, color, and texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape. However, the change should remain subordinate to the existing characteristic landscape.

Class IV - The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, the change should repeat the basic elements (form, line, color, and texture) inherent in the characteristic landscape.

PETTICOAT PEAK RNA
CRITERIA REVIEW CHECKLIST

Nominated RNA: Petticoat Peak RNA ~ 400 acres Public Land

Nominated By: Idaho Natural Areas Coordinating Committee

Location: Boise Meridian, T 9S., R 38E, Section 1: SW1/4 SE1/4, SW1/4, SW1/4NW1/4; Section 2 SE1/4, SE1/4SW1/4; Section 11 N1/2 NE1/4; Section 12 N1/2 NW1/4, SW1/4 NW1/4, E1/2 NE1/4

Relevance: Does the area contain a significant historic, cultural or scenic value; fish or wildlife resource; natural process or system; or natural hazard?	**Yes or No[2]**
Historic: No known significant historic values occur within the nominated area.	No
Cultural: Small lithic scatter has been documented at the edge of the proposed RNA.	No
Scenic: VRM Class I area.	Yes
Fish or Wildlife Resource: Petticoat Peak contains 13 habitat types for wildlife. Deer, elk, rabbits, porcupine, a variety of passerine birds and raptors including the northern goshawk, as well as the occasional moose are observed throughout this environment. No nests of the sensitive northern goshawk are found in the area, and no other known threatened/endangered or candidate species inhabit this part of Petticoat Peak.	No
Natural Process or System: The varied vegetation in the RNA includes 13 habitat types in pristine or near pristine condition. Habitat types within the RNA include: 1) mountain sagebrush (*Artemisia tridentata* ssp. *vaseyana*)/ mountain snowberry (*Symphoricarpos oreophilus*)/ bluebunch wheatgrass (*Pseudoroegneria spicata*) 2) mountain sagebrush/bluebunch wheatgrass 3) mountain sagebrush/ California brome (*Bromus carinatus*) 4) curl-leaf mountain mahogany (*Cercocarpus ledifolius*)/ king bladderpod (*Lesquerella kingii*) 5) curl-leaf mountain mahogany / bluebunch wheatgrass 6) bigtooth maple (*Acer grandenditatum*) / Rocky Mountain juniper (*Juniperus scopulorum*) 7) aspen (*Populus tremuloides*)/ pinegrass (*Calamagrostis rubescens*) 8) limber pine (*Pinus flexilis*) / curl-leaf mountain mahogany 9) Douglas-fir (*Pseudotsuga menziesii*)/ creeping oregongrape (*Mahonia repens*) 10) Douglas-fir / pinegrass 11) Douglas-fir / bigtooth maple 12) Subalpine fir (*Abies lasiocarpa*)/ pinegrass 13) Subalpine fir/ bigtooth maple	Yes
Natural Hazard: No known significant natural hazards occur in the nominated area.	No
Importance: Does the value, resource system, process, or hazard meet one or more of the following importance factors: (1) has more than locally significant qualities and special worth or cause for concern; (2) has qualities/circumstances making it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change; (3) is recognized as warranting protection to satisfy national priority concerns or carry out FLPMA's mandates; (4) warrants highlighting to satisfy concerns about safety and public welfare?	**Yes/ No or N/A[3]**

Historic:	N/A
Cultural: Lithic scatter is found throughout the area.	No
Scenic: The scenery within the nominated area is unique or of more than local significance (*Importance Factor 1*). Vegetation types, especially bigtooth maple and aspen, provide high quality visuals (Class 1) from US Hwy 30.	Yes
Fish or Wildlife Resource: Deer, elk, rabbits, porcupine, a variety of passerine birds and raptors including the northern goshawk are present throughout the area.	No
Natural Process or System: Habitat types are present throughout the region but few if any on BLM lands that are pristine or near pristine condition. There are no known mineral occurrences within the project boundary; however, within a 2 to 3 mile radius, there are known deposits of manganese, magnesium, sand & gravel, and geothermal resources. Manganese mineralization, as manganese oxide fillings on fractures and in breccias, is associated with hydrothermal activity now exploited by the town of Lava Hot Springs. Historically, several attempts have been made to mine dolomite and magnesium from local outcrops of the Laketown Dolomite. Sand & Gravel, and possibly quartzite as building stone, have been mined from the Portneuf River terraces approximately one mile west of the project area. Any geothermal exploration in the area would likely take place in the valley bottoms and not within the RNA. The USGS considers the project area to have moderate potential for the discovery of Oil and Gas. There are currently no Oil and Gas leases in the area, but in the 1980's the RNA covered by leases.	Yes
Natural Hazard:	N/A

The nominated RNA meets the relevance and importance criteria to be considered as a potential RNA. The rationale for proposing the nominated Petticoat Peak RNA for designation under Alternatives B and C, are as follows:

The nominated RNA meets relevance and importance criteria for scenic values and a natural system. Overall, the scenic nature of the peak and its inherent value as a reference area with its value as an example of an ecosystem supporting habitat types that are not yet in the RNA system combine to establish the relevance and importance of Petticoat Peak RNA.

Scenic Values - Although several canyon environments exist on Petticoat Peak this one is visible from the resort town of Lava Hot Springs and forms a backdrop to the viewshed of that town. Its scenic value contributes to the esthetics of a trip on US Highway 30 from McCammon to the Wyoming border. Its dominance of the local viewshed also puts those same scenic values at risk, unless special management actions are implemented.

Natural System - Designating the Petticoat Peak RNA would add several habitat types that are not currently representative to the RNA system and would preserve its integrity for use as a reference area and control for scientific research and to provide the BLM a reference area against which to measure management success or failure in areas with similar potential.

If the nominated RNA meets the relevance and importance criteria, list the relevant and important value(s) that need special management attention and describe the management prescriptions necessary to protect those values.

<u>Scenic Values:</u>

(a) Continue to manage the area as VRM Class I.
(b) **Note:** Many of the actions listed under "Natural System or Process" below would also help protect the unique scenic values in the nominated area.

<u>Natural System or Process:</u> The primary purpose for designating the Petticoat Peak RNA is because of its importance as a reference area in southeastern Idaho. The following actions would highlight and protect the Petticoat Peak RNA. They would also have the indirect effect of protecting the identified scenic values.

- The area would be discretionarily closed for solid leasable minerals and salable minerals.
- Fluid minerals would be leased with a NSO stipulation.
- A withdrawal for locatable minerals would be pursued.
- The OHV designation would be "Closed".
- The area would be identified as an "Exclusion" area for ROWs.
- The area would be a priority for weed control.
- If necessary, livestock grazing would be adjusted to maintain the values of the RNA.
- Wildland fire would be suppressed.
- Public lands would be retained.
- Vegetation would be inventoried to establish baseline information and monitored to understand natural ecological processes and/or determine trends/threats.

Rationale for not proposing the RNA for designation under Alternative D:

Although the nominated Petticoat Peak RNA meets relevance and importance criteria for scenic values and a natural system, the BLM does not recommend this potential RNA for designation under Alternative D for the following reasons:

<u>Scenic Values:</u> The identified scenic values include the area's steepest slopes. These scenic values are not in jeopardy under current planning guidance and management, i.e., Wilderness Study Area so no additional special management is needed to protect the scenic values.

<u>Natural System or Process:</u> The Petticoat Peak area was identified as a relevant and important natural system. However, this system is not in jeopardy under existing management. The steep slopes form a natural barrier to many forms of disturbance that may otherwise occur in a grazed system, and existing management tools (such as implementing rangeland standards and guidelines) are sufficient to maintain and improve vegetation conditions.

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AIR QUALITY ASSESSMENT TECHNICAL REPORT

Bureau of Land Management Pocatello Field Office
Pocatello, Idaho

Prepared for:

UNITED STATES BUREAU OF LAND MANAGEMENT

Upper Snake River District, Pocatello Field Office
4350 Cliffs Drive
Pocatello, Idaho 83204

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EXECUTIVE SUMMARY

This technical report presents an assessment of the regional air quality of lands managed by the U.S. Bureau of Land Management (BLM) Pocatello Field Office (PFO) located within southeastern Idaho. The report has been prepared to assist BLM in preparing a resource management plan and subsequent National Environmental Policy Act-compliant Environmental Impact Statement for both the Pocatello and Malad planning areas.

Topics and issues addressed in this document include: 1) relevant Federal and State regulations and guidelines; 2) delineated airsheds and meteorology within the PFO boundaries; 3) current air quality and areas where standards are exceeded; 4) areas within the PFO boundaries that may be sensitive to air quality impacts; and, 5) a discussion of ongoing and potential activities that may occur on BLM-managed lands that may impact air quality.

Air quality within the PFO boundaries is governed by Federal laws that the State of Idaho has been given authority to administer by the EPA. Statutes within the Idaho Environmental Protection and Health Act codify the Idaho Department of Environmental Quality (IDEQ) compliance and enforcement authority over the air quality program. The framework for the air quality program is based on the Federal Clean Air Act as amended in 1990. National Ambient Air Quality Standards (NAAQS) are established for six criteria pollutants; specifically, carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), sulfur dioxide (SO_2), and two categories of particulate matter; fine particulates with an aerodynamic diameter of 10 micrometers or less (PM_{10}), and fine particulates with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$). The IDEQ has included an additional standard for fluorides bringing the applicable standards in Idaho to seven.

Two PM_{10} non-attainment areas have been designated in the PFO area. These areas include the Portneuf Valley PM_{10} non-attainment area and the Federal Fort Hall PM_{10} non-attainment area. Impacts to air quality in the vicinity of the City of Soda Springs is also a concern. Exceedances of PM_{10} and SO_2 have been recorded in the area. The area is not currently designated a non-attainment area, but PM_{10} and SO_2 monitoring is ongoing due to concern about current mining and mineral processing activities in the area.

In evaluating the impacts of various activities on air quality, consideration must be given to the location of the proposed activities and their proximity to areas that may be particularly sensitive to air quality impacts. Areas that have been identified as sensitive to air quality impacts include locations such as NAAQS non-attainment areas, hospitals, airports, Class I visibility areas, major transportation corridors, as well as population centers.

While most BLM programs in the planning area are not generally considered likely to significantly affect air quality, the increased emphasis on the use of prescribed fire must be evaluated with respect to its impact on air quality. Other identified activities and sources occurring on BLM lands that may impact air quality include mining and mineral processing (particularly phosphate mining and processing), forestry, construction, off- and on-road vehicle use, and recreational use (campgrounds).

1.0 INTRODUCTION

This technical report presents an assessment of the air quality in the region of the U.S. Bureau of Land Management (BLM) Pocatello Field Office (PFO) located within southeastern Idaho. The report has been prepared to assist BLM in preparing a resource management plan (RMP) and subsequent National Environmental Policy Act (NEPA) compliant Environmental Impact Statement (EIS) for both the Pocatello and Malad planning areas.

The air quality assessment report will be used to prepare the RMP/EIS through a discussion of: 1) relevant Federal and State regulations and guidelines; 2) climate, meteorology and delineated airsheds within the PFO boundaries; 3) current air quality and areas where standards are exceeded; 4) areas within the PFO boundaries that may be sensitive to air quality; and, 5) ongoing and potential activities that may occur on BLM-managed lands that may impact air quality.

1.1 Goals

The technical report has been prepared to assist the PFO with its overall RMP/EIS planning effort to provide a collaborative, community-based planning approach to updating existing management decisions and resource allocations (BLM 2003) as such decisions pertain to air quality. This document addresses the topics listed above with the objective of providing a review of relevant regulations, data and issues that may be important in preparing the Affected Environment portion of the RMP/EIS. An air quality analysis has also been conducted for the PFO planning area as part of the BLM, Upper Snake River District Fire Management Direction Amendment (FMDA) currently being developed (BLM 2004). The FMDA EIS will also serve as an important document for the RMP EIS in establishing smoke and fire management guidelines and policies with respect to air quality.

This air quality assessment document specifically addresses the resource-specific decision guidance for air quality outlined in Appendix C of the BLM's Land Use Planning Handbook (BLM 2000). This report has also been prepared in general accordance with the "Guiding Principles for Analyses" outlined in the RMP/EIS Statement of Work (BLM 2003).

A subsequent strategy document will be prepared to present appropriate strategies and methods for describing the potential air quality impacts of proposed planning alternatives. These strategies will be primarily utilized in preparing the Alternatives Evaluation chapter of the RMP/EIS, with the stated objective of facilitating management activities that meet or exceed air quality standards (BLM 2003).

1.2 Scope

This technical report presents a current assessment of the regional climatic conditions and air quality of the approximately 614,300 acres of lands managed by the PFO located within nine southeastern Idaho counties: Bannock, Bear Lake, Bingham, Bonneville, Caribou, Cassia, Franklin, Oneida and Power (Figure 1). The BLM-managed lands within the planning area are adjacent to National Forest, State of Idaho and private lands and the Fort Hall Indian Reservation.

In considering the impacts on air quality of ongoing or potential activities, the US Environmental Protection Agency (EPA) air quality permitting system suggests that the analysis of air impacts should consider all airsheds within 100 kilometers (km) of proposed facilities and projects (EPA 1992). To be consistent with this directive, the area of consideration for air quality impacts includes airsheds over lands within the PFO as well as lands within a 100 km radius of the PFO boundary (see Figure 2).

While most BLM programs in the planning area are not generally considered likely to significantly affect air quality, the increased emphasis on the use of prescribed fire must be evaluated with respect to its impact on air quality. Both wildland and prescribed fire have the potential to significantly effect air quality. Other ongoing activities occurring on BLM lands that may impact air quality, such as mining and mineral processing, forestry, construction, off- and on-road vehicle use, and recreational use (campgrounds), will also be discussed.

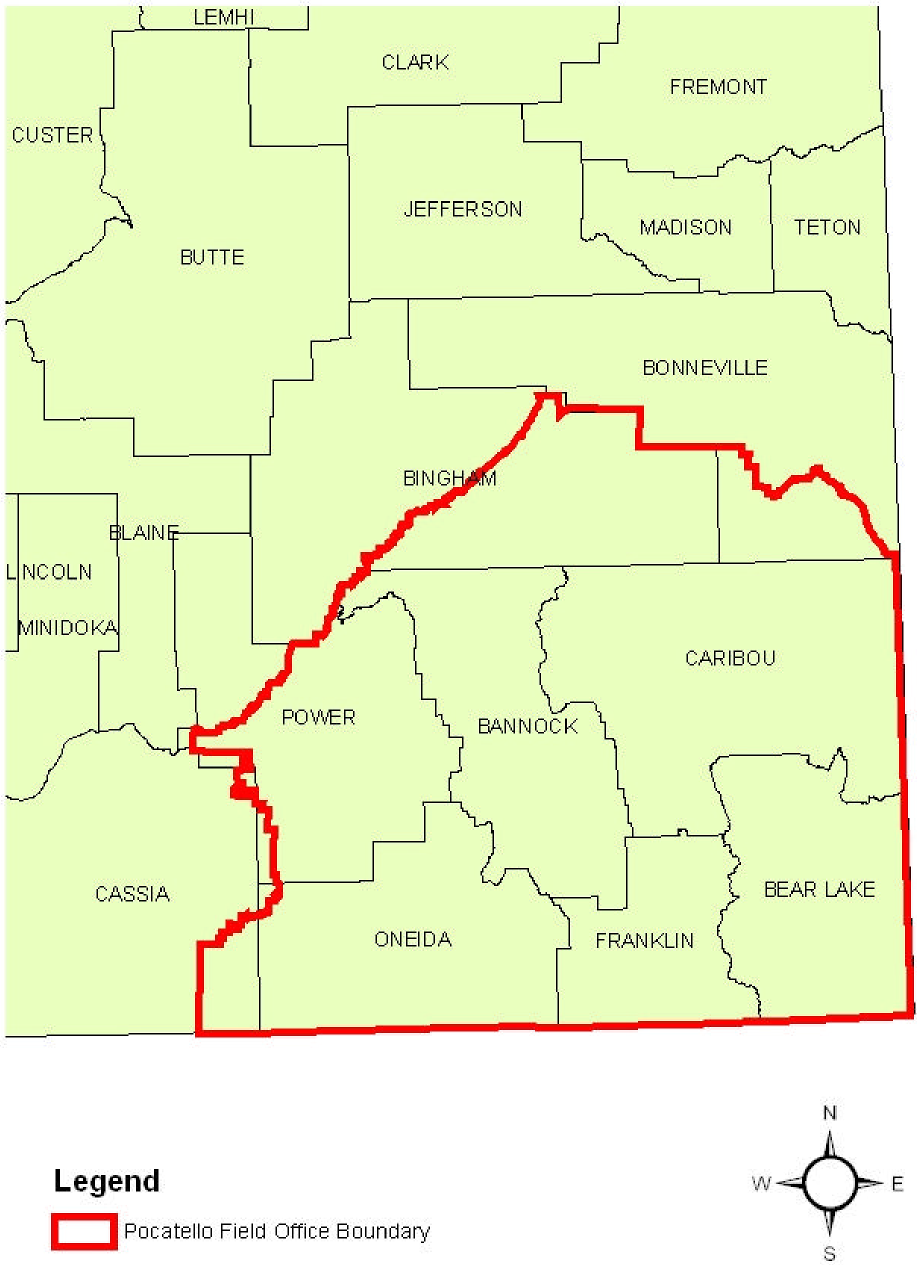

FIGURE 1: BLM-Pocatello Field Office Area

FIGURE 2: BLM-Pocatello Field Office area and Area of Consideration (approximate 100 km radius)

2.0 AIR QUALITY STANDARDS

Air quality within the PFO boundaries is governed by Federal laws that the State of Idaho has been given authority to administer by the EPA. Statutes within the Idaho Environmental Protection and Health Act codify the Idaho Department of Environmental Quality (IDEQ) compliance and enforcement authority over the air quality program. The framework for the air quality program is based on the Federal Clean Air Act (CAA) as amended in 1990. Idaho generally regulates the emission of various pollutants although the EPA retains primacy on some programs. Specifically, the State of Idaho has adopted the Federal regulations promulgated in 40 CFR 52 Approval and Promulgation of Implementation Plans (Prevention of Significant Deterioration); 40 CFR 60 Standards of Performance for New Stationary Sources; and 40 CFR 61 & 63 National Emission Standards for Hazardous Air Pollutants. These regulations can be found as State rules in Idaho Administrative Procedures Act (IDAPA) 58.01.01 Rules for the Control of Air Pollution in Idaho.

The CAA was passed by Congress to protect human health and the environment, as well as visibility in sensitive areas. The CAA encourages or otherwise promotes reasonable Federal, State, and local governmental actions, consistent with the provisions of the Act, for pollution prevention. The CAA consists of six titles, several of which cover a broad spectrum of concerns. Of the six titles, Title I has the most impact on actions undertaken by the PFO planning effort. Title I of the CAA addresses primarily air pollution prevention and control with subparts pertaining to emissions limitations, ozone protection, prevention of significant deterioration of air quality, and plan requirements for non-attainment areas. A full description of the CAA can be found at www.epa.gov/oar/caa/contents.html.

The BLM's Land Use Planning Handbook (BLM 2000) also specifies the CAA requirements for a) Applicable National Ambient Air Quality Standards (Section 109); b) State Implementation Plans (Section 110); c) Control of Pollution from Federal Facilities (Section 118); d) Prevention of Significant Deterioration, including visibility impacts to Mandatory Class I Areas (Section 160 et. Seq); and e) Conformity Analysis and Determinations (Section 176(c)) be considered in land use planning decisions. The Handbook guidelines also specify the requirements for "Implementation Decisions" and "Notices, Consultations, and Hearings" (BLM 2000).

2.1 National Ambient Air Quality Standards

National Ambient Air Quality Standards (NAAQS) are defined in the CAA Title I, Part A, Section 109 as levels of pollutants above, which detrimental effects on human health and welfare may result. The EPA established NAAQS for six criteria pollutants. These include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), sulfur dioxide (SO_2), and two categories of particulate matter; fine particulates with an aerodynamic diameter of 10 micrometers or less (PM_{10}), and fine particulates with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$). The IDEQ has included an additional standard for fluorides bringing the applicable standards in Idaho to seven.

There are two types of air quality standards; primary and secondary. Primary standards are designed to protect susceptible segments of the population, including the very young, the very old, and those with respiratory problems or other ailments. Secondary standards are designed to protect human health welfare, or quality of life for the criteria pollutants. Most of the secondary standards are set at the same levels as the primary standards. All of the standards are expressed as concentration and duration of exposure, including both short-term and long-term exposure. For example, the PM_{10} average annual standard is 50 micrograms per cubic meter (ug/m^3) and the 24-hour standard is 150 ug/m^3. Standards for $PM_{2.5}$ include an annual average standard of 15 ug/m^3 and a 24-hour standard is 65 ug/m^3. Fluoride standards, which correlate the concentration in air to the concentration in vegetation, has a primary and secondary standard expressed as those concentrations in the ambient air that result in a total fluoride content in vegetation used for feed and forage of no more than 40 milligrams per kilogram (mg/kg) annually, 60 mg/kg bimonthly, and 80 mg/kg monthly.

When an area within a state exceeds an ambient air quality standard (usually around an urban center), it may be designated as a non-attainment area (NAA). Areas in which levels of a criteria pollutant measure below the health-based standard are designated as attainment areas. Areas that have been designated as NAAs may also be subclassified based on the severity of non-attainment. For example, PM_{10} NAAs may initially be classified as "moderate" or "severe" areas depending whether the areas is determined to be practicably able to attain NAAQS for PM_{10} within six years. It is possible for a geographic area to be an attainment area for one criteria pollutant and a non-attainment area for another. Air-monitoring networks which measure ambient air quality have been established to determine whether an area meets the ambient air quality standard (IDEQ 2003a). An area that has been designated as a non-attainment area, but subsequently meets the NAAQS, may be redesignated by the EPA as a maintenance area.

