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

Four Rivers Field Office Draft Resource Management Plan and Draft Environmental Impact Statement

Four Rivers Field Office, Boise District, Idaho (Volume 2)

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Appendix A: Collaboration and Consultation

Interagency and Tribal Relationships

Section 202(c)(9) of FLPMA requires BLM to provide for public involvement of other federal agencies and State and local government officials in developing land use decisions for public lands, including early public notice of proposed decisions that may have a significant impact on lands other than BLM. It also requires, to the extent practical, that BLM keeps itself informed of other Federal, State, and local land use plans; assures that consideration is given to those plans germane to the development of BLM land use plan decisions; and assists in resolving inconsistencies between federal and non-federal plans, if possible.

The CEQ regulations require an early and open process for identifying significant issues related to a proposed action and obtaining input from the affected public prior to making a decision that could significantly affect the environment. These regulations specify public involvement at various junctures in the development of an EIS. The BLM designed an iterative review process in order to capture issues from numerous public sources and to satisfy CEQ and FLPMA requirements. These reviews consisted of:

- ID Team product development and internal agency review;
- Issue review from the Resource Advisory Council (RAC);
- Formal government-to-government consultation with Native American Tribes;
- Review and comment from cooperating agencies;
- Review and comment from the general public; and
- ID Team revisions based on this feedback.

Cooperating Agencies

The CEQ defines a cooperating agency as any agency that has jurisdiction, by law or special expertise, for proposals covered by NEPA (40 CFR 1501.6). Any Federal, State or local government jurisdiction with such qualifications may become a cooperating agency by agreement with the lead agency. Formal cooperating agencies include the State of Idaho, by and through the Idaho governor's Office of Energy and Mineral Resources (OEMR); U.S. Department of Interior, Fish and Wildlife Service; U.S. Department of Interior, Bureau of Reclamation; and U.S. Department of Agriculture, Forest Service. Cooperating agencies provided input into the development of alternatives and reviewed preliminary versions of the Draft EIS to identify issues of consistency with other relevant plans.

Tribes

The United States has a unique legal relationship with American Indian tribal governments, as set forth in the U.S. Constitution, treaties, statutes, Executive Orders, and court decisions. All federally recognized Tribes have off-reservation interests in public land, and many retain pre-existing rights reserved through treaty or Executive Order language and other relevant mandates. The relationship between Federal agencies and sovereign Tribes is defined by numerous laws and regulations addressing the requirement of Federal agencies to notify and/or consult with Native American Tribes and to consider their rights and interests when planning and implementing Federal undertakings.

The United States government has a trust responsibility to Federally recognized Native American tribes that covers lands, resources, money, or other assets held by the Federal government in trust or restricted against alienation for Native American Tribes and Native American individuals. Additionally, the Bureau of Land Management (BLM) must consider and protect off-reservation treaty-reserved fishing, hunting, gathering, and similar unrelinquished rights of access and resource use on the public lands it

administers. This includes rights of access and use for ceremonial and other traditional cultural practices. The Shoshone-Bannock Tribes of the Fort Hall Reservation have rights, reserved in the Fort Bridger Treaty of 1868, to hunt, fish, and gather on the unoccupied (i.e., public) lands of the United States. The Shoshone-Paiute Tribes of the Duck Valley Reservation assert aboriginal rights to their traditional homelands as their treaties with the United States were never ratified.

Consultation with the Shoshone-Paiute Tribes of the Duck Valley Reservation and the Shoshone-Bannock Tribes of the Fort Hall Reservation over the years indicates the presence of a wide range of resources related to Tribal rights and/or interests and ongoing tribal use in the PA. These include resources associated with hunting, trapping, fishing, and gathering food, medicinal plants, and other natural products; the availability of clean water and healthy plant and animal populations, as well as aboriginal archaeological sites, sacred sites, and traditional cultural properties.

The Four Rivers Field Manager corresponded with the Shoshone-Bannock, Burns Paiute, and Nez Perce Tribes on June 19, 2008, offering government-to-government consultation. Additional information was provided to the Nez Perce Tribe, and BLM will continue to collaborate during the ongoing planning process.

Consultation with the Shoshone-Bannock and Shoshone-Paiute Tribes and participation in the planning process began with publication of the Federal Register NOI. Throughout the development of this document, the Tribes have played an active role, understanding that this involvement will result in a RMP that provides for better, more responsive land stewardship. The Tribes not only helped identify issues to be addressed, but also helped in the analysis of those issues and development of the desired future conditions (DFCs) for the Planning Area. The DFCs are directly responsive to the issues.

Consultation with the Shoshone-Paiute Tribes is conducted through the Wings and Roots Native American Campfire, an established government-to-government consultation process. The EIS was first discussed at Wings and Roots meetings held on June 19, 2008. The following is a statement from the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation that describes RMP consultation and their relationship with the Four Rivers Planning Area:

> The Shoshone-Paiute Tribes, headquartered at the Duck Valley Indian Reservation, have engaged in an extensive government-to-government consultation with the Bureau of Land Management in a collaborative effort to produce this Four Rivers Management Plan (RMP) through the Wings and Roots Program. It reflects a successful partnering to reflect the mandating of our two sovereign nations to identify our respective expectations.
>
> While specific cultural sites are of greatest importance to archaeologists, the tribes use the Four Rivers Planning Area and surrounding region as a whole for activities such as gathering medicinal and food plants, minerals, craft materials, and for hunting antelope, deer, badgers, rabbits, sage hens, bobcats, groundhogs, ants and anthills, birds, elk, mountain sheep, cougars, and a variety of small game.
>
> Because of the Shoshone-Paiute peoples' ancient occupation, the Four Rivers Planning Area is filled with ceremonial, hunting, gathering, teaching, and historical sites as well as resource-gathering areas for food, medicinal plants, and craft materials utilized in their daily lives. For example, ceremonies are conducted at sites in the area where certain tribal members' ancestors lie buried near ancient massacre sites. Ceremonies are also conducted at sites to insure the health and survival of the wildlife found there. Several buttes and peaks with or without rock alignments, appear to have served as a lookout for early warning of cavalry and militias in former times and/or to monitor game animals' movements, as well as for viewing the arrival and movements of distant family bands or groups as far as 50 miles away.

> For the Shoshone-Paiute, the natural world is regarded as part of many sacred cyclical patterns; therefore, words such as "subsistence," "food," "medicine," and "use" have fundamentally and culturally distinct meanings to non-Indians and tribal people. For example, for the Shoshone-Paiute foods are medicines that have spiritual healing qualities for the body and the spirit, as well as being objects for sacred offerings to spirits.
>
> Beyond relationships of culture, including hunting, gathering, crafts, trade, etc., landscape features are also places of personal communication with the spirits and opportunities for people to enter the sacred and acquire guidance and help. The Shoshone-Paiute relationship to the land connects fundamental symbols and patterns of culture and human relationships by creating an organization that gives geography significance and intelligibility. The more central a geographic place is in the religious life of a group, the more numerous its symbolic representations are likely to be, as we see repeatedly in the culture of the Shoshone-Paiute.
>
> Virtually all aspects of Shoshone-Paiute culture is tied to the land, and any landscape feature can have different meanings and functions as sacred sites as well as sites for hunting, gathering, healing, etc. Just as the land has different functions and meaning, so to do rock structures. Any one rock structure can have a multitude of uses, while a group of structures together may have only one function or meaning. As man-made objects within a multidimensional landscape, rock structures must be carefully investigated as complex cultural artifacts that have complex meanings and functions in the culture and history of the Shoshone-Paiute.

A Tribal ethnography was presented to BLM on January 19, 2011 during the Wings and Roots Native American Campfire consultation for the Four Rivers RMP. The following paragraphs are the Shoshone-Bannock Tribes characterization of the Field Office's affected environment from the Tribal perspective:

> The Four Rivers Resource Area has been a part of the homelands of the Shoshone and Paiute people since time immemorial. The movements of the people were dictated by the resources and the seasons. The weather is milder in the valleys than it is at the higher elevations. As the winter gave to spring many people went to areas in the mountains as the weather got warmer, as fall approached and the weather began turning colder they returned to the milder climate at the lower elevations. The Boise Valley, Indian Valley, Weiser Valley, and other locations along the Snake, Boise and Payette Rivers and the tributaries were some of the areas preferred for winter camps.
>
> The annual subsistence cycle began in the spring with some groups going into the mountains for large game and roots while others went to favorite fishing locations on the Rivers and its tributaries in the area (Snake, Boise and Payette rivers). The mid-summer period was also a time of large intertribal gatherings in areas such as Boise, Weiser, and the Lemhi Country. Fishing, hunting and root digging supported large numbers who came from many directions to enjoy time with friends and relatives and to trade.
>
> Women gathered berries, roots, nuts, seeds and insects intensively during the spring, summer and early fall. The people utilized well over 100 different plants for food, medicines and other purposes such as weaving baskets, winnowing trays and other containers, tools and weapons as needed. Large game resources included elk, deer, antelope, moose, mountain sheep, and bear.
>
> Late fall was a time of intensive preparation for winter; meats and various plant foods were cached in protected, well drained locations for use during winter months. When necessary, some winter hunting was conducted, but in general the period from December through

February was one of limited hunting and gathering. Shoshone, Paiute fishing implements include spears, harpoons, traps, dip nets, seines (large weighted nets) and weirs. Three major anadromous fish runs took place beginning during the season beginning in the spring thru fall. Two of these were Chinook salmon runs, and another of Steel head trout. Other species of fish regularly taken include the three-tooth lamprey, Columbia River sturgeon, cut throat trout, and Rocky Mountain whitefish. Twined conical baskets normally used for gathering seeds were sometimes used for dipping fish from small streams.

Fish weirs and traps were limited primarily to locations on the Snake River, and the community usually cooperated in their construction and use. There was also communal net hunting for antelope, rabbits, and certain waterfowl. Water fowl were killed with clubs or by wringing the neck. Snares and spring-pole traps were also used for birds and small game. Deadfalls, pitfalls, decoys and blinds were used to take game as well.

Rodents were smoked out or extracted from their burrows with the aid of a "rodent skewer," a long thin pole that was twisted into the animal's skin.

Both wooden and horn bows were backed with sinew; while knives and arrow tips were made of stone; bone was used for salmon spears, awls, and other small tools. Other utensils were made primarily from bison and mountain sheep horn or basketry.

Conical carrying baskets were used to transport different types of seeds. Twined basketry seed beaters or sharp wooded and bone seed knives were used to knock the ripened seeds into baskets. Foods were transported in woven sagebrush bark baskets; pack straps of skin and vegetable fibers supported the bark baskets.

Pitch-lined water storage containers were used widely. Although most basketry was twilled, occasionally coiled samples were seen.

Food was stone boiled in baskets covered with rawhide. Seeds were pounded and roasted in willow trays and chokecherries were mashed and sun-dried, while camas and similar tuberous roots were baked in earth ovens and formed into sun-dried loafs.

Contact between the explorers and Shoshone-Paiute

The journals of explorers and trappers, such as Lewis and Clark (1804 -1806), the British North West Company (1807 -1809), and the American Pacific Fur Company (l810), are some of the earliest written records of contact between the Shoshone, and Paiute people and the non-Indians. These accounts are valuable for their recording of the fierce competition between the British and American trading companies which resulted in severe degradation of the environment. Beaver were nearly trapped to extinction by the British in order to deter competing American companies. Bison vanished from southern Idaho; otter and other fur-bearing animals also severely declined. This severely impoverished the Tribes and strained relations with the immigrants.

The first settlers reached the Boise Valley in 1836, by the early 1840s the migration increased along the Oregon Trail, eventually bringing more than 18,000 people and some 50,000 animals through southern Idaho between 1842 and 1852. This resulted in the depletion of grass, game, and other resources. Hunters from wagon trains eliminated big game for as far as 50 miles on either side of the trails.

Gold was discovered in the Boise Basin in 1862, and the gold rush was on. Miners, prospectors, settlers, and others flocked into the area. Displacement of the Native American Indians began full scale, Indian lives, rights, and properties were disregarded as the whites encroached onto to Indian lands creating conflicts.

Fort Boise was established in 1863 by the U.S. Government and manned by cavalry troops, for the protection of immigrants. The increased desire for Indian lands and hostile attitudes of settlers led to demands that the Indians be removed from their homelands.

The Indian people in the Boise area were forcefully relocated to the present location of Arrowrock Dam, there was much hardship and sickness, many people died.

Boise Valley Treaty, October 10, 1864
Caleb Lyons (Governor of the Idaho Territory and Superintendent of Indian Affairs) signed a treaty with the Boise Shoshone who agreed to relinquish the Boise Basin, and some adjacent lands in return for an undetermined sum of money and a parcel of land in the vicinity for a reservation. The Indians complied with the terms of the treaty and relinquished lands and ceased hostilities. However, the U.S. Senate failed to ratify the treaty and the Indians did not receive what was promised. Caleb Lyons suffered severe personal ridicule and life threats from white settlers because of his policy of dealing justly and fairly with the Indian people.

Bruneau Valley Treaty, April, 10 1866
Caleb Lyons signed a treaty with the Bruneau Shoshone in order to obtain an important mining region around Silver City in the Owyhee Mountains. Some lands near the Snake River was also ceded to the U.S., much of the extensive Bruneau Shoshone land holdings was designated as a reservation. Again, the Indians complied with the terms of the treaty, and again, the United States Senate failed to ratify the treaty.

Terror at Camas Prairie (Bannock War)
The Bannock War of 1878 began there, from a camp in the forbidding lavas a few miles away that Buffalo Hom led his war party on a campaign that lasted several months and killed at least 40 soldiers and civilians, and spread terror in several states. Causes of the war were rooted in many factors. The immediate spark was the rooting of hogs that destroyed the camas crop at Camas Prairie. This took place even though the Indians objected strenuously to the running of pigs by settlers on fields where Indians had for years dug for camas as a staple of their diet. The U.S. Government promised to provide the Indians with provisions if they moved to the reservations. Very little was provided to the people, they were starving, and many had to return to their historical gathering areas to find food. Most of the provisions were taken by crooked Indian agents that sold the food. Following their surrender in Weiser Idaho, all Indian people, whether they participated in the hostilities or not were rounded up by Gen. Howard and Gen. Miles with the aid of Sarah Winnemucca and were herded like cattle in the dead of winter to Yakima. Over 550 people were driven to Yakima with over 1000 head of horses. Less than 200 returned to their homeland after being held as prisoners of war for five years, with less than 100 head of horses. Following their release, some went in search of family members and relatives and eventually ended up living on several reservations such as Warms Springs OR, Burns OR, Fort McDermitt, and Fort Hall. Others returned to their homelands in southern Idaho and the Owyhee Canyonlands and now reside on the Duck Valley Indian Reservation.

Contemporary Shoshone-Paiute people continue to visit sacred sites, conduct ceremonies and to harvest resources throughout the area. Modem day Indian tribes are living cultures who still practice their traditions and culture. The lithic scatters and rock structures and alignments are resources, must be protected and preserved for contemporary and ongoing use for tribal members and future generations.

(Vine Deloria) A belief in the sacredness of lands, when seen in the Indian context, is an integral part of the experiences of the people, past, present and future. Indians who have

> never visited certain sacred sites nevertheless know of these places from community knowledge, and they intuit this knowing to be an essential part of their being. Every identifiable region has sacred places peculiar to its geography. Their sacredness does not depend on human occupancy but on stories that describe the revelation that enabled their people to experience the holiness there. Sacred places are the foundation of all other beliefs and practices because they represent the presence of the sacred in our lives. They properly inform us that we are not larger than nature and that we have responsibilities to the rest of the natural world that transcend our own desires and wishes."

The BLM met with the Natural Resources staff for the Shoshone-Bannock Tribe for the first time on August 19, 2008 to discuss areas of Tribal interest, and have continued to collaborate during the planning process. The Shoshone-Bannock Tribes have developed position statements for developed campgrounds on federal lands, for management of Snake River Basin resources, and transfer of federal lands. The policy statements are listed below:

Policy Statement Regarding Developed Campgrounds: The Shoshone-Bannock Tribes exercise inherent and reserved treaty rights within their own authorities and responsibilities. Federal Land Developed Campground fees, reservation systems, and any other fee-based campground services shall not apply to the enrolled members of the Shoshone-Bannock Tribes, in accordance with Article IV of the Fort Bridger Treaty, on all unoccupied lands of the United States. The Treaty does not state, nor was it the intent of our leaders at the time of signing of the treaty, to impose or restrict Tribal members from exercising off-Reservation rights to hunt, fish and gather, and the corresponding right to camp. Federal permitting requirements are contrary to the rights reserved by the Tribes in the Fort Bridger Treaty.

Policy for Management of Snake River Basin Resources: The Shoshone-Bannock Tribes (Tribes) will pursue, promote, and where necessary, initiate efforts to restore the Snake River systems and affected unoccupied lands to a natural condition. This includes the restoration of component resources to conditions which most closely represents the ecological features associated with a natural riverine ecosystem. In addition, the Tribes will work to ensure the protection, preservation, and where appropriate-the enhancement of Rights reserved by the Tribes under the Fort Bridger Treaty of 1868 (Treaty) and any inherent aboriginal rights.

Position Regarding the Transfer of Federal Lands: The Shoshone-Bannock Tribes set forth the following position concerning any deposition, sale or transfer of federal lands, use rights or other rights in lands that may affect the Shoshone-Bannock Tribes' treaty rights as guaranteed by the Fort Bridger Treaty of July 3, 1868 and subsequent cession agreements. The Tribes oppose any federal land disposition, sales or transfers to private entities or State and local governments based on two fundamental reasons. First, the United States government entered into a solemn treaty with the Shoshone and Bannock tribal peoples in which the Tribes reserved certain off-reservation hunting, fishing and gathering rights which they continue to exercise on unoccupied lands of the United States. Subsequent to the 1868 Treaty, the Tribes ceded certain lands to the United States and reserved in the cession agreements certain communal rights for grazing and use of the public lands. Second, the United States, including its federal agencies, have a trust responsibility as established in the Fort Bridger Treaty and other federal laws, policies and executive orders to protect and preserve the rights of Indian tribes, and to consult with the Tribes prior to such land sales or transfers.

Treaty Guaranteed Rights: The Shoshone-Bannock Tribes ("Tribes") have reserved rights based on their Treaty of Fort Bridger of July 3, 1868. In the treaty negotiations, the Tribal leaders made it clear that they wished to continue to fish for salmon, hunt buffalo and elk, gather the plants and medicines and other cultural resources in their aboriginal areas within the United States, including but not limited to the present states of Idaho, Utah, Wyoming, Nevada and Montana. The Tribes ceded millions of acres of their aboriginal homelands in return for a much smaller reservation known as the Fort Hall Reservation:

Accordingly, the Tribes in the Treaty reserved certain off-reservation hunting, fishing and gathering rights which they continue to exercise on unoccupied lands. These reserved treaty rights have been recognized and confirmed by the Idaho Supreme Court.