If an area falls into a non-attainment status the IDEQ is required to prepare an State Implementation Plan (SIP) to describe how the area will be brought into an attainment status. As an example, a small portion of PFO area (Portneuf Valley around Pocatello and Chubbuck) is designated a non-attainment area for PM_{10}. The IDEQ is currently preparing a draft SIP to address PM_{10} exceedances, which is scheduled for submittal to the EPA in April 2004. Title I Part D Subpart 1 Section 176(c) of the CAA, pertaining to federal actions where an SIP has been approved by the EPA, states: *"No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to an implementation plan after it has been approved or promulgated under Section 110."*

The Pocatello RMP planning area falls under the jurisdiction of the IDEQ Division of Air Quality. As a part of the CAA adopted by the State of Idaho, a conformity determination must be made for projects planned within non-attainment or maintenance areas to show that the projects will not contribute to any ambient air quality standard violations. Persons planning projects in the vicinity of non-attainment or maintenance areas would need to evaluate the potential impacts of emissions to these areas in project-specific NEPA analyses.

Under the EPA's Natural Events Policy, the EPA may exercise its discretion not to designate an area as non-attainment if high PM_{10} concentrations are attributable to wildland fire. However, the State is required to develop and implement a Natural Events Action Plan (NEAP) to respond to the health impacts of natural events. In March of 2002, the IDEQ completed a NEAP for Idaho in response to the extensive natural wildland fire events of 2000 (IDEQ 2002).

NAAQS Related Programs

The emission of the six NAAQS criteria pollutants plus fluoride can have a direct impact not only on human health in local areas but also on regional visibility and pollution levels. Specific programs to address the affected resources or the sources of impacts are summarized below.

Prevention of Significant Deterioration of Air Quality

The Title 1, Part C of the CAA, entitled Prevention of Significant Deterioration (PSD) and identified in IDAPA 58.01.01.579 through 581, applies to all areas of the State except those designated as non-attainment. In addition, a potential new emission source (whether a new facility or major modifications to an existing facility) must undergo a New Source Review (NSR) as outlined in IDAPA 58.01.01.205 and 205.

The baseline for the criteria pollutants necessary to determine whether an area's air quality is deteriorating was developed, starting in 1975. Incremental increases in certain criteria air pollutants (PM_{10}, SO_2 and NO_2) are allowed over the baseline concentrations. There are different permissible increments for PM_{10}, SO_2 and NO_2 for different averaging times and areas (termed "Classes"). There are three Classes that an area could be designated.

- Class I areas were in existence on August 7, 1977 and are comprised of a) International Parks; b) National Wilderness areas which exceed 5,000 acres; c) National Memorial Parks which exceed 5,000 acres; and d) National Parks which exceed 6,000 acres.

- All other areas of the State have been designated as Class II.

Similar special status areas created after 1977, including National Wildlife Refuges, National Wild and Scenic Rivers, and others that exceed 10,000 acres can be redesignated as Class I. Class I areas afford the highest protection to air quality by most restricting the amount of further degradation allowed. An area can be designated as Class III with legislative action, consultation with regulatory agencies, impacted land management agencies and others, and public involvement. Sensitive areas identified within the PFO area of consideration (including Class 1 areas) are discussed in Chapter 5 of this document.

In addition to the further degradation limits applied to Class I areas, 1999 amendments to the CAA in Section 169A set forth a national goal for visibility. The rule, referred to as the Regional Haze Rule, calls for States to establish goals and emission reduction strategies for improving visibility in all mandatory Class I national parks and wilderness areas. In compliance with the EPA's Regional Haze Rule, the State of Idaho is currently preparing a regional haze SIP.

Wildland and Prescribed Fire Smoke Management

In April 1998, the EPA in cooperation with other Federal land managers, States and Tribes, issued the *Interim Air Quality Policy on Wildland and Prescribed Fires*. One of the goals of this policy is to allow fire to function as a disturbance process on federally managed wildlands while protecting public health and welfare. Smoke management programs can be certified by the EPA and are determined at the State's discretion to be either voluntary or mandatory.

An example of this management that directly affects the PFO and RMP planning effort is the management of smoke emissions from forest and range prescribed burning under the Montana/Idaho Joint Smoke Management Program. Participants include landowners and managers (Federal, State, Tribal, and private), DEQ, and the National Weather Service. The program is voluntary in Idaho. Burn plans written under this program must include actions to minimize fire emissions, a smoke dispersion evaluation, public notification, exposure reduction procedures, and an air quality-monitoring plan. Groups planning a burn(s) submit planned burn lists at the beginning of the calendar year and report individual burns one day prior to ignition. A full-time meteorologist uses burn activity, weather, and air quality information to make daily "go/no go" recommendations for planned burns (BLM 2004).

2.2 National Emission Standards for Hazardous Pollutants and the Idaho Air Toxics Program

Hazardous air pollutants are defined as pollutants that cause or may cause cancer or other serious health impacts, such as reproductive effects or birth defects, or adverse environmental and ecological effects (IDEQ 2003c). Air toxics are regulated by both State and Federal programs. Idaho's Air Toxics Program regulates approximately 350 toxic air pollutants (TAPs), while EPA's Federal program regulates approximately 188 hazardous air pollutants (HAPs). Both TAPs and HAPs are referred to as air toxics.

Idaho's TAP program preceded the Federal program. Some areas overlap in the State and Federal programs (IDEQ 2003c).

Idaho's TAP Program

Idaho's TAP Program is a stand-alone risk-based program that regulates approximately 350 pollutants determined by their nature to be toxic to human or animal life or vegetation. Idaho's regulations prohibit emission of these contaminants alone or in combination with other contaminants in amounts that would injure or unreasonably affect human or animal life or vegetation. TAP emission limits from industrial sources are limited by acceptable ambient concentrations (AACs) for carcinogenic and non-carcinogenic pollutants and by screening emission levels (ELs) for non-carcinogens (IDEQ 2003c). AACs are the maximum concentration levels allowed in the outside air from a pollution source or sources under construction or modification. Compliance is often verified by computer modeling or ambient air sampling. AACs for non-carcinogens are 24-hour averages. These levels can be found in IDAPA 58.01.01.585. Acceptable ambient concentrations for carcinogens (AACCs) are annual averages. These levels can be found in IDAPA 58.01.01.586.

ELs are stack-based emission levels and are based on pounds of each pollutant emitted per hour. Compliance is often verified by engineering calculations, computer modeling, or stack sampling. Emission levels for non-carcinogens can be found in IDAPA 58.01.01.585, while emission levels for carcinogens can be found in IDAPA 58.01.01.586

If a new or modified source emits an air toxic that is regulated by both Idaho's program and EPA's HAP program, the source is regulated by the Federal standard. If the source emits additional TAPs not covered under the applicable Federal standard, the source is also subject to the State regulations for those pollutants.

EPA's Hazardous Air Pollutant Program

The CAA Section 112 requires EPA to regulate emissions of 188 Hazardous Air Pollutants (HAPs) from a published list of industrial "source categories." EPA has identified source categories that must meet technology requirements to control HAP emissions and is required to develop regulations for all industries that emit one or more of the HAPs in significant quantities. These standards are called the "National Emissions Standards for Hazardous Air Pollutants" (NESHAPs) or "Maximum Achievable Control Technology" (MACT) standards. MACT standards are based on emissions levels already achieved by the best-performing similar facilities and are designed to reduce HAP emissions to a maximum achievable degree, taking into consideration the cost of reductions and other factors. The standards have been codified in 40 CFR 63.

EPA's MACT standards are based on emissions levels already achieved by the "best-performing" similar facilities. When developing a MACT standard for a particular source category, EPA considers the current level of emissions achieved by best-performing similar sources through clean processes, control devices, work practices, or other methods. These emissions levels set a baseline, often referred to as the "MACT floor" for the new standard. At a minimum, a MACT standard must achieve, throughout the industry, a level of emissions control that is at least equivalent to the MACT floor. EPA can establish more stringent standards based on economic, environmental, and public health considerations.

Fugitive Dust

Fugitive dust is defined as particulate matter suspended in the air by the wind and human activities. It originates primarily from the soil and is not emitted from vents, chimneys or stacks (IDEQ 2003b). Idaho air quality regulations also stipulate that "all reasonable precautions shall be taken to prevent particulate matter from becoming airborne" (IDAPA 58.01.01.651). A fugitive dust Best Management Practices (BMP) document has been developed by IDEQ and representatives of the rock crushing industry to help manage and minimize fugitive dust at facilities where fugitive dust has been identified as a issue (IDEQ 2003b).

3.0 REGIONAL CLIMATE AND METEOROLOGY

The PFO area is bounded by the southeastern edge of the Snake River Plain on the northwest and includes north-south trending mountain ranges of the Idaho-Wyoming Thrust Belt in the northern and eastern portion and north-south trending mountain ranges of the Basin and Range physiographic province in the western portion. Major valley elevations range from approximately 4,500 to 6,000 feet above mean sea level with mountain top elevations ranging between 9,000 to 10,000 feet above mean sea level. The topography of the area locally influences wind speed and direction as well as precipitation amounts due to orographic lifting.

Climate in the PFO planning area varies widely. Table 1 presents temperature, precipitation, and snowfall averages for six valley locations within the PFO area. Regionally, the amount of precipitation received in the PFO area is directly influenced by the Cascade and Sierra mountains to the west and the Bitterroot and Rocky Mountains to the north. These features reduce the amount of Pacific moisture available to fall as precipitation and effectively create a semi-arid climate in the PFO area.

Monsoonal moisture flows in the summer are modified by the arid Great Basin area of Utah and Nevada and occur infrequently. While the amount of precipitation falling across the PFO area is a limiter of dry land agricultural activities, the relatively large precipitation amounts received in headwater mountains, utilized through reservoirs and canal systems, in combination with deep irrigation wells, allows for a greater range of agricultural products in certain areas. The growing season (freeze-free duration) is in the order of 125 days in the Pocatello area and shorter in other higher elevation areas including the eastern PFO area valleys (Idaho Climatologist, 2003).

The Climate Prediction Center (CPC), together with the United States Department of Agriculture, the National Drought Mitigation Center in Lincoln, Nebraska, and NOAA's National Climatic Data Center, issues a weekly drought assessment called the United States Drought Monitor. The Monitor provides a consolidated depiction of national drought conditions based on a combination of drought indicators and field reports. The CPC issues the Seasonal United States Drought Outlook each month in conjunction with the Thursday release of the long-lead temperature and precipitation outlooks near the middle of the month (NOAA/NWS, 2003). Current conditions may be found on the NOAA web site at http://www.cpc.noaa.gov/products/expert assessment/drought assessment.html.

3.1 Temperature

The winter can bring temperatures well below 0 degrees Fahrenheit (°F), however, frequent southwest winds can moderate cold winter conditions. Sub-zero conditions usually last only a few days each season. Several periods of continuous below-freezing temperatures are common and can last several days. Spring and fall temperatures can vary widely with daytime temperatures typically ranging between 30°F and 70°F. Summer temperatures frequently rise into the 90°F range, however, long spells of extremely hot weather are not common. Summertime night temperatures frequently drop into the 50°F and 60°F.

TABLE 1
Monthly Climatic Data Summary
Pocatello RMP Planning Area

Month	Malad				Pocatello				Preston			
	Average Max Temp (°F)	Average Min Temp (°F)	Average Total Precip (in)	Average Total Snowfall (in)	Average Max Temp (°F)	Average Min Temp (°F)	Average Total Precip (in)	Average Total Snowfall (in)	Average Max Temp (°F)	Average Min Temp (°F)	Average Total Precip (in)	Average Total Snowfall (in)
JAN	32.2	13.5	1.59	10.8	32.5	15.1	1.1	9.4	31.3	12.9	1.29	11.1
FEB	37.5	17.8	1.26	5.4	38.4	19.9	0.9	6.2	36.7	15.7	1.19	7.9
MAR	46.4	24.4	1.15	5.2	47.3	26.2	1.18	5.4	48.5	24.6	1.34	4.1
APR	58.6	32.5	1.23	1	58.2	32.9	1.1	3.7	58	31.3	1.44	1.5
MAY	68.7	39.7	1.52	0	68.2	40.4	1.34	0.4	68.4	39.1	2	0
JUN	77.8	46.1	1.4	0	77.5	46.9	1.05	0	77.6	45.1	1.45	0
JUL	88.4	52.9	0.8	0	88.2	53.2	0.53	0	87	51	0.89	0
AUG	86.7	51.2	0.81	0	86.8	51.6	0.6	0	86.7	50.3	1.01	0
SEP	77.2	42.4	0.96	0	75.8	42.9	0.79	0	75.6	41.3	1.41	0
OCT	64.1	33.6	1.1	0.5	62.5	33.6	0.86	1.8	61.6	31.4	1.55	0.7
NOV	46.2	24.2	1.3	3.5	45.3	24.9	1.06	4.7	44.9	23.4	1.31	2.9
DEC	35.8	17.5	1.48	9.3	34.8	17.5	1.03	8.5	32.6	13.7	1.5	12.1
ANNUAL	60	33	14.59	35.7	59.6	33.8	11.55	40.3	59.1	31.7	16.39	40.4
	Soda Springs				**Montpelier**				**Conda**			
JAN	30.5	8.9	1.12	11.3	29.5	6.3	1.2	13.4	29.2	8.2	2.05	25.9
FEB	32.6	10.3	1.14	8.6	33.6	8.6	1.15	11.8	33.2	9.8	1.58	19.4
MAR	41.8	19.1	1.36	7.8	40.3	16.1	1.28	9.4	38.8	14.6	1.55	16.8
APR	53.9	26.4	1.32	3.3	52.9	26.7	1.32	3.9	49.2	25.2	1.6	7
MAY	63.7	34.1	2.3	0.5	64.7	34.7	1.42	0.8	62.6	33.8	2	2.1
JUN	73.7	39.8	1.36	0.1	74.3	41.3	1.48	0.1	71.3	39.8	1.72	0.1
JUL	83.4	44.6	1.3	0	85	47.2	0.76	0	81.7	45.4	0.9	0
AUG	82.7	43.9	1.29	0	83.4	45	0.91	0	81.3	43.5	1.08	0
SEP	72.2	36	1.28	0	73.1	36.2	1.15	0.2	71.7	35.1	1.37	0
OCT	58.6	26.3	1.19	1	60.6	27.8	1.14	1.6	58.9	27.1	1.33	3.4
NOV	41.5	18.5	1.21	5.6	42.5	18.4	1.09	7.1	41.6	18.7	1.74	11.2
DEC	30.9	8.3	1.04	9.3	32.4	10.5	1.19	13.3	31.5	10.5	2	22.2
ANNUAL	55.4	26.3	15.91	47.6	56	26.6	14.09	61.6	54.2	26	18.91	108.2

Data from Western Regional Climate Center 11/21/03 (www.wrcc.dri.edu/narratives/Idaho.htm)

3.2 Precipitation

Spring months in the PFO area are normally wet and windy. Weather conditions fluctuate quickly during the spring. Thunderstorms are not uncommon, and are usually accompanied by rain showers and occasional snow. Low elevation snowpack usually melts quickly during the spring, but high elevation snowpack can persist into late June.

Thunderstorms with accompanying showers are common from late spring through summer. Precipitation is usually localized during these events. The severity of thunderstorms is usually not significant and tornadoes are infrequent. However, lightning, hail, and gusty winds may present a hazard during thunderstorm events.

Cooler weather in the fall generally begins in early September. Daytime highs in the 70s°F migrating to the mid 40s°F by mid-November are common. Fall storms are usually very fast moving, and can usher in cold weather suddenly. These temperatures generally abate after a few days. Sunny, warm days with cool nights typify the season. Continuous home heating is seldom needed until mid October. The first significant cold period with highs below 20°F and lows around 0°F may arrive anytime between late November and late December (Idaho Climatologist, 2003). A color relief figure depicting the annual average precipitation in the PFO area is presented as Figure 3.

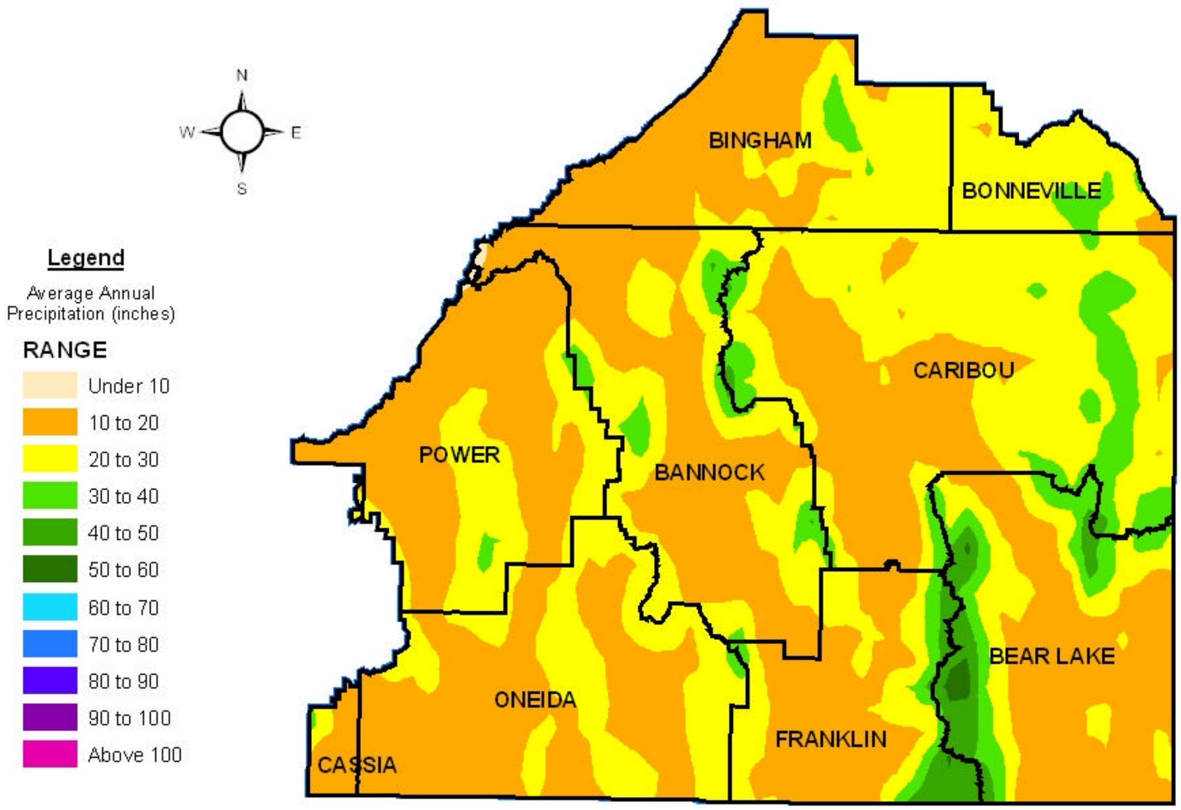

FIGURE 3: Average annual precipitation in the PFO area (NRCS 2003).

3.3 Wind

More than 50 percent of the observed wind directions are from the quadrant between south and west (IDEQ 1999). The strongest wind events generally are associated with thunderstorm activities that occur in the spring and summer. These events are generally limited in duration but 40 to 60 mile per hour (mph) gusts are possible. Longer term wind events are common with the approach of low pressure frontal boundaries. These conditions are typified by south to southwesterly wind directions prior to frontal passage followed by northwesterly winds. The events may last several days with wind speeds commonly between 15 and 30 mph. The frontal passages creating the winds are most common in the fall, winter and spring. A third type of condition, typified by persistent southwest to west winds that can moderate cold temperatures and improve inverted atmospheric conditions, is common in the winter and is often associated with the a lower elevation jet stream. This condition is regionally referred to as a "Chinook" but also is applied to winds associated with an approaching frontal boundary.

The effect of strong winds on soil moisture evaporation and snowpack sublimation can be significant in the region. The effect of local topography can alter the prevailing wind direction as well as increase the wind speed through constricted valleys. Ridge tops typically experience accelerated wind speeds as air is forced over the ridge tops.

3.4 Fog and Inversion

The data on fog are limited to areas where National Weather Service offices are located. The Pocatello area has an average of 18 days of dense fog per year (IDEQ 1999), the maximum monthly average being four in January (Idaho Climatologist, 2003). These occurrences of fog are relatively infrequent, so much so that no extensive statistics on frequency or critical areas are available (Idaho Climatologist, 2003). The occurrence of PM_{10} exceedances are commonly associated with inversion and fog events.

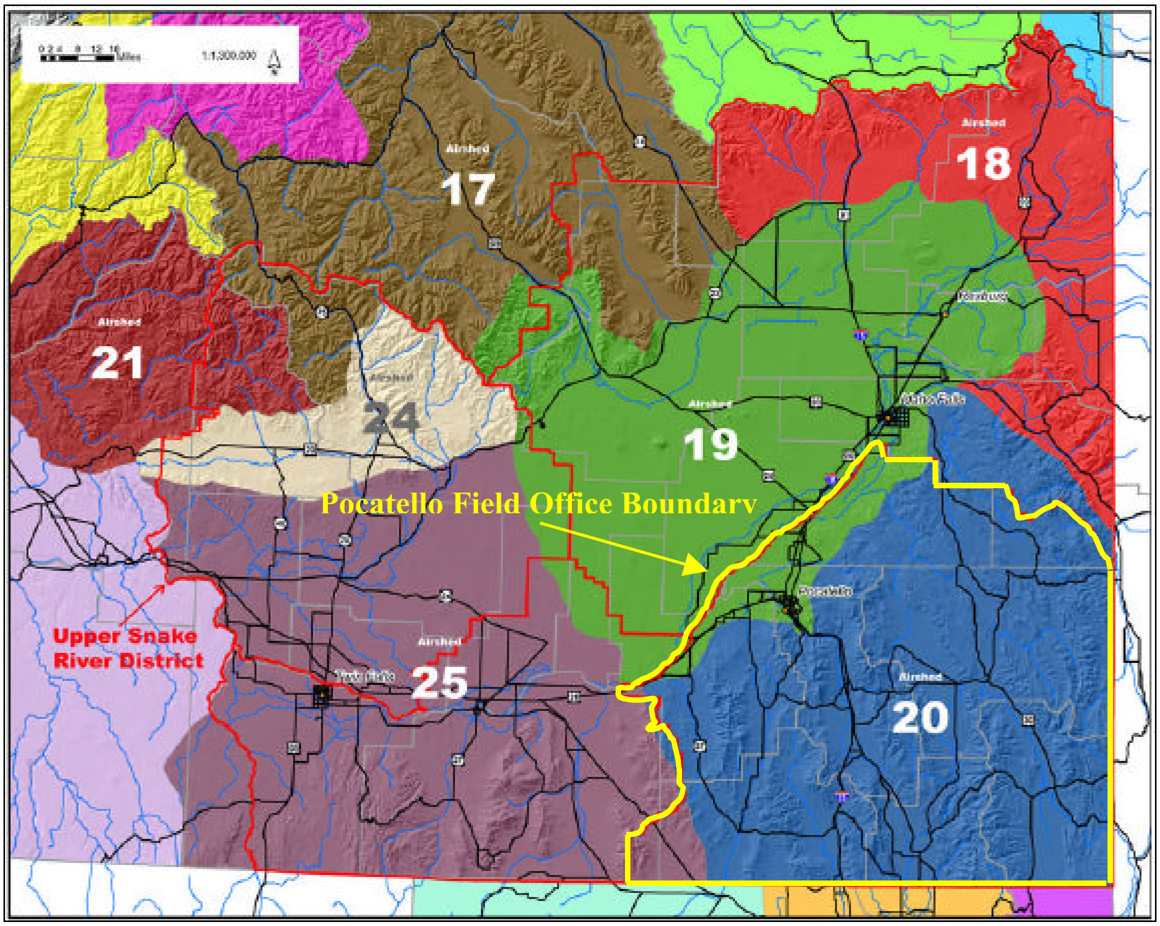

FIGURE 4: Airshed delineations in the Pocatello RMP planning area (from Trinity 2003).