The Nez Perce Tribe have reserved rights based on the Stevens Treaty which contains similar language as the Treaty of Fort Bridge but goes on to say that the exclusive right of taking fish in all the streams running through or bordering the reservation is secured. As also the right of taking fish at all usual and accustomed places in common with citizens of the territory, and of erecting temporary buildings for curing, together with the privilege of hunting, gathering, and pasturing horses and cattle upon open and unclaimed land.

Following the Treaty of 1868, the United States sought further land cessions from the Tribes in the late 1880s. Under these cession agreements the Tribes reserved grazing and gathering rights on public or unoccupied lands. Today, Tribal members continue to graze their livestock on federal lands, and gather firewood, posts, poles, food and medicinal plants for traditional practices.

The disposition, sale or transfer of federal lands to a private entity or State and local governments adversely impacts the Shoshone-Bannock Tribes' guaranteed off-reservation treaty rights by diminishing the locations and access to areas where Tribal members exercise treaty rights. Tribal members, whose ancestors hunted, fished or gathered on aboriginal lands for thousands of years, are forced to relocate to other areas or cease the exercise of such treaty guaranteed rights. Tribal members' grazing areas are also reduced by land transfers, depositions or sales and access for gathering may be severely limited. The transfer, patent or outright purchase of federal lands, and the extension of leases for mining on federal lands by private businesses enable them to control access and use, which jeopardize access to certain Shoshone-Bannock traditional fishing, hunting and gathering areas, and grazing and plant material use.

Federal Trust Responsibility: It is well established that the United States has a solemn trust obligation to the Shoshone-Bannock Tribes. Under this obligation, the United States has a special fiduciary responsibility to consider the best interests of the Shoshone-Bannock Tribes pursuant to the Fort Bridger Treaty. The United States assumed this responsibility when it entered into the Treaty with the Tribes. Today, most fundamentally, the modern form of the trust obligation is the Federal Government's duty to protect tribal lands and treaty resources, including the off-reservation rights the Tribes reserved. This duty to protect treaty resources includes preserving the integrity of lands upon which the resources are located.

The cultural resources located on many off-Reservation lands are essential to the culture and traditions of the Tribes. Importantly, these resources provide subsistence to a majority of Tribal families residing on the Fort Hall Reservation. Loss of the aboriginal lands because of federal land depositions, sale or transfers to private businesses and non-Federal Government agencies may be devastating to the Tribes and lead to irreversible cultural extinction of traditional practices. Loss of Tribal culture and traditions occur because Tribal identity depends heavily upon the socio-cultural ties that link individuals, families and groups to specific traditional and aboriginal territories and lands. The reservation of these aboriginal areas for hunting, gathering and fishing were contemplated by the Tribal leaders and reserved in the Fort Bridger Treaty. Accordingly, elimination of the federal lands through transfers severely impacts the subsistence food sources for Tribal members, severs the family and cultural ties to certain traditional lands, and restricts the use of cultural resources which are not found on the Fort Hall Reservation.

The federal trust obligations require a federal agency to carefully consider and investigate the effects of its actions on tribal interests and assess its obligation to tribes. The Tribes must not be treated like merely citizens. Instead, the federal land management agencies owe a duty to preserve and protect the Tribal resources by diligently discussing and considering the Shoshone-Bannock Tribal interests through consultation with the Tribes concerning any consideration of a transfer of lands located within the Tribes' aboriginal areas. Proposed land depositions, sales or transfers must consider appropriate

mitigations to address reserved treaty rights, cultural resource laws and Tribal policy. Consultation is required by numerous federal laws, including Executive Orders 12875, 13007, 13084 and 13175.

The Shoshone-Bannock Tribes oppose any federal land depositions, sales or transfers that may adversely impacts natural and cultural resources and/or our reserved treaty rights of hunting, fishing and gathering on unoccupied lands of the United States. We certainly welcome the opportunity to work with any federal agency in transferring any federal lands to the Shoshone Bannock Tribes to insure the Tribes' treaty rights are secured for future generations.

Other Stakeholder Relationships

The Boise District Resource Advisory Council (RAC) is a 15 member advisory panel that provides advice and recommendations to BLM on resource and land management issues. Membership includes a cross section of Idahoans representing energy, tourism and commercial recreation, environmental, and archaeological or historic interests, as well as elected officials, a tribal representative, and the public-at-large. Council members are selected for their ability to provide informed, objective advice on a broad array of public land issues, and their commitment to collaboration in seeking solutions to those issues. Input from the RAC is sought at key points in the planning process.

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Appendix B - Planning Criteria

The BLM planning regulations (*43 CFR 1610*) require identification of planning criteria to guide development of RMPs. Criteria are the constraints, or rules, which guide and direct the plan's development. They influence all aspects of the planning process, including inventory and data collection, formulation of alternatives, estimation of effects, and, ultimately, the development of an RMP. They ensure that plans are tailored to the identified issues and that unnecessary data collection and analyses are avoided. Planning criteria are based primarily on standards prescribed by applicable laws, regulations, and agency guidance, and consultation with Native American Tribes. They are also based on consultation and coordination with public, other federal, State, and local agencies and government entities and analysis of information pertinent to the Planning Area. Planning criteria also help to guide the final plan selection and are used as a basis for evaluating responsiveness of the planning options.

Planning criteria primarily identify the legal, regulatory, and policy authorities and requirements that direct or limit the ability of the BLM to resolve issues. The BLM managers can also identify additional factors to guide decision making, analysis and data collection during planning. Overall, planning criteria serve three main functions by:

- Describing the general and resource-specific standards, rules, and measures that constrain or shape decisions;
- Guiding the development of the Environmental Impact Statement to ensure it is tailored to identified issues; and
- Identifying factors and data to consider in making decisions and gathering data to deter unnecessary collection and analysis.

Planning criteria also streamline the plan's preparation; establish standards, rules, and measures to be used; guide and direct the resolution of issues through the planning process; and indicate factors and data that must be considered in making decisions. The following general planning criteria will be considered in developing the RMP.

The Federal Land Policy and Management Act of 1976 (FLPMA) provides the authority for BLM land use planning. The following summary of FLPMA requirements is addressed in BLM Manual 1601.

Section 201 requires the Secretary of the Interior to prepare and maintain an inventory of the public lands and their resources and other values, giving priority to Areas of Critical Environmental Concern (ACECs).

Section 202(c) (1-9) requires that, in developing land use plans, BLM shall use and observe the following principles of multiple use and sustained yield:

- Use a systematic interdisciplinary approach
- Give priority to the designation and protection of areas of critical environmental concern
- Rely on the inventory of public lands, to the extent available; consider present and potential uses of those lands
- Consider the relative scarcity of the values involved and the availability of alternative means and sites for realizing those values
- Weigh long-term benefits to the public against short-term benefits

- Provide for compliance with applicable pollution control laws, including State and federal air, water, noise or other pollution standards or implementation plans
- Consider the policies of approved State and Tribal land resource management programs, develop land use plans that are consistent with State and local plans, to the maximum extent possible, consistent with federal law and the purposes of this Act.
- Integrate physical biological, economic and other sciences in the development of land use plans

Section 202(d) provides that all public lands, regardless of classification, are subject to inclusion in land use plans, and that the Secretary may modify or terminate classifications consistent with land use plans.

Section 202(f) and Section 309(e) provide that federal, state, and local governments and the public be given adequate notice and an opportunity to comment on the formulation of standards and criteria for, and to participate in, the preparation and execution of plans and programs for the management of public lands.

Section 302(a) requires the Secretary of the Interior to manage BLM lands under the principles of multiple use and sustained yield, in accordance with available land use plans developed under Section 202 of FLPMA.

The BLM Planning Handbook H-1601-1 relies on available inventories (with updates) of the public lands, their resources, and other values to reach sound management decisions.

The National Environmental Policy Act of 1969 (NEPA) requires the consideration and public availability of information regarding the environmental impacts of major federal actions significantly affecting the quality of the human environment. This includes the consideration of alternatives and mitigation of impacts.

The Clean Air Act of 1990 requires federal agencies to comply with all federal, State and local requirements regarding the control and abatement of air pollution. This includes abiding by the requirements of State implementation plans.

The Clean Water Act of 1987 establishes objectives to restore and maintain the chemical, physical, and biological integrity of the Nation's water.

The Federal Water Pollution Control Act of 1948 requires federal land managers to comply with all federal, State, and local requirements, administrative authorities, processes, and sanctions regarding the control and abatement of water pollution in the same manner and to the same extent as any nongovernmental entity.

The Endangered Species Act (ESA) of 1973 in:

Section 1531(b) provides a means whereby the ecosystems upon which endangered and threatened species depend may be conserved and provides a program for the conservation of such endangered and threatened species.

Section 1531(c) (1) requires all federal agencies to seek to conserve endangered and threatened species, and utilize applicable authorities in furtherance of the purposes of the ESA.

The Sikes Act of 1974, Title II (16 U.S.C. 670g *et seq.*), as amended directs the Secretaries of Interior and Agriculture to, in cooperation with the State agencies, develop plans to "develop, maintain, and coordinate programs for the conservation and rehabilitation of wildlife, fish and game. Such conservation and rehabilitation programs shall include, but not limited to, specific habitat improvement projects, and related activities and adequate protection for species considered threatened or endangered." Section 1536(a) requires all federal agencies to avoid jeopardizing the continued existence of any

species that is listed or proposed for listing as threatened or endangered or destroying or adversely modifying its designated or proposed critical habitat.

The Wild and Scenic Rivers Act of 1968 requires federal land management agencies to identify potential river systems and then study them for potential designation as wild, scenic or recreational rivers.

The Wilderness Act of 1964 authorizes the President to make recommendations to Congress for federal lands to be set aside for preservation as wilderness.

The Antiquities Act of 1906 protects cultural resources on federal lands.

The National Historic Preservation Act (NHPA) of 1966 expands protection of historic and archaeological properties to include those of National, State or local significance, and directs federal agencies to consider the effects of proposed actions on properties eligible for, or included in, the National Register of Historic Places (NRHP).

The American Indian Religious Freedom Act of 1978 establishes a National policy to protect and preserve the right of American Indians to exercise traditional Indian religious beliefs and practices.

The Taylor Grazing Act of 1934 authorizes the Secretary of the Interior to establish grazing districts, or additions thereto, and/or modify the boundaries thereof.

The Public Rangelands Improvement Act of 1978 provides that public rangelands be managed so that they become as productive as feasible, in accordance with management objectives and the land use planning process.

The General Mining Act of 1872 opened federal public lands to exploration and development of valuable mineral deposits and established a procedure for locating mining claims.

Mineral Leasing Act of 1920 authorizes and governs leasing of public lands for developing deposits of coal, phosphates, petroleum, natural gas and other minerals in the United States.

Energy Policy Act of 2005 authorizes the Department of the Interior to grant leases for activities that involve the production, transportation or transmission of various energy resources.

Energy Independence and Security Act of 2007 The stated purpose of the act is “to move the United States toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy greenhouse gas capture and storage options, and to improve the energy performance of the Federal Government, and for other purposes.

Executive Orders 11644 and 11989 establish policies and procedures to ensure that off-road vehicle use shall be controlled so as to protect public lands.

Executive Order 11990 requires federal agencies to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands". To meet these objectives, the Order requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided.

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

Executive Order 13007 requires federal agencies to the extent practicable permitted by law, and not clearly inconsistent with essential agency functions 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 13112 provides that no federal agency shall authorize, fund or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species, and that all feasible and prudent measures to minimize risk or harm will be taken in conjunction with the actions.

Specific Guidance

In addition to the general criteria listed above, the following program-specific criteria will apply to individual program decisions. Most of the program specific guidance comes from the Land Use Planning Handbook (H-1601-1).

Air Quality: Under the Clean Air Act, BLM lands were given a Class II air quality classification. This classification allows deterioration associated with moderate, well controlled industrial and population growth. All lands will be managed under Class II standards, unless they are reclassified by the State, as provided for in the Act.

Water Quality: The BLM will incorporate applicable best management practices or other conservation measures into the RMP for specific programs and activities. Water quality will be maintained or improved in accordance with State and federal standards.

Vegetation Management: The BLM will:

- Identify the desired future conditions for vegetative resources, including the desired mix of vegetative types, structural stages, and landscape and riparian functions, and provide for native plant, fish, and wildlife habitats. Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management establish the minimums that will be applied to the development of the desired future conditions.
- Designate priority plant species and habitats, including Special Status Species, and populations of plant species recognized as significant for at least one factor, such as density, diversity, size, public interest, remnant character or age.
- Identify the actions needed to achieve desired vegetative conditions.
- Use the guidance provided in the *Management Considerations for Sagebrush (Artemisia) in the Western United States*: a selective summary of current information about the ecology and biology of woody North American sagebrush taxa.

Noxious Weed Control: Control will be conducted in accordance with the integrated weed management guidelines and design features identified in the *Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic*

Environmental Impact Statement (PEIS) and the *Final Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Report* (PER) and the 2007 statewide Noxious and Invasive Weed Environmental Assessment (EA).

Cultural Resources: The BLM will identify area-wide criteria and use restrictions that apply to special, cultural resource issues that may affect the location, timing or method of development or use of other resources.

Visual Resources: The BLM will manage resources in accordance with Visual Resource Management (VRM) objectives. It will designate VRM classes for all areas of BLM land, based on an inventory of visual resources and management considerations for other resource uses. The VRM management classes may differ from inventory classes, based on management priorities for land uses.

Special Status Species: The BLM sensitive species will be managed so that BLM actions do not contribute to the need to list any species as threatened or endangered. The guidance contained in the *Framework to Assist in Making Sensitive Species Habitat Assessments for BLM Administered Public Lands in Idaho* and BLM Manual 6840, Special Status Species Management, will be applied to all actions.

Greater Sage-grouse: During the development of the Four Rivers RMP/EIS, the BLM and USFS completed a planning effort to amend land use plans with management direction that best responds to greater sage-grouse threats identified as part of a National Greater Sage-Grouse Planning Strategy. The Idaho and Southwest Montana Greater Sage-Grouse Proposed LUP Amendment and Final EIS analyzed a range of alternatives, including an alternative developed by the BLMs Sage-Grouse National Technical Team (NTT) and an alternative submitted by the Governor of Idaho. The Record of Decision (ROD) and ARMPAs for the Great Basin Region Greater Sage-grouse Sub-regions (Idaho and Southwestern Montana, Nevada and Northeastern California, Oregon, and Utah) were published in September of 2015. The Idaho and Southwestern Montana Greater Sage-Grouse ARMPA amends existing land use plans in Idaho and southwestern Montana. Management direction resulting from the Idaho and Southwestern Montana ARMPA has been incorporated into this planning effort. Greater sage-grouse habitat on BLM-administered lands in the Idaho and Southwestern Montana Greater Sage-grouse planning area consists of lands allocated as Priority Habitat Management Areas (PHMA), Important Habitat Management Areas (IHMA), and General Habitat Management Areas (GHMA). IHMA and GHMA occur in the Four Rivers Planning Area. IHMA encompass areas of generally moderate to high conservation value habitat and populations. GHMA encompass areas of occupied seasonal or year-round habitat outside of PHMA or IHMA areas where some special management would apply to sustain greater sage-grouse populations. Biologically significant units (BSUs) have also been designated in the Idaho and Southwestern Montana Greater Sage-grouse ARMPA. BSUs are geographical/spatial areas within greater sage-grouse habitat that contains relevant and important habitats. BSU extents are used as the basis for comparative calculations to support evaluation of changes to habitat. Two BSUs, the Idaho Desert Conservation area and the Idaho Mountain Valleys CA, occur over 62,264 and 94,799 acres in the Planning Area, respectively.

Planning criteria carried forward for the Idaho and Southwestern Montana Greater Sage-grouse ARMPA are as follows:

- The BLM used the Western Association of Fish and Wildlife Agencies (WAFWA) Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats and any other appropriate resources to identify greater sage-grouse habitat requirements and required design features.
- The ARMPA is consistent with the BLM's 2011 National Greater Sage-grouse Conservation Strategy.
- The ARMPA complies with BLM direction, such as FLPMA, NEPA, and CEQ regulations at 40 CFR, Parts 1500-1508; DOI regulations at 43 CFR, Parts 4 and 1600; the BLM H-1601-1 Land Use Planning Handbook, "Appendix C: Program-Specific and Resource-Specific Decision Guidance Requirements" for affected resource programs; the 2008 BLM NEPA Handbook(H-1790); and all other applicable BLM policies and guidance.
- The ARMPA complies with the Wild Free-Roaming Horses and Burro Act of 1971 (as amended).
- The ARMPA is limited to providing direction specific to conserving greater sage-grouse species and habitats.

- The BLM considered land allocations and prescriptive standards to conserve greater sage-grouse and its habitat, as well as objectives and management actions to restore, enhance, and improve greater sage-grouse habitat.

Fish and Wildlife: The BLM will work with State and federal wildlife agencies to describe existing and desired populations and habitat conditions for major habitat types that support a wide variety of game and non-game species. Actions and area-wide use restrictions needed to achieve desired populations and habitat conditions will be identified, while maintaining a thriving, natural ecological balance and multiple-use relationships.

Fire Management: Fire, as a critical natural process, will be integrated on a landscape scale through the planning process. The response to wildland fire will be based on ecological, social, and legal consequences. The RMP will set the objectives for the use of fire and the desired future condition of the public lands.

Livestock Grazing: Decisions identifying lands available or not available for livestock grazing may be revisited through the RMP revision process. This analysis would consider other uses for the land; terrain characteristics; soil, vegetation, and watershed characteristics; the presence of undesirable vegetation, including significant invasive weed infestations; and the presence of other resources that may require special management or protection, such as special status species or ACECs.

For lands available for grazing, the land use plan would describe how those lands would be managed to become as productive as feasible for livestock grazing, including a description of possible grazing management practices, such as, grazing systems, range improvements, changes in seasons of use and/or stocking rates. The plan will identify priorities for completing assessments based on specific, natural resource objectives and conditions. Initial actions and assumptions for achieving Idaho's Standards for Rangeland Health will be identified.

Recreation: The public lands will be managed to enhance recreational opportunities. The BLM's *Priorities for Recreation and Visitor Services* and the *Unified Strategy* will be used as guides. All lands will be evaluated to determine whether they fit the criteria for designation as either a Special Recreation Management Area (SRMA) or an Extensive Recreation Management Area (ERMA).For each SRMA selected, a market-based strategy will be developed to identify whether management should be for destination recreation-tourism, community recreation-tourism or an undeveloped, recreation-tourism market. SRMAs with more than one distinct, primary market will be divided into separate areas. Each SRMA identified will have distinct Recreation Management Zones. In each zone, the land use plan will identify the recreation niche to be served; specific recreation opportunities to be produced; activities, experiences, and benefits provided in that zone; recreation setting required to produce the desired recreation experiences and benefits; and administrative support actions necessary to attain recreation management prescriptions and settings.