3.5 Airshed Delineation and Characterization

An airshed is defined as "a geographical area in which atmospheric characteristics are similar e.g. mixing height and transport winds" (MIAG 2003). Twenty-five airsheds have been delineated within the Montana/Idaho airshed group. The PFO boundary incorporates the majority of airshed 20, and portions of airsheds 19 and 25 (Figure 4). Airshed 19 covers approximately 4,889,269 acres, including approximately 36 percent BLM-managed lands. Airshed 20 covers approximately 4,956,485 acres with approximately 10 percent BLM-managed lands. Airshed 25 covers about 4,975,314 acres with approximately 45 percent BLM-managed lands (Trinity 2003). Wind dispersion potential of the Upper Snake River District airsheds is generally characterized with the highest wind speeds occurring during the summer months (April to July) and the lowest in the fall (October). The wind direction during the times of highest wind speed tends to be from the southwest and from the northeast during the times of lower wind speed. An extensive analysis of air quality within the PFO and surrounding area has been compiled in an "Airshed Characterization Report" being completed by Trinity Consultants as part of the BLM – Upper Snake River District FMDA (BLM 2004).

4.0 CURRENT AIR QUALITY

The State of Idaho DEQ maintains an extensive air quality monitoring network that routinely measures ambient concentrations of five criteria pollutant identified by the CAA (PM_{10}, $PM_{2.5}$, CO, NO_2, SO_2, O_3; the IDEQ no longer monitors airborne Pb levels). Flourides are primarily monitored in the Portneuf Valley area. Particulate matter (PM_{10}, $PM_{2.5}$) is currently the most common pollutant identified in the PFO area. Appendix A presents a table summarizing PM_{10}, $PM_{2.5}$, and SO_2 air quality monitoring trends (NAAQS exceedances) collected between 1993 and 2003 (EPA 2003). Common sources of particulate matter include wind blown dust, re-entrained road dust, smoke (residential, agricultural, and forest fires), industrial emissions, and motor vehicle emissions. Localized sources (primarily large industrial sources in Pocatello and Soda Springs) of NO_2 and SO_2 are also a concern (IDEQ 2001).

As previously noted, an extensive analysis of air quality within the PFO and surrounding area has been compiled in an Airshed Characterization Report (Trinity 2003) summarizing airshed descriptions, emissions summaries, monitoring networks, fire history, and dispersion potential. In brief, particulate matter emissions are the predominant air pollutant identified in the PFO area. Within the counties located in the PFO, the predominant (generally greater than 90 percent) particulate matter sources are categorized as "fugitive dust" and "agricultural and forestry activities," with the exceptions of Power County where “mineral product processing” accounts for approximately 21 percent of PM_{10} emissions and 50 percent of $PM_{2.5}$ emissions, and Caribou County were “inorganic chemical manufacturing” accounts for 19 percent of $PM_{2.5}$ emissions. All of the counties within the PFO boundary show an improving (decreasing annual emissions) trend over a five year period (1995-1999) for both PM_{10} and $PM_{2.5}$ concentrations (Trinity 2003).

4.1 Areas Exceeding NAAQS

Two PM_{10} non-attainment areas (NAA) have been designated in the PFO area. These areas include the Portneuf Valley PM_{10} NAA and the Federal Fort Hall PM_{10} NAA. Both of these areas have been classified as "moderate" PM_{10} NAAs. These areas were previously designated as the single Power/Bannock Counties PM_{10} NAA. The Federal Fort Hall PM_{10} NAA lies within the Fort Hall Indian Reservation, and is administered by the Shoshone-Bannock Tribes with environmental program direction provided by the EPA. The Portneuf Valley PM_{10} NAA is under the jurisdiction of the IDEQ Division of Air Quality.

The Portneuf Valley PM_{10} NAA is comprised of 96.6 square miles of Pocatello, Chubbuck and surrounding areas, and includes BLM and Caribou National Forest land, as well as privately owned land (IDEQ 2001). The IDEQ is currently preparing a draft SIP and maintenance plan to address PM_{10} exceedences, which is scheduled for submittal to the EPA in April 2004.

The Federal Fort Hall PM_{10} NAA is located adjacent to the northwest of the Portneuf Valley PM_{10} NAA (see figures in Appendix B, IDEQ 1999 and 2001) and is under the jurisdiction of the Shoshone-Bannock tribes. An EPA - Federal Implementation Plan (FIP) for the area was completed in August 2000 (EPA 2000). A primary source for PM_{10} emissions in the Fort Hall area was identified as the Astaris, LLP (formerly FMC) elemental phosphorous plant located west of the NAA. The Astaris plant closed in December 2001.

The City of Soda Springs is also an area of concern. Exceedances of PM_{10} and SO_2 have been recorded in the area. The area is not currently designated a NAA, but PM_{10} and SO_2 monitoring is ongoing due to concern about current mining and mineral processing activities in the area.

5.0 SENSITIVE AREAS

In evaluating the impacts of various activities on air quality, consideration must also be given to the location of the proposed activities and their proximity to areas that may be particularly sensitive to air quality. Areas that have been identified as sensitive to air quality include locations such as NAAQA non-attainment areas, hospitals, airports, Class I visibility areas, major transportation corridors, as well as population centers.

5.1 Non-attainment Zones

Areas in which levels of criteria pollutants measure above the health-based standards are designated as non-attainment areas. The dominant air pollutant identified in the region is particulate matter from sources such as wind blown dust, re-entrained road dust, smoke, industrial emissions, and motor vehicle emissions (IDEQ 2001).

There are two areas within the PFO boundary that are classified as non-attainment areas, including the Portneuf Valley Area (Pocatello area) and Fort Hall Indian Reservation (Tribal/EPA area) (see Appendix B). Both of these areas are non-attainment areas for PM_{10}. Ogden City in Weber County, Utah has also been identified as a non-attainment area within the 100 km area of consideration.

5.2 Impact Zones

Impact zones are areas considered by IDEQ and the Montana/Idaho Airshed Group (MIAG) to be areas where smoke is likely to be a problem because of local topography, meteorology, existing air quality problems, or other factor (MIAG 2003). Ten impact zones have been established in Idaho. The PFO boundary and area of consideration contain the Pocatello (PID) and Idaho Falls (IDA) impact zones. Approximately 35,354 acres of BLM-managed lands lie within the PID impact zone, and approximately 503,690 acres of BLM-managed land are within the IDA impact zone. Appendix C presents a map identifying the impact zones established by MIAG (2003).

5.3 Class I Visibility Areas

There are no Class I visibility areas currently designated within the PFO boundary (EPA 2002). There are portions of three Class I areas identified within the area of consideration. These include: Craters of the Moon National Monument and Preserve Wilderness Area, Grand Teton National Park, and the Bridger Wilderness Area.

5.4 Hospitals

There are numerous hospitals and medical centers within the PFO boundary and the area of consideration. Table 2 presents the name and locations of the identified hospitals.

TABLE 2
Location of Hospitals within the PFO Boundary and Area of Consideration

COUNTY	HOSPITAL	MUNICIPALITY
Bannock, ID	Northwest Band of Shoshone Health Center	Fort Hall Indian Reservation
	Portneuf Regional Medical Center	Pocatello
	Rocky Mountain Surgery Center	Pocatello
Bear Lake, ID	Bear Lake Regional Hospital	Montpelier
Bingham, ID	Bingham Memorial Hospital	Blackfoot
	State Hospital South	Blackfoot
Bonneville, ID	Eastern Idaho Regional Medical Center	Idaho Falls
	Grand Teton Surgical Center	Idaho Falls
Butte, ID	Lost Rivers District Hospital	Arco
Caribou, ID	Caribou Memorial Hospital and Living Center	Soda Springs
Cassia, ID	Cassia Regional Medical Center	Burley
Franklin, ID	Franklin County Medical Center	Preston
Madison, ID	Madison Memorial Hospital	Rexburg
Oneida, ID	Oneida County Hospital	Malad
Power, ID	Harms Memorial Hospital	American Falls
Teton, ID	Teton Valley Hospital and Surgicenter	Driggs
Lincoln, WY	Star Valley Medical Center	Afton
Teton, WY	St John's Hospital and Living Center	Jackson
Uintah, WY	Evanston Regional Hospital	Evanston
	Wyoming State Hospital	Evanston
Weber, UT	McKay – Dee Hospital	Ogden
	Ogden Regional Hospital	Ogden
Box Elder, UT	Bear River Valley Hospital	Trementon
	Brigham City Community Hospital	Brigham
Cache, UT	Cache Valley Specialty Hospital	Logan
	Logan Regional Hospital	Logan

5.5 Airports

Airports within the Pocatello Field Office boundary and area of consideration are listed in Table 3.

TABLE 3
Location of Airports within the PFO Boundary and Area of Consideration

COUNTY	AIRPORT	MUNICIPALITY
Bannock, ID	Downey (Hyde Memorial) Airport	Downey
Bear Lake, ID	Bear Lake County Airport	Paris
Bingham, ID	Midway Airport	Atomic City
	Coxs Well Airport	Atomic City
	Big Southern Butte Airport	Atomic City
	McCarley Field Airport	Blackfoot
	Rockford Municipal Airport	Rockford
Bonneville, ID	Idaho Falls Regional Airport	Idaho Falls
Butte, ID	Arco – Butte County Airport	Arco
	Howe Airport	Howe
Caribou, ID	Bancroft Municipal Airport	Bancroft
	Allen H. Tigert Airpot	Soda Springs
Cassia, ID	Burley Municipal Airport	Burley
	Oakley Municipal Airport	Oakley
Franklin, ID	Preston Airport	Preston
Fremont, ID	Stanford Field Airpot	St Anthony
Jefferson, ID	Rigby-Jefferson County Airport	Rigby
Madison, ID	Rexburg – Madison County Airport	Rexburg
Minidoka, ID	Bear Trap Airport	Minidoka
Oneida, ID	Malad City Airport	Malad
Power, ID	American Falls Airport	American Falls
	Pocatello Regional Airport	Outside Pocatello
Teton, ID	Driggs-Reed Airport	Driggs
Box Elder, UT	Brigham City Airport	Brigham
Cache, UT	Logan-Cache Airport	Logan
Weber, UT	Ogden-Hinckley Airport	Ogden
	Hill Air Force Base	Ogden
Lincoln, WY	Kemmerer Municipal Airport	Kemmerer
	Cokeville Municipal Airport	Cokeville
	Afton Municipal Airport	Afton
	Alpine Airport	Alpine
Sublette, WY	Big Piney – Marbleton Airport	Big Piney
	Ralph Wenz Field Airport	Pinedale
Teton, WY	Jackson Hole Airport	Jackson
Uinta, WY	Evanston – Uinta County Airport – Burns Field	Evanston
	Fort Bridger Airport	Fort Bridger

5.6 Major Transportation Corridors

There are several transportation corridors that run through the PFO boundary and the area of consideration. They include US Interstate 15, US Interstate 84, US Interstate 86, US Interstate 80, and US Highways 20, 26, 30, 89, 91, 93, 189, and 191. Table 4 presents a listing of transportation corridors and the counties where such features are found.

TABLE 4
Transportation Corridors within the PFO boundary and Area of Consideration

COUNTY	CORRIDORS
Bannock, ID	I-15, I-86, and US Highway 30
Bear Lake, ID	US Highway 89, US Highway 30
Bingham, ID	I-15, US Highways 20, 26, and 91
Bonneville, ID	I-15, US Highways 20, 26, and 91
Butte, ID	US Highways 20, 26, and 93
Caribou, ID	US Highway 30
Cassia, ID	I-84, I-86, and US Highway 30
Franklin, ID	US Highway 91
Madison, ID	I-15
Oneida, ID	I-15, and I-84
Power, ID	I-86
Box Elder, UT	I-15, I-84, US Highways 89, and 91
Cache, UT	US Highways 89, and 91
Weber, UT	I-15
Lincoln, WY	US Highways 26, 30,89, and 189
Sublette, WY	US Highways 189, and 191
Teton, WY	US Highways 26, 89, and 191
Uinta, WY	I-80, US Highway 189

6.0 ONGOING AND POTENTIAL ACTIVITIES

While most BLM programs in the planning area are not generally considered likely to significantly affect air quality, the increased emphasis on the use of prescribed fire must be evaluated with respect to its impact on air quality. Both wildland and prescribed fire can result in air quality impacts on a short-term basis.

Other identified activities (ongoing or potential) or sources that may impact air quality include mining and mineral processing, agriculture, forestry, construction, off-road vehicles using small or large engines (such as off-highways vehicles and bulldozers, respectively), on-road vehicles such as passenger cars, gas stations and other commercial or transportation petroleum sites, municipal waste incineration, burns on private land, wood-burning stoves, large industrial or commercial point sources such as power plants, and biogenics (naturally occurring emissions from vegetation). Cumulative effects on air quality of ongoing and potential activities should also be considered when evaluating proposed projects or new emission sources.

6.1 Prescribed and Wildfire Emissions

Prescribed burns, as well as wildland fires, may produce significant ozone, carbon monoxide, and particulate matter emissions. Photochemical reactions that produce ozone occur where smoke is penetrated by the ultraviolet wavelengths of sunlight, predominantly in the upper smoke column. Ozone may pose a problem in areas downwind of the smoke source, particularly in urban areas where ozone concentrations may already be elevated from other sources (Dost 1990, National Wildfire Coordinating Group 2001). Carbon dioxide exposure from forest or range fire appears to present minimal community health risk because it is rapidly diluted within short distances (Sandberg and Dost 1990). Particulate matter resulting from fire, however, is a concern to public health and safety. Large volumes of particulate matter can be produced from burning vegetation and may affect large geographical areas depending on meteorological conditions.

Prescribed burns, however, are viewed as beneficial because without fires, fuels, and vegetation management planning, increasing fuel loads have the potential to allow more intense uncontrolled wildland fires that may burn for longer periods of time. Thus, prescribed burns and controlled wildfires may be instrumental in minimizing or limiting hazardous particulate matter concentrations. Guidance for wildland and prescribed burn management is presented in the Draft and Final BLM-Upper Snake River District FMDA, the Interim Air Quality Policy on Wildland and Prescribed Fire (EPA 1998), the State of Idaho's final Regional Haze Rule – Visibility Plan, MIAG programs (MIAG 2003), and the EPA FIP and IDEQ SIPs. A subsequent strategy document will be prepared to present appropriate strategies and methods for describing the potential air quality impacts of proposed planning alternatives (including fire management) as part of the Pocatello RMP planning process.

6.2 Other Activities and Sources

Mining and mineral processing have been identified as important potential sources for air quality impacts (BLM 2003). Larger scale mining and processing activities in the PFO are primarily located in the Pocatello and Soda Springs areas. There are currently three active mining operations which annually produce approximately five million tons per year of raw phosphate ore combined. It is currently estimated that only a small fraction of the potentially available ore under lease in the area has been mined to date.

The following mines within the PFO area have active Federal phosphate leases, administered by BLM, as part of their authorized mine and reclamation plans:

Company	Mine	Status	Surface Owner or Mgmt. Agency
Astaris	Dry Valley	T	B, F, S, P
Agrium	Rasmussen Ridge	A	F, S
Monsanto	Enoch Valley	R	F, S, P
Monsanto	South Rasmussen Ridge	A	F, S
Simplot	Smoky Canyon	A	F
Simplot/FMC	Gay	R	I

Key:

Status	Surface Owner/Management Agency
A = Active	B = BLM
T = Active, but Temporarily Idle	F = USFS
R = Mining Complete, Reclamation in Progress	S = State of Idaho
	I = Indian (Ft. Hall Reservation)
	P = Private

In addition to concerns about PM_{10} emissions from dust and processing activities, SO_2 and fluorides have been identified as a concern from the mineral processing activities. In 1997, IDEQ reestablished an ambient SO_2 monitoring site in the Soda Springs area in response to concerns about current industrial SO_2 emissions (IDEQ 2001). While ongoing (and proposed) mining activities are strictly monitored and permitted by numerous agencies, consideration of mining activities conducted on BLM land should include an assessment of air quality impacts, including cumulative impacts such as local total emissions from all combined sources, as well as distant cumulative effects (such as the transport of mined materials elsewhere for processing).

Particulate emissions in the form of fugitive dust resulting from activities such as forestry, construction, mining and mineral processing, off-road vehicle use, and recreation activities (campgrounds) have also been identified as contributors to particulate matter emissions. In many areas fugitive dust contributes more than 75 percent of the reported particulate matter emissions (Trinity 2003). Where fugitive dust may be of concern, dust control measures are required to minimize particulate matter entrainment into the atmosphere.

The reduction of criteria pollutant and volatile organic compound emissions from activities and sources occurring on non-BLM managed land such as commercial or transportation petroleum sites, municipal waste incineration, burns on private land, wood-burning stoves, large industrial or commercial point sources should also be considered when relevant to RMP alternative evaluations or future management decisions.

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APPENDIX A

Air Monitor Trends Report
(EPA 2003)

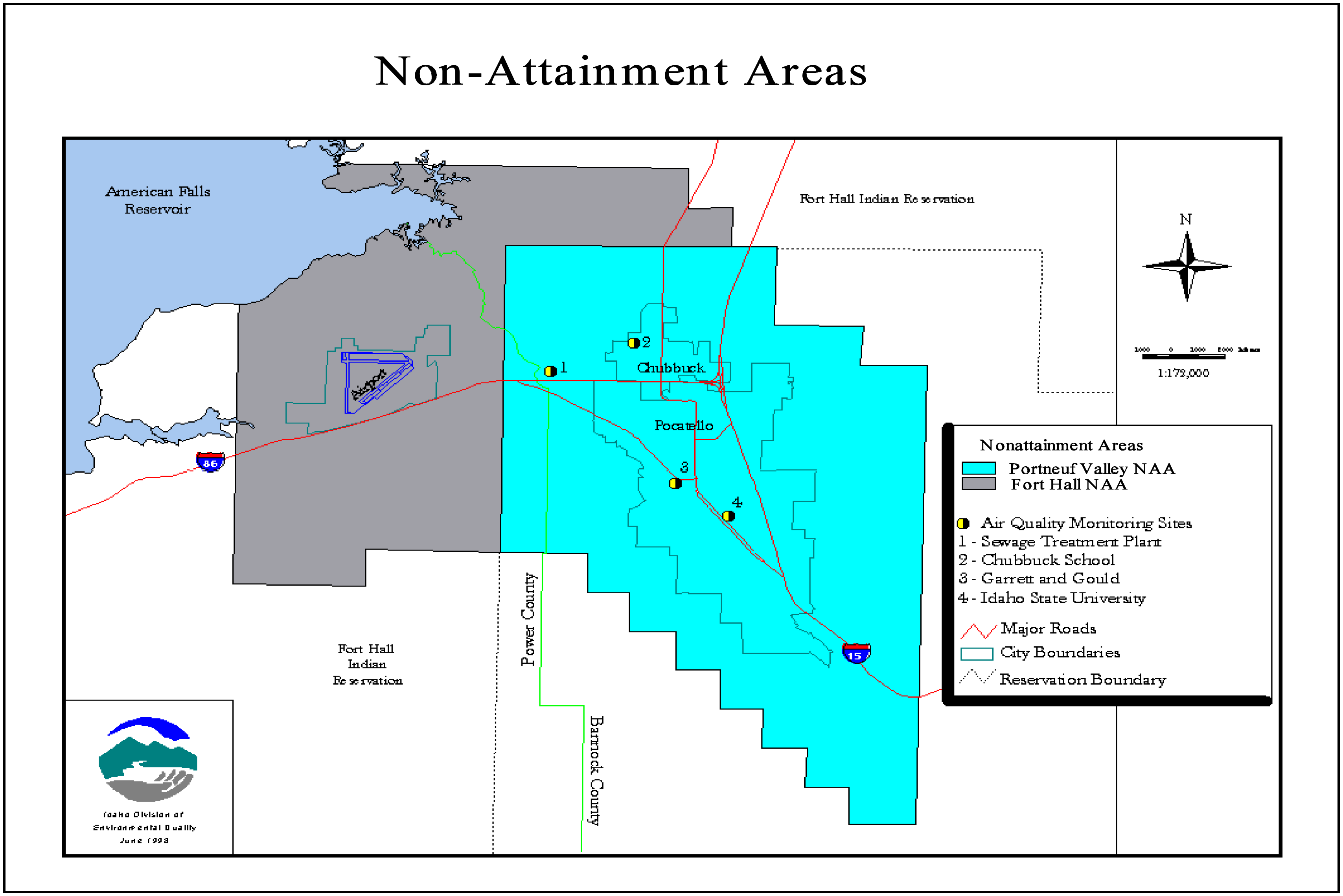
* US EPA - AirData Monitor Trends Report
* Thursday, 9-Oct-2003 at 1:32:35 PM (USA Eastern time zone)
* Geographic Area: Bannock Co, Bingham Co, Bonneville Co, Caribou Co, Power Co, ID
* Year: 2003, 2002, 2001, 2000, 1999, 1998, 1997, 1996, 1995, 1994, 1993
* Air Quality Monitors
*

Exceedances																	
1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**Pollutant**	**Monitor ID**	**Site Address**	**City**	**County**	**State**	**EPA Region**
0	0	0	0	0	0	0	0	0	0		PM10	160050004 -1	Stp/Batiste & Chubbuck Rd	Pocatello	Bannock Co	ID	10
	0	0	0	0	0	0	0	0	0	0	SO2	160050004 -2	Stp/Batiste & Chubbuck Rd	Pocatello	Bannock Co	ID	10
1	0	0	0	0	0	0					PM10	160050005 -1	Isu/Carter & 8th Street	Pocatello	Bannock Co	ID	10
0	0	0	0	0	0	0					PM10	160050006 -1	Chubbuck/5045 Hawthorne Rd	Chubbuck	Bannock Co	ID	10
						1	0	0	0	0	PM25	160050006 -1	Chubbuck/5045 Hawthorne Rd	Chubbuck	Bannock Co	ID	10
	0	0	0	0	0	0					NO2	160050015 -1	G&G/Corner Of Garret & Gould	Pocatello	Bannock Co	ID	10
					1	0	0	0	0	0	PM25	160050015 -1	G&G/Corner Of Garret & Gould	Pocatello	Bannock Co	ID	10
	0	0	0	0	0	0					SO2	160050015 -1	G&G/Corner Of Garret & Gould	Pocatello	Bannock Co	ID	10
1	0	0	0	0	0	1	0	0	0	0	PM10	160050015 -1	G&G/Corner Of Garret & Gould	Pocatello	Bannock Co	ID	10
									0	0	PM10	160050015 -2	G&G/Corner Of Garret & Gould	Pocatello	Bannock Co	ID	10
								0	0	0	PM25	160050015 -3	G&G/Corner Of Garret & Gould	Pocatello	Bannock Co	ID	10
	0	0	0	0	0	0	0	0	0		PM10	160050016 -1	Inkom/251 Grant, Inkom		Bannock Co	ID	10
		0	0								PM10	160050017 -1	Inkom-B/110 E. Hwy. 30, Inkom		Bannock Co	ID	10
								0	0	0	PM10	160050020 -1	Ballard Rd		Bannock Co	ID	10
							0	1	0	0	PM10	160110002 -1	Ross Fork Rd And Interstate 15		Bingham Co	ID	10
0											PM10	160190005 -1	Corner 6ht & N Lee St.	Idaho Falls	Bonneville Co	ID	10
	0	0	0	0	0	0					PM10	160190006 -1	Idaho Falls/1990 Rollandet Ave	Idaho Falls	Bonneville Co	ID	10
							0	0	0		PM10	160190010 -1	850 Cleveland Idaho Falls, Id	Idaho Falls	Bonneville Co	ID	10
						0	0	0	0		PM25	160190010 -1	850 Cleveland Idaho Falls, Id	Idaho Falls	Bonneville Co	ID	10
								0	0	0	PM25	160190011 -1	Hickory And Sycamore St, Idaho Falls	Idaho Falls	Bonneville Co	ID	10
										0	PM25	160190013 -2	North Holms And Pop Kroll	Idaho Falls	Bonneville Co	ID	10
							0	0	0		PM10	160290003 -1	Soda Springs/Soda Springs High School	Soda Springs	Caribou Co	ID	10
									0	0	PM25	160290003 -1	Soda Springs/Soda Springs High School	Soda Springs	Caribou Co	ID	10
				0	0	0	0	0	0		SO2	160290003 -1	Soda Springs/Soda Springs High School	Soda Springs	Caribou Co	ID	10
0	0	0	0	0	0	0	0				PM10	160290030 -1	Soda Springs (Norton)/State Highway 34	Soda Springs	Caribou Co	ID	10
								12	0	0	SO2	160290031 -1	5 Mile Road	Soda Springs	Caribou Co	ID	10
			0	0							PM10	160770008 -1	3 Kilometer Mark On Michaud Creek Road		Power Co	ID	10
			0	0	0	0	0				PM10	160770009 -1	Michaud Creek Rd And Fmc Plant Road		Power Co	ID	10
			1	1	1	1	1	0	0	0	PM10	160770010 -1	S Of Hwy 30 And W Of Weaver Rd		Power Co	ID	10
			1	1	1	1	1	0	0	0	PM10	160770011 -1	S Of Hwy 30 And E Of Weaver Rd		Power Co	ID	10
							0	0	0	0	PM25	160770011 -1	S Of Hwy 30 And E Of Weaver Rd		Power Co	ID	10
			1	1	1	1	1	0	0	0	PM10	160770011 -2	S Of Hwy 30 And E Of Weaver Rd		Power Co	ID	10
							1	0	0	0	PM25	160770011 -2	S Of Hwy 30 And E Of Weaver Rd		Power Co	ID	10

APPENDIX B

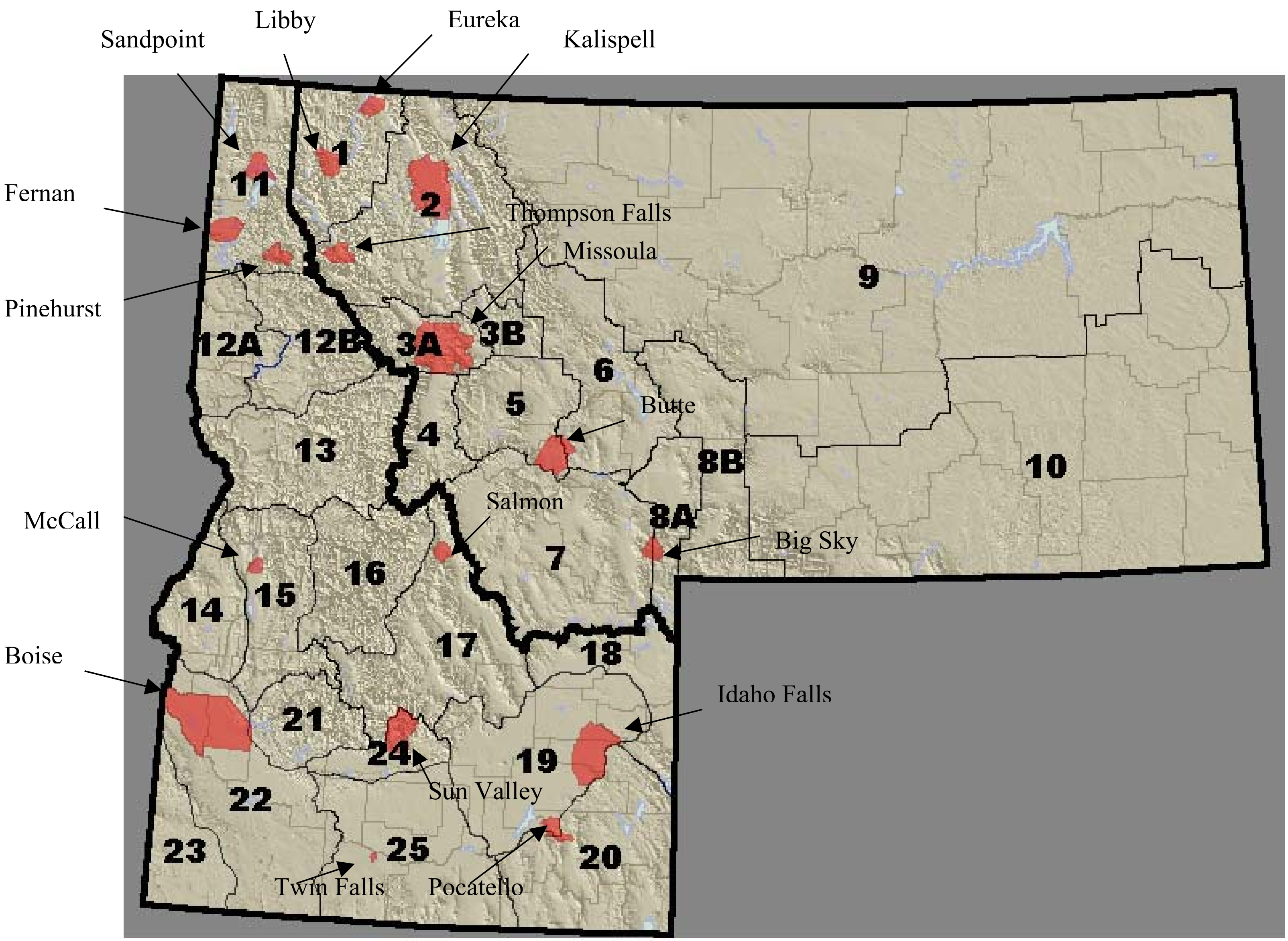
Non-attainment Areas Maps
(IDEQ 1999 and 2001)

Figure 3. Nonattainment Areas and Monitoring Sites



APPENDIX C

Air Quality Impact Zones Map
(MIAG 2003)



Idaho/Montana Airsheds and Impact Zones

APPENDIX M

PLANTS, FUNGI AND WILDLIFE SPECIES OF CULTURAL SIGNIFICANCE TO THE SHOSHONE-BANNOCK TRIBES WITHIN THE POCATELLO FIELD OFFICE AREA

PLANTS

Abronia mellifera , White sand verbena
Acer glabrum, Rocky mountain maple
Acer negundo, Box elder
Achnatherum hymenoides, Indian ricegrass
Agastache spp., Giant hyssop
Agrostis spp., Bentgrass
Alectoria spp. (lichen), witch's hair lichen
Allium spp., Onion
Alopecurus, Foxtail
Amelanchier spp., Serviceberry
Amsinckia spp., Fiddleneck
Apocynum spp., Dogbane
Aquilegia formosa, Western columbine
Arabis spp., Rockcress
Artemisia spp., Sagebrush
Aster spp., Aster
Atriplex spp., Saltbush
Balsamorhiza spp., Balsamroot
Betula occidentalis, Water birch
Bromus spp., Brome
Calochortus spp., Segolily
Camassia quamash, Camas
Carex spp., Sedge
Castilleja spp., Indian paintbrush
Ceanothus velutinus, Snowbush ceanothus
Cercocarpus ledifolius, curl-leaf mountain mahogany
Chaenactis douglasii , Hoary false yarrow
Chenopodium spp., Goosefoot
Chrysothamnus spp., Rabbitbrush
Cirsium spp., Thistle
Clematis ligusticifolia, Western white clematis
Cleome lutea, yellow spiderflower
Corallorrhiza maculata , summer coralroot
Cornus sericea, Redosier dogwood
Corydalis aurea, Scrambled eggs
Crataegus douglasii, Black hawthorn
Crepis spp., Hawksbeard
Cuscuta spp., Dodder
Cymopterus spp., Springparsley
Delphinum spp., Larkspur
Draba oligosperma, Whitlow grass
Eleocharis spp., Spikerush
Elymus spp., Ryegrass
Epilobium spp., Willowherb
Erigeron spp., Daisy
Eriogonum spp., Buckwheat
Fragaria spp., Strawberry
Fritillaria spp., Fritillary
Galium spp., Bedstaw
Geum macrophyllum, Large-leaved avens
Gilia leptomeria , Sand gilia
Glyceria grandis , American mannagrass
Glycyrrhiza lepidota, American licorice
Gutierrezia sarothrae, Broom snakeweed
Hedysarum boreale, Northern sweetvetch
Helianthus spp., Sunflower
Hesperostipa comata, Needle and thread
Heuchera parvifolia , littleleaf alumroot
Holodiscus dumosus, Rock spirea
Hordeum jubatum , Foxtail barley
Juncus spp., Rush
Juniperus spp., Juniper
Lactuca tatarica var. *pulchella* , Blue lettuce
Lepidium spp., Pepperweed
Lewisia rediviva, Bitteroot
Leymus spp., Wildrye
Lithospermum ruderale , Western stoneseed
Lomatium sp., Desertparsley
Lygodesmia spp., Skeletonplant
Mahonia repens, Creeping barberry
Maianthemum stellatum, starry false lily of the valley
Melica bulbosa, Oniongrass
Mentha arvensis, Wild mint
Mentzelia spp., Blazingstar
Microseris spp., Silverpuffs
Mimulus spp., Monkeyflower
Monolepis spp., Povertyweed
Nicotiana attenuata , Coyote tobacco
Nuphar lutea, yellow pond-lily
Oenothera spp., Evening-primrose
Opuntia polyacantha, Plains pricklypear
Orogenia linearifolia, Great Basin Indian potato
Packera spp., Groundsel
Penstemon spp., Beardtongue
Perideridia spp., Yampa
Phacelia spp., Phacelia
Pinus spp., Pine
Plantago spp., Plantain
Poa spp., Bluegrass
Populus angustifolia, Narrowleaf cottonwood
Populus tremuloides, Aspen
Potentilla spp., Cinquefoil

Prunus virginiana, Common chokecherry
Pseudoroegneria spicata, Bluebunch wheatgrass
Pseudotsuga menziesii, Douglas-fir
Purshia tridentata , Bitterbrush
Pyrrocoma lanceolata, Lanceleaf goldenweed
Ranunculus spp., Buttercup
Rhus trilobata , Skunkbush sumac
Ribes spp., Current
Rosa woodsii, Wood's rose
Rubus idaeus, American red raspberry
Rumex spp., Dock
Salix spp., Willow
Sambucus nigra , European black elderberry
Sarcobatus vermiculatus , Greasewood
Scirpus spp., Bulrush
Solanum spp., Nightshade
Solidago missouriensis , Missouri goldenrod
Sphaeralcea munroana, Munro's globemallow
Sporobolus spp., Dropseed
Stanleya viridiflora , Stanleya viridiflora
Symphoricarpos oreophilus , Mountain snowberry
Thermopsis montana, Mountain goldenbanner
Typha latifolia, Common cattail
Vaccinium spp., Huckleberry
Valeriana edulis , Tobacco root
Verbena bracteata, bigbract verbena
Veronica spp., Speedwell
Vicia americana, American vetch
Viola spp., Violet

FUNGI:

Amanita spp., Amanita
Calvatia spp., Puff ball
Coprinus spp., Ink caps
Geastrum spp., Earthstars
Morchella spp., Morels
Pleurotus spp., Oyster mushrooms
Trametes spp., Turkey tail
Tuberales group, Truffles

WILDLIFE

Mammals

Antelope
Badger
Bear
Beaver
Big Horn Sheep
Bobcat
Deer
Elk
Fox
Mink
Moose
Mountain lion
Musk rat
Otter
Porcupine
Rabbit
Raccoon
River otter
Squirrel
Wolf
Yellow bellied marmot

Birds

Blackbird
Chucker
Crane
Crow
Doves
Eagle
Falcons
Goshawk
Grouse
Hawk
Herons
Hummingbird
Jay
Meadowlark
Owls
Pelican
Pheasant
Quail
Raven
Snipe
Songbird
Swan
Turkey
Water fowl
Woodpecker
Yellowbilled cuckoo

Fish

Brook trout
Brown trout
Cutthroat trout
Finespot cutthroat
Rainbows
Redside shiners
Sculpin
Speckled base
Utah suckers
Whitefish

APPENDIX N

WILDLIFE SPECIES LIKELY TO OCCUR IN THE POCATELLO FIELD OFFICE AREA

The status column provides specific information about the individual species as follows:

- Number (**1, 2, 3, or 4**) - The species is on BLM Idaho Sensitive Species list. The number represents the species ranking as described in **Appendix N**.
- "**M**" - The species is covered by Migratory Bird Treaty Act.
- "**P**" - The species is identified as "High Priority Breeding Bird" by Idaho Partners in Flight.
- "**W**" - The species is identified as a "Watch" species by BLM Idaho.
- "**I**" - The species is an "Introduced" species.

BIRDS	SCIENTIFIC NAME	STATUS
American avocet	*Recurvirostra americana*	M, P
American bittern	*Botaurus lentiginosus*	M
American coot	*Filica americana*	M
American crow	*Corvus brachyrhynchos*	M
American dipper	*Cinclus mexicanus*	M, P
American goldfinch	*Carduelis tristis*	M
American kestrel	*Falco sparverius*	M
American pipit	*Anthus rubescens*	M
American redstart	*Setophaga ruuticilla*	M
American robin	*Turdus migratorius*	M
American tree sparrow	*Spizella arborea*	M
American white pelican	*Pelecanus erythrorhynchos*	2, M, P
American wigeon	*Anas americana*	M
Ash-throated flycatcher	*Myiarchus cinerascens*	M
Baird's sandpiper	*Calidris bairdii*	M
Bald eagle	*Haliaeetus leucocephalus*	2, M
Bank swallow	*Riparia riparia*	M
Barn owl	*Tyto alba*	M
Barn swallow	*Hirunda rustica*	M
Barred owl	*Strix varia*	M
Barrow's goldeneye	*Bucephala islandica*	M, P
Belted kingfisher	*Ceryle alcyon*	M
Black tern	*Chlidonias niger*	3, M
Black-backed woodpecker	*Picoides arcticus*	M, P
Black-bellied plover	*Pluvialis squatarola*	M
Black-billed magpie	*Pica hudsonia*	M, P
Black-capped chickadee	*Poecile atricapilla*	M
Black-chinned hummingbird	*Archilochus alexandri*	M, P
Black-crowned night-heron	*Nycticorax nycticorax*	M
Black-headed grosbeak	*Pheucticus melanocephalus*	M
Black-necked stilt	*Himantopus mexicanus*	M, P
Black-throated gray warbler	*Dendroica nigrescens*	M, P
Blue grouse	*Dendragapus obscurus*	P

BIRDS	SCIENTIFIC NAME	STATUS
Blue-gray gnatcatcher	*Polioptila caerula*	M
Blue-winged teal	*Anas discors*	M
Bobolink	*Dolichonyx oryzivorus*	M
Bohemian waxwing	*Bombycilla garrulus*	M
Bonaparte's gull	*Larus philadelphia*	M
Boreal owl	*Aegolius funereus*	W, M
Brewer’s blackbird	*Euphagus cyanocephalus*	W, M
Brewer’s sparrow	*Spizella breweri*	3, M, P
Broad-tailed hummingbird	*Selasphorus platycercus*	M
Brown creeper	*Certhia americana*	M, P
Brown-headed cowbird	*Molothrus ater*	M
Bufflehead	*Bucephala albeola*	M
Burrowing owl	*Athene cunicularia*	W, M
Bushtit	*Psaltriparus minimus*	M
California gull	*Larus californicus*	M
Calliope hummingbird	*Stellula calliope*	3, M, P
Canada goose	*Branta canadensis*	M
Canvasback	*Aythya valisineria*	M
Canyon wren	*Catherpes mexicanus*	M
Caspian tern	*Sterna caspia*	M
Cassin’s finch	*Carpodacus cassinii*	W, M
Cassin's kingbird	*Tyrannus vociferans*	M
Cattle egret	*Bubulcus ibis*	M
Cedar waxwing	*Bombycilla cedrorum*	M
Chipping sparrow	*Spizella passerina*	M
Chukar	*Alectoris chukar*	I
Cinnamon teal	*Anas cyanoptera*	M, P
Clark’s grebe	*Aechmorphorus clarkii*	M
Clark’s nutcracker	*Nucifraga columbiana*	M
Cliff swallow	*Petrochelidon pyrrhonota*	M
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	3, M, P
Common goldeneye	*Bucephala clangula*	M
Common grackle	*Quiscalus quiscula*	M
Common loon	*Gavia immer*	M
Common merganser	*Mergus merganser*	M
Common nighthawk	*Chordeiles minor*	M
Common poorwill	*Phalaenoptilus nuttallii*	M
Common raven	*Corvus corax*	M
Common redpoll	*Carduelis flammea*	M
Common snipe	*Gallinago gallinago*	M
Common tern	*Sterna hirundo*	M
Common yellowthroat	*Geothlypis trichas*	M
Cooper’s hawk	*Accipiter cooperii*	M
Cordilleran flycatcher	*Empidonax occidentallis*	W, M
Dark-eyed junco	*Junco hyemalis*	M
Double-crested cormorant	*Phalacrocorax auritus*	M

BIRDS	SCIENTIFIC NAME	STATUS
Downy woodpecker	*Picoides pubescens*	M
Dunlin	*Calidris alpina*	M
Dusky flycatcher	*Empidonax oberholseri*	M, P
Eared grebe	*Podiceps nigricollis*	M
Eastern kingbird	*Tyrannus tyrannus*	M
European starling	*Sturnus vulgaris*	I
Evening grosbeak	*Coccothraustes vespertinus*	M
Ferruginous hawk	*Buteo regalis*	3, M, P
Flammulated owl	*Otus flammeolus*	3, M, P
Forster’s tern	*Sterna forsteri*	M
Fox sparrow	*Passerlla iliaca*	M
Franklin’s gull	*Larus pipixan*	M, P
Gadwall	*Anas strepera*	M
Golden eagle	*Aquila chrysaetos*	M, P
Golden-crowned kinglet	*Regulus satrapa*	M
Grasshopper sparrow	*Ammodrmus savannarum*	W, M, P
Gray catbird	*Dumetella carolinensis*	M
Gray flycatcher	*Empidonax wrighti*	M, P
Gray jay	*Perisoreus canadensis*	M
Gray partridge	*Perdix perdix*	I
Great blue heron	*Ardea herodias*	M
Great egret	*Casmerodius albus*	M
Great gray owl	*Strix nebulosa*	W, M
Great horned owl	*Bubo virginianus*	M
Greater sage-grouse	*Centrocercus urophasianus*	2, P
Greater scaup	*Aythya marila*	M
Greater white-fronted goose	*Anser albifrons*	M
Greater yellowlegs	*Tringa melanoleuca*	M
Green-backed heron	*Butorides virescens*	M
Green-tailed towhee	*Pipilo chlorurus*	W, M
Green-winged teal	*Anas crecca*	M
Gyrfalcon	*Falco rusticolus*	M
Hairy woodpecker	*Picoides villosus*	M
Hammond’s flycatcher	*Empidonax hammondii*	3, M, P
Hermit thrush	*Catharus guttas*	M
Herring gull	*Larus argentatus*	M
Hooded merganser	*Lophodytes cucullatus*	M, P
Horned grebe	*Podiceps auritus*	M
Horned lark	*Eremophilla alpestris*	M
House finch	*Carpodacus mexicanus*	M
House sparrow	*Passer domesticus*	I
House wren	*Troglodytes aedon*	M
Killdeer	*Charadrius vociferus*	M, P
Lapland longspur	*Calcarius lapponicus*	M
Lark bunting	*Calamospiza melanocorys*	M
Lark sparrow	*Chondestes grammacus*	M, P