Comprehensive Trails and Travel Management: The RMP will delineate travel management areas and designated off-highway vehicle (OHV) management areas. Comprehensive trails and travel management will address all resource use aspects (e.g., recreational, traditional, agricultural, and commercial) and all accompanying modes of travel on public land. For motorized vehicle activities, all areas of public lands must be classified as Closed, Open or Limited. In Wilderness Study Areas (WSAs), motorized and mechanized travel must be limited to ways and trails existing at the time the area became a WSA. Future travel designations may be made in the RMP for a WSA, in the event Congress releases it from study.

If it is not practical to define/delineate a travel management network through the planning process, a preliminary network must be identified and a method established to select a final travel network. In this case, the RMP must create a preliminary route network map; define short-term management for road

and trail access in uncompleted areas; provide a clear planning/public participation sequence for road and trail identification; and provide a schedule for those areas not yet completed. If the decision on delineating travel management networks is deferred in the land use plan, all deferred work should normally be completed within five years of the signing of the ROD for the RMP.

Lands and Realty: Criteria to identify lands available for disposal will be identified. These would include proposed Section 205 acquisitions or interest in lands and/or withdrawal areas; where and under what circumstances land use authorizations, such as major leases and land use permits, may be granted; and right-of-way corridors, avoidance areas, and exclusion areas. All public lands will be retained in federal ownership unless determined that disposal will serve the public interest.

Criteria developed to identify lands for acquisition will be based on public benefits, management considerations, and public access needs. Specific actions to implement land tenure decisions will include full public participation. Public lands will generally be available for transportation and utility rights-of-way, except where specifically prohibited by law or regulation (such as WSAs) or in areas identified for avoidance or exclusion to protect resource values.

Energy and Minerals: Areas open or closed to the operation of the mining laws, mineral material disposal, and leasing will be identified, including, in open areas, any area-wide terms, conditions or special considerations needed to protect resource values. Except where specifically withdrawn to protect resource values, public land will be available for energy and mineral exploration and development based on applicable federal and State laws and regulations. Mitigation measures will be developed to protect resource values.

Special Designations: Consistent with Section 202 of FLPMA, BLM will analyze public nominations for special designations; in particular, WSAs to be managed in accordance with BLM Manual 6330 — Management of Wilderness Study Areas. The inventory of lands with wilderness characteristics in the Planning Area will be updated; decisions to protect or preserve wilderness characteristics (naturalness, opportunities for solitude, and outstanding opportunities for primitive and unconfined recreation) will be identified. Goals and objectives to protect the resource(s) and management actions necessary to achieve these objectives will be included. For authorized activities, BLM will include conditions of use that would avoid or minimize impacts on wilderness characteristics.

Riparian Areas, Flood-plains and Wetlands: Generally riparian areas, flood plains, and wetlands will be managed to protect, improve, and restore their natural functions to benefit water storage, groundwater recharge, water quality, and fish and wildlife values. The Clean Water Act and the Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management will be used to establish the minimum standards which will be applied to the development of desired future conditions.

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Appendix C – Supplemental Information on Social and Economic Conditions

Demographics

According to estimates provided by the American Community Survey (ACS), the median age for the state of Idaho in 2016 was 35.7. Seven counties in the analysis area have median ages above Idaho's: Ada (36.1), Adams (51.7), Boise (53.1), Gem (45.4), Payette (39.1), Valley (48.8), and Washington (44.6) Counties (U.S. Census Bureau 2018a[1]). Canyon and Elmore both have median ages below the state average (33.0 and 31.1, respectively).

The level of education also varies throughout the socioeconomic analysis area. The socioeconomic analysis area is home to a higher proportion of adults with a high school diploma (91%) than the national average (87%). A slightly lower percentage of adults in the socioeconomic analysis area have a bachelor's degree or higher (29.6%) as compared to the national average (30.3%). Percentages of adults lacking high school diplomas are greater than the national average (13.0%) in Canyon (15.9%), Elmore (13.7%), and Washington (16.2%) counties.

The U.S. Census Bureau reports a total of 291,987 housing units in the nine-county socioeconomic analysis area. Of this total, 263,848 units (90.4%) are occupied homes (rentals or owned) and 28,139 units (9.6%) are vacant (for sale or rent). Between 2012 and 2016, Valley County had the highest estimated percent of vacant housing (71.1%) and Ada County had the lowest (4.4%). The number of building permits issued throughout the socioeconomic analysis area was 8,225, of which 72% were in Ada County.

Table C-1 Labor Earnings in the Socioeconomic Analysis Area 1970-2016

	1970	2000	2016	Change 2000-2016
Personal Income (thousands of 2017 $s)	5,936,840	21,872,932	31,728,723	9,855,791
Labor Earnings	4,466,478	15,400,190	19,946,506	4,546,316
Non-Labor Income	1,470,362	6,472,742	11,782,218	5,309,476
Dividends, Interest, and Rent	970,360	4,207,160	6,369,492	2,162,332
Age-Related Transfer Payments	288,192	1,277,963	3,190,410	1,912,447
Hardship-Related Payments	77,234	608,010	1,348,293	740,283
Other Transfer Payments	130,745	379,456	874,023	494,567
Percent of Total				**Percent Change 2000-2016**
Personal Income				45.1%
Labor Earnings	75.2%	70.4%	62.9%	29.5%
Non-Labor Income	24.8%	29.6%	37.1%	82.0%
Dividends, Interest, and Rent	16.3%	19.2%	20.1%	51.4%
Age-Related Transfer Payments	4.9%	5.8%	10.1%	149.6%
Hardship-Related Payments	1.3%	2.8%	4.2%	121.8%
Other Transfer Payments	2.2%	1.7%	2.8%	130.3%

Income

Per capita income is the total personal income generated in the local economy, divided by the total number of people living there (including non-wage earners such as children). In 2016, the per capita

[1] Unless otherwise noted, all analysis below evaluates the latest data available from the U.S. Census Bureau (U.S. Census Bureau 2018a; US Census Bureau 2018b) and U.S. Bureau of Economic Analysis (U.S. Bureau of Economic Analysis 2017).

income in the entire socioeconomic analysis area was $41,474 (a 66% increase from 1970).

Total labor earnings (in 2017 dollars) in the socioeconomic analysis area grew from $4.5 million in 1970 to $19.4 million in 2016. Growth across all industries has remained stable, with the notable exception of a period of time during the economic downturn (around 2010) being less stable for many non-services related industries.

From 1970 to 2016, earnings (in 2017 dollars) in non-services related industries grew from $1.5 billion to $5.1 billion in the socioeconomic analysis area, and earnings in services-related industries grew from $2.0 billion to $13.6 billion, a (Table C-1). From 1970 to 2016, earnings in government in the socioeconomic analysis area grew from $1.1 billion to $3.6 billion.

Employment

Table C-2 presents the number of jobs, by industry, in the socioeconomic analysis area from 1970 to 2016. From 1970 to 2016, total employment in the socioeconomic analysis area grew from 110,531 to 414,139, a 275 percent increase.

Characteristics of the 23 economic sectors of the socioeconomic analysis area in 2017 are summarized in Table C-3. This table describes the baseline economic condition of Alternative A.

Table C-2 Number of Jobs, by Industry, 1970 to 2016

	1970	1990	2001	2010	2016
Non-Services Related	31,255	54,550	77,477	~60,771	~73,306
Farming	10,523	8,909	9,909	9,042	9,478
Forestry, fishing, & agricultural services	1,263	4,044	2,443	~2,362	~2,607
Mining (including fossil fuels)	201	642	531	~888	~1,339
Construction	5,734	12,805	26,428	22,356	28,837
Manufacturing	13,534	28,150	38,166	26,123	31,045
Services Related	54,321	123,987	215,783	~265,948	~313,204
Utilities	*	*	606	~1,255	~1,456
Transportation & warehousing	5,672	10,453	12,527	~12,818	~12,510
Wholesale trade	4,712	10,483	39,178	41,967	~17,080
Retail trade	17,185	34,863	9,726	~10,078	48,572
Information	**	**	5,252	~6,195	~6,286
Finance and Insurance	***	***	13,163	~18,624	~20,584
Real estate and rental and leasing	7,841	17,070	12,307	~20,363	23,333
Professional and technical services	****	****	18,162	~22,365	~27,942
Management of companies and enterprises	****	****	6,448	~4,792	~4,209
Administrative and waste services	****	****	20,919	~28,456	~30,829
Educational services	****	****	4,175	~7,465	~8,378
Health care and social assistance	****	****	30,604	~43,042	~50,940
Arts, entertainment, and recreation	****	****	5,623	7,610	~9,049
Accommodation and food services	****	****	20,966	22,794	30,340
Other services, except public administration	18,911	51,118	16,127	18,124	21,696
Government	24,387	35,630	48,244	54,476	56,183
Total	**110,034**	**214,245**	**341,528**	**381,513**	**443,267**

~ = indicates an estimated value
*- value grouped with Transportation and warehousing
**- value not reported in 1970 and 1990
***- value grouped with real estate
****- values grouped into services
Source: U.S. Census Bureau 2018

Table C-3 Employment, Output Value, and Total Labor Earnings by Industry Sector for the Socioeconomic Analysis Area in 2017

Industry Sector	Employment (Number of jobs)	Employment Rank	Value of Output (2017 Dollars)	Output Rank	Total Labor Earnings (2017 Dollars)	Earnings Rank
Farming	10,053.30	14	$1,592,850,560	15	$474,992,960	14
Forestry, Fishing, and Agricultural Services	2,238.80	21	$160,588,192	23	$89,933,588	22
Mining	1,059.20	23	$260,810,400	22	$87,587,614	23
Construction	27,385.50	9	$4,328,283,136	4	$1,252,350,368	6
Manufacturing	28,970.00	6	$11,780,795,392	1	$2,122,282,840	3
Utilities	1,594.40	22	$1,557,515,648	16	$199,465,800	19
Wholesale Trade	14,873.00	12	$3,372,464,640	8	$1,127,537,568	8
Retail Trade	45,210.80	2	$3,706,645,504	6	$1,584,404,608	5
Transportation and Warehousing	12,743.50	13	$1,863,412,480	12	$634,396,528	11
Information	6,810.10	16	$2,326,011,136	11	$378,295,246	17
Finance and Insurance	20,226.20	11	$4,093,825,536	5	$1,198,823,616	7
Real Estate	21,079.00	10	$6,794,180,096	2	$351,512,672	18
Professional and Technical Services	28,846.40	7	$3,670,178,816	7	$1,684,535,296	4
Management of Companies and Enterprises	4,267.50	20	$867,112,192	18	$406,129,271	15
Administrative and Waste Services	29,086.70	5	$1,841,961,344	13	$980,511,360	10
Educational Services	5,938.10	19	$300,101,440	21	$144,571,264	20
Health Care and Social Assistance	49,435.70	1	$4,592,522,240	3	$2,582,380,192	1
Arts, Entertainment, and Recreation	8,505.90	15	$446,143,680	20	$119,827,150	21
Accommodation and Food Services	30,328.00	4	$1,683,544,704	14	$595,512,560	12
Other Services except Public Ad- ministration	27,676.60	8	$2,655,452,416	10	$1,085,781,056	9
Federal Government	6,057.80	18	$914,070,528	17	$594,612,288	13
State and Local Government	40,580.20	3	$2,873,280,768	9	$2,279,435,008	2
Military	6,323.30	17	$522,347,488	19	$401,254,336	16
TOTAL	429,290.10		$62,204,098,336		$20,376,133,188	

Source: IMPLAN Group 2016 Notes:
1. All totals were calculated using unrounded original numbers.
2. Employment includes full- and part-time jobs.

Total industry output was $60.6 billion in 2014 (in 2014 dollars). The industry sectors employed over 406,000 people who collectively earned approximately $18.8 billion in the form of employee compensation and proprietor income (profit). Health care and social assistance ranked first in employment and labor earnings and manufacturing ranked first in economic output.

Government Employment

Government employment is one of the largest employment sectors in the socioeconomic analysis area. In 2016, there were 56,917 total government jobs in the analysis area (Table C-4). Of this total, 7,571 were federal civilian jobs, 5,677 were military jobs, and 43,735 were jobs with state and local governments. From 1970 to 2016, government employment in the socioeconomic analysis area grew from 24,387 to 56,917 jobs, an increase of 130 percent. In contrast, non-government employment grew from 85,647 to 387,084 jobs, an increase of 352 percent, during this same time period.

From 1970 to 2016, state and local employment grew from 13,804 to 43,669 jobs, an increase of 216 percent. During this time period, military employment shrank from 6,279 to 5,677 jobs (a decrease of 10 percent) and federal civilian employment grew from 4,724 to 7,571 jobs (an increase of 60 percent).

From 1970 to 2014, government employment per 1000 people shrank from 105 to 74 jobs, a decrease of 30 percent.

Table C-4 Total Number of Government Jobs in 2016

	Federal Jobs	Military Jobs	State and Local Jobs	All Government
Ada County	5,606	1,511	29,039	36,156
Adams County	121	13	213	347
Boise County	147	23	342	512
Canyon County	363	684	9,079	10,126
Elmore County	872	3,211	1,024	5,107
Gem County	82	56	860	998
Owyhee County	46	37	651	734
Payette County	31	75	1,046	1,152
Valley County	252	34	721	1,007
Washington County	51	33	694	778
Socioeconomic Analysis Area	7,571	5,677	43,735	56,917
Source: U.S. Census Bureau 2017				

Non-Labor Income

Non-labor income, such as income from dividends, interest, rent, age-related transfer payments, and hardship-related transfer payments, has been an increasing component of personal income over time (Table C-5). In 2016, 37.1 percent of the total percent of income in the analysis area was derived from non-labor income, as compared to 24.9 percent in 1970. In 2016, 10.0 percent of total personal income was due to age-related transfer payments, as compared to 4.8 percent in 1970. The increase in non-labor income and age-related transfer payments is linked in part to the increasing median age of the population in the analysis area.

Table C-5 Components of Personal Income over Time, 1970 to 2016

	1970	2000	2016	Change 2000-2016
Labor Earnings	4,466,478	15,400,190	19,946,506	4,546,316
Non-Labor Income	1,470,362	6,472,742	11,782,218	5,309,476
Dividends, Interest, and Rent	970,360	4,207,160	6,369,492	2,162,332
Age-Related Transfer Payments	288,192	1,277,963	3,190,410	1,912,447
Hardship-Related Transfer Payments	77,234	608,010	1,348,293	740,283
Other Transfer Payments	130,745	379,456	874,023	494,567
Total	5,936,840	21,872,932	31,728,723	9,855,791

1. All income data are reported by place of residence and are displayed in thousands of 2017 dollars. Labor earnings and non-labor income may not add to total personal income due to adjustments made by the Bureau of Economic Analysis.
2. Source: U.S. Census Bureau 2018

From 1970 to 2016, total employment in the socioeconomic analysis area grew from 110,034 to 443,267, a 300 percent increase. Unemployment in 2017 was lower than unemployment levels in 1976 (Table C-6); however, all counties in the socioeconomic analysis area underwent increases in unemployment around the year of 2010 due to an economic recession. Adams County has had the highest unemployment rate in the analysis area from 1976 to 2017. During the time period from 1976 to 2017, the annual unemployment rate ranged from a low of 2.7 percent in 2017 (Ada County) to a high of 18.5 percent in 2010 (Adams County).

Table C-6 Unemployment in the Socioeconomic Analysis Area from 1976 to 2017.

	1990	2000	2010	2017	AverageAnnual Percent Change (2010-2017)
Ada County	3.7%	3.4%	8.3%	2.7%	-5.6%
Adams County	12.0%	10.0%	18.5%	5.5%	-13.0%
Boise County	5.8%	4.9%	10.6%	4.7%	-5.9%
Canyon County	6.4%	4.5%	11.3%	3.5%	-7.8%
Elmore County	5.7%	5.7%	8.6%	3.6%	-5.0%
Gem County	6.6%	5.1%	11.4%	3.9%	-7.5%
Owyhee County	4.8%	3.9%	4.2%	3.8%	-0.4%
Payette County	8.5%	6.8%	9.7%	3.9%	-5.8%
Valley County	8.4%	6.7%	15.7%	4.3%	-11.4%
Washington County	9.7%	6.8%	10.3%	4.7%	-5.6%
Socioeconomic Analysis Area	5.0%	4.1%	9.3%	3.1%	-6.2%
State of Idaho	5.5%	4.7%	9.0%	3.2%	-5.8%
Source: U.S. Census Bureau 2018					

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Appendix D – Seasonal Wildlife Restrictions

In general, BLM-generated projects (e.g., vegetation treatments, range improvements) and other actions for which BLM authorization is required (e.g., rights-of-way, lease authorizations, organized recreational events), should be analyzed in accordance with the National Environmental Policy Act (NEPA) and sited or designed in a manner that avoids impacts to wildlife species or habitats of concern to the extent possible, based on current science. Seasonal wildlife restrictions are intended to protect wildlife resources from disturbance during important seasons of the year, such as breeding, nesting or wintering.

Raptors and Migratory Birds – During project planning, the BLM and project proponents should work closely with the USFWS in identifying and incorporating provisions and protocols for the conservation of migratory birds.

Raptor habitat management and activities should be planned to:

- Consider impacts to raptor prey populations beyond the natural range of variation;
- Avoid or minimize impacts to habitats preferred by raptors for nest and roost locations;
- Identify high-use habitat and nest aggregation areas for species which demonstrate group behavior (see Table A.5.), and avoid or minimize habitat fragmentation;
- Mitigate for unavoidable habitat losses; and
- Monitor to determine suitability and efficacy of mitigation.

Species	Distance Restriction	Timing Restriction
Raptor Winter Concentration Areas	1-mile from occupied habitat	Nov 1 – March 31
Bald Eagle Winter Roost	1-mile from occupied habitat	Nov 1 – March 31
Bald Eagle nest	0.5-1 mile of occupied nests	Jan 1 – Aug 31
Golden Eagle	0.5 mile of occupied nest	Jan 1 – Aug 31
Ferruginous Hawk	1-mile of occupied nest	Mar 1 – Aug 1
Swainson's Hawk	0.25 mile of occupied nest	Mar 1 – Aug 31
Red-tailed hawk	0.33 mile of occupied nest	Mar 15 – Aug 31
Northern Goshawk	0.5 mile of occupied nest	Mar 1 – Aug 15
Peregrine Falcon	1- mile of occupied nest	Mar 1 – Aug 31
Prairie Falcon	0.5 mile of occupied nest	Apr 1 – Aug 31
Northern Harrier	0.5-mile of occupied nest	Apr 1 – Aug 31
Osprey	0.5-mile of occupied nest	Apr 1 – Aug 31
Short-eared Owl	0.25-mile of occupied nest	Mar 1 – Aug 1
Long-eared Owl	0.5mile of occupied nest	Feb 1 – Aug 15
Western Screech Owl	0.25 mile of occupied nest	Mar 1 – Aug 15
Great Gray Owl	0.5 mile of occupied nest	
Great Horned Owl	0.25 mile of occupied nest	Dec 1 – Sept 30
Northern Saw Whet Owl	0.25 mile of occupied nest	Mar 1 – Aug 31
Northern Pygmy Owl	0.25 mile of occupied nest	Apr 1 – Aug 31
Long Billed Curlew	0.25 mile of occupied nest All of Curlew ACEC	Mar 1 – June 30

Big Game Winter Range – Winter range is delineated locally by the IDFG for each big game species based on the most recent available information. Factors to consider when granting exceptions to seasonal restrictions on winter range or in bighorn sheep lambing habitat include:

- Animal presence or absence
- Animal condition
- Weather severity including snow conditions, seasonal weather patterns, wind chill, temperatures, duration of winter conditions, long range forecast
- Habitat condition and availability including animal density, forage condition and availability (amount of forage and snow depth/crusting), forage availability in the vicinity
- Site location such as thermal and hiding cover, topographic features and other activity in the area that could cause cumulative impacts
- Timing, whether the project is early or nearing the end of the winter season, and the type and duration of the disruptive activity.

Species	Distance Restriction	Timing Restriction
Elk Winter Range	Designated Winter Range	Nov 15 - April 30
Mule Deer Winter Range	Designated Winter Range	Nov 15 – April 30
Pronghorn Winter Range	Designated Winter Range	Nov. 15 – April 30
Bighorn Winter Range	Designated Winter Range	Nov 15 – April 30

Greater Sage-grouse – The following restrictions are from the 2015 GRSG ARMPA. In May 2018, BLM published a Draft RMP Amendment/ Draft EIS to potentially amend some or all of the Greater Sage-grouse Decisions published in 2015. The timing and distance restrictions identified below for Greater Sage-grouse are in conformance with the decisions found in the 2015 ARMPA. As such, the decisions are included below for reference, and the reader is directed to the Sage-grouse Amendment for the most current direction pertaining to Greater Sage-grouse management on public lands.

Species	Distance Restriction	Timing Restriction
Greater Sage-Grouse IHMA and GHMA	1. linear features (roads) within 3.1 miles of leks 2. infrastructure related to energy development within 3.1 miles of leks. 3. tall structures (e.g., communication or transmission towers, transmission lines) within 2 miles of leks. 4. low structures (e.g., fences, rangeland structures) within1.2 miles of leks. 5. surface disturbance (continuing human activities that alter or remove the natural vegetation) within 3.1 miles of leks. 6. noise and related disruptive activities including those that do not result in habitat loss (e.g., motorized recreational events) at least 0.25 miles from leks.	1. No repeated or sustained behavioral disturbance (e.g., visual, noise over 10 dbA at lek, etc.) to lekking birds from 6:00 pm to 9:00 am within 2 miles (3.2 km) of leks during the lekking season. 2. Avoid mechanized anthropogenic disturbance, in nesting habitat during the nesting season when implementing: 1) fuels/ vegetation/habitat restoration management projects, 2) infrastructure construction or maintenance, 3) geophysical exploration activities; 4) organized motorized recreational events. 3. Avoid mechanized anthropogenic disturbance during the winter, in wintering areas when implementing: 1) fuels/vegetation/habitat restoration management projects, 2) infrastructure construction or

Species	Distance Restriction	Timing Restriction
		maintenance, 3) geophysical exploration activities; 4) organized motorized recreational events.
Sharp Tailed Grouse Leks	3.1 miles of occupied or undetermined status lek	March 1 – May 15

Exceptions to Timing and Distance Restrictions

Seasonal wildlife restrictions are intended to protect wildlife resources from disturbance during important seasons of the year such as breeding, nesting or wintering. Exceptions to seasonal restrictions may be considered and granted by the field office manager if the BLM field office biologist, in consultation with IDFG, believes that granting an exception will not unacceptably disturb, displace or distress the wildlife species being protected. Use of available data and knowledge of local conditions will be the primary factors in making the recommendation. The general process will be as follows:

1) All requests[1] for an exception to a seasonal wildlife restriction must be initiated in writing to the BLM field office manager. The request must include a description of the activity needing exception, the need and rationale for the exception, mitigation measures and alternatives such as traffic restriction, alternative scheduling, staged activity, etc., that may reduce impacts to the wildlife resource and dates for the requested exception.
2) The BLM field office biologist, in coordination with the appropriate IDFG staff, will review the application for the exception and available information, including site visits as appropriate, and provide a recommendation in writing to the field office manager.
3) A final determination for granting an exception to seasonal wildlife restrictions will be made by the BLM field office manager, in consideration of the biologist's recommendation and consistent with applicable law, regulation, policy, or local planning. The request for exception is considered as a unique, site specific action and is analyzed and subsequently documented by the field office manager or his/her representative, with respect to RMP and project NEPA compliance. If existing project-level NEPA documentation is adequate, a Determination of NEPA Adequacy (DNA) and Decision Record are sufficient (See BLM NEPA Handbook H-1790-1 (2008). In other cases, preparation of a separate EA may be necessary; however under those circumstances it would be difficult to accommodate an exception on short notice. In all cases, the rationale for granting or not granting the exception must be documented in the Decision Record, including the biologists' findings and recommendation and concurrence or non-concurrence with IDFG recommendations.
4) Notification to the applicant will occur in writing, via letter or email from the field office manager or his/her representative.
5) Exceptions may be cancelled by the field office manager/ authorized officer in the event that local conditions change suddenly in a manner that places wildlife at unacceptable risk. For example, a temporary exception for construction activities in big game winter range granted on a Monday could be cancelled if heavy snowfall on the following Wednesday results in an unanticipated concentration of mule deer in the project area. In such cases, the field office manager or his/her representative will contact the project proponent as soon as possible to discuss the situation and negotiate an appropriate resolution.

[1] Exception requests are required for both internal and external generated projects.

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Appendix E – Fluid Mineral Leasing Stipulations

The following are mineral leasing stipulations to be applied, as appropriate, to parcels if offered for fluid mineral leasing. A lease stipulation is a condition of lease issuance that provides protection for other resource values or land uses by restricting lease operation during certain times or locations or to avoid unacceptable impacts, to an extent greater than standard lease terms or regulations. A stipulation is an enforceable term of the lease contract, supersedes any inconsistent provisions of the standard lease form, and is attached to and made a part of the lease. Stipulations further implement the Bureau's regulatory authority to protect known resources or resource values. Lease stipulations are developed during the land use planning process. The special stipulations may be used on a site-specific basis. Their use and details, such as dates and buffer sizes, may vary through the alternatives. When processing an Application for Permit to Drill (APD) or other related use authorization on a lease, the stipulations must be reviewed in the site-specific NEPA analysis conducted for approval of the APD or use authorization. If it is determined that a stipulation is no longer justified or if the proposed operations would not cause unacceptable impacts, the BLM may consider granting an exception, modification, or waiver in accordance with procedures outlined in 43 CFR 3101.1-4.

Description of Stipulations

No Surface Occupancy (NSO) = NSO areas are closed to any surface-disturbing activity, including drilling and the placement of surface facilities.

Timing Limitation Stipulations (Seasonal Restrictions) = Areas with seasonal restrictions are open for leasing but surface-disturbing activities would not be allowed during identified time frames. Activity is subject to restraints during the time period specified in the stipulation description. This stipulation would not apply to operation and maintenance activities, unless otherwise specified.

Controlled Surface Use (CSU): CSU areas are open for leasing but would require proposals for surface-disturbing activities to be authorized only according to the controls or constraints specified.

Exceptions, Modifications, and Waivers

The definitions for exceptions, modifications, and waivers are as follows:

Exception = A one-time exemption for a particular site within the leasehold; exceptions are determined on a case-by-case basis; the stipulation continues to apply to all other sites within the leasehold.

Modification = A change to the provisions of a lease stipulation, either temporarily or for the term of the lease. Depending on the specific modification, the stipulation may or may not apply to all sites within the leasehold to which the restrictive criteria are applied. The lessee must be able to demonstrate the operations can be conducted without causing unacceptable impacts, and that less restrictive stipulations will protect the public interest. Alternatively, BLM may show that circumstances or relative resource values have changed.

Waiver = A permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

Standard Leasing Terms

Standard leasing terms for oil and gas are found on BLM Form 3100-11, *Offer to Lease and Lease for Oil and Gas Form 3100-11*. Section 6 of the lease form states:

> Lessee must conduct operations in a manner that minimizes adverse impacts on the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users. Lessee must 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 must be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee must 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 on 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 must immediately contact lessor. Lessee must cease any operations that would result in the destruction of such species or objects.

Standard terms for geothermal leasing can be found in *Offer to Lease and Lease for Geothermal Resources (Form 3200-24)*, and are very similar to those described above for oil and gas leasing.

Powersite Stipulation (*Form No. 3730-1*) is to be used on all lands within powersite reservations.

Any proposed post-lease activities shall be subject to the stipulations attached to and made part of the lease; Federal regulations at 43 CFR 3100 (for oil and gas), 43 CFR 3200 (for geothermal) or 43 CFR 3500 (for solid leasables), including mandatory bonding; and applicable Onshore Orders.

To the extent consistent with lease rights granted, BLM may impose reasonable measures (conditions of approval) to operational aspects of oil and gas development to control the manner and pace of development including modification of siting or design of facilities, timing of operations, and specifying interim or final reclamation measures, provided that they do not: require relocation of proposed operations by more than 200 meters; require that operations be sited off the leasehold; or prohibit new surface disturbing operations for a period in excess of 60 days in any lease year. BLM may impose reasonable measures (conditions of approval) to operational aspects of oil and gas development to control the manner and pace of development including modification of siting or design of facilities, timing of operations, and specifying interim or final reclamation measures.

At a minimum, the BLM will attach the following three mandatory stipulations to any mineral lease that is offered within the Planning Area:

CULTURAL RESOURCE PROTECTION STIPULATION

This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders. The BLM will not approve any ground-disturbing activities that may affect any such properties or resources until it completes its obligations (e.g., State Historic Preservation Officer (SHPO) and tribal consultation) under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized, or mitigated.

ENDANGERED SPECIES ACT SECTION 7 CONSULTATION STIPULATION

The lease area may now or hereafter contain plants, animals or their habitats determined to be threatened, endangered, or other special status species. The BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. The BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction

or adverse modification of a designated or proposed critical habitat. The BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. 1531 et seq., including completion of any required procedure for conference or consultation.

WATER QUALITY

The lessee is given notice that, at the time of development, drilling operators will additionally conform to the operational regulations in: 1) Onshore Oil and Gas Order No. 2 which requires the protection of all usable quality waters; 2) Onshore Oil and Gas Order No. 7 which prescribes measures required for the handling of produced water to ensure the protection of surface and ground water sources; and 3) the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development The Gold Book, Fourth Edition—Revised 2016, or latest edition) which provides information and requirements for conducting environmentally responsible oil and gas operations. Additional mitigation measures may be necessary to prevent adverse impacts from oil and gas exploration and development activities. Mitigation measures may include submittal of an erosion and sediment control plan with best management practices that address sediment and water control with interim and final reclamation. Project activities in sensitive areas, or near water sources, may require a semi or closed-loop drilling system.

Special Leasing Stipulations and Conditions for Granting Exceptions, Modifications, and Waivers of proposed management actions.

Management Action	**MA-MR-03**
Resource Objective	To protect Historic Properties listed in the National Register of Historic Places
Stipulation Type	NSO
RMP Acres Affected	10 acres
Stipulation Description	NSO or use is allowed within historic properties listed in the National Register of Historic Places for the purpose of protecting historic properties. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so it will not be placed within the actual boundaries of or will not disturb the site within the defined NSO area. Modification: The BLM authorized officer may modify the stipulation in consultation with State Historic Preservation Office (SHPO), applicable tribes, and other interested parties, if the site is no longer considered eligible under National Register of Historic Places (NRHP) or if, in consultation with SHPO, applicable Indian tribes, and other interested parties it is determined that the identified property's sacred, spiritual, and/or traditional values have been downgraded and/or the tribes have reduced the previous avoidance distance around the site. Waiver: The BLM authorized officer may waive this stipulation if it is determined in consultation with SHPO, applicable Indian tribes, and other interested parties, that the identified site is no longer considered sacred, spiritual, and/or traditional.

Management Action	**MA-MR-03**
Resource Objective	To protect cultural resources protected under the National Historic Preservation Act, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders.
Stipulation Type	NSO
RMP Acres Affected	
Stipulation Description	NSO or use is allowed within the boundaries of cultural resources protected under the National Historic Preservation Act, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders. The BLM will not approve any ground-disturbing activities that may affect any such properties or resources until it completes its obligations (e.g., State Historic Preservation Officer (SHPO) and tribal consultation) under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized, or mitigated. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so it will not be placed within the actual boundaries of or will not disturb the site within the defined NSO area. Modification: The BLM authorized officer may modify the stipulation in consultation with State Historic Preservation Office (SHPO), applicable tribes, and other interested parties, if the site is no longer considered eligible under National Register of Historic Places (NRHP) or if, in consultation with SHPO, applicable Indian tribes, and other interested parties it is determined that the identified property's sacred, spiritual, and/or traditional values have been downgraded and/or the tribes have reduced the previous avoidance distance around the site. Waiver: The BLM authorized officer may waive this stipulation if it is determined in consultation with SHPO, applicable Indian tribes, and other interested parties, that the identified site is no longer considered sacred, spiritual, and/or traditional.

Management Action	**MA-MR-03**
Resource Objective	To protect slopes greater than 40%
Stipulation Type	CSU
RMP Acres Affected	122,400 acres
Stipulation Description	Surface disturbance is restricted on slopes greater than 40%. Prior to surface disturbance on slopes greater than 40% a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The Plan must include designs approved and stamped by a licensed engineer. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the BLM authorized officer's satisfaction how the operator will meet the following performance standards: ● Slope stability is maintained preventing slope failure or mass wasting. ● The disturbed area will be stabilized with no evidence of accelerated erosion features. ● The disturbed area shall be managed to ensure soil characteristics approximate an appropriate reference site with regard to erosional features to maintain soil productivity and sustainability. ● Sufficient viable topsoil is maintained for ensuring successful final reclamation. At locations where interim reclamation will be completed, this will be accomplished by respreading all salvaged topsoil over the areas of interim reclamation. ● The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation. On lands as mapped by the U.S. Geological Survey (USGS) 1:24,000 scale topographic maps, USGS Digital Elevation Models, and/or as determined by a BLM evaluation of the area. For the purpose of ensuring successful reclamation and erosion control on slopes greater than 40% in order to meet the standards outlined in Chapter 6 of the BLM's Oil and Gas Gold Book, as revised. Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a failure to meet the performance standards above, or a BLM evaluation determines that the disturbed area is not located on slopes greater than 40%. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation of the area. The stipulation and performance standards identified above may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include slopes greater than 40%. This determination shall be based upon USGS mapping and/or BLM evaluation of the area.

Management Action	**MA-MR-03**
Resource Objective	To protect soils with a severe erosion hazard rating
Stipulation Type	CSU
RMP Acres Affected	46,930 acres
Stipulation Description	Surface disturbance is restricted on soils with a severe erosion hazard rating. Prior to surface disturbance on soils with a severe erosion hazard rating a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the Bureau of Land Management (BLM) by the applicant as a component of the Application for Permit to Drill (APD) (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the BLM authorized officer's satisfaction how the operator will meet the following performance standards: ● The disturbed area will be stabilized with no evidence of accelerated erosion features. ● The disturbed area shall be managed to ensure soil characteristics approximate an appropriate reference site with regard to erosional features to maintain soil productivity and sustainability. ● Sufficient viable topsoil is maintained for ensuring successful final reclamation. At locations where interim reclamation will be completed, this will be accomplished by respreading all salvaged topsoil over the areas of interim reclamation. ● The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation. On lands as mapped by the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) Order 3 soil survey and/or as determined by a BLM evaluation of the area. For the purpose of ensuring successful reclamation and erosion control on soils with a severe erosion hazard rating in order to meet the standards outlined in Chapter 6 of the BLM's Oil and Gas Gold Book, as revised. Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a failure to meet the performance standards above or a BLM evaluation determines that the affected soils do not meet the severe erosion hazard rating criteria. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a NRCS soil survey or BLM evaluation. The stipulation and performance standards identified above may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include soils with severe erosion hazard. This determination shall be based upon NRCS mapping and/or BLM evaluation of the area.

Management Action	MA-MR-03
Resource Objective	To protect soils with limited reclamation potential
Stipulation Type	CSU
RMP Acres Affected	
Stipulation Description	Surface disturbance is prohibited or restricted on limited reclamation potential areas such as areas possessing sensitive geologic formations, extremely limiting soil conditions, biological soil crusts, badlands, rock outcrops, and slopes susceptible to mass failure. CSU (1): (a) CSU (1): (a) Prior to surface disturbance on limited reclamation potential areas a site-specific construction, stabilization, and reclamation plan (Plan) must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5) – Surface Use Plan of Operations. The Plan must include designs approved and stamped by a licensed engineer. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions, as appropriate). The Plan must demonstrate to the BLM authorized officer's satisfaction how the operator will meet the following performance standards: ● The disturbed area will be stabilized with no evidence of accelerated erosion features. ● The disturbed area shall be managed to ensure soil characteristics approximate an appropriate reference site with regard to erosional features to maintain soil productivity and sustainability. ● Slope stability is maintained preventing slope failure and erosion. ● Sufficient viable topsoil is maintained for ensuring successful final reclamation. At locations where interim reclamation will be completed, this will be accomplished by respreading all salvaged topsoil over the areas of interim reclamation. ● The original landform and site productivity will be partially restored during interim reclamation and fully restored as a result of final reclamation. On lands as mapped by the NRCS SSURGO Order 3 soil survey or as determined by a BLM evaluation of the area. For the purpose of ensuring successful reclamation and erosion control on limited reclamation potential areas in order to meet the standards outlined in Chapter 6 of the BLM's Oil and Gas Gold Book, as revised. Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a failure to meet the performance standards above or a BLM evaluation determines that the area does not meet the limited reclamation criteria. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a NRCS soil survey and BLM evaluation. The stipulation and performance standards identified above may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not include limited reclamation potential areas. This determination shall be based upon NRCS mapping and BLM evaluation.