BIRDS	SCIENTIFIC NAME	STATUS
Lazuli bunting	*Passerina amoena*	M
Least sandpiper	*Calidris minutilla*	M
Lesser golden-plover	*Pluvialis dominica*	
Lesser scaup	*Aythya affinis*	M
Lesser yellowlegs	*Tringa flavipes*	M
Lewis' woodpecker	*Melenerpes lewis*	3, M, P
Lincoln's sparrow	*Melospiza lincolnii*	M
Loggerhead shrike	*Lanius ludovicianus*	3, M, P
Long-billed curlew	*Numenius americanus*	W, M, P
Long-billed dowitcher	*Limnodromus scolopaceus*	M
Long-eared owl	*Asio otus*	M
Macgillivray's warbler	*Oporornis tolmiei*	M, P
Mallard	*Anas platyrhynchos*	M
Marbled godwit	*Limosa fedoa*	M
Marsh wren	*Cistothorus palustris*	M
Merlin	*Falco columbarius*	M
Mountain bluebird	*Sialia currucoides*	M
Mountain chickadee	*Poecile gambeli*	M
Mourning dove	*Zenaida macroura*	M
Nashville warbler	*Vermivora ruficapilla*	M
North rough-winged swallow	*Stelgidopteryx serripennis*	M
Northern flicker	*Coloptes auratus*	M
Northern goshawk	*Accipiter gentilit*	3, M, P
Northern harrier	*Circus cyaneus*	M
Northern mockingbird	*Mimus polyglottos*	M
Northern oriole	*Icterus gabula*	M
Northern pintail	*Anas acuta*	M
Northern pygmy-owl	*Glaucidium californicum*	W
Northern saw-whet owl	*Aegolius acadicus*	M
Northern shoveler	*Anas clypeata*	M
Northern shrike	*Lanius excubitot*	M
Northern waterthrush	*Seiurus noveboracensis*	M
Oldsquaw	*Clangula hyemalis*	M
Olive-sided flycatcher	*Contopus cooperi*	3, M, P
Orange-crowned warbler	*Vermivora celata*	M
Osprey	*Pandion haliaetus*	M
Pacific loon	*Gavia pacifica*	M
Peregrine falcon	*Falco pergrinus*	3, M
Pied-billed grebe	*Podilymbus podiceps*	M
Pine grosbeak	*Pinicola enucleator*	M
Pine siskin	*Carduelis pinus*	M
Pinyon jay	*Gymnorhinus cyanocephalus*	W, M, P
Plain titmouse	*Parus inornatus*	M
Prairie falcon	*Falco mexicanus*	3, M, P
Red crossbill	*Loxia curvirostra*	M
Red-breasted merganser	*Mergus serrator*	M

BIRDS	SCIENTIFIC NAME	STATUS
Red-breasted nuthatch	*Sitta canadensis*	M
Red-eyed vireo	*Vireo olivaceus*	M
Redhead	*Aythya americana*	M, P
Red-naped sapsucker	*Sphyrapicus nuchallis*	W, M
Red-necked phalarope	*Phalaropus lobatus*	M
Red-tailed hawk	*Buteo jamaicensis*	M
Red-throated loon	*Gavia stellata*	M
Red-winged blackbird	*Agelaius phoeniceus*	M
Ring-billed gull	*Larus delawarensis*	M
Ring-necked pheasant	*Phasianus colchicus*	I
Rock dove	*Columba livia*	I
Rock wren	*Salpinctes obsoletus*	M, P
Ross' goose	*Chen rossii*	M
Rosy finch	*Leucosticte atrata*	M, P
Rough-legged hawk	*Buteo lagopus*	M
Ruby-crowned kinglet	*Regulus calendula*	M
Ruddy duck	*Oxyura jamaicensis*	M
Ruffed grouse	*Bonasa umbellus*	P
Rufous hummingbird	*Selasphorus rufus*	M, P
Sage sparrow	*Amphispiza belli*	3, M,P
Sage thrasher	*Orreoscoptes montanus*	W, M, P
Sanderling	*Calidris alba*	M
Sandhill crane	*Grus canadensis*	M, P
Savannah sparrow	*Passerculus sandwichensis*	M
Say's phoebe	*Sayornis saya*	M
Scott's oriole	*Icterus parisorum*	M
Scrub jay	*Aphelocoma californica*	M
Semipalmated plover	*Charadrius semipalmatus*	M
Sharp-shinned hawk	*Accipiter striatus*	M, P
Sharp-tailed grouse	*Tympanuchus phasianellus*	3, P
Short-billed dowitcher	*Limnodromus griseus*	M
Short-eared owl	*Asio flammeus*	W, M, P
Snow bunting	*Plectrophenax nivalis*	M
Snow goose	*Chen caerulescens*	M
Snowy egret	*Egreta thula*	M
Snowy owl	*Nyctea scandiaca*	M
Solitary sandpiper	*Tringa solitaria*	M
Solitary vireo	*Vireo solitarius*	M
Song sparrow	*Melospiza melodia*	M
Sora	*Porzana Carolina*	M
Spotted towhee	*Pipilo erythrophthalmus*	M
Spotted sandpiper	*Acitis macularia*	M
Steller's jay	*Cyanocitta stelleri*	M
Stilt sandpiper	*Calidris himantopus*	M
Swainson's thrush	*Catharus ustulatus*	M
Swainson's hawk	*Buteo swainsonii*	W, M, P

BIRDS	SCIENTIFIC NAME	STATUS
Three-toed woodpecker	*Picoides tridactylus*	M
Townsend's solitaire	*Myadestes townsendi*	M
Townsend's warbler	*Dendroica townsendii*	M,P
Tree swallow	*Tachycineta bicolor*	M
Trumpeter swan	*Cygnus buccinator*	3, M
Tundra swan	*Cygnus columbianus*	M
Turkey vulture	*Cathartes aura*	M
Upland sandpiper	*Bartramia longicauda*	M
Veery	*Catharus fuscescens*	M
Vesper sparrow	*Pooecetes gramineus*	M
Violet-green swallow	*Tachycineta thalassina*	M
Virginia rail	*Rallus limicola*	M
Virginia's warbler	*Vermivora virginiae*	4, M, P
Warbling vireo	*Vireo gilvus*	M
Western grebe	*Aechmophorus occidentalis*	M, P
Western kingbird	*Tyrannus verticalis*	M
Western meadowlark	*Sturnella neglecta*	M, P
Western sandpiper	*Calidris mauri*	M
Western screech-owl	*Megascops kennicottii*	M
Western tanager	*Piranga ludoviciana*	M, P
Western wood-pewee	*Contopus sordidulus*	M
White-breasted nuthatch	*Sitta carolinensis*	M
White-crowned sparrow	*Zonotrichia leucophrys*	M
White-faced ibis	*Plegadis chihi*	4, M, P
White-throated swift	*Aeronautes saxatalis*	M
White-winged crossbill	*Loxia leucoptera*	M
Wild turkey	*Meleagris gallopavo*	
Willet	*Catoptrophorus semipalmatus*	M
Williamson's sapsucker	*Sphyrapicus thryoideus*	3, M, P
Willow flycatcher	*Empidonax traillii*	3, M, P
Wilson's phalarope	*Phalaropus tricolor*	W, M
Wilson's warbler	*Wilsonia pusilla*	M
Wood duck	*Aix sponsa*	M
Wood stork	*Mycteria americana*	M
Yellow warbler	*Dendroica petechia*	M,P
Yellow-breasted chat	*Icteria virens*	M
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	M
Yellow-rumped warbler	*Dendroica coronata*	M

MAMMALS	SCIENTIFIC NAME	STATUS
Badger	*Taxidea taxus*	
Beaver	*Castor canadensis*	
Big brown bat	*Eptesicus fuscus*	
Black bear	*Ursus americanus*	
Black-tailed jackrabbit	*Lepus townsendii*	
Bobcat	*Lynx rufus*	
Bushy-tailed woodrat	*Neotoma cinerea*	

MAMMALS	SCIENTIFIC NAME	STATUS
California myotis	*Myotis califonicus*	
Columbian ground squirrel	*Spermophilus columibianus*	
Coyote	*Canis latrans*	
Deer mouse	*Peromyscus maniculatus*	
Dusky shrew	*Sorex monticolus*	
Elk	*Cervus elephas*	
Fringed myotis	*Myotis thysanodes*	
Golden-mantled ground squirrel	*Spermophilus lateralis*	
Gray wolf	*Canis lupus*	1
Great Basin pocket mouse	*Perognathus parvus*	
Heather vole	*Phenacomys intermedius*	
Hoary bat	*Lasiurus cinereus*	
Kit fox	*Vulpes macrotis*	4
Least chipmunk	*Tamias minimus*	
Little brown myotis	*Myotis lucifugus*	
Long-eared myotis	*Myotis evotis*	W
Long-legged myotis	*Myotis volans*	W
Long-tailed vole	*Microtus longicaudis*	
Long-tailed weasel	*Mustela frenata*	
Merriam's shrew	*Sorex merriami*	
Montane vole	*Microtus montanus*	
Moose	*Alces alces*	
Mountain cottontail	*Sylvilagus nuttallii*	
Mountain lion	*Felis concolor*	
Mule deer	*Odocoileus hemionus*	
Muskrat	*Ondatra zibethicus*	
Northern pocket gopher	*Thomomys talpoides*	
Ord's kangaroo rat	*Dipodomys ordii*	
Pallid bat	*Antrozous pallidus*	
Pika	*Ochotona princeps*	
Piute ground squirrel	*Spermophilus mollis*	
Porcupine	*Erethizon dorsatum*	
Pronghorn	*Antilocapra americana*	
Pygmy rabbit	*Brachylagus idahoensis*	2
Raccoon	*Procyon lotor*	
Red fox	*Vulpes vulpes*	
Red squirrel	*Tamiasciurus hudsonicus*	
Sagebrush vole	*Lagurus curtatus*	
Short-tailed weasel	*Mustela ermina*	
Silver haired bat	*Lasionycteris noctivagans*	
Small-footed myotis	*Myotis leibii*	
Snowshoe hare	*Lepus americanus*	
Striped skunk	*Mephitis mephitis*	
Townsend's big-eared bat	*Corynorhinus townsendii*	3
Vagrant shrew	*Sorex vagrans*	
Western harvest mouse	*Reithrodontomys megalotis*	
Western jumping mouse	*Zapus princeps*	
Western small-footed myotis	*Myotis ciliolabrum*	W
Western spotted skunk	*Spilogale gracilis*	
White-tailed jackrabbit	*Lepus californicus*	
Yellow-bellied marmot	*Marmota flaviventris*	

MAMMALS	SCIENTIFIC NAME	STATUS
Yellow-pine chipmunk	*Tamias amoenus*	
Yuma myotis	*Myotis yumanensis*	W

REPTILES	SCIENTIFIC NAME	STATUS
Common garter snake	*Thmnophis sirtalis*	3
Desert horned lizard	*Phrynosoma platyrhinos*	
Gopher snake	*Pituophis catenifer*	
Longnose leopard lizard	*Gambelia wislizenii*	
Racer	*Coluber constrictor*	
Ringneck snake	*Diodophis punctatus*	W
Rubber boa	*Charina bottae*	
Sagebrush lizard	*Sceloporus graciosus*	
Short-horned lizard	*Phrynosoma douglasii*	
Striped whipsnake	*Masticophis taeniatus*	
Western fence lizard	*Sceloporus graciosus*	
Western rattlesnake	*Crotalus viridis*	
Western skink	*Eumeces skiltonianus*	
Western terrestrial garter snake	*Thamnophis elegans*	
Western yellow-bellied racer	*Coluber constrictor*	

AMPHIBIANS	SCIENTIFIC NAME	STATUS
Boreal chorus frog	*Pseudacris maculate*	
Great Basin spadefoot toad	*Spea intermontana*	
Northern leopard frog	*Rana pipiens*	2
Pacific tree frog	*Pseudacris regilla*	
Striped chorus frog	*Pseudacris maculate*	
Tiger salamander	*Ambystoma tigrinum*	
Boreal (western) toad	*Bufo boreas*	2

INVERTABRATES	SCIENTIFIC NAME	STATUS
Utah valvata snail	*Valvata utahensis*	1

FISH	SCIENTIFIC NAME	STATUS
Bonneville cutthroat trout	*Oncorhynchus clarki utah*	2
Bear lake cutthroat trout	*Oncorhynchus clarki spp.*	2
Yellowstone cutthroat trout	*Oncorhynchus clarki bouvieri*	2
Mountain whitefish	*Prosopium williamsoni*	
Bear Lake whitefish	*Prosopium abyssicola*	2
Bonneville whitefish	*Prosopium spilonotus*	2
Bonneville cisco	*Prosopium gemmiferum*	2
Leatherside chub	*Gila copei*	3
Utah chub	*Gila atraria*	
Longnose dace	*Rhinichthys cataractae*	
Speckled dace	*Rhinichthys osculus*	
Redside shiner	*Richardsonius balteatus*	
Utah sucker	*Catosomus ardens*	
Mountain sucker	*Catosomus platyhynchus*	
Bluehead sucker	*Catosomus discobolus*	
Mottled sculpin	*Cottus bairdi*	
Bear Lake sculpin	*Cottus extensus*	2

FISH	SCIENTIFIC NAME	STATUS
Piute sculpin	*Cottus beldingi*	
White sturgeon	*Acipenser transmontanus*	
Rainbow trout	*Oncorhynchus mykiss*	I
Brown trout	*Salmo trutta*	I
Brook trout	*Salvelinus fontinalis*	I
Lake trout	*Salvelinus namaycush*	I
Channel catfish	*Ictalurus punctatus*	I
Brown bullhead	*Ictalurus macrochirus*	I
Bluegill	*Lepomis macrochirus*	I
Green sunfish	*Lepomis cyanellus*	I
Black crappie	*Pomoxis nigromaculatus*	I
White crappie	*Pomoxis annularis*	I
Largemouth bass	*Micropterus salmoides*	I
Smallmouth bass	*Micropterus dolomieui*	I
Yellow perch	*Perca flavescens*	I
Walleye	*Stizostedion vitreum*	I

Instruction Memorandum

ID-2003-057

Idaho BLM Special Status Species Ranking Protocols 2003

Introduction

Conservation management for native special status species is becoming increasingly important for public land management agencies in order to avoid the need to list species under the Endangered Species Act (ESA). Early management efforts to conserve habitats important for candidate and BLM sensitive species prior to formal listing are now common interagency efforts (e.g., Bonneville cutthroat trout and Townsend=s big-eared bat conservation strategies). In the past Idaho BLM has not attempted to rank or categorize special status species based on extinction risks. However, today we need this information to help establish conservation priorities for special status species and associated habitats. A protocol for classifying special status species based on their potential for extinction was clearly needed. With this new protocol we hope to have a system that:

$ Can be applied consistently and objectively by a variety of people.
$ Is consistent with State, National and Global ranking systems.
$ Provides guidance for determining rarity and degree of endangerment.
$ Provides better understanding of how Idaho BLM special status species are determined.
$ Complements the Idaho Species of Special Concern list.
$ Complements the criteria used by the Fish and Wildlife Service (FWS) for listing priorities.

BLM Special Status Species

BLM includes the following as special status species:

1. Species officially **listed or proposed** for listing as threatened or endangered under the ESA or **candidates** for listing as threatened or endangered under the ESA.

2. Species listed by a State in a category such as threatened or endangered implying potential endangerment or extinction.

3. Species designated by the BLM State Director as **sensitive**.

National policy directs State Directors to designate BLM sensitive species in cooperation with the State fish and wildlife agency (BLM Manual 6840). As such, Idaho BLM includes appropriate Idaho Species of Special Concern addressed in Item 2 as BLM sensitive species. The sensitive species designation is normally used for species that occur on BLM public lands and for which BLM has the capability to significantly affect the conservation status of the species through management. Generally a native species may be listed as Asensitive@ when it:

1. Could become endangered or extirpated from a state, or within a significant portion of its range in the foreseeable future,

2. Is under status review by the FWS and/or National Marine Fisheries Service (NMFS),

3. Is undergoing significant current or predicted downward trends in habitat capabilility that would reduce a species=existing distribution,

4. Has typically small and widely dispersed populations,

5. Inhabits ecological refugia, specialized or unique habitats or

6. Is listed by the State and a sensitive species designation by BLM would help in conservation efforts.

Rarity and Endangerment

All special status species lists, whether they are global or local lists attempt to identify and rank species based on risk of extinction through all or a portion of their range (Master 1991, IUCN 1994, Idaho CDC 1994, U.S. Forest Service 1999, Ginsberg 2002). Extinction risks for a species of concern are associated with two primary factors: species rarity and species endangerment (Morse 1996). Rarity is an expression of the intrinsic pattern of distribution and abundance of a species at a given time. Endangerment refers to factors (typically anthropogenic) that may make a species more susceptible to decline or extinction (Morse 1996). Habitat loss or degradation and population exploitation (e.g., hunting, trapping and collecting) are common anthropogenic factors although disease and predation, exclusive of human interference, may also be endangerment factors.

Rarity and endangerment must be evaluated for species of concern using consistent criteria designed to accommodate the differences between species. There are some endemic species that are naturally rare, occupying small, unique habitats. In many cases these species are not threatened by habitat loss or other endangerment factors. However, even with low endangerment risks there is a certain amount of extinction risk due soley to the extreme natural rarity of these species. Conversely, there are wide-ranging species whose habitats are becoming more constricted, fragmented and isolated - they may not be as Arare@ as the above endemic species but they are highly endangered based on habitat trends. Thus, rarity and endangerment are important concepts for ranking special status species but these concepts must be applied on a species-specific basis acknowledging the vast distribution and habitat scale differences between species.

Ranking Protocols

We tried to use the same protocol for plants and animals as much as possible. However, most of the special status plants are locally endemic and globally rare, unlike many of the animals. In addition., the Idaho Native Plant Society (INPS) has extinction risk categories for plants that provide greater detail than information available for animals and they annually reviews threats to sensitive species using the criteria developed by the FWS for determining listing priorities. In order to effectively use this status information for plants some differences between the ranking categories for plants and animals had to be acknowledged. Therefore, two protocols were developed, one for plants and one for animals.

These protocols provide a framework for identifying species that are at risk of extinction over all or a significant portion of their range and occur on BLM-administered public lands in Idaho. They are modeled after a similar protocol developed by Region 1 of the U.S. Forest Service, and rely on an international system for ranking species imperilment originally set up by the Nature Conservancy for the Natural Heritage Programs and Conservation Data Centers in North and South America (we will refer to this system as the CDC Network). State and provincial government agencies continue to use the CDC Network to assess species status and extinction risks. Other sources of information used to determine and categorize Idaho BLM special status species included:

- $ 2001 IUCN Red List of Threatened Species.
- $ Idaho Department of Fish and Game Species of Special Concern List.
- $ The Idaho Native Plant Society=s rankings and list.
- $ Partner=s In Flight national and state rankings for birds.
- $ Association for Biodiversity Information website (NatureServe.org)
- $ Idaho Conservation Data Center
- $ Species experts in Idaho

Terms and Definitions Referenced in Protocols

CDC Network Categories

G = Global rank indicator; denotes rank based on rangewide status.
T = Trinomial rank indicator; denotes range wide status of variety or subspecies.
S = State rank indicator; denotes rank based on status within Idaho.

1 = Critically imperiled because of extreme rarity or because of some factor of its biology making it especially vulnerable to extinction.
2 = Imperiled because of rarity or because of other factors demonstrably making it very vulnerable to extinction.
3 = Rare or uncommon, but not imperiled.
4 = Not rare and apparently secure, but with cause for long-term concern.
5 = Demonstrably widespread, abundant, and secure.

INPS Categories

State Priority 1 (S1) = Taxa in danger of becoming extinct or extirpated from Idaho in the foreseeable future if identifiable factors contributing to their decline continue to operate; these are taxa whose populations are present only at critically low levels or whose habitats have been degraded or depleted to a significant degree.

State Priority 2 (S2) = Taxa likely to be classified as Priority 1 within the foreseeable future in Idaho, if factors contributing to their population decline or habitat degradation or loss continue.

Sensitive (S) = Taxa with small populations or localized distributions within Idaho that presently do not meet the criteria for classifications as Priority 1 or 2 but whose populations and habitats might be jeopardized without active management or removal of threats.

Monitor (M) = Taxa common within a limited range as well as those taxa which are uncommon but have no identifiable threats.

Review (R) = Taxa which may be of conservation concern in Idaho, but lack sufficient data to base a recommendation regarding their appropriate classification.

Animal Special Status Species Protocol

Type 1. Threatened, Endangered, Proposed and Candidate Species

Species are listed by the FWS or NMFS as threatened or endangered, or they are proposed or candidates for listing under the Endangered Species Act.

Type 2. Rangewide / Globally Imperiled Species

These are species that are experiencing significant declines throughout their range with a high likelihood of being listed in the foreseeable future due to their rarity and/or significant endangerment factors.