Management Action	MA-MR-03
Resource Objective	To protect 100-year floodplains
Stipulation Type	NSO
RMP Acres Affected	3,280 acres
Stipulation Description	No surface occupancy or use allowed within the active channel or 100-year floodplain. On lands as mapped by FEMA and/or as determined by a BLM evaluation of the area. For the purpose of ensuring protection of floodplains. Exception: None Modification: None Waiver: None

Management Action	MA-MR-03
Resource Objective	To protect lands within 500-feet of Perennial Streams, Riparian Areas, Wetlands, Springs, and Irrigation Ditches/Canals
Stipulation Type	NSO
RMP Acres Affected	79,600 acres
Stipulation Description	For the purpose of preventing watershed damage, no occupancy or other surface disturbance will be allowed within 500 feet of intermittent and perennial streams, rivers, riparian areas, wetlands, springs, and irrigation ditches/canals. Exception: The BLM authorized officer may grant an exception if it is determined that the action will not result in a failure to meet the performance standards above. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a USGS National Hydrologic Inventory and/or BLM evaluation, in coordination with the Idaho DEQ and. The stipulation may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 500 feet of perennial streams, riparian areas, wetlands springs or irrigation ditches/canals. This determination shall be based upon USGS National Hydrologic Inventory and/or BLM evaluation, in coordination with the Idaho DEQ.

Management Action	MA-MR-03
Resource Objective	To protect Air Quality through fugitive dust control
Stipulation Type	CSU
RMP Acres Affected	ALL
Stipulation Description	A Fugitive Dust Control Plan is required for mineral activities that would disturb a surface area larger than 0.25 acres or that would involve truck traffic on unpaved or untreated surfaces. Exception: None Modification: The Authorized Officer may modify the stipulation as a result of new information if: 1) the protection provided by the stipulation is no longer justified or necessary to meet resource objectives established in the Four Rivers RMP; 2) the protection provided by the stipulation is no longer sufficient to meet resource objectives established in the Four Rivers RMP; or 3) proposed operations would not cause unacceptable impacts. The Authorized Officer may require additional plans of development, surveys, mitigation proposals, or environmental analysis, and may be required to consult with other government agencies and/or the public in order to make this determination. The modification may be subject to public review for at least a 30-day period. Waiver: None

Management Action	**MA-MR-03**
Resource Objective	To protect Air Quality
Stipulation Type	CSU
RMP Acres Affected	ALL
Stipulation Description	All drilling and production operations are required to adhere to the following minimum standards: 1. Drill rig engines must meet Tier II or better standards, as necessary based on air quality conditions or projections, and consistent with the most stringent Environmental Protection Agency emissions standards that are in force at the time of installation or approval. 2. Stationary internal combustion engine standard of 2g NOx/bhp-hr for engines<300HP and 1g NOx/bhp-hr for engines >300 HP. 3. Low bleed or no bleed pneumatic controller. 4. Dehydrator VOC emission controls to +95 percent efficiency. 5. Tank VOC emission controls to +95 percent efficiency equivalent to NSPS subpart 0000. To mitigate any potential impact mineral development emissions may have on regional ozone formation. Exception: None Modification: The Authorized Officer may modify the stipulation as a result of new information if: 1) the protection provided by the stipulation is no longer justified or necessary to meet resource objectives established in the Four Rivers RMP; 2) the protection provided by the stipulation is no longer sufficient to meet resource objectives established in the Four Rivers RMP; or 3) proposed operations would not cause unacceptable impacts. The Authorized Officer may require additional plans of development, surveys, mitigation proposals, or environmental analysis, and may be required to consult with other government agencies and/or the public in order to make this determination. The modification may be subject to public review for at least a 30-day period. Waiver: None

Management Action	**MA-MR-03**
Resource Objective	To protect Paleontological Resources
Stipulation Type	CSU
RMP Acres Affected	Areas with PFYC Class 4 or 5
Stipulation Description	The lessee is hereby notified that prior to any surface disturbing activities, an inventory of paleontological resources (fossils) may be required. Mitigation may be required such as monitoring in any area of Probable Fossil Yield Classification (PFYC) 4 or 5 and also upon the discovery of any vertebrate fossil or other scientifically important paleontological resource. Mitigation of scientifically important paleontological resources may include avoidance, monitoring, collection, excavation, or sampling. Mitigation of discovered scientifically important paleontological resources may require the relocation of the surface disturbance activity over 200 meters. Inventory and any subsequent mitigation shall be conducted by a BLM permitted paleontologist. Exception: None Modification: The Authorized Officer could modify the stipulation if it is determined that the project area is not located within a PFYC Class 4 or 5 area. Waiver: The Authorized Officer could waive the stipulation if it is determined that the entire lease area is not located within a PFYC Class 4 or 5 area.

Management Action	MA-MR-07
Protected Resource	To protect Groundwater Resources
Stipulation Type	CSU
RMP Acres Affected	ALL
Stipulation Description	Surface occupancy or use is subject to the following special operating constraints. Oil and gas operations using multi-stage hydraulic fracturing shall use the following measures to protect potentially usable water bearing intervals: • In all directions a minimum of 2,500 feet of buffer distance (or greater if deemed necessary by BLM) between the well bore (production string) and the lower extent of shallow (<2,000 feet), potentially usable groundwater (<10,000 total dissolved solids) aquifer, shall be maintained so that fractures from the hydraulic fracturing process do not intersect shallow aquifers. • Operators are required to acquire all appropriate federal, state and/or local licenses and/or permits. Exception: None Modification: The Authorized Officer may modify the stipulation as a result of new information if: 1) the protection provided by the stipulation is no longer justified or necessary to meet resource objectives established in the Four Rivers RMP; 2) the protection provided by the stipulation is no longer sufficient to meet resource objectives established in the Four Rivers RMP; or 3) proposed operations would not cause unacceptable impacts. The Authorized Officer may require additional plans of development, surveys, mitigation proposals, or environmental analysis, and may be required to consult with other government agencies and/or the public in order to make this determination. The modification may be subject to public review for at least a 30-day period. Waiver: None

Management Action	MA-MR-07
Protected Resource	To protect Critical Groundwater Areas
Stipulation Type	NSO
RMP Acres Affected	82,000
Stipulation Description	Surface occupancy or use is not allowed within Critical Groundwater areas as defined by Idaho department of Water Resources. Exception: None Modification: None Waiver: None

Management Action	MA-SSS-12 (Alternative B)
Resource Objective	To protect Southern Idaho Ground Squirrel
Stipulation Type	NSO
RMP Acres Affected	206,560 acres
Stipulation Description	NSO or use is allowed within southern Idaho ground squirrel occupied and historic habitat. For the purpose of ensuring the function and suitability southern Idaho ground squirrel occupied and historic habitat. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not impair the function or suitability of southern Idaho ground squirrel occupied and historic habitat. Modification: The BLM-authorized officer may modify the area subject to the stipulation based upon an IDFG and BLM evaluation, in coordination with the IDFG. The stipulation may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within southern Idaho ground squirrel occupied and historic habitat. This determination shall be based upon a BLM evaluation, in coordination with the IDFG.

Management Action	MA-SSS-13 (All Alternatives)
Resource Objective	To protect Greater Sage-grouse Important Habitat Management Area (IHMA)
Stipulation Type	NSO
RMP Acres Affected	83,260 acres
Stipulation Description	Important Habitat Management Areas (IHMA) would be open to mineral leasing and development and geophysical exploration subject to NSO to protect Greater Sage-grouse habitat in IHMA. Exception: The Authorized Officer may grant an exception to a fluid mineral lease NSO stipulation only where the proposed action: i. Would not have direct, indirect, or cumulative effects on GRSG or its habitat; or, ii. Is proposed to be undertaken as an alternative to a similar action occurring on a nearby parcel or the State of Idaho recommends the project goes forward, based on its determination that the action would not result in a net loss to Greater Sage-Grouse habitat. Exceptions based on the goal of achieving no net loss may only be considered: (a) in PHMA of mixed ownership where federal minerals underlie less than 50 percent of the total surface, or (b) in areas of the public lands where the proposed exception is an alternative to an action occurring on a nearby parcel subject to a valid federal fluid mineral lease existing as of the date of this Proposed Plan Amendment. Exceptions based on the no net loss goal must also include measures, such as enforceable institutional controls and buffers, sufficient to allow the BLM to conclude that such benefits will endure for the duration of the proposed action's impacts. Any exceptions to this lease stipulation may be approved by the BLM Authorized Officer, only with the concurrence of the BLM State Director and in coordination with the technical and policy team (BLM 2019). Approved exceptions will be made publicly available. Waiver: None Modification: None

Management Action	MA-SSS-13 (All Alternatives)
Resource Objective	To protect Greater Sage-grouse leks within Important Habitat Management Area (IHMA)
Stipulation Type	NSO
RMP Acres Affected	11,560 acres
Stipulation Description	No surface occupancy is allowed within 2-miles of occupied Greater Sage-grouse leks. Exception: The Authorized Officer may grant an exception to a fluid mineral lease NSO stipulation only where it is impracticable, technically or economically to locate the project outside of the buffer area and impacts are avoided through project siting and design to the extent reasonable or impacts are minor or non-existent. A justifiable departure to decrease this distance, based on local data, best available science, landscape features, and other existing protections (e.g., state regulations) may be appropriate for determining activity impacts. Any exceptions to this lease stipulation may be approved by the BLM Authorized Officer, only with the concurrence of the BLM State Director and in coordination with the technical and policy team (BLM 2019). Approved exceptions will be made publicly available. Waiver: None Modification: None

Management Action	MA-SSS-13 (All Alternatives)
Resource Objective	To protect Greater Sage-grouse leks within General Habitat Management Area (GHMA)
Stipulation Type	NSO
RMP Acres Affected	1,930 acres
Stipulation Description	Surface occupancy is prohibited within 0.6-miles of occupied Greater Sage-grouse leks. Exception: The Authorized Officer may grant an exception to a fluid mineral lease NSO stipulation only where it is impracticable, technically or economically to locate the project outside of the buffer area and impacts may be avoided through project siting and design to the extent reasonable or impacts are minor or non-existent. A justifiable departure to decrease this distance, based on local data, best available science, landscape features, and other existing protections (e.g., state regulations) may be appropriate for determining activity impacts. The Authorized Officer will coordinate with IDFG regarding any variations to buffer distances. Waiver: None Modification: None

Management Action	MA-SSS-13 (All Alternatives)
Resource Objective	To protect Greater Sage-grouse leks within General Habitat Management Area (GHMA)
Stipulation Type	CSU
RMP Acres Affected	16,750 acres
Stipulation Description	Surface disturbance is restricted within 2-miles of occupied Greater Sage-grouse leks. Exception: The Authorized Officer may grant an exception to a fluid mineral lease CSU stipulation only where it is impracticable, technically or economically to locate the project outside of the buffer area and impacts are avoided through project siting and design to the extent reasonable or impacts are minor or non-existent. A justifiable departure to decrease this distance, based on local data, best available science, landscape features, and other existing protections (e.g., state regulations) may be appropriate for determining activity impacts. The Authorized Officer will coordinate with IDFG regarding any variations to buffer distances. Waiver: None Modification: None

Management Action	MA-SSS-13 (All Alternatives)
Resource Objective	To protect Greater Sage-grouse habitat in IHMA and GHMA
Stipulation Type	TLS
RMP Acres Affected	468,760 acres
Stipulation Description	Avoid mechanized anthropogenic disturbance, in nesting habitat during the nesting Season (March 1-June 15) and in wintering habitat during the winter season (November 1-February 28) when implementing infrastructure construction or maintenance. Exception: The BLM may grant an exception if- • the stipulation is documented to not be applicable to the site-specific conditions of the project/activity, such as due to site limitations or engineering considerations. Economic considerations, such as increased costs, do not necessarily require that the stipulation be varied or rendered inapplicable; • the stipulation will provide no additional protection to Greater Sage-grouse or its habitat; Waiver: None Modification: None

Management Action	MA-SSS-13 (All Alternatives)
Resource Objective	To protect Greater Sage-grouse leks in IHMA and GHMA
Stipulation Type	TLS
RMP Acres Affected	468,760 acres
Stipulation Description	No repeated or sustained behavioral disturbance from large scale infrastructure of facilities (e.g., visual, noise over 10 dbA at lek above ambient levels, etc.) to lekking birds from 6:00 pm to 9:00 am within 2-miles (3.2, km) of leks during the lekking season (approximately March 15-May 1 in lower elevations and March 25-May 15 in higher elevations). Exception: The BLM may grant an exception if- • the stipulation is documented to not be applicable to the site-specific conditions of the project/activity, such as due to site limitations or engineering considerations. Economic considerations, such as increased costs, do not necessarily require that the stipulation be varied or rendered inapplicable; • the stipulation will provide no additional protection to Greater Sage-grouse or its habitat; Waiver: None Modification: None

Management Action	MA-SSS-20 (Alternative A)
Resource Objective	To protect Special Status Plant Types 1-4
Stipulation Type	NSO
RMP Acres Affected	14,910 acres
Stipulation Description	NSO or use is allowed within special status species plant populations as mapped on the FRFO GIS database, or determined by BLM from field evaluation, in coordination with the USFWS for the purpose of protecting special status species plant populations. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not adversely affect special status species plant populations. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the USFWS. The stipulation may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain a special status species plant populations. This determination shall be based upon a BLM evaluation, in coordination with the USFWS.

Management Action	MA-SSS-20 (Alternative B)
Resource Objective	To protect Special Status Plant Types 2 and 3 Element Occurrences
Stipulation Type	NSO
RMP Acres Affected	5,920 acres
Stipulation Description	NSO or use is allowed within special status plant Types 2 and 3 element occurrences and within 0.25-mile of special status plant types 2 element occurrences as mapped on the FRFO GIS database, or determined by BLM from field evaluation, in coordination with the USFWS for the purpose of protecting special status plant types 2 and 3 element occurrences. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not adversely affect special status plant types 2 and 3 element occurrences. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the USFWS. The stipulation may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain a special status plant types 2 or 3 element occurrences. This determination shall be based upon a BLM evaluation, in coordination with the USFWS.

Management Action	MA-SSS-20 (Alternatives C and D)
Resource Objective	To protect Special Status Plants
Stipulation Type	CSU
RMP Acres Affected	14,910 acres
Stipulation Description	Surface disturbance is restricted within special status plant populations as mapped on the FRFO GIS database, or determined by BLM from field evaluation, in coordination with the USFWS for the purpose of protecting special status plant. Prior to surface disturbance within special status plant habitat, surveys must be conducted and a plan must be submitted to the BLM by the applicant as a component of the APD (BLM Form 3160-3) or Sundry Notice (BLM Form 3160-5)- Surface Use Plan or Operations. The operator shall not initiate surface-disturbing activities unless the BLM authorized officer has approved the Plan (with conditions as appropriate). The plan must demonstrate to the authorized officer's satisfaction the special status plants will not be harmed. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not adversely affect special status plants. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the USFWS. The stipulation may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain a special status plant. This determination shall be based upon a BLM evaluation, in coordination with the USFWS.

Management Action	MA-NT-09 (Alternative A)
Resource Objective	To retain characteristics and values associated with the Oregon National Historic Trail
Stipulation Type	NSO
RMP Acres Affected	18,760 acres
Stipulation Description	Surface occupancy or use will be prohibited within 0.5-miles of the trail. Exception: The authorized officer may grant an exception if surveys determine that other historic trail remnants are not present or it is determined that the section of trail is sufficiently compromised that the action will not result in an adverse effect to the trail. Modification: If surveys determine that a portion of the lease area does not contain contributing trail segments, then the stipulation may be modified. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM. Waiver: The authorized officer may grant a waiver if surveys determine that the entire lease area does not contain contributing trail segments, then the stipulation may be waived. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM.

Management Action	MA-NT-09 (Alternative C)
Resource Objective	To retain characteristics and values associated with the Oregon Trail Protection Zone
Stipulation Type	NSO
RMP Acres Affected	12,730 acres
Stipulation Description	Surface occupancy or use will be prohibited within 0.125-miles of the trail. Exception: The authorized officer may grant an exception if surveys determine that other historic trail remnants are not present or it is determined that the section of trail is sufficiently compromised that the action will not result in an adverse effect to the trail. Modification: If surveys determine that a portion of the lease area does not contain contributing trail segments, then the stipulation may be modified. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM. Waiver: The authorized officer may grant a waiver if surveys determine that the entire lease area does not contain contributing trail segments, then the stipulation may be waived. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM.

Management Action	MA-NT-09 (Alternative D)
Resource Objective	To retain characteristics and values associated with the Oregon Trail Protection Zone
Stipulation Type	NSO
RMP Acres Affected	24,910 acres
Stipulation Description	Surface occupancy or use will be prohibited within 0.25-miles of the trail. Exception: The authorized officer may grant an exception if surveys determine that other historic trail remnants are not present or it is determined that the section of trail is sufficiently compromised that the action will not result in an adverse effect to the trail. Modification: If surveys determine that a portion of the lease area does not contain contributing trail segments, then the stipulation may be modified. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM. Waiver: The authorized officer may grant a waiver if surveys determine that the entire lease area does not contain contributing trail segments, then the stipulation may be waived. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM.

Management Action	MA-NT-09 (Alternative B)
Resource Objective	To retain characteristics and values associated with the Oregon Trail Management Corridor
Stipulation Type	NSO
RMP Acres Affected	114,740 acres
Stipulation Description	Surface occupancy or use will be prohibited within 2.0-miles of the trail. Exception: The authorized officer may grant an exception if surveys determine that other historic trail remnants are not present or it is determined that the section of trail is sufficiently compromised that the action will not result in an adverse effect to the trail. Modification: If surveys determine that a portion of the lease area does not contain contributing trail segments, then the stipulation may be modified. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM. Waiver: The authorized officer may grant a waiver if surveys determine that the entire lease area does not contain contributing trail segments, then the stipulation may be waived. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM.

Management Action	MA-NT-09 (Alternative C)
Resource Objective	To retain characteristics and values associated with the Oregon Trail Management Corridor
Stipulation Type	CSU
RMP Acres Affected	75,440 acres
Stipulation Description	Surface occupancy or use will be restricted or prohibited within (1) 1-mile from the Oregon NHT or the visual horizon whichever is closer where setting is an important aspect of the integrity for the trail unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts. The Plan must demonstrate proposed infrastructure is either not visible or will result in a weak contrast rating; (2) Disturbance associated with leasable mineral development would not exceed 2% of the Management Corridor area. Exception: The authorized officer may consider a lease stipulation exception within the National Trails Management Corridor if 1) an action is at least 2 miles from a National Trail, a significant National Trail historical or recreational site, or Trail-related recreational activities; or, 2) all components and effects of the action are in compliance with the RMP-designated VRM standard in consultation with appropriate federal agency. The proposal must be capable of attaining a no adverse-affect determination in consultation with SHPO. Modification: The authorized officer may modify the area subject to the stipulation or surface occupancy criteria if it is determined by the BLM, after consultation with the appropriate federal and/or agency that a portion of the NSO area does not contribute, as determined by Section 106, to the trails' nature and purpose or their setting or if the proposed action can be developed in a way that meets the management objectives for the NHTs. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM. Waiver: The authorized officer may grant a waiver if it is determined, in consultation with the appropriate federal and/or state agency, that the area is no longer considered to contribute to the trails' nature and purpose or setting or if the proposed action can be developed in a way that meets the management objectives for the NHTs. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM.

Management Action	MA-NT-09 (Alternative D)
Resource Objective	To retain characteristics and values associated with the Oregon Trail Management Corridor
Stipulation Type	CSU
RMP Acres Affected	137,670 acres
Stipulation Description	Surface occupancy or use will be restricted or prohibited within (1) 2-miles from the Oregon NHT or the visual horizon whichever is closer where setting is an important aspect of the integrity for the trail unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts. The Plan must demonstrate proposed infrastructure is either not visible or will result in a weak contrast rating. Exception: The authorized officer may consider a lease stipulation exception within the National Trails Management Corridor if 1) an action is at least 2 miles from a National Trail, a significant National Trail historical or recreational site, or Trail-related recreational activities; or, 2) all components and effects of the action are in compliance with the RMP-designated VRM standard in consultation with appropriate federal agency. The proposal must be capable of attaining a no adverse-affect determination in consultation with SHPO. Modification: The authorized officer may modify the area subject to the stipulation or surface occupancy criteria if it is determined by the BLM, after consultation with the appropriate federal and/or agency that a portion of the NSO area does not contribute, as determined by Section 106, to the trails' nature and purpose or their setting or if the proposed action can be developed in a way that meets the management objectives for the NHTs. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM. Waiver: The authorized officer may grant a waiver if it is determined, in consultation with the appropriate federal and/or state agency, that the area is no longer considered to contribute to the trails' nature and purpose or setting or if the proposed action can be developed in a way that meets the management objectives for the NHTs. This determination shall be based upon field evaluation of the area by a qualified archaeologist/historian and subject to confirmation by the BLM.

Management Action	MA-WW-07 (Alternative B)
Resource Objective	To retain characteristics and values associated with the Watchable Wildlife Areas
Stipulation Type	NSO
RMP Acres Affected	137,670 acres
Stipulation Description	No surface occupancy is permitted on lands within Watchable Wildlife Areas. Exception: Consider exceptions if exploration and development would not impair identified wildlife resources. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. Modification: The stipulated area may be modified by the authorized officer if the boundaries are changed. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. Waiver: A waiver may be granted if the restriction violates the leaseholder/operator lease rights. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes.

Management Action	MA-WSR-07 (Alternatives C and D)
Resource Objective	To retain characteristics and values associated with the Wild and Scenic Rivers
Stipulation Type	NSO
RMP Acres Affected	950 acres (Alternative C) 5,890 acres (Alternative D)
Stipulation Description	No surface occupancy is permitted on lands within Wild and Scenic Rivers. Exception: Consider exceptions if exploration and development would not impair the outstandingly remarkable values of the WSR. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. Modification: The stipulated area may be modified by the authorized officer if the boundaries are changed. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. Waiver: A waiver may be granted if the restriction violates the leaseholder/operator lease rights. Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes.

Management Action	MA-REC-06 (Alternative D)
Resource Objective	To retain characteristics and values associated with developed recreation sites within the Oxbow/Brownlee ERMA
Stipulation Type	NSO
RMP Acres Affected	880 acres
Stipulation Description	No surface occupancy or use is permitted on lands located within 0.5 miles of developed recreation sites within the Oxbow/Brownlee ERMA. Exception: An exception to this stipulation may be granted by the BLM authorized officer if the BLM determines that the function and utility of the recreational resources are not adversely affected. Modification: The BLM authorized officer may modify the stipulation if the boundaries of recreational sites are changed or a portion of the lease area is determined not to be located within the viewshed of developed recreation sites. Waiver: This BLM authorized officer may waive this stipulation if it is determined that the entire leasehold is not within the viewshed of the developed recreation sites.

Management Action	MA-REC-10 (Alternative A)
Resource Objective	To retain characteristics and values associated with the R&PP Lease Areas
Stipulation Type	NSO
RMP Acres Affected	340 acres
Stipulation Description	No surface occupancy or use is permitted within lands held through R&PP Leases for the protection of values for which the lease was issued. Exception: An exception to this stipulation may be granted by the BLM authorized officer if the BLM determines that the function and utility of the recreational resources are not adversely affected. Modification: The BLM authorized officer may modify the stipulation if the boundaries of recreational sites are changed or a portion of the lease area is determined not to be located within the Clay Peak Cycle park. Waiver: This BLM authorized officer may waive this stipulation if it is determined that the entire leasehold no longer contains the Clay Peak Cycle park.

Management Action	MA-REC-06 (Alternative A)
Resource Objective	To retain characteristics and values associated with the Developed Recreation Sites
Stipulation Type	NSO
RMP Acres Affected	20 acres
Stipulation Description	No surface occupancy or use is permitted within developed recreation sites for the protection of designated campgrounds, trailheads, day use areas, and similar recreation sites. Exception: An exception to this stipulation may be granted by the BLM authorized officer if the BLM determines that the function and utility of the recreational resources are not adversely affected. Modification: The BLM authorized officer may modify the stipulation if the boundaries of recreational sites are changed or a portion of the lease area is determined not to be located within a designated recreational site. Waiver: This BLM authorized officer may waive this stipulation if it is determined that the entire leasehold no longer contains developed recreation areas.

Management Action	MA-BB-ACEC-05 (Alternative B)
Resource Objective	To retain characteristics and values associated with the Bannister Basin ACEC
Stipulation Type	NSO
RMP Acres Affected	5,840 acres
Stipulation Description	NSO or use is allowed within the Bannister Basin Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-BF-ACEC-05 (Alternative B)
Resource Objective	To retain characteristics and values associated with the Boise Front ACEC
Stipulation Type	NSO
RMP Acres Affected	24,630 acres
Stipulation Description	NSO or use is allowed within the Boise Front Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-BW-ACEC-05 (Alternatives A and B)
Resource Objective	To retain characteristics and values associated with the Buckwheat Flats RNA/ACEC
Stipulation Type	NSO
RMP Acres Affected	200 acres
Stipulation Description	NSO or use is allowed within the Buckwheat Flats Research Natural Area (Alternative A)/ Area of Critical Environmental Concern (Alternative B) on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-CC-ACEC-04 (Alternative A)
Resource Objective	To retain characteristics and values associated with the Cartwright Canyon ACEC
Stipulation Type	NSO
RMP Acres Affected	400 acres
Stipulation Description	NSO or use is allowed within the Cartwright Canyon Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-CG-ACEC-04 (Alternative B)
Resource Objective	To retain characteristics and values associated with the Cherry Gulch ACEC
Stipulation Type	NSO
RMP Acres Affected	3,070 acres
Stipulation Description	NSO or use is allowed within the Cherry Gulch Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-CST-ACEC-06 (Alternatives A, C and D)
Resource Objective	To retain characteristics and values associated with the Columbian Sharp Tailed Grouse Habitat ACEC
Stipulation Type	TLS
RMP Acres Affected	4,170 acres (Alternative A) 12,870 acres (Alternative C) 18,660 acres (Alternative D)
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from March 1 to May 15 within 3.1 miles of the perimeter of occupied sharp-tailed grouse leks as mapped by the IDFG and evaluated by the BLM. For the purpose of ensuring the function and suitability of sharp-tailed grouse nesting habitat within the Columbian Sharp Tailed Grouse Habitat ACEC. Exception: The BLM authorized officer may grant an exception if it is determined that the action will not affect reproductive displays, nest attendance, egg or chick survival, or early brood-rearing success. Actions designed to enhance the long-term utility or availability of suitable sharp-tailed grouse habitat may be exempted from this timing limitation. The determination may include coordination with the IDFG, so that granting an exception would not adversely impact the population being protected. Modification: The BLM authorized officer may modify the size and shape of the TLS area or the TLS criteria if it is determined that the actual habitat suitability for seasonal sharp-tailed grouse activities is greater or less than the stipulated area, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the ACEC for the seasonal habitat, life-history, or behavioral needs of the sharp-tailed grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Waiver: The BLM authorized officer may waive this stipulation if it is determined, in coordination with the IDFG, that the described lands are incapable of serving the long-term requirements of sharp-tailed grouse breeding, nesting, and early brood-rearing habitat.

Management Action	MA-CST-ACEC-06 (Alternative B)
Resource Objective	To retain characteristics and values associated with the Columbian Sharp Tailed Grouse Habitat ACEC
Stipulation Type	NSO
RMP Acres Affected	21,100 acres
Stipulation Description	NSO or use is allowed within the Columbian Sharp Tailed Grouse Habitat Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-GC-ACEC-05 (Alternatives A and B)
Resource Objective	To retain characteristics and values associated with the Goodrich Creek RNA/ACEC
Stipulation Type	NSO
RMP Acres Affected	360 acres (Alternative A) 450 acres (Alternative B)
Stipulation Description	NSO or use is allowed within the Goodrich Creek Research Natural Area (Alternative A)/Area of Critical Environmental Concern (Alternative B) on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-HG-ACEC-05 (Alternative A)
Resource Objective	To retain characteristics and values associated with the Hulls Gulch ACEC
Stipulation Type	NSO
RMP Acres Affected	120 acres
Stipulation Description	NSO or use is allowed within the Hulls Gulch Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-LB-ACEC-05 (Alternatives A and B)
Resource Objective	To retain characteristics and values associated with the Lost Basin Grassland RNA ACEC
Stipulation Type	NSO
RMP Acres Affected	60 acres
Stipulation Description	NSO or use is allowed within the Lost Basin Grassland Research Natural Area (Alternative A)/ Area of Critical Environmental Concern (Alternative B) on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-LC-ACEC-07
Resource Objective	To protect Long-billed Curlew
Stipulation Type	TLS
RMP Acres Affected	45,020 acres (Alternative A) 46,310 acres (Alternative B) 26,810 acres (Alternatives C and D)
Stipulation Description	Avoid or minimize disruption of long-billed curlew nesting activity by siting or prioritizing vegetation clearing, facility construction, and concentrated operational activities (e.g., drilling, completion, utility installation) to avoid the involvement of higher value habitats, particularly during the nesting season (March 1- June 30). Exception: The BLM authorized officer may grant an exception if a staff review determines that the action will not disturb long-billed curlew nesting activity. This determination shall be based upon field study by a qualified representative, subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain long-billed curlew nests. Confirmation may include coordination with the IDFG or USFWS.

Management Action	MA-MH-ACEC-07 (Alternative B)
Resource Objective	To retain characteristics and values associated with the Mountain Home ACEC
Stipulation Type	NSO
RMP Acres Affected	520 acres
Stipulation Description	NSO or use is allowed within the Mountain Home Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-RS-ACEC-07 (Alternatives A and B)
Resource Objective	To retain characteristics and values associated with the Rebecca Sandhill RNA/ACEC
Stipulation Type	NSO
RMP Acres Affected	240 acres (Alternative A) 1,250 acres (Alternative B)
Stipulation Description	NSO or use is allowed within 0.25-mile of SSP EOs and their pollinator habitat within the Rebecca Sandhill Research Natural Area (Alternative A)/ Area of Critical Environmental Concern (Alternative B) on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-SK-ACEC-07 (Alternatives A and B)
Resource Objective	To retain characteristics and values associated with the Sand-capped Knob ACEC
Stipulation Type	NSO
RMP Acres Affected	40 acres (Alternative A) 180 acres (Alternative B)
Stipulation Description	NSO or use is allowed within the Sand-capped Knob Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-SH-ACEC-07 (Alternative A and B)
Resource Objective	To retain characteristics and values associated with the Sand Hollow ACEC
Stipulation Type	NSO
RMP Acres Affected	1,300 acres (Alternative A) 1,330 acres (Alternative B)
Stipulation Description	NSO or use is allowed within the Sand Hollow Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-SC-ACEC-06 (Alternative B)
Resource Objective	To retain characteristics and values associated with the Sheep Creek ACEC
Stipulation Type	NSO
RMP Acres Affected	1,970 acres
Stipulation Description	NSO or use is allowed within the Sheep Creek Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-SuC-ACEC-06 (Alternatives A and B)
Resource Objective	To retain characteristics and values associated with the Summer Creek RNA/ACEC
Stipulation Type	NSO
RMP Acres Affected	240 acres (Alternative A) 630 acres (Alternative B)
Stipulation Description	NSO or use is allowed within the Summer Creek Research Natural Area (Alternative A)/ Area of Critical Environmental Concern (Alternative B) on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-WC-ACEC-08 (Alternatives A and B)
Resource Objective	To retain characteristics and values associated with the Willow Creek ACEC
Stipulation Type	NSO
RMP Acres Affected	1,010 acres (Alternative A) 1,120 acres (Alternative B)
Stipulation Description	NSO or use is allowed within the Willow Creek Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-WG-ACEC-07 (Alternatives A and B)
Resource Objective	To retain characteristics and values associated with the Woods Gulch ACEC
Stipulation Type	NSO
RMP Acres Affected	40 acres
Stipulation Description	NSO or use is allowed within the Woods Gulch Area of Critical Environmental Concern on the lands as mapped or determined by BLM for the purpose of protecting the relevant and important values. Exception: The BLM authorized officer may grant an exception if it is determined that the action is of a scale, sited in a location, or otherwise designed so that the action will not result in a failure to protect the relevant and important values. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation. The stipulation may be modified based on monitoring results, or if a portion of the lease is no longer located in the ACEC. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain relevant and important ACEC values.

Management Action	MA-MR-03
Resource Objective	To protect Migratory Birds
Stipulation Type	TLS
RMP Acres Affected	acres
Stipulation Description	Avoid or minimize disruption of migratory bird nesting activity by siting or prioritizing vegetation clearing, facility construction, and concentrated operational activities (e.g., drilling, completion, utility installation) to avoid the involvement of higher value migratory bird habitats, particularly during the core migratory bird nesting season (April 1–July 15). Exception: The BLM authorized officer may grant an exception if a staff review determines that the action will not disturb migratory bird nesting activity. This determination shall be based upon field study by a qualified representative, subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area does not contain migratory bird nests. Confirmation may include coordination with the IDFG or USFWS.

Management Action	MA-SSS-12
Resource Objective	To protect Greater Sage-grouse General Habitat Management Areas
Stipulation Type	CSU
RMP Acres Affected	385,500 acres
Stipulation Description	Parcels would not be offered for lease if buffers and restrictions (including RDFs) preclude development in the leasing area. Exception: RDFs are continuously improving as new science and technology become available and therefore are subject to change. All variations in RDFs would require that at least one of the following be demonstrated in the NEPA analysis associated with the project/activity: • A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable; • An alternative RDF is determined to provide equal or better protection for GRSG or its habitat; • A specific RDF will provide no additional protection to GRSG or its habitat. Waiver: None Modification: None

Management Action	MA-SSS-09
Resource Objective	To protect 1-mile buffer of Bald Eagle Nests
Stipulation Type	TLS
RMP Acres Affected	2,140 acres
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from February 1 to July 31 within 1.0 mile of active bald eagle nests as mapped on the FRFO GIS database or determined by field evaluation, in coordination with the IDFG and/or USFWS. For the purpose of ensuring productivity of bald eagles. Exception: The BLM authorized officer may grant an exception if a staff review determines that the action will not disturb nesting bald eagles. This determination shall be based upon field study by a qualified representative, subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 1.0 mile of a bald eagle nest. Confirmation may include coordination with the IDFG or USFWS.

Management Action	MA-SSS-09
Resource Objective	To protect 0.25 mile buffer of Burrowing Owl Nests
Stipulation Type	TLS
RMP Acres Affected	1,040 acres
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from February 1 to July 31 within 0.25-mile of active burrowing owl nests as mapped on the FRFO GIS database or determined by field evaluation, in coordination with the IDFG and/or USFWS. For the purpose of ensuring productivity of burrowing owls. Exception: The BLM authorized officer may grant an exception if a staff review determines that the action will not disturb nesting burrowing owls. This determination shall be based upon field study by a qualified representative, subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 0.25-mile of a burrowing owl nest. Confirmation may include coordination with the IDFG or USFWS.

Management Action	MA-SSS-09
Resource Objective	To protect 1-mile buffer of Ferruginous Hawk Nests
Stipulation Type	TLS
RMP Acres Affected	28,070 acres
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from February 1 to July 31 within 1.0 mile of active ferruginous hawk nests as mapped on the FRFO GIS database or determined by field evaluation, in coordination with the IDFG and/or USFWS. For the purpose of ensuring productivity of ferruginous hawks. Exception: The BLM authorized officer may grant an exception if a staff review determines that the action will not disturb nesting ferruginous hawks. This determination shall be based upon field study by a qualified representative, subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 1.0 mile of a ferruginous hawk nest. Confirmation may include coordination with the IDFG or USFWS.

Management Action	MA-SSS-09
Resource Objective	To protect 0.5-mile buffer of Golden Eagle Nests
Stipulation Type	TLS
RMP Acres Affected	3,680 acres
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from February 1 to July 31 within 0.5-mile of active golden eagle nests as mapped on the FRFO GIS database or determined by field evaluation, in coordination with the IDFG and/or USFWS. For the purpose of ensuring productivity of golden eagles. Exception: The BLM authorized officer may grant an exception if a staff review determines that the action will not disturb nesting golden eagles. This determination shall be based upon field study by a qualified representative, subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Modification: The BLM authorized officer may modify the area subject to the stipulation based on local evaluation including topography, visibility, disturbance and human activity levels, and other factors. The stipulation may be modified based on monitoring results. The determination shall be based upon field studies of the area by a qualified representative and subject to confirmation from BLM. Confirmation may include coordination with the IDFG or USFWS. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within 0.5- mile of a golden eagle nest. Confirmation may include coordination with the IDFG or USFWS.