This includes species ranked by the CDC Network with global ratings of G1-G3 or T1-T3 or recent data indicate species is at significant rangewide risk and this is not currently reflected by CDC Network global rankings.

Type 3. Regional/ State Imperiled Species

These are species that are experiencing significant declines in population or habitat and are in danger of regional or local extinctions in Idaho in the foreseeable future if factors contributing to their decline continues.

This includes Idaho BLM sensitive species that (a) are not in Type 2, (b) have an S1 or S2 State ranking (exception being a peripheral or disjunct species), or (c) score high (18 or greater) using the Criteria for Evaluating Animals for Sensitive Species Status (Table 1) or (d) other regional/national status evaluations (e.g., Partners-in-Flight scores) indicate significant declines.

Type 4. Peripheral Species

These are species that are generally rare in Idaho with the majority of the breeding range largely outside the state (Idaho CDC 1994).

This includes sensitive species that have an S1 or S2 state ranking but are peripheral species to Idaho.

Type 5. Watch List

Watch list species are not considered BLM sensitive species and associated sensitive species policy guidance does not apply. Watch list species include species that may be added to the sensitive species list depending on new information concerning threats, species biology or statewide trends.

The Watch List include species with insufficient data on population or habitat trends or the threats are poorly understood. However, there are indications that these species may warrant special status species designation and appropriate inventory or research efforts should be a management priority.

Table 1. Criteria for evaluating animals for special status species designation.

I. Abundance (refer to CDC Network rankings)	**Score (circle)**
Extremely Rare (G1-G2, T1-T2, S1-S2)	9
Rare (G3, T3, S3)	6
Uncommon (G4, T4, S4)	3
Common (G5, T5, S5)	0
II. Distribution	
Endemic: Idaho represents at least 75% of the species distribution.	6
Disjunct: Population in Idaho is outside of primary range of species.	4
Peripheral: Population in Idaho is on the edge of its primary range.	2
Widespread: None of the above	0
III. Degree of Threat of Habitat Loss	
High: Habitat substantially threatened by human or natural disturbances.	9
Moderate: Habitat moderately threatened by human or natural disturbances.	6
None: Habitat not threatened.	0
IV. Population Impacts	
Species potentially impacted significantly by extrinsic factors such as predation, disease or direct exploitation.	3
Species potentially moderately impacted by extrinsic factors such as predation, disease or direct exploitation.	2
Species not affected or only slightly by predation, disease or direct exploitation.	0
V. Specialized Habitat / Ecological Amplitude	
Narrow: Species is restricted to a unique or limited habitat or combination of habitats, and/or species has a high degree of habitat specificity.	3
Intermediate: Species is restricted to a relatively unique habitat or combination of habitats, and/or species has a moderate degree of habitat specificity.	1
No Specialization: Species is not restricted to unique habitats.	0
VI. Population Trends	
Known Downward Trend: Known or strongly suspected that species has had serious population declines.	6
Possible: Information is lacking, but downward trend a possibility.	3
Static: No indication that species has had population declines.	0
Species Overall Score	

Plant Special Status Species Protocol

Type 1. Threatened, Endangered, Proposed and Candidate Species

These species are listed by theFWS as threatened or endangered, or they are proposed or candidates for listing under the Endangered Species Act.

Type 2. Rangewide / Globally Imperiled Species - High Endangerment

These are species that have a high likelihood of being listed in the foreseeable future due to their global rarity and significant endangerment factors.

Species ranked by the CDC Network with global ratings of G1-G3 or T1-T3 with a threat priority of 1-9 using the FWS Listing Priority Criteria (Table 2).

Type 3. Rangewide / Globally Imperiled Species - Moderate Endangerment

These are species that are globally rare with moderate endangerment factors. Their global rarity and inherent risks associated with rarity make them imperiled species.

Idaho BLM sensitive species that (a) are ranked by the CDC Network with global ratings of G1-G3 or T1-T3 with (a) a threat priority of 10-12 using the FWS Listing Priority Criteria or (b) an INPS ranking of Priority 1-2 or Sensitive (INPS sensitive species with the majority of the population on BLM-administered lands).

Type 4. Species of Concern

These are species that are generally rare in Idaho with small populations or localized distribution and currently have low threat levels. However, due to the small populations and habitat area, certain future land uses in close proximity could significantly jeopardized these species.

INPS sensitive species that are not Type 3.

Type 5. Watch List

Watch list species are not considered BLM sensitive species and associated sensitive species policy guidance does not apply. Watch list species include species that may be added to the sensitive species list depending on new information concerning threats and species biology or statewide trends.

This includes (a) INPS Monitor and Review species and (b) INPS Sensitive species (Types 2, 3, or 4) that are only suspected to occur in a resource area.

Table 2. Threatened and endangered species listing priority criteria used by the FWS.

Listing Priority	Taxonomic Status	Extinction Threats	
		Magnitude	**Immediacy**
1	Monotypic genus	HIGH	Imminent
2	Species		
3	Subspecies/Variety		
4	Monotypic genus		Non-imminent
5	Species		
6	Subspecies/Variety		
7	Monotypic genus	LOW	Imminent
8	Species		
9	Subspecies/Variety		
10	Monotypic genus		Non-imminent
11	Species		
12	Subspecies/Variety		

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APPENDIX P

POCATELLO FIELD OFFICE ALLOTMENT STATUS

Table P-1. Allotment Permitted Use (AUMs) and Season of Use by Livestock Kind.

Allotment Name	Allotment Number	Earliest Begin Date	Latest End Date	Animal Unit Months (AUMs)				
				Cattle	Horse	Sheep	Suspended	Total Preference
18 MI. - LITTLE FLAT	04162	05/15/99	10/15/99	206				206
1ST & 2ND HOLLOWS	04195	07/01/89	09/25/89	90				90
2 1/2 MILE	06094	05/01/02	10/16/02	426			92	518
2 1/2 MILE	06094	05/01/02	11/15/02		11			11
ABOVE COTTONWOOD CRK	14008	05/15/03	09/30/03	13				13
ADLER CREEK	04336	05/15/99	09/30/99	93				93
ALDRIDGE	14064	05/15/99	10/20/99	15				15
ALTON	04327	05/16/99	09/30/99	47				47
ANDERSEN	06084	04/20/00	09/30/03	108				108
ARBON	06082	08/01/02	12/10/02	113			30	143
ARKANSAS CREEK	06063	05/07/89	06/21/89	26			24	50
ASPEN ROAD	06070	05/01/99	06/15/99	10				10
BAGLEY HOLLOW	04048	05/15/89	06/15/89	8				8
BAKER CANYON	06351	05/16/03	09/30/03	170				170
BANCROFT	06032	05/16/89	09/30/04	1225				1225
BARNETT	03852	05/01/99	06/30/99	11				11
BASIN DIVIDE	04265	05/16/99	10/31/99	267				267
BEAR CREEK SPRING	04203	06/01/98	09/30/98	65				65
BEAR CREEK SPRING	14099	06/11/00	09/30/00	24				24
BEAR HOLLOW	06353	05/16/91	09/15/91	995				995
BEAR LAKE CANAL	04290	09/01/99	10/31/99	5				5
BEAR RIVER NARROWS	04356	06/01/91	10/01/91	72				72
BEAR RIVER-1	04357	06/01/99	09/30/99	120				120
BEAR RIVER-2	04362	05/01/89	09/30/89	16				16
BEAR RIVER-3	04383	05/16/99	09/30/99	6				6
BEAR RIVER-5	14096	05/16/97	09/30/97	8				8
BEAR RIVER-6	14318	09/01/89	09/30/89			12		12
BEAVER CREEK-1	04021	05/10/99	10/31/99	125				125
BEAVER CREEK-2	04316	09/10/02	11/01/02	54				54
BEE HUNT HOLLOW	14038	05/16/89	09/30/89	31				31
BELL MARSH CREEK	03809	05/01/99	08/30/99		13			13
BIG CANYON	06355	05/15/99	10/14/99	818				818
BIG CANYON	06355	05/20/99	07/31/99			354		354
BIG HILL	04344	05/01/99	09/30/99	21				21
BIG MOUNTAIN	04148	05/01/99	09/30/99	80				80
BIG ONION	06009	05/26/00	09/19/01	1908				1908
BISCHOFF CANYON	14034	06/01/01	09/30/01	26				26
BLACKFOOT MOUNTAIN-1	04152	05/01/99	10/20/99		30			30
BLACKFOOT MOUNTAIN-2	04364	07/01/89	08/31/89	60				60
BLACKFOOT MOUNTAINS	04396	10/01/98	02/28/99	62				62
BLACKFOOT RESERVOIR	04190	05/01/98	10/30/98			120		120
BLACKFOOT RESERVOIR	04190	05/10/98	10/30/98	124				124
BLACKFOOT RIVER	04201	04/15/89	11/30/89	64				64
BLACKFOOT RIVER	04320	05/01/89	11/10/89			317		317
BLACKFOOT RIVER	04430	04/01/94	04/15/94	20				20

Allotment Name	Allotment Number	Earliest Begin Date	Latest End Date	Animal Unit Months (AUMs)				
				Cattle	Horse	Sheep	Suspended	Total Preference
BLACKFOOT RIVER-1	14092	05/01/89	10/31/89	15	15			30
BLACKROCK	06097	04/16/01	06/04/04			1065		1065
BLOOMINGTON	04182	05/16/99	09/30/99	7	4			11
BORDER SUMMIT-1	04325	05/16/00	09/30/00	67				67
BRIGHT ROAD	06058	05/01/99	10/15/99	63				63
BROWNS CANYON-1	14027	05/16/99	09/30/99	72				72
BRUSH CREEK	06054	05/15/89	10/15/89	3			3	6
BURTON CREEK NORTH	04258	05/01/99	09/30/99	16				16
BURTON CREEK-1	04058	05/15/98	11/30/98	47				47
BURTON CREEK-2	04194	05/16/03	09/30/03	113				113
CART HOLLOW	04169	05/16/99	09/30/99	11				11
CEDAR CREEK	04382	05/20/98	09/30/98			230		230
CEDAR CREEK BUTTES	04440	09/30/93	02/28/94	63				63
CEDAR MOUNTAIN	06010	04/26/00	05/25/03	100				100
CEDAR MOUNTAIN	06071	06/01/99	09/30/99	12				12
CEDAR RIDGE	05318	05/01/98	06/01/98	35				35
CHAUSSE	14044	05/01/95	08/15/95	170				170
CHEATBECK CANYON	14079	05/01/99	09/30/99	13				13
CHEATBECK CANYON	14084	05/01/89	09/30/89	17				17
CHESTERFIELD RES.	04345	05/01/03	09/30/03	30				30
CHESTERFIELD RG.	14069	05/01/98	09/30/98	448				448
CHINKS PEAK	03803	05/08/04	07/05/04			200		200
CHRISTY CANYON	24013	04/15/99	06/01/99	10				10
CLIFTON CREEK-1	03810	05/10/99	09/30/99	18				18
CLIFTON CREEK-2	06099	05/01/99	09/15/99	18				18
CO-0P C	04348	05/15/89	09/30/89	46				46
COLD WATER ISOLATED	05329	04/01/89	05/31/89	14				14
CONLIN	03851	10/01/01	10/30/01	10				10
COOK SPRINGS	14086	05/16/99	09/30/99	13				13
COOLEY CANYON	14166	05/15/99	08/15/99	132				132
COTTONWOOD	14055	05/01/99	08/31/99	6				6
COTTONWOOD CREEK-1	14054	05/01/99	09/30/99	9				9
COTTONWOOD CREEK-2	14128	06/01/00	09/30/00	155				155
CROSSLEY HOLLOW	14053	05/20/99	06/26/99	44				44
CROW CREEK-1	04269	06/01/02	09/01/02	26				26
CROW CREEK-2	14015	06/01/89	09/30/89	19				19
CRYSTAL-1	03801	06/15/99	09/30/02	660			564	1224
CURLEW	16001	04/16/89	11/15/03	22852			2189	25041*
CURLEW	16001	04/16/99	11/15/03		134			134
CURLEW	16001	05/12/99	07/10/99			116		116
CUSICK CREEK	04177	05/16/89	10/15/89		10			10
DAIRY CREEK	06011	05/16/89	09/15/96	1,025				1,025
DAIRY HOLLOW	04407	05/16/02	09/01/02	52				52
DAIRY RIDGE	04305	05/16/98	09/30/98	739				739
DAM HOLLOW	04352	05/16/89	09/30/89	4				4
DEEP CREEK	06013	06/01/92	09/15/92	32			5	37
DEER POINT	14074	06/01/99	10/10/99	26				26
DENSMORE CREEK ROAD	04153	05/01/90	11/01/90	59				59
DEVIL'S HILL	03854	05/01/92	09/30/92	24				24
DIAMOND CREEK	14028	05/16/99	09/30/99	37				37
DOWNATA HOT SPRINGS	06074	05/01/99	09/30/99	40				40
DRY CANYON	04295	05/16/89	09/30/89	18				18
DRY CREEK	14070	05/15/03	10/15/03	37				37

Allotment Name	Allotment Number	Earliest Begin Date	Latest End Date	Animal Unit Months (AUMs)				
				Cattle	Horse	Sheep	Suspended	Total Preference
DRY CREEK, NO. FORK	04351	06/01/99	09/30/99	19				19
E. OF BEAVER DAM	04350	05/01/99	06/01/99	82				82
E. OF TYGEE CREEK	14129	06/01/99	09/30/99	50				50
EAGLE CREEK	04346	05/01/00	07/31/00	29				29
EAST DANIELS	06012	05/01/02	09/30/02	14				14
EAST FORK	06014	06/07/92	09/30/92	174			132	306
EAST HOLBROOK	06361	04/16/89	10/15/89		66			66
EAST HOLBROOK	06361	04/16/99	09/30/99	199				199
EIGA-BLACKFOOT RIVER	14112	05/10/98	11/10/98	650		705		1,355
EMIGRANT TRAIL	14100	05/16/89	09/30/89	21				21
FISH CREEK	16084	05/16/89	10/30/89	83				83
FISH CREEK	16084	05/26/99	10/20/99			420		420
FISH CREEK BASIN	04267	05/16/89	09/30/89	71				71
FISH HAVEN-1	14111	05/16/02	09/30/02	13				13
FISH HAVEN-2	14125	05/16/89	09/30/89	120				120
FORD ROAD-1	06052	05/15/00	08/30/00	10				10
FORD ROAD-2	06059	05/01/00	05/09/00	22			9	31
FOSSIL CANYON	04285	05/15/99	10/01/99			25		25
FOX HOLLOW	06091	05/16/89	09/15/89	52				52
FREEWAY	06078	04/16/89	10/31/89	40				40
GARDEN CREEK	27000	05/01/02	06/15/02	189				189
GARDEN GAP SEC.3	06092	05/01/99	09/18/99	23				23
GARDEN GAP SEC15	06066	04/16/00	09/21/00	14			5	19
GLENDALE PEAK	04149	05/01/99	09/30/99	17				17
GLENDALE RESERVOIR	04397	05/01/99	09/30/99	48				48
GRAEHL CANYON	14005	06/01/02	09/30/02	20				20
GRAYS LAKE OUTLET	03344	05/15/89	09/30/89	11				11
GREEN CANYON	04302	05/20/99	09/30/99	3				3
HANSEL MOUNTAIN	06365	05/16/01	10/15/01	672			336	1008
HARDMANS HOLLOW	01558	06/01/89	08/31/89	3				3
HARER POINT-1	04200	05/16/99	09/30/99	64				64
HARER POINT-2	04354	05/16/89	09/30/89	188				188
HARKNESS/BEACH HOLLO	06089	05/01/89	11/30/01	52			6	58
HARKNESS/BEACH HOLLO	06089	05/18/00	09/06/00			206	138	344
HAWKINS	06085	05/01/89	10/31/89	10				10
HENRY CREEK-1	04147	06/01/99	08/31/99	16				16
HENRY CREEK-2	04268	05/01/03	11/30/03	180				180
HENRY CREEK-3	04403	06/01/99	10/01/99	77				77
HERMAN	04239	06/01/99	08/31/99	20				20
HERMITSVILLE	06086	05/15/00	10/15/00	7				7
HIGH COUNTRY	04423	07/01/94	09/30/94	128				128
HOOT OWL	03853	05/01/93	08/30/93			8		8
HORSE CREEK-1	04045	06/01/02	09/30/02	74				74
HORSE CREEK-2	04332	06/15/99	10/31/99	13				13
HORSE HOLLOW-1	04165	09/01/98	09/30/98	39				39
HORSE HOLLOW-2	04329	05/05/99	10/20/99			418		418
HORSE PASTURE	04317	05/01/00	09/30/00	5	5			10
HOUTZ CANYON	05316	05/21/89	08/31/89	261			254	515
ID-UT STATELINE	04378	04/15/99	12/15/99	147				147
INDIAN CREEK	04232	05/01/01	06/15/01	42				42
INDIAN SPRINGS	06016	06/16/03	09/30/03	1,057			518	1575
INKOM	06083	05/16/02	08/15/03	407			428	835
IRELAND CANYON	06362	10/01/99	10/15/99	50				50

Allotment Name	Allotment Number	Earliest Begin Date	Latest End Date	Animal Unit Months (AUMs)				
				Cattle	Horse	Sheep	Suspended	Total Preference
ISOLATED 40	24056	06/01/02	09/30/02	6				6
JACK KNIFE CREEK	14119	06/01/89	07/31/89	7				7
JACOBS CANYON	04260	05/16/99	09/30/99	12				12
JENKINS CANYON-1	06056	05/01/00	07/15/00	40			18	58
JENKINS CANYON-2	06080	04/16/99	09/30/99	8				8
JOHNSON RESERVOIR	04181	05/01/99	09/30/99	72				72
JOHNSON SPRING	04207	06/01/99	09/30/99	60				60
JONES BASIN-1	04422	05/01/94	06/01/94	21				21
JONES BASIN-2	14095	06/01/94	07/07/94	33				33
JUNIPER ALLOTMENT	06131	05/16/99	08/31/99	120				120
KACKLEY SPRINGS	14117	05/01/03	09/30/03	10				10
KNOX CANYON	06346	05/20/89	09/19/89			480		480
KNOX CANYON	06346	06/01/89	09/30/03	946				946
L. ONEIDA NARROW	04310	06/01/99	08/31/99	4				4
LANDER TRAIL	04236	05/16/98	09/30/98	50				50
LANES CREEK 40	14120	06/01/99	09/30/99	10				10
LEFT HAND FK OF MRSH	06069	05/16/99	10/31/99	6				6
LH FORK MARSH CREEK	14090	06/01/99	09/30/99	18				18
LITTLE BLACKFOOT R.	14319	06/15/89	07/15/89			3		3
LITTLE BLACKFOOT RIV	14075	05/16/99	09/30/99	19				19
LITTLE FLAT 18 MILE	04161	05/15/99	10/30/99	269				269
LITTLE GRAY RIDGE-1	04358	05/16/99	09/30/99	7				7
LITTLE GRAY RIDGE-2	04389	05/16/99	09/30/99	32				32
LONG GROVE	04296	05/16/03	09/30/03	9				9
LOOKOUT MOUNTAIN	06347	05/01/99	09/30/99	42			42	84
LOWER MAIN CANYON	04256	05/15/99	06/16/99	95				95
LT HAND FK OF MRSH C	06077	04/16/02	10/30/02	142				142
LUND	03808	05/16/99	10/20/99			503		503
LUND COVE	14123	05/15/99	09/30/99			330		330
LWR.BIG MTN.	14016	04/15/99	11/30/99	22				22
MADSEN	06007	05/15/89	06/15/89	26			16	42
MAHOGANY RIDGE	04167	06/01/99	10/31/99	175				175
MAPLE CANYON	04303	05/20/89	06/25/89	48				48
MAPLE CREEK	04246	05/01/02	09/30/02	6				6
MAPLE GROVE	04253	06/01/99	08/01/99	10				10
MAPLETON-1	04330	05/22/00	10/10/00	16				16
MARSH CREEK-1	06068	04/16/99	09/30/99	17				17
MARTHAS CANYON-ID	04266	06/01/03	09/30/03	47				47
MARTHA'S CANYON-WY	01552	06/01/03	09/30/03	28				28
MEADOW CREEK	04136	05/15/89	09/30/89	43				43
MERKLEY MOUNTAIN	04312	05/16/89	09/30/89	72				72
MIDDLE CONE	14065	09/15/89	10/31/89	24				24
MILL CREEK	14104	06/16/99	09/30/99	10				10
MILLER CREEK	04199	05/25/98	12/15/98	43				43
MINER CREEK	04413	10/01/98	02/28/99	8				8
MONROE CANYON	04254	04/01/99	11/15/99	203				203
MONTPELIER CANYON-1	14139	05/16/89	09/30/89	20				20
MOONLIGHT MOUNTAIN	06090	05/16/00	08/02/00	245				245
MORGAN CANYON	04349	06/01/90	08/01/90	27				27
MT. TAYLOR-1	14072	06/01/99	09/30/99	86				86
MT. TAYLOR-2	14093	06/01/89	09/30/89	10				10
N ONEIDA NARROWS RES	04214	05/01/99	09/30/99	4				4
N. SULPHUR & TRAIL	14031	05/15/89	07/15/89			324		324

Allotment Name	Allotment Number	Earliest Begin Date	Latest End Date	Animal Unit Months (AUMs)				
				Cattle	Horse	Sheep	Suspended	Total Preference
NINEMILE	06055	06/01/99	09/20/99	182				182
NO GREEN ROAD	06095	05/10/00	06/30/00	20				20
NO. MILES CANYON	04293	06/01/89	10/20/89			89		89
NO. PETTERSON RANCH	04371	06/01/97	09/30/97	148				148
NO. PINE GAP RIDGE	14122	05/25/00	07/25/00		9			9
NORTH ANT UNIT	14133	06/11/99	08/25/99	63				63
NORTH BULL CANYON	06356	07/01/99	08/15/99			890		890
NORTH CREEK	14089	06/01/89	09/30/89	44				44
NORTH FK KING CR	14007	05/16/03	08/01/03	8				8
NORTH WOLVERINE	04368	05/01/89	11/30/89			115		115
OLD TOM MOUNTAIN	03804	09/05/97	11/03/97			470		470
OXFORD SLOUGH	04189	05/01/89	09/30/89	30				30
PARADISE MOUNTAIN	04091	05/01/04	10/31/04	35		105		140
PARIS CANYON	14087	06/26/89	09/25/89	25			25	50
PARIS CANYON RANCH	04209	05/01/89	11/15/94	25				25
PEAK	06354	05/16/99	10/15/99	126				126
PEBBLE	03807	09/08/00	09/20/00			44		44
PEBBLE POINT-1	16085	10/01/00	10/31/00	54				54
PEGRAM	04326	05/16/91	09/30/91	338				338
PEGRAM CREEK-1	04183	05/16/89	09/30/89	146				146
PEGRAM CREEK-2	04421	06/01/95	09/30/95	81				81
PELICAN SLOUGH-1	04408	05/01/99	09/30/99	27				27
PELICAN SLOUGH-2	14135	05/01/89	09/30/89	35				35
PINE MOUNTAIN	04282	06/01/97	09/30/97	28				28
PINE SPRING RIDGE	04313	05/16/99	09/30/99	16				16
PLEASANTVIEW	06004	05/02/02	07/29/02			677		677
PLEASANTVIEW	06004	05/29/02	09/04/02	10564				10564
POLE CANYON	04174	06/01/99	09/30/99	28				28
PORTNEUF RIVER-1	03821	05/01/99	09/30/99	60				60
POST HOLLOW-WMS CRK.	04404	05/16/99	07/01/99	62				62
PREUSS RANGE-1	04160	05/20/00	10/30/00	215		235		450
RAPID CREEK	16082	04/16/99	05/31/02	454			31	485
RATTLESNAKE/ACE	04369	09/30/94	02/28/95	64				64
RATTLESNAKE-1	16034	06/01/99	08/31/99	139			11	150
RED CANYON	14067	05/16/89	06/13/89	23				23
RIDGEDALE	06360	05/01/89	10/30/00			1,575		1,575
RIDGEDALE	06360	05/01/98	08/28/03	888				888
RIGHT HAND FORK	04353	07/01/99	08/31/99	10				10
ROCKS	16086	04/16/02	05/30/02	700				700
ROCKY KNOLL	04030	05/10/99	09/15/99	18				18
ROCKY PEAK	04412	05/01/95	09/15/95	157				157
S. GARDEN CREEK	03817	05/15/89	10/30/89	6			1	7
S0 FRK MINK CRK	06088	06/16/02	10/15/02	64				64
SAMARIA	06005	04/16/97	05/01/97			135		135
SAMARIA	06005	07/06/00	09/10/00	2,722				2,722
SAND HOLLOW	16063	06/01/93	09/30/93	601			466	1067
SAWMILL CANYON	06006	06/01/89	09/30/94	421			254	675
SAWMILL CREEK	16020	06/01/93	06/14/93			30		30
SCHMID RIDGE	04022	05/16/99	09/30/99			34		34
SCHMID RIDGE	14046	06/15/89	10/15/97	430				430
SCHRIVES ROAD	06064	05/01/00	09/30/00	3			3	6
SHEEP CREEK HILLS-1	04107	05/05/99	12/15/99		8	35		43
SHEEP CREEK HILLS-1	04107	05/15/99	10/15/99	15				15

Allotment Name	Allotment Number	Earliest Begin Date	Latest End Date	Animal Unit Months (AUMs)				
				Cattle	Horse	Sheep	Suspended	Total Preference
SHEEP CREEK HILLS-2	04185	05/05/99	12/15/99		89	456		545
SHEEP CREEK HILLS-2	04185	05/15/99	10/15/99	153				153
SHEEP CREEK HILLS-3	04347	05/16/89	09/30/89	126				126
SHEEP CREEK HILLS-4	14097	05/16/99	09/30/99		20			20
SHEEP CREEK RES	14103	05/15/98	11/30/98			27		27
SHOESTRING	06081	05/16/97	05/24/97			89	73	162
SHOESTRING	06081	06/01/99	10/10/02	126			29	155
SLEIGHT CANYON	04393	05/16/99	07/31/99	30				30
SMITH & DRY CREEK	04355	05/16/99	09/30/99	83				83
SMITH CANYON-1	06053	04/16/89	06/16/89	2			4	6
SMITH GULCH	16033	07/01/03	09/30/03	138			58	196
SO OF MAIN CANYON	14257	06/16/99	09/30/99	88				88
SO TWIN LAKES RES.	04250	03/01/99	10/31/99	16				16
SO. MILES CANYON	04415	06/16/89	10/05/89			129		129
SO. OF BROWNS CANYON	04212	06/01/99	10/15/99	37				37
SO. PETTERSON RANCH	04287	06/01/97	09/30/97	148				148
SO. SOUTH HILL	04388	06/01/99	09/30/99	20				20
SODA FLATS	04211	04/20/99	06/02/99			252		252
SODA HILLS-1	04314	05/01/00	09/30/00	30				30
SODA HILLS-2	04324	06/01/02	09/30/02	604				604
SODA HILLS-3	04359	05/01/01	08/13/01	123				123
SODA POINT-1	04137	05/15/89	09/30/89	5				5
SODA POINT-2	14036	05/16/99	09/30/99	12				12
SOUTH ANT CANYON	04363	05/01/02	09/30/02	25				25
SOUTH BULL	06003	05/01/89	08/15/01	550			86	636
SOUTH CANYON-1	04322	05/20/89	09/10/89	73				73
SOUTH CRYSTAL	06038	06/15/99	08/30/99	42				42
SOUTH GREEN ROAD	04340	06/19/99	08/29/99		11			11
SOUTH HILL-1	04280	05/15/89	09/30/89	25				25
SOUTH HILL-2	04375	05/16/99	09/30/99	80				80
SOUTH STONE	06002	05/10/00	07/05/00	2,193				2,193
SOUTH TWIN LAKES	04202	05/15/00	11/30/00	20				20
SPRING CREEK	14033	05/01/89	10/30/89	20				20
SPRING HOLLOW	14083	05/16/95	09/30/95	185				185
STAR VALLEY	04360	07/01/90	09/30/90	22				22
STEVES CREEK	04335	05/16/99	09/15/99	135				135
STEWART CANYON	06357	05/16/91	09/30/91	890				890
STOCK VALLEY HILLS	04206	05/01/89	09/30/89	109				109
STOCKTON CREEK-1	06061	06/01/99	09/30/99	30				30
STOCKTON CREEK-2	06076	05/01/99	11/20/99	87				87
STOCKTON CREEK-3	06096	08/15/99	09/30/99	14			1	15
STRAWBERRY CREEK	14062	05/01/99	09/30/99	26				26
STUMP CREEK	14006	06/01/99	09/30/99	27				27
STUMP CREEK GAP	14018	06/01/99	09/30/99	20				20
SURNGE CANYON-1	04343	05/15/89	10/15/89	13				13
SURNGE CANYON-2	04379	05/15/89	10/15/89	35				35
SWAN LAKE	06067	06/15/89	09/15/89	3			3	6
SWEETWATER	04334	05/16/99	09/30/99	76				76
TABLE MOUNTAIN	05317	04/01/99	11/30/99	90				90
TAYLOR MOUNTAIN	04244	06/01/99	10/13/99	26				26
THATCHER HILL-1	04450	06/01/99	09/30/99	42				42
THATCHER HILL-2	14060	05/01/89	09/30/89	68				68
THATCHER HILL-3	14127	05/16/99	10/15/99	120				120

Allotment Name	Allotment Number	Earliest Begin Date	Latest End Date	Animal Unit Months (AUMs)				
				Cattle	Horse	Sheep	Suspended	Total Preference
THOMAS FORK	14124	05/16/02	09/30/02	133				133
TIMBER	06349	05/15/00	09/15/00	117				117
TOMS CANYON	14014	06/01/99	09/30/99	136				136
TOP OF LITTLE MOUNT.	04173	04/01/99	07/31/99	7				7
TOPONCE	03342	05/21/99	10/20/99	636				636
TOPONCE	03342	06/16/99	06/17/99			12		12
TOPONCE CREEK	06093	05/15/99	06/01/99	34				34
TRAIL CANYON-1	04226	05/01/99	09/30/99			30	4	34
TRAIL CANYON-2	04289	05/01/00	09/15/00			30	5	35
TRAIL CREEK-1	04419	10/01/98	02/28/99	8				8
TRAIL CREEK-2	06098	05/01/99	06/30/99	550				550
TRAIL HOLLOW	04157	09/16/99	10/30/99	17				17
TRAYIS	03811	05/01/93	08/30/93	84				84
TREASURETON HILL-1	04315	06/01/99	08/31/99	9		11		20
TREASURETON HILL-2	24011	06/01/03	09/30/03	23				23
TROUT CREEK SPRING	04154	04/25/99	06/24/99	86				86
TWIN LAKES CANAL	14115	05/01/99	09/30/99	12				12
TYGEE CREEK	04233	07/15/89	09/30/89	56				56
TYGEE RIDGE-1	04208	06/01/99	09/30/99	27		26		53
TYGEE RIDGE-2	04238	06/01/02	09/01/02	43				43
TYGEE RIDGE-3	04365	06/01/99	09/15/99	53				53
UNIT 4 SLUG CREEK	14110	06/06/99	09/20/99	32				32
VIRGINIA ROAD	06065	05/16/99	07/26/99	7			3	10
W OF ROCKY KNOLL	04414	05/01/99	09/30/99	50				50
WARM SPRINGS	05315	04/01/99	11/29/99	52				52
WARM SPRINGS	05315	08/03/99	10/20/99			468		468
WEBSTER SPRING	14012	05/01/89	09/30/89	56				56
WEST MOUND VALLEY	04405	07/01/89	10/01/89	11				11
WEST OF WAYAN	04283	05/16/89	09/30/89	13				13
WESTON CANYON	04217	06/01/99	08/31/99	12				12
WHEELVIEW	14063	05/01/99	10/30/99	10				10
WHITE HILL	24009	05/21/98	11/30/98	8				8
WHITNAH	06352	06/10/99	10/10/99	320				320
WIDE HOLLOW-1	04231	06/01/02	09/14/02	15				15
WIDE HOLLOW-2	04381	05/01/99	09/30/99	65				65
WILLIAMS CREEK SO	04252	05/15/99	09/30/99	8				8
WILLOW CREEK	04210	06/01/98	08/31/98	10				10
WILLOW CREEK CTY LN	03802	06/01/96	09/30/96	11				11
WINDMILL	06350	05/16/91	09/15/91	142				142
WINDY CANYON	06087	06/15/03	08/15/03	4				4
WIREGRAS RES.	06073	04/16/00	08/26/00	13			5	18
WIREGRASS RES.	06060	05/05/96	05/30/96	79				79
WOLVERINE CANYON	14094	05/01/89	10/31/89	75				75
WOODALL MOUNTAIN	04554	05/16/99	09/30/99			63	153	216
WOODALL RANCH	04386	05/16/99	09/30/99	191				191
WOODALL SPRING	04338	05/15/89	09/30/89	57				57
WOODLAND	06050	05/15/99	09/15/99	8				8
WOOLEY RIDGE-1	04395	06/01/89	10/15/89	53				53
WOOLEY RIDGE-2	14109	05/16/99	09/30/99	32				32
YAGO CREEK	06079	06/01/89	09/09/89	102			90	192
ZIEGLER MOUNTAIN	04229	05/01/99	10/15/99	20				20
			Totals	**73,022**	**425**	**11,863**	**6,114**	**91,424**

Table P-2. Allotments Available - Not Permitted/Leased.

Allotment Name	Allotment Number	Public Land Acres
BEAR HOLLOW	10052	80
BEAR RIVER AT ROSE	04402	120
BLACKFOOT RES.PT.	10087	40
BLACKFOOT RIVER-2	14121	220
BORDER SUMMIT-2	10039	214
BUCKSKIN MOUNTAIN	10025	120
CENTER HENRY MINE	10016	40
CHERRY CREEK	10083	40
CHUKAR RIDGE	10044	320
CITY CREEK	10056	300
CONDA MINE	10020	489
COTTONWOOD CAMP	10035	22
CRYSTAL-2	10064	40
DEMPSEY CREEK	03806	40
DENSMORE CREEK	10026	63
DOWNATA	10082	23
DRY VALLEY - CHICKEN	04176	80
FLAT CANYON POINT	03343	40
FOX HILLS	14088	40
GEORGETOWN	14077	80
GLENDALE RIDGE	10036	80
HEART MOUNTAIN	10086	160
HOOT OWL TOO	10060	40
INMAN POINT	10061	40
JACKSON CREEK	10062	80
LAST CHANCE	04243	200
MAPLETON-2	10046	40
MARSH CENTER	10076	15
MARSH CREEK-2	10067	40
MIDNIGHT CREEK	10063	120
MORGAN RIDGE	10047	20
MULLEN CANYON	10070	40
PEBBLE CREEK-USFS	06051	80
PORTNEUF RANGE	10080	520
PREUSS CREEK	10030	37
PREUSS RANGE-2	10040	40
RASMUSSEN RIDGE	10017	109
RATTLESNAKE-2	10068	40
RAWLINS CREEK	10004	40
RED ROCK PASS	10084	40
RIVER BEND	10024	49
SALT RIVER CANYON	10031	46
SAW LOG BASIN	04215	40
SHEEEP CREEK HILLS	10041	42
SHEEP ROCK	10023	868
SMITH CANYON-2	10081	1880
SOUTH CANYON-2	10050	40
SWAN LAKE POINT	10085	40
WALKER BENCH	10066	40
WALKER CREEK	10065	40
WESTON 40	10045	40
WINDMILL FLATS	04409	253

Table P-3. Allotments Not Available to Livestock Grazing.

Allotment Name	Allotment Number	Public Land Acres
90% RANGE	04328	40
ARIMO BENCH	00078	80
ARIMO BENCH	10078	80
BEAR LAKE OUTLET	10037	15
BEAR R. SO OF SODA	10022	323
BEAR R./8-MILE CRK.	10029	40
BEAR RIVER-4	14071	802
BEAR RIVER-DINGLE	10074	4
BLACK CANYON	10027	80
BLACKFOOT NARROWS	10015	195
BROWNS CANYON-2	10008	230
BUCK CREEK	10055	320
BUCKSKIN	10058	140
CHINA HAT	10014	277
CROOKED CREEK	10048	40
DYKE LAKE C.G.	10013	120
EAST SUBLETTE RD	00077	120
FORMATION SPRINGS	10021	78
GEORGETOWN CANYON	10032	80
GIBSON JACK	10054	240
GOODENOUGH	10049	23
GOV'T DAM - BSD	10010	320
INDIAN HILLS	10053	360
L HILL	10073	120
LAVA HILL	10072	100
LWR.BLKFT.R.NARROWS	10089	80
MARSH VALLEY PIT	10079	40
MONTPELIER CANYON-2	10038	601
MUD LAKE MARSH	10042	40
NEGRO CREEK -BSD	10006	518
NORTH BEACH S.P.	10051	33
NORTH FORK POC. CRK	10057	1500
ONEIDA NARROWS RES.	00036	948
OXFORD RESERVOIR	10034	40
PEBBLE POINT-2	10009	11
PORTNEUF RIVER-2	10088	3
ROBBERS ROOST	10069	800
ROBIN	10075	14
SAGEHEN C.G. - BSD	10007	160
SELLARS CREEK	10001	80
STAUFFER MINE	10018	160
SWAN LAKE SHORE	10033	15
TAYLOR MOUNTAIN	14043	200
WOMACK-SPR.CRK.-BSD	10005	566
WORM CREEK-WSA	10043	40

APPENDIX Q

OIL AND GAS RESOURCES, REASONABLY FORSEEABLE DEVELOPMENT SCENARIO

Introduction

The Idaho-Wyoming Fold and Thrust Belt covers the eastern portion of the PFO area. Discoveries in the 1970's and 1980's have indicated the potential for Oil and Gas resources within the belt. There are producing fields in both Wyoming and Utah, yet none in Idaho. Currently, all of the discoveries and producing fields are located east of the Bear Lake Thrust and most are related to deformation of the Absaroka Thrust, located further to the east in Wyoming. Most of the oil and gas uncertainty in Idaho comes from the general lack of knowledge pertaining to the older, western thrust plate geometries. The western portion of the PFO area lies within the Basin and Range province. Although there are two small, producing oil fields within the Basin and Range in Nevada, the Idaho-Wyoming Thrust Belt has the highest development potential in the district. Overall, the probability of discovering and developing a producing oil or gas field with in the PFO area is considered low. (For the geology background to this RFD, see the Administrative Record.)

Oil and gas has not been produced at economic levels in the state of Idaho. However, some resources may exist primarily in eastern Idaho. There are currently four federal oil and gas leases within the PFO. Unless drilling occurs and oil and gas resources are found, they will expire ten years from their issuance date. Approximately 51 wells have been drilled to date. The most recent drilling occurred at five wildcat exploration holes in the 1980's. No economically producible hydrocarbons were discovered. Very little activity has occurred since that time except for the issuance and expiration of a few oil and gas leases.

In this Reasonably Foreseeable Development (RFD) scenario, typical activities that could result as a consequence of issuance of an approved Oil and Gas lease are generally described. Federal regulations pertaining to oil and gas leasing are found at 43 CFR 3100. The following five phases of Oil and Gas Exploration/Development are typical in searching for and developing an oil and gas resource:

1. Preliminary Exploration
2. Exploratory Drilling
3. Field Development
4. Production
5. Abandonment

The following assumptions and scenarios are based on historical drilling activity in Southeastern Idaho as well as the oil and gas potential for the area.

Preliminary Exploration

Generally, the first step in Oil and Gas exploration is the examination of available geologic information. This may include, but is not limited to literature, maps, remote sensing data, satellite imagery, and photos. Where this information is not available, it may be collected with very little to no surface disturbance. Local geology may be mapped; samples collected or various forms of geophysical data may be gathered.

Geophysical techniques are often implemented to identify subsurface geologic structures. The BLM reviews and approves geophysical operations on a case by case basis. Gravity, magnetics and seismic reflection are the most common techniques used. Both gravity and magnetic surveys cause very little disturbance. The instruments used are small and easily transportable in light vehicles or OHV's. One to three vehicles may be used at a time. It is preferable to use existing roads, yet some overland travel is sometimes necessary. In addition, both low resolution gravity and magnetic surveys can be completed from aircraft, virtually eliminating surface disturbance.

Seismic reflection surveys are the most commonly used geophysical tool. They require a seismic energy source and an array of receptors. Shock waves are created either through the use of small explosive charges or by vibrating or thumping the ground. The explosive charges are the preferred method, and are used when access, road conditions, or population centers are not an issue. Shallow, two to six inch diameter, shot holes are drilled by a truck mounted drill rig to depths between 25 and 200 feet. Explosive charges between 5 and 50 pound are detonated. Reflected seismic waves are recorded by a series of surface equipment along a three to five mile line. In situations where explosives are not used, the ground surface is mechanically thumped using truck mounted equipment. Both operations generally utilize a crew of 10 to 15 people with 5 to 7 vehicles. Seismic surveys may be supported by aircraft.

It is anticipated that two geophysical plans would be approved during the life of the RMP with very little to no surface disturbance.

Exploratory Drilling

In order to test geologic targets exploration wells are drilled. On federal mineral estate, an oil and gas lease must be obtained and an application for permit to drill must be submitted to the field office. Site specific stipulations can be attached to the approved drilling permit. Exploration holes range in depth from a few thousand feet to many thousands of feet, but are typically about ten thousand feet deep. From the assembly of the rig to well completion the site would be active for approximately three months. It may take an additional several months to determine the production capability and economic viability of the well.

Drilling to such depths requires large drill rigs and ancillary equipment. A drill pad from 1 to 4 acres in size would be constructed. Topsoil would be removed and stored on site for reclamation. In addition to the drill rig, the pad may house a mud sump, tool shed, drill pipe, fuel tanks, water tanks, generators, pumps, equipment storage, and temporary office quarters.

Temporary roads are needed to transport and maintain the heavy equipment. Either existing roads will be improved or new roads will be constructed to accommodate the traffic. Typically, roads are constructed with a 20 foot wide, graveled, running surface with adjacent ditches and berms for a total width of about 40 feet.

Well drilling requires water. As much water as possible is recycled on site, yet about 5,000 to 15,000 gallons of water may be needed each day depending on well conditions.

At the conclusion of well testing, if paying quantities of oil and gas are not discovered, the operator is required to plug the well according to Federal and State standards. Cement plugs are placed above and below water bearing units and drilling mud fills the space between plugs. When abandonment is complete, the site is reclaimed. Typically, the pad and road are recontoured, topsoiled, and seeded. Erosion control measures would be incorporated into the reclamation design as needed.

Currently, the focus on Oil and Gas development appears to be on reserves in other basins with a history of production. Because the Idaho portion of the thrust belt is relatively untested, the risks associated with drilling are likely perceived as greater. It is anticipated that five exploration wells may be drilled during the life of the plan. Each exploration plan would be analyzed under NEPA separate from the leasing analysis. The assumed road construction to each site would be approximately four miles. On average, each site would disturb approximately 25 acres for a total of 125 acres of temporary disturbance. The exploration drilling would most likely occur in the Bear Lake area.

Field Development

Due to the current lack of infrastructure, it is assumed that exploration wells encountering limited reserves of oil or gas would not be economically producible. If an economic quantity of oil or gas is discovered, additional development wells would be drilled to confirm the discovery, establish the limits of the field, and to drain the field. Depending on the field characteristics, an oil field well spacing would be about one well per 40 acres. Well spacing in a gas field may be up to several hundred acres per well. The speed at which a field is developed is dependant on the anticipated productivity. It may take from one to three years to fully develop an oil or gas field. Large fields with several operators may be unitized to reduce surface impacts.