Management Action	MA-SSS-09
Resource Objective	To protect 3.1-mile buffer of Columbian Sharp Tailed Grouse Nests
Stipulation Type	TLS
RMP Acres Affected	54,180 acres
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from March 1 to May 15 within 3.1 miles of the perimeter of occupied sharp-tailed grouse leks as mapped by the IDFG and evaluated by the BLM. For the purpose of ensuring the function and suitability of sharp-tailed grouse nesting habitat. Exception: The BLM authorized officer may grant an exception if it is determined that the action will not affect reproductive displays, nest attendance, egg or chick survival, or early brood-rearing success. Actions designed to enhance the long-term utility or availability of suitable sharp-tailed grouse habitat may be exempted from this timing limitation. The determination may include coordination with the IDFG, so that granting an exception would not adversely impact the population being protected. Modification: The BLM authorized officer may modify the size and shape of the TLS area or the TLS criteria if it is determined that the actual habitat suitability for seasonal sharp-tailed grouse activities is greater or less than the stipulated area, or it is identified through scientific research or monitoring that the existing criteria are inadequate or overly protective for maintaining the function or utility of the site for the seasonal habitat, life-history, or behavioral needs of the sharp-tailed grouse, including (but not limited to) reproductive display, daytime loafing/staging activities, and nesting. Waiver: The BLM authorized officer may waive this stipulation if it is determined, in coordination with the IDFG, that the described lands are incapable of serving the long-term requirements of sharp-tailed grouse breeding, nesting, and early brood-rearing habitat.

Management Action	MA-FW-07
Resource Objective	To protect Mule Deer Winter Range
Stipulation Type	TLS
RMP Acres Affected	343,890 acres
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from November 15 to April 30 within mule deer winter range. On the lands described below: TLS as mapped by the IFGD and evaluated by the BLM. For the purpose of ensuring the function and suitability of mule deer winter ranges. Exception: The BLM authorized officer may grant an exception if the operator demonstrates that the winter habitat is not occupied during the period of concern, subject to confirmation by the IDFG and BLM; or it is determined that the action will not impair the function or suitability of the winter habitat. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the IDFG, to determine that the mule deer winter range is not present or boundaries of the subject winter range areas have been refined. The stipulation may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within mule deer winter range. This determination shall be based upon a BLM evaluation of the area, in coordination with IDFG.

Management Action	MA-FW-07
Resource Objective	To protect Elk Winter Range
Stipulation Type	TLS
RMP Acres Affected	473,930 acres
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from November 15 to April 30 within elk winter range. On the lands described below: TLS as mapped by the IFGD and evaluated by the BLM. For the purpose of ensuring the function and suitability of elk winter ranges. Exception: The BLM authorized officer may grant an exception if the operator demonstrates that the crucial habitat is not occupied during the period of concern, subject to confirmation by the IDFG and BLM; or it is determined that the action will not impair the function or suitability of the winter habitat. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the IDFG, to determine that the elk winter range is not present or boundaries of the subject winter range areas have been refined. The stipulation may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within elk winter range. This determination shall be based upon a BLM evaluation of the area, in coordination with IDFG.

Management Action	MA-FW-07
Resource Objective	To protect Pronghorn Winter Range
Stipulation Type	TLS
RMP Acres Affected	acres
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from November 15 to April 30 within pronghorn winter range. On the lands described below: TLS as mapped by the IFGD and evaluated by the BLM. For the purpose of ensuring the function and suitability of pronghorn winter ranges. Exception: The BLM authorized officer may grant an exception if the operator demonstrates that the crucial habitat is not occupied during the period of concern, subject to confirmation by the IDFG and BLM; or it is determined that the action will not impair the function or suitability of the winter habitat. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the IDFG, to determine that the pronghorn winter range is not present or boundaries of the subject winter range areas have been refined. The stipulation may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within pronghorn winter range. This determination shall be based upon a BLM evaluation of the area, in coordination with IDFG.

Management Action	MA-FW-07
Resource Objective	To protect Bighorn Sheep Winter Range
Stipulation Type	TLS
RMP Acres Affected	acres
Stipulation Description	Surface-disturbing and disruptive activities are prohibited or restricted from November 15 to April 30 within bighorn sheep winter range. On the lands described below: TLS as mapped by the IFGD and evaluated by the BLM. For the purpose of ensuring the function and suitability of bighorn sheep winter ranges. Exception: The BLM authorized officer may grant an exception if the operator demonstrates that the winter range is not occupied during the period of concern, subject to confirmation by the IDFG and BLM; or it is determined that the action will not impair the function or suitability of the winter range. Modification: The BLM authorized officer may modify the area subject to the stipulation based upon a BLM evaluation, in coordination with the IDFG, to determine that the bighorn sheep winter range is not present or boundaries of the subject winter range areas have been refined. The stipulation may be modified based on monitoring results. Waiver: The BLM authorized officer may waive this stipulation if it is determined that the entire lease area is not within bighorn sheep winter range. This determination shall be based upon a BLM evaluation of the area, in coordination with IDFG.

Appendix F - Aquatic Resources

In 1972, Congress passed the Federal Water Pollution Control Act, more commonly called the Clean Water Act. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Water Pollution Control Federation 1987). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The CWA has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was protecting and managing waters to insure "swimmable and fishable" conditions. This goal, along with a 1972 goal to restore and maintain chemical, physical, and biological integrity, relates water quality with more than just chemistry.

Background

The Federal Government, through the U.S. Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the country. The Department of Environmental Quality (DEQ) implements the CWA in Idaho, while EPA oversees Idaho and certifies the fulfillment of CWA requirements and responsibilities.

Streams within this analysis area have been designated by the State of Idaho for the beneficial use designations of primary contact recreation, cold-water biota, agricultural water supply, wildlife habitat, and aesthetics. The most limiting of these is cold-water biota. State of Idaho criteria for cold-water biota beneficial uses are water temperatures of 22°C or less with a maximum daily average of less than 19°C.

DEQ's stream temperature standards are designed to protect aquatic life uses, which are the only uses that have temperature requirements. The criteria vary by aquatic use—warm water, seasonal cold water, cold water, salmonid spawning, and bull trout (see table below). The latter two uses are subcategories of the cold water use. For all but bull trout, DEQ uses a pair of criteria, targeting daily maximum and daily average temperatures. Depending on the diurnal (day to night) temperature range in a given stream, one or the other of these paired criteria will limit the stream's warmth. Using a pair of criteria provides regulation over a broader range of streams than either alone could. For bull trout the criterion is for a seven-day rolling average of daily maximums. This rolling average regulates maximums while allowing a few individual days to be slightly warmer.

Use Metric	Warm Water	Seasonal Cold	Cold Water	Salmonid Spawning	Bull Trout
MDMT[a]	33 °C (91 °F)	26 °C (79 °F)	22 °C (72 °F)	13 °C (55 °F)	N/A
MWMT[b]	N/A	N/A	N/A	N/A	13 °C (55 °F)
MDAT[c]	29 °C (84 °F)	23 °C (73 °F)	19 °C (66 °F)	9 °C (48 °F)	N/A

[a]MDMT = Maximum Daily Maximum Temperature
[b]MWMT = Maximum Weekly (7-day average) Maximum Temperature
[c]MDAT = Maximum Daily Average Temperature

Intermittent Water Bodies

All surface waters are protected for the following beneficial uses: wildlife habitat, agricultural water supply, industrial water supply (Idaho Administrative Procedures Act [IDAPA] 58.01.02). All

undesignated surface waters are protected for the following beneficial uses: primary or secondary contact recreation, cold water aquatic life and the protection and propagation of fish, shellfish, and wildlife, where attainable.

The state of Idaho defines an intermittent stream as one that has a period of zero (0) flow for at least one (1) week during most years or has a 7Q2 hydrologically-based flow of less than one-tenth (0.10) cfs (IDAPA 58.01.02.003.51). The 7Q2 is defined as the seven day average flow over a two week period. If a stream contains natural perennial pools containing significant aquatic life, it is not considered intermittent.

Water quality standards shall only apply to intermittent waters during optimum flow periods sufficient enough to support the beneficial uses for which the water body has been designated IDAPA 58.01.02.070.07) The optimum flow for contact recreation is equal to, or greater than five (5.0) cubic feet per second (cfs). The optimum flow for aquatic life is equal to or greater than one (1.0) cfs.

The PA incorporates portions of the Boise, Camas, Payette, Salmon, and Snake Rivers' sub-basins and all of the Weiser sub-basin. Approximately 434 miles of perennial streams and rivers and 2,384 miles of intermittent streams flow across BLM-managed lands (Table F-1), which constitutes about ten-percent of the total stream miles in the PA. Many of the water courses in the PA flow through lands not managed by the BLM. Land management practices on both BLM and non-BLM lands can affect water quality and quantity. In most cases, BLM can only address water quality issues that arise from activities on BLM-managed land through cooperative efforts with other federal, state, and private land owners.

Table F-1 Stream Miles by Ownership in the PA

Ownership	Stream Miles	Percent
BLM	2,664	10
USFS	13,431	51
STATE	1,432	6
PRIVATE	8,659	33
Total	**26,186**	**100**
Source: USGS NHD flowline database; perennial and intermittent stream miles.		

Although the final authority to determine beneficial uses, enforce water quality compliance, and determine total maximum daily loads (TMDLs) is held by IDEQ and EPA, maintaining water quality is a key concern for BLM as many aquatic species, including special status fish (e.g., bull trout and redband trout) and amphibians (e.g., northern leopard frog) rely on clean water. Therefore, the BLM plays an integral role in managing water quality by maintaining and improving riparian and upland habitat quality. Improving rangeland health through the Idaho Standards & Guidelines and achieving properly functioning riparian and wetland ecosystems helps to maintain or improve water quality indicators (water temperature, sediment load, nutrient levels, etc.).

The IDEQ establishes water quality standards for Idaho which provide a foundation to protect, maintain or improve water resources. These standards support federal laws such as the Clean Water Act (CWA) of 1977, Water Resources Planning Act of 1962, Pollution Prevention Act of 1990, and Safe Drinking Water Act of 1977. The Clean Water Act of 1977, as amended in 1987, provides for the protection, restoration, or improvement of water quality; enables states to establish programs for regulating and managing non-point source pollution; and directs federal agencies to comply with state water quality laws. Various Executive Orders and Department of Interior (DOI) and BLM manuals also direct the BLM to maintain and/or improve water quality.

IDEQ has responsibility for protecting water quality within Idaho and enforcing specific water quality standards for each beneficial use. Idaho water quality standards are used to ensure protection of designated beneficial water uses, including cold water fisheries, recreation, and agriculture. Section 303(d) of the CWA requires states to identify pollutant-impaired water segments and develop Total

Maximum Daily Loads (TMDL) that set the maximum amount of pollutants a waterbody can receive without violating standards. In Idaho, TMDLs are coordinated by IDEQ. Idaho BLM strives to adhere to these water quality and TMDL limits in order to protect public health and welfare and enhance water quality on public land. The statewide IDEQ standards for water quality indicators are identified in Table F-2.

Cold water aquatic life and primary and secondary contact recreation, and drinking water are the designated beneficial uses for perennial streams that are to be protected (IDAPA 58.01.02.100 and 58.01.02.100.02). The cold water aquatic life beneficial use is given to waters that are suitable, or intended to be made suitable, for protection and maintenance of viable communities of aquatic organisms and populations of desirable aquatic species that have optimal growing temperatures <18° C (<64° F). Primary and secondary contact recreation standards are numeric, and relate to the maximum allowed concentrations of bacteria (*E. coli*) present in a waterbody.

The IDEQ uses indicators for water quality that include sediment, water temperature, dissolved oxygen (DO), E. coli (Escherichia coli), streamflow alterations/diversions, nutrients, pesticide pollutants (e.g. chlorpyrifos) and mercury.

Table F-2 Indicators and Standards for Monitoring Watershed Water Quality

Indicator	Measurement	IDEQ Standard
Sediment levels	Total suspended solids (turbidity metrics)	50-52 mg/l (average monthly)
		80 mg/l (weekly maximum)
Water Temperature	Maximum instantaneous temperature	72° F
	Maximum daily average temperature	66° F
Dissolved Oxygen (DO)	DO (mg/l)	Greater than 6.0 mg/l
Bacterial levels	*E. coli* (cfu/100ml)[a]	Less than 126 cfu/100 ml (geometric mean criterion)
Streamflow Alteration/Diversions	Presence/absence of de-watering	No de-watering
Nutrients levels	Ammonia	The 30–day average of total ammonia nitrogen is not to exceed the Criterion Continuous Concentration[b] more than once every 3 years.
	Total Phosphorous	0.100 mg/l free-flowing streams, 0.050 mg/l from mouth of streams into lake/reservoir, 0.025 mg/l lake/reservoir
Toxic Substances	Methyl Mercury,	0.3 mg/kg of fresh weight fish tissue
Source: Idaho Administrative Procedures Act (IDAPA) 58.01.02		

[a] The concentration of *E. coli*, based on a minimum of five samples during any 30-day period, must not exceed a geometric mean of 126 per 100 ml, nor may more than ten percent of total samples during any 30-day period exceed 410 per 100 ml. [b] See IDAPA 58.01.02 for formula to calculate Criterion Continuous Concentration.

If a stream reach has an IDEQ assigned Total Maximum Daily Load (TMDL), or is 303(d) listed (2012 Integrated Report), BLM routinely examines those streams for compliance with water quality standards while conducting Standards and Guidelines assessments. In addition, in streams hosting salmonid fishes (e.g. redband trout), stream temperatures are periodically monitored with temperature data loggers. Further, streams on the 303(d) list which have assigned TMDLs for bacteria are periodically sampled for pathogen levels.

The Proper Functioning Condition (PFC) assessment method was created to qualitatively evaluate the foundation of these processes—specifically the functionality of the physical processes occurring on a stream. These physical processes include the interactions of hydrology, stabilizing deep-rooted hydrophilic vegetation, and geomorphology (soils and landform). Because the PFC assessment compares each stream to its own potential, it is universally applicable to all but the most highly modified perennial and intermittent streams. The abbreviation PFC describes both the assessment method and a defined on-the-ground condition of a riparian area. The on-the-ground condition termed PFC refers to how well physical processes are functioning.

Over the past 20 years, nearly all perennial streams and wetlands in the Planning Area have been assessed for PFC as least once. The majority of perennial flow regime streams were assessed on-site using protocols in either Technical Reference (TR)-1737 1996, or the most recent TR 1737-15 2015. Streams and wetlands in remote or difficult to access areas, or in areas where a Standards and Guides Assessment has not been completed, were sometimes rated for PFC employing guidance found in *Using Aerial Photographs to Assess Proper Functioning Condition of Riparian-Wetland Areas* TR-1737-12 (1996).

These standards support federal laws such as the Clean Water Act (CWA) of 1977, Water Resources Planning Act of 1962, Pollution Prevention Act of 1990, and Safe Drinking Water Act of 1977. The Clean Water Act of 1977, as amended in 1987, provides for the protection, restoration, or improvement of water quality; enables states to establish programs for regulating and managing non-point source pollution; and directs federal agencies to comply with state water quality laws. Various Executive Orders and Department of Interior (DOI) and BLM manuals also direct the BLM to maintain and improve water quality.

Idaho water quality standards are used to ensure protection of designated beneficial water uses, including cold water fisheries, recreation, and agriculture. Section 303(d) of the CWA requires states to identify pollutant-impaired water segments and develop Total Maximum Daily Loads (TMDL) that set the maximum amount of pollutions a waterbody can receive without violating standards. In Idaho, TMDLs are coordinated by IDEQ. Idaho BLM strives to adhere to these water quality and TMDL standards in order to protect public health and welfare, and enhance water quality on public land. The statewide IDEQ standards for water quality indicators are identified in Table F-2.

The optimum flow rates are >1.0 cubic-feet-per-second (cfs) for cold water aquatic life and >5.0 cfs for primary and secondary contact recreation. The cold water aquatic life beneficial use is given to waters that are suitable, or intended to be made suitable, for protection and maintenance of viable communities of aquatic organisms, and populations of significant aquatic species that have optimal growing temperatures <18° C (<64° F). Primary and secondary contact recreation standards are numeric, and relate to the allowed concentrations of bacteria (*E. coli*) present in a waterbody. Although Idaho considers spring flows to be waters of the state, IDEQ has no water quality standards that are specific to springs or wetlands.

Of 47.1 miles of water quality impaired reaches, 25.2-stream-miles (53%) met water quality standards, and 21.9-stream-miles (47%) did not meet water quality standards. Of 47.1 stream-miles of perennial flow regime water quality limited streams, 14.1 miles (30%) were in PFC, and 33.0 miles (70%) were in functional—at risk (FAR) condition.

Although streams may be listed by as water quality impaired (303(d)), that does not necessarily mean that individual reaches occurring on BLM administered lands or other ownerships are not meeting water quality standards, or TMDL limits. Rather, often streams in the entire watershed are shown (mapped) as not meeting IDEQ standards. BLM routinely tests for bacterial concentrations, and water temperature in fish bearing streams, regardless of any individual stream's 303(d) listing, or designated TMDL limits.

Water Quality Impaired waterbodies present on BLM lands in the Planning Area

Waterbody	Miles	Pollutant/s	Status[a]	Standards[b] met?(yes/no)	Functioning[c] Condition
Big Willow Creek	4.7	Temperature	TMDL	yes	PFC
Little Willow Creek	2.9	Temperature	TMDL	yes	FAR
Blacks Creek	0.5	Sediment, Bacteria	303(d)	yes	PFC
Boise River	0.3	Temperature	303(d)	no data	PFC
Cold Springs Creek	0.1	Sediment	TMDL	yes	PFC
Cove Creek	5.3	Nutrient, Sediment	303(d)	yes	FAR
Crane Creek	10.3	Sediment, Bacteria	TMDL	no	FAR
Grimes Creek	1.0	Temperature	TMDL	yes	FAR
Hog Creek	3.0	Phosphorus	TMDL	yes	FAR
Lime Creek	0.9	Temperature	TMDL	no	PFC
Little Canyon Creek	4.4	Sediment	303(d)	yes	PFC
Little Weiser River	1.5	Temperature,	TMDL	no	FAR
Mores Creek	0.2	Sediment	TMDL	no	FAR
Scott Creek	1.5	Bacteria	303(d)	yes	FAR
Anderson Creek	1.8	Bacteria	303(d)	yes	PFC
Weiser River	7.3	Temperature,	TMDL	no	FAR
Wildhorse River	1.4	Temperature	TMDL	no	PFC
Grand Total	**47.1**				

[a]**TMDL** = Total Maximum Daily Loads Assigned, **303(d)** = water quality limited reach with no TMDL assigned

[b]Water quality findings from BLM assessment and monitoring data.