During field development, the road system is greatly expanded. Temporary roads are usually improved to accommodate more traffic and increased duration of use. Improvements may include crowning, capping, and implementing additional erosion controls. New roads would also be constructed. Depending on well location and topography, a main access road is build with smaller secondary roads running to each pad.

In addition to roads, other facilities may also be installed. They include power lines, tank farms, pipelines, oil/water separators, and injection wells.

It is anticipated that one well would encounter hydrocarbons in sufficient quantities to warrant field development. Based on this discovery, a five well field would be developed, producing

1,000 barrels of oil per day. Disturbance for additional roads, pads, pipelines, storage tanks may total over 60 acres. The product would likely be trucked to refineries in northern Utah. Well operators would continue to have all service operations (cementing, logging, bits, testing, etc.) provided by established service organizations in Wyoming.

Oil consumption in the United States is expected to slowly increase over the next 20 years. Although oil prices have fluctuated dramatically from $32.50 to 55.00 in 2004, the Department of Energy's Energy Information System (2004) projects oil prices in the lower 48 states to average $32.80 per barrel in 2010 and to gradually increase to $34.90 per barrel in 2025. If industrialization and consumption in third-world countries grows at a higher rate than anticipated, oil prices may increase higher than the Energy Information System predicts. In response, additional exploration may be proposed in areas including eastern Idaho.

Most sectors of natural gas consumption, industrial, electrical, transportation, residential, and commercial are expected to increase over the next 20 years. As a result of technical improvements in production, natural gas prices are forecast to fall slightly until 2006 and then generally increase. Wellhead prices are projected to be $ 3.25 per thousand cubic feet in 2010 and $ 3.80 in 2025.

Production

The production phase of an oil or gas field begins soon after discovery, and may coincide with development. Temporary facilities will be used initially, but as the extent of the field is determined, permanent facilities will be installed.

Where oil and gas flow to the surface naturally, control valves and collection pipes are attached to the well head. Otherwise pumps are installed. Oil is typically produced along with water and gas. Separation facilities are constructed on site to remove water, carbon dioxide and hydrogen sulfide. The oil and natural gas are then separated from one another. Water, usually saline, is disposed of either by discharge into surface drains, evaporation ponds or is reinjected into the producing formation.

If gas is present in economic quantities, and a pipeline is located within close proximity, a network of pipelines will be constructed to collect and transport the gas. If not, gas will likely be reinjected into the reservoir. Oil would be collected in a similar manner and stored in tanks in a central location. Depending on the size of the field, oil will either be trucked or piped to refineries.

It appears that oil or natural gas production will occur in southeastern Idaho only if a significant oil or gas discovery is made. A significant discovery could be a 4,000 foot deep reservoir capable of producing more than one million barrels of oil or a billion cubic feet of natural gas, or it could be a 15,000 foot reservoir capable of producing 500 to 700 million barrels of oil equivalent. Fields of the 500 to 700 million barrel size, or larger are common in the over thrust belt in southwestern Wyoming. These fields contain 20 to 30 producing wells. It is unrealistic to project the development of a 20 to 30 well field in this analysis, because of the past history of drilling in the area and the uncertainty that significant reservoirs even exist in Idaho.

The probability of full field development and production occurring in Southeastern Idaho over the life of the plans is considered low. The existence of or size of oil and natural gas reserves potentially found in southeastern Idaho is highly uncertain. Approximately 51 wells have been drilled in the area without encountering economically producible hydrocarbons. Currently, very little oil and gas infrastructure exists, making the costs associated with developing and producing a field higher than other area of the thrust belt.

Limited reserve gas discoveries, such as marsh gas, are also unlikely to be developed in the foreseeable future in southeastern Idaho. Gas pipelines are necessary to move gas products. Two pipelines, the 22 inch Williams Pipeline and Intermountain Gas Pipeline, are located in Southeastern Idaho. Small gas discoveries would not contain reserves sufficient to justify the investment in small diameter, high pressure lines that could, in turn, be connected to a larger, existing line.

Abandonment

The producing life span of an oil or gas field varies depending on field characteristics. A field may produce for a few years to many years. Commodity price, recovery technique, and the political environment also affect the life of a field. Abandonment of wells may begin as soon as they are depleted or wells may be rested for a period of time and put back into production. In well abandonment, it may be feasible to recover well casing, otherwise it is cut off about three feet below the ground surface. Holes are plugged, as previously described, to Federal and State standards.

After well plugging, equipment is removed and sites are reclaimed. Surface facilities and pipelines are removed. Underground pipelines are often plugged and left in place in order to avoid redisturbing these areas. Heavy equipment is used to recontour, topsoil and reseed areas disturbed in drilling and production.

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APPENDIX R

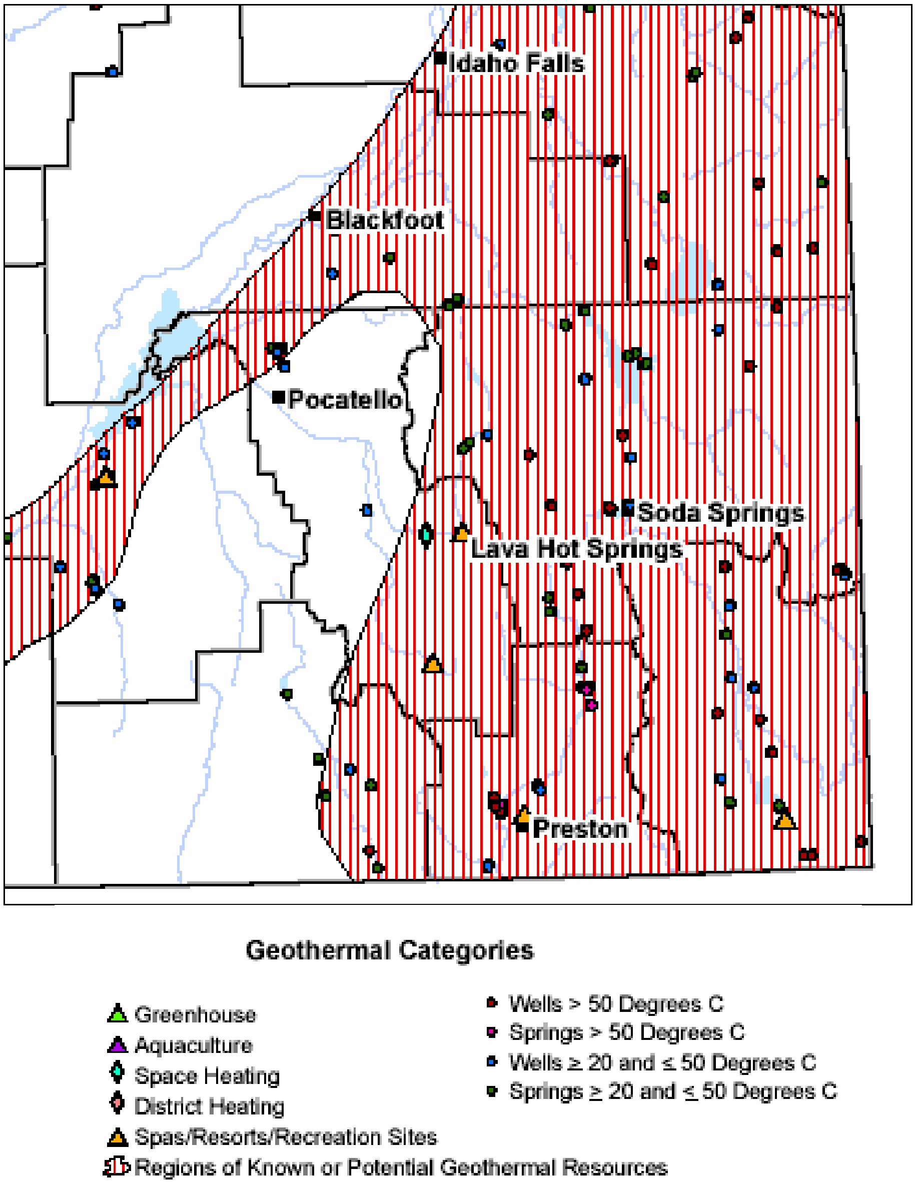
GEOTHERMAL RESOURCES, REASONABLY FORSEEABLE DEVELOPMENT SCENARIO

Introduction

In 1979, BLM prepared an environmental assessment for proposed geothermal leasing for the Idaho Falls District - Soda Springs Resource Area (BLM, 1979). At that time, more than 85 geothermal-lease applications had been filed on more than 105,000 acres of federal lands in the Resource Area. Historically, there has been one Known Geothermal Resource Area (KGRA) in the district. The Conda KGRA (IDI-28109) was established in 1978 and was declassified in 1982. While geothermal interest decreased in the subsequent 25 years, a subtle re-emergence of interest in alternative energy sources is now occurring in the western U.S. In Southeastern Idaho, Idatherm, LLC is presently proposing exploration and potential geothermal development in three different areas. If this trend continues, it is anticipated that the Pocatello Field Office will receive ten geothermal lease applications and three exploration proposals during the life of the RMP.

Idaho's geology is potentially conducive to geothermal development. Basalt, from 1 to 3 million years old, fills many of the valley basins in Southeast Idaho. Young volcanic rocks are generally indicators of potential thermal anomalies. Several exploratory oil and gas wells have reportedly encountered down-hole temperatures of 150^{o} to 500^{o}F. Hot springs in the area are not uncommon. Several have been developed using the geothermal energy directly, in the form of recreation and agriculture. To date, no thermal resources have been sufficient for the economical production of electrical energy. Developed commercial, recreational hot springs in SE Idaho include Lava Hot Springs, Downata Hot Springs, Bear Lake Hot Spring, Indian Springs, and Maple Grove.

Location of Thermal Springs and Wells in the Pocatello Field Office Area.
(INEEL/MIS 2002-1618 Rev. 2, November 2003)



To the west of the Pocatello Field Office (PFO) area, the Raft River Geothermal Resource Area was explored in the mid-1970's by the Department of Energy to test the feasibility of generating electricity from intermediate temperature systems. The stabilized production well temperature was 297^{o} F. In 1981, electricity was produced from a five megawatt binary power plant. At that time, production was not economic. This resource and others like it may become feasible in the future.

In this Reasonable Foreseeable Development (RFD) scenario, typical activities that could result as a consequence of issuance of a geothermal lease will be generally described. This RFD scenario has been developed by analogy with comparable geothermal developments in Nevada and California (BLM, 2002 a, b). Much of this scenario's content has been modeled after those efforts.

The following four phases of Geothermal Exploration/Development are typical in searching for and developing a geothermal resource:

1. Exploration
2. Development
3. Production
4. Closeout

The level of development will be determined by the temperature, reservoir characteristics, and extent of the geothermal resource as defined by exploration. Other financial and practical considerations will also impose limits. If a viable geothermal resource is discovered, it is likely to attract great interest since it's located in the heart of the Western Phosphate Field. Nearby, existing, phosphate processing and slurry pump plants would be significant potential users of electricity produced in this area. All geothermal actions on federal surface are required to be NEPA compliant and in accordance with federal regulations at 43 CFR 3200.

It is expected that over the next 10 to15 years, interest in the potential geothermal resources within the PFO area would either stay the same or increase slightly. Under the RFD scenario, it is likely that the PFO would issue about 10 Geothermal Leases. There is no disturbance associated with issuing leases. About five exploration holes would be drilled. Although location and depth of holes would vary, approximately 87 acres could be disturbed in the construction of drill pads and roads. Not all disturbances would take place concurrently. Assuming that one geothermal resource area, sufficient for electrical generation, was encountered, an additional area of about 42 acres could be disturbed in the development and production process. This disturbance would include production wells, injection wells, pipelines, power lines, and a power generation plant.

Exploration

During the exploration phase, varied geologic, geochemical, and geophysical data may be gathered to determine the presence and extent of the geothermal resource. Once the exploration target has been refined, it is likely that roads and drill pads would be constructed to provide access for drilling temperature gradient and/or exploration wells.

It is anticipated that the office would receive 3 applications for an exploration permits during the life of the plan. Application requirements are detailed in 43 CFR 3251.12. Each exploration proposal would be analyzed under NEPA separate from the leasing analysis. The exploration plans would entail building roads and pads for a total of about 5 exploration drill holes; one at each unsuccessful venture and three at a successful venture. Where possible, existing roads would be used, but up to four miles of road (30 feet wide) may be needed for each hole. Although not disturbed concurrently, a total of 87.5 acres could be disturbed by geothermal exploration. The following exploration techniques are expected to be employed during exploration:

A. Geologic, geophysical, and geochemical surveys: Detailed geologic mapping, shallow geophysical prospecting, and collection of samples typically result in low impact to surface resources. Geophysics can be effectively used to define drilling targets. Most common geophysical methods include: geothermal-gradient surveys, heat-flow determinations, electrical conductivity surveys, and microearthquake measurements (Combs and Muffler, 1973). Dipole-dipole resistivity surveys have been proposed at the Idatherm projects. Where thermal springs are present, chemical geothermometers can be used to estimate temperature of the reservoir.

B. Drilling of Shallow and other Temperature gradient wells: Temperature gradient wells may be drilled in selected locations to determine how temperature varies with depth. A grid of shallow wells, less than 20 ft in depth can be drilled to do near-surface temperature measurements. Other deeper small-diameter (3.5-4.5-inch-diameter) wells are typically drilled to a few hundred feet depth from a truck-mounted drill rig to determine temperature gradient. Gradient wells are not suitable for production of geothermal fluids. In addition to logging the down-hole temperatures with depth, geologists examine drill cuttings from the holes to determine lithology, mineralogy, and thermal alteration. High-temperature gradients aid in determining best locations for exploration wells. Surface disturbance is generally limited to a .1 to .25 acre pad that includes a space for the truck-mounted drill rig, a water truck space, a steel mud tank, and a small (e.g., 10 ft x 5 ft x 5 ft) lined mud pit. Drilling mud is generally used to control circulation and return cuttings to the surface, although air, mist, and foam can also be used in some applications. Drilling mud is not toxic.

C. Exploration well drilling: Geothermal anomalies identified through field surveys can be better defined and tested for temperature, fluid, and reservoir characteristics through drilling. Typically, exploration wells disturb 1 to 3 acres of surface plus access roads. Geothermal wells are completed in accordance with standard industry standards (as specified in Geothermal Resources Operational Orders) including specifications for well casing, cementing of casing, pressure testing, deviation surveys, blowout prevention, drilling fluid control, monitoring, and well logging. Wells (including intervals at depth) are drilled no closer than 100 feet of the outer boundary of the lease. Wells may be drilled vertically or inclined. Where steep slopes or other environmental protections preclude drilling, wells may be directionally drilled beneath the Federal land. Exploration wells are larger diameter than temperature gradient wells. While wells may be located along existing roads, additional access roads may need to be constructed.

Development

Not all exploration activity on leases results in development of a geothermal resource. Where the geothermal resource can be proven, the resource is developed with the assembly of infrastructure necessary to tap and utilize the geothermal reservoir. Development includes:

A. The drilling and testing of production wells; and
B. Construction of site facilities, power plant, and power line.

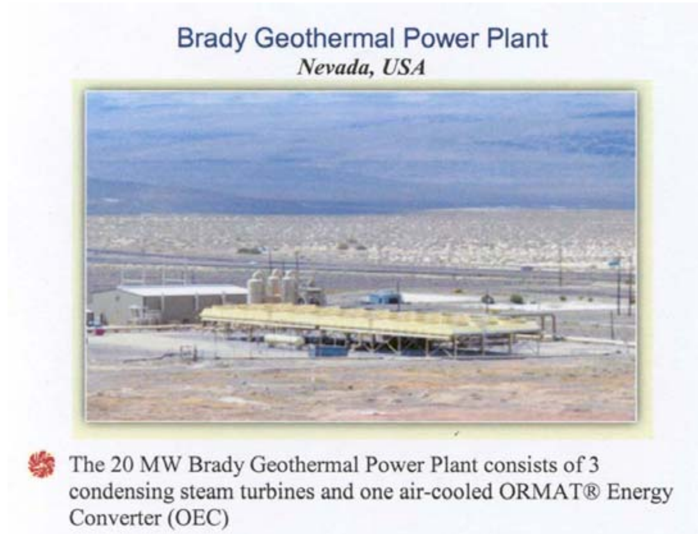


Figure 1. Example of surface facilities at a geothermal power plant in Nevada (Ormat, 2003).

It is anticipated that one exploration project would encounter a geothermal resource sufficient for development of electrical generation. The typical small geothermal field is expected to consist of five production wells, two injection wells, pipelines, power lines, and a 30 Megawatt binary power plant. Production well spacing would depend on the field characteristics. More than one production well could be drilled from the same pad. The total disturbance may be up to about 42 acres.

If a warm resource, insufficient for electrical production, is encountered it may be put to direct use. Warm water from 50^{o} to 300^{o}F may be used for household heating; agriculture, in the form of heating greenhouses or aquaculture; or for recreation, in the form of developed hot springs. Developed commercial hot springs in SE Idaho include Lava Hot Springs, Downata, Bear Lake, Indian Springs, and Maple Grove. An alligator farm, on private land, near Twin Falls, Idaho, is heated by thermal water.

<u>Production wells</u> are generally thousands of feet deep and may occupy about a 4-acre well pad, plus access roads. Production wells may have a diameter of 8-20 inches. Many of the same considerations apply to production wells that apply to exploration wells. Casing size generally diminishes with depth. Adhering to strict requirements for casing and well completion will assure prevention of contamination of shallow aquifers by geothermal fluids. Pumping from a production well could conceivably cause surface subsidence. However, extraction from the depths ranging from 6000 to 10,000 feet, which may be necessary, would not cause noticeable subsidence. Injection wells are similarly drilled and used to return spent geothermal fluids to the reservoir. Casing requirements and careful selection of the injection interval would prevent contamination of shallow aquifers.

<u>Power Plant.</u> There are generally three types of electrical power plants: dry steam, flashed steam, and binary plants. The plants are generally low-profile and orderly in appearance. An example of the surface facilities of a geothermal power plant at Brady, Nevada is shown in Figure 1. The surface space required for all related production wells, plant, and surface facilities is about 1 acre per Megawatt produced (St. Marie and others, 2002).

At extreme temperatures, water may exist as steam in an underground reservoir. At such locations, dry steam generation is possible. A well is drill-ed and steam is brought to the surface where it is used to drive a turbine, which turns a generator. This requires exceptionally high temperatures and large underground steam aquifers. There is currently only one dry steam power facility in the U.S. According to the Idaho Department of Water Re-sources, to date no such resources have been identified in Idaho.

Flashed steam generation relies on water which is liquid while under pressure at depth, yet boils instantaneously when raised to the surface. Idaho Department of Water Resources states that water greater than 182°C is needed. The steam expands, is separated from remaining water, and is used to drive a generator.

Binary power plants are suitable for lower water temperatures, between 224-360°F (St. Marie and others, 2002). A binary plant uses heat from the geothermal resource to boil a secondary fluid with a low boiling point. This "working fluid" is vaporized, expands, and turns a steam turbine. The working fluid never directly contacts the geothermal water. Working fluid is cooled, condensed, and recycled and geothermal water is injected into the aquifer. A schematic diagram in Figure 2 displays the general components of the plant. A pilot binary power plant was constructed in the 1970's in the Raft River Valley of south central Idaho. While it was only operational for a few months, a company is now attempting to get that plant back into production. The plant is located on private land.
Other facilities include geothermal pipelines (24-36 inches in diameter) that are covered with insulation and run parallel to existing access roads. While the primary goal is electric power generation, it is possible that other lower temperature aquaculture applications could be "cascaded" off the geothermal fluid exiting the power plant. This could involve the construction of other facilities such as green houses or warm-water ponds.

Minor environmental impacts from the development phase could include: venting of hydrogen sulfide from wells, fugitive dust from construction, localized heating, loss of vegetation and habitat, noise, lowering of groundwater table, and localized loss of other surface resources. Existing geothermal operations in other states show that all impacts can be successfully mitigated.

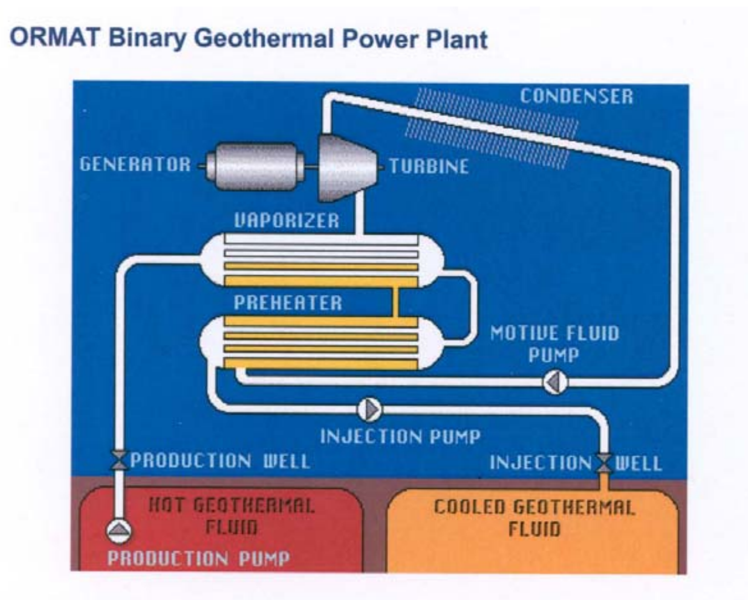


Figure 2. Diagram of basic components of a binary (-cycle) geothermal power plant (Ormat, 2004).

Production

The production phase of a geothermal power plant could last 10 to 35 years. The main activity during this phase would be operation and maintenance of the plant and facilities. During the operation of the production facility, it may become necessary to drill new production wells. Environmental effects may be related to: waste generated by activities, emissions from plant, wells, and fugitive dust, noise, as well as management of the geothermal water. Little additional ground disturbance is expected from production.

Closeout

After production ends, the closeout phase of the geothermal facility would include: proper abandonment of the facility and wells. All plants and associated structures, pipelines, and facilities would be disassembled and removed. Surface reclamation would include grading and re-vegetation of all disturbed areas. Wells would be abandoned in accordance with 43 CFR 3263 (Well Abandonment).

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