[c]Stream functioning condition (TR-1737-15 Second Edition 2015)

Perennial streams on BLM administered lands that meet water quality standards are commonly (but not always) characterized by one or more of the following:

- Have PFC ratings.
- Streambank stability ≥80%.
- Vegetative canopy cover ≥ 60%, or equivalent/combined geologic shading or overhanging streambanks in salmonid bearing streams.
- Stream temperatures do not exceed natural background levels (at full potential).
- Bacterial levels are at low levels (e.g., bacteria ≤136 colonies/ml (30-day mean), and fine sediments <30% in pools).
- Accessibility to livestock is limited due to dense vegetation, larger rocks, or other restrictive terrain characteristics.
- Are not encumbered by upstream pollutant contributions (*E. coli*, high water temperatures)

Perennial streams on BLM administered lands that do not meet water quality standards are commonly (but not always) characterized by one or more of the following:

- May have FAR or nonfunctional (NF) functioning condition ratings
- Streambank stability < 70%.
- Fine sediment in pools > 30%
- Vegetative canopy cover or equivalent/combined geologic shading, or overhanging banks in salmonid bearing streams < 50%.
- Stream temperatures are elevated beyond natural background levels.
- Bacterial levels (*E. coli*) > 136 colonies/ml (30-day mean).
- Excessive erosion rates resulting from historic channel straightening (e.g. portions of Little Weiser and Weiser River in agricultural areas).
- Have large storage reservoirs upstream (e.g. Crane Creek Reservoir).

- Excessive sediment, nutrient, thermal, or pesticide contribution as a direct result of upstream flood irrigation return flows.
- Feedlots or other animal concentration are present upstream.

AQUATIC RIPARIAN MANAGEMENT STRATEGY

Introduction

The Four Rivers RMP Aquatic and Riparian Management Strategy (ARMS) provides guidance and programmatic direction for riparian and aquatic conservation and restoration and is integrated with other management direction. Conservation of fish, wildlife, plants, and habitats at risk of degradation should be considered together with the full array of broad-scale ecosystem components addressed by the strategy, which include the following: landscape dynamics, terrestrial source habitats, aquatic species and riparian and hydrologic processes. Management actions will balance short-term risks with long-term benefits as actions are considered to move these resources toward a natural variability of conditions or desired conditions.

The key components of the Four Rivers RMP Aquatic and Riparian Management Strategy are as follows:

- Aquatic and riparian management direction (for example, goals and objectives.)
- Establishment of Riparian Conservation Areas (RHCAs), which are areas where aquatic and riparian dependent resources receive management emphasis.
- Protection of all existing populations and critical aquatic habitats of Threatened bull trout (16-stream-miles) and sensitive inland redband trout (171-stream-miles).
- Restoration priorities and guidance will be identified for geographic areas and by general type.
- Standards and Guidelines and Best Management Practices (BMPs), which are applicable to all RHCAs and to projects and activities in areas outside of RHCAs that are identified through NEPA analysis as potentially degrading to RHCAs and desired conditions.

Aquatic and Riparian Goals and Objectives

The goals establish an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated aquatic habitats. Because the quality of water and fish habitat in aquatic systems are inseparably related to the integrity of riparian areas within the watersheds, the goals are to maintain, strive towards, or restore the following:

Goals

- Upland and riparian conditions would support PFC streams, and related water quality consistent with the State of Idaho's water quality standards.
- Soil and watershed conditions would be maintained or restored to promote soil stability, watershed health, and biotic integrity.
- Native forest, rangeland, and riparian and wetland plant communities would be healthy and vigorous.
- The distribution, abundance, and quality of fish and wildlife habitats would be maintained or improved to provide food, cover, and space for healthy populations of game and non-game species.
- Fish and wildlife habitat connectivity would be improved and fragmentation reduced.

Objectives

- Riparian and wetland vegetation and structure and associated stream channels and floodplains would be in, or making progress towards, proper functioning condition to promote good water quality.
- All riparian and wetland areas would meet the Rangeland Health Standards for proper functioning condition (PFC) to sustain a diversity of riparian-dependent species.
- Soils would be managed to minimize erosion.
- Desired native plant communities would be maintained or improved to provide for wildlife and fisheries needs.
- Vegetative projects would be designed to minimize potentially adverse impacts and improve wildlife habitat.
- Livestock grazing management would be adjusted where necessary to protect newly listed threatened and endangered aquatic species, as well as species formally proposed for listing.

Aquatic and Riparian Management Direction

The BLM has jurisdiction of 16-miles of bull trout habitat and 171 miles of redband trout habitat in the Four Rivers Planning area. Because of the limited special status fish habitat in the Planning Area, the management direction focuses on protecting all habitat under BLM jurisdiction for aquatic Special Status and narrow range endemic species and does not differentiate between conservation watersheds and population strongholds.

Riparian Conservation Areas

RHCAs are portions of watersheds where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. However, they are not intended to be treated as no management zones, since treatments may be essential to achieving or maintaining desired riparian and aquatic conditions. This strategy allows for adjustment to RHCAs to reflect specific site conditions while also recognizing watershed riparian conditions and trends.

RHCA Widths

RHCAs are portions of watersheds where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. RHCAs are lands that are most sensitive to land uses that are likely to affect the condition and/or function of aquatic habitat, and include areas adjacent to streams, ponds, lakes, and wetlands. The dimensions of such lands and uses that promote or do not preclude achievement of functional conditions may be best defined by site-specific analysis or watershed analysis. In the absence of such analysis, the following default RHCA widths apply.

Category 1—Fish-bearing streams: RHCAs consist of the stream and the area on either side of the stream. This area extends from the edges of the active channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of the riparian vegetation, or 300 feet slope distance (600 feet, including both sides of the stream channel), whichever is greatest.

Category 2—Perennial non-fish-bearing streams: RHCAs consist of the stream and the area on either side of the stream. This area extends from the edges of the active channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of the riparian vegetation, or 150 feet slope distance (300 feet, including both sides of the stream channel), whichever is greatest.

Category 3—Natural ponds, lakes, reservoirs, and wetlands greater than one acre: RHCAs consist of the body of water or wetland and the area to the outer edges of the riparian vegetation, or to the extent of the seasonally saturated soil, or 150 feet slope distance from the edge of the maximum pool elevation of natural ponds and lakes, or from the edge of the wetland, pond, or lake, whichever is greatest.

RHCA Delineation and Modification
Specific default RHCA widths apply, unless a watershed analysis or site-specific (local) analysis has been completed. Modification of RHCAs requires watershed or site specific analysis to provide the ecological basis for the change or may be specific to land uses taking place or proposed to take place within the RHCA.

RHCA Delineation
To promote or maintain desired conditions or objectives, default RHCA widths identify areas where riparian and aquatic dependent resources receive emphasis for management. The default RHCA widths generally provide proper and adequate dimensions to address primary influence areas that may affect key riparian and aquatic processes. It is acknowledged that RHCA modification and delineation needs to consider ecological and geomorphic factors, which vary across the Four Rivers Planning Area. Delineation of site specific or specific watershed RHCAs requires fine-scale application of appropriate criteria using a two-tier approach.

The first tier involves identification of ecological and geomorphic delineation criteria. This is done by applying a protocol identified through a watershed analysis and/or site specific analysis, or a programmatic planning analysis. This analysis is intended to provide the context needed to understand riparian area interactions and processes.

The second tier applies the criteria from the first tier analysis to specific areas on the ground in conjunction with proposed management activities.

Conceptually, the first tier analysis results in identification of ecologically appropriate RHCA criteria by using existing information to characterize the extent, conditions, and trends of riparian areas within the analysis area. This analysis identifies dominant physical and biological features in the watershed that influence the riparian network, and addresses important biophysical functions and processes. The issues associated with the riparian system, including past, current, and potential future management emphases, are used to ascertain the rigor and depth of analysis needed. The resulting information is synthesized and interpreted using a process in which potential criteria are examined and selected or eliminated based on their appropriateness to meet the overall intent of aquatic and riparian management objectives at the finer scale.

The overall intent of the first tier analysis is to document relationships between key riparian processes and functions and ecological and/or geomorphic factors (such as shade and site potential tree height), which should help to appropriately identify RHCAs. Default widths would be used to delineate RHCAs, until the first tier analysis has been completed.

The second tier applies the RHCA criteria to specific areas on the ground while designing and planning proposed management actions. The intent is that the associated site-specific analysis and decision would disclose how the criteria would be used to delineate RHCAs on the ground and the degree to which they provide for riparian processes and functions and contribute to meeting aquatic and riparian management objectives. Any necessary site-specific refinements of the criteria would also be documented in the analysis and decision document.

RHCA Modification
RHCAs may be modified by amendment in the absence of watershed analysis where stream reach or site-specific data support the change. Watershed analysis or site-specific analysis is not a decision process; it would provide information for ecologically appropriate criteria that would support site-specific analysis and determination on RHCA delineation. In all cases, the rationale supporting RHCA widths and their effects would be documented. Refer to previous listed important values for managing RHCAs; pertinent site-specific, stream reach, and watershed values (e.g., desired conditions, WACIs,

specific riparian or aquatic characteristics, slope, soils, etc.) need to be specifically addressed in supporting rationale for modifying RHCAs and land uses occurring in these areas.

During watershed analysis and/or site-specific analysis or through the appropriate programmatic planning processes, default RHCA dimensions may be modified with site specific analysis and determination of land uses that are consistent with the RHCA management intent and the attainment of RHCA management objectives, such as desired conditions.

These criteria shall be identified using scientific information in combination with local knowledge and information on riparian and aquatic processes and functions, resource values, and risks (first tier). Application of criteria to delineate RHCAs shall occur during project-level planning or implementation for management activities that could affect attainment of RHCA objectives (second tier). Rationale for identifying final RHCA delineation criteria shall be presented through the appropriate analysis making process.

Protection of Population Strongholds for Aquatic special Status and Narrow Range Endemic Species

As described above, all habitats under BLM jurisdiction for aquatic special status and narrow range endemic species will be protected, and there is no differentiation between conservation watersheds and population strongholds.

Management Actions Designed to Protect Aquatics Habitats and Water Quality

Standard Operating Procedures Common to all Alternatives

- Implementation of water resource objectives and maintenance or improvement of existing water quality would continue. Public lands adjacent to stream segments that are not meeting State water quality standards and/or Proper Functioning Condition (PFC) would be managed to produce an upward trend in the structure and composition of key riparian/wetland vegetation, as well as the desired physical characteristics of the stream channel.
- Mechanical impacts on the soil surface would be minimized through proper timing (after spring wet period) and duration; for type of authorized use; and with regard to soil type, moisture content, and biological soil crust vulnerability.
- Vegetation treatments would be consistent with the most current BLM management policy or guidance.
- All herbicides would be applied with strict adherence to label stipulations and Boise District policy.
- Stream herbicide application buffers would be applied according to the following minimum distances: 15 feet (hand application), 25 feet (vehicle application), or 100 feet (aerial application).
- Priority would be given to meeting emergency needs in watersheds due to flooding or wildland fire.

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Appendix G - Standard Operating Procedures:

This appendix provides a listing of best management practices (BMPs), design features, and operating procedures that, when applied with management actions in the ROD/RMP, would aid in achieving goals and objectives. These BMPs, design features, and operating procedures are tools to reduce adverse social, economic, and environmental effects. Additional practices may be added or included in this list as they are developed and determined to reduce unwanted impacts from management activities. Likewise, practices included in this list that do not achieve the desired results may be altered or removed from consideration. These BMPs, design features, and operating procedures were from many sources and could be applied alone or in combination as necessary to make progress towards or to achieve objectives.

While the overall vision embraces the use of these BMPs, design features, and operating procedures to reduce or minimize impacts, they are not to be considered a land use plan decision. They are dynamic and may be updated or modified based on future guidance, policy, and science without a plan amendment. BMPs, design features, and operating procedures used in site-specific situations would be incorporated into the proposed action or used as mitigation measures to reduce impacts. The determination of which BMPs, design features, and operating procedures to apply will be made during individual project planning. The use of BMPs, design features, or operating procedures will be analyzed through the NEPA process for site-specific projects.

The BMPs, design features, and operating procedures are categorized by resource use or activity. Because BMPs, design features, or operating procedures from programmatic Records of Decision are included, some are listed more than once. New information could result in BMPs being modified or added to reduce or mitigate impacts.

TRIBAL INTERESTS:

American Indian treaty and aboriginal rights will be preserved and protected.

CULTURAL RESOURCES:

BLM management of cultural resources is guided by laws, Executive Orders, regulations, and policies. The National Historic Preservation Act (NHPA) of 1966, as amended, directs federal agencies to provide leadership in the protection and preservation of prehistoric and historic cultural properties that have been determined eligible for listing or are listed in the National Register of Historic Places (NRHP). Section 106 of the NHPA directs federal agencies to consider the effects of agency and agency-approved actions that could affect significant archaeological and historic properties through a process of inventory, evaluation and effects analysis, and consultation with American Indian Tribes, State Historic Preservation Office, Advisory Council on Historic Preservation, and interested publics. Section 110 directs agencies to establish programs to inventory, evaluate and nominate sites to the NRHP, and to protect, preserve, manage, and maintain cultural properties.

The Oregon National Historic Trail, Goodale’s Cutoff, and Kelton Road would be managed consistent with the Oregon National Historic Trail Management Plan.

All actions will follow all applicable laws, regulations, and policies pertaining to the preservation and protection of cultural resources.

PALEONTOLOGICAL RESOURCES:

Paleontological resources would be located, protected, and managed for their scientific, educational, and recreational values.

VEGETATION

Mechanical impacts on the soil surface would be minimized through proper timing (after spring wet period) and duration; for type of authorized use; and with regard to soil type, moisture content, and biological soil crust vulnerability.

If prescribed fire is used in sage grouse habitat, the NEPA analysis for the Burn Plan will address:

- why alternative techniques were not selected as a viable options;
- how sage grouse management goals and objectives will be met by its use;
- how the COT Report objectives will be addressed and met;
- a risk assessment to address how potential threats to sage grouse habitat will be minimized.

Allow prescribed fire as a vegetation or fuels treatment in sagebrush-steppe sites, or in areas with a potential for post-fire exotic annual dominance only after the NEPA analysis for the Burn Plan has addressed the four bullets outlined above.

Allow prescribed fire in known sage grouse winter range only after the NEPA analysis for the Burn Plan has addressed the four bullets outlined above. Any prescribed fire in winter habitat will need to be designed to strategically reduce wildfire risk around and/or in the winter range and designed to protect winter range habitat quality.

Vegetation treatments would be consistent with the most current BLM management policy or guidance.

Management of new noxious and invasive weeds would be a high priority. Treatments would focus on treating new, small populations before they become established.

All herbicides would be applied with strict adherence to label stipulations and Boise District policy.

During project-level planning, the sensitivity of soil resources would be considered in the affected area on a site-specific basis

Mechanical impacts on the soil surface would be minimized through proper timing (after spring wet period) and duration; for type of authorized use; and with regard to soil type, moisture content, and biological soil crust vulnerability

Mitigate impacts of management and authorized uses on soils with severe or very severe potential for wind erosion and/or high potential for water erosion.

Develop and implement an erosion control strategy for new land use authorizations, special recreation permits and mineral exploration/development involving surface disturbance on slopes greater than 25% and/or soils with severe or very severe potential for wind erosion or with high potential for water erosion.

SPECIAL STATUS SPECIES

Native shrub communities would occur in contiguous blocks of sufficient size and diversity to sustain shrub-dependent species.

Identify areas to serve as examples of historic vegetation conditions (reference conditions) and maintain conditions that will protect that value.

Implement guidelines for habitat improvement and protection of migratory birds according to USFWS and IDFG habitat restoration and species conservation plans.

An exclosure of appropriate size would be established on a case-by-case basis for effectiveness monitoring in restoration or rehabilitation areas.

Priority for habitat improvement or maintenance will be given to threatened, endangered and sensitive species. In accordance with the ESA, the USFWS will be consulted on any action that may affect a federally listed, proposed or candidate species. Proposed actions which may adversely affect sensitive species will be modified to avoid adverse impacts or will provide mitigation.

Cap pipes and cover or seal all small, dark spaces where birds may enter and become trapped. Caps will be placed on all open pipes in the following manner: 1) Cap open fencing pipes during fence maintenance; 2) Cap all open mining claim PVC pipes within the next 2 years.

Use the least toxic herbicide that will accomplish the desired condition. Do not exceed application rates recommended in the 2007 and 2016 Programmatic Environmental Impact Statements for Using Herbicides on BLM lands in 17 Western States.

Closely monitor aspen stands, mountain shrub communities, and riparian areas to ensure these areas important for mule deer fawning (Mule Deer Working Group, 2004) and elk calving retain adequate cover for mule deer fawns and elk calves. Limit livestock utilization to less than 25% of current annual growth of aspen and key shrub (e.g., chokecherry and serviceberry) twigs less than 5 feet. Maintain cover of the herbaceous understory of aspen stands, mountain shrub communities, and riparian areas at 90% of site potential. Schedule livestock use to reduce or eliminate impacts to mule deer fawning and wintering habitat (Mule Deer Working Group, 2004).

FISH AND WILDLIFE

The BLM is responsible for managing fish and wildlife habitat on public land while the Idaho Department of Fish and Game (IDFG) is responsible for managing game and non-game populations. The BLM coordinates its activities and actions with IDFG, as appropriate.

Habitat management for migratory bird species of conservation concern would emphasize avoiding or minimizing negative impacts and restoring and enhancing habitat quality to implement Executive Order 13186.

Adverse impacts on migratory bird habitats would be avoided, reduced or mitigated, in a manner consistent with current regional or statewide bird conservation priorities.

Through the transportation and travel management planning process, address important wildlife habitat values including key sage-grouse breeding habitat (Braun, 2006; Idaho Sage-grouse Advisory Committee, 2006) and big game parturition and winter habitats (Mule Deer Working Group, 2004).

Field office staff would coordinate with Idaho Department of Fish and Game and/or Oregon Department of Fish and Wildlife personnel on an annual basis to assess disease transmission risk for domestic sheep allotments.

AQUATIC RESOURCES

Implementation of water resource objectives and maintenance or improvement of existing water quality would continue. Public lands adjacent to stream segments that are not meeting State water quality standards and/or Proper Functioning Condition (PFC) would be managed to produce an upward trend in the structure and composition of key riparian/wetland vegetation, as well as the desired physical characteristics of the stream channel.

Mechanical impacts on the soil surface would be minimized through proper timing (after spring wet period) and duration; for type of authorized use; and with regard to soil type, moisture content, and biological soil crust vulnerability.

Vegetation treatments would be consistent with the most current BLM management policy or guidance.

All herbicides would be applied with strict adherence to label stipulations and Boise District policy.

Stream herbicide application buffers would be applied according to the following minimum distances: 15 feet (hand application), 25 feet (vehicle application), or 100 feet (aerial application).

Priority would be given to meeting emergency needs in watersheds due to flooding or wildland fire.

WILDFIRE ECOLOGY AND FUELS MANAGEMENT:

To reduce wildfire hazards across administrative boundaries, BLM would cooperate and collaborate with adjacent landowners, local governments, fire departments, cooperators, agencies, and Tribes.

All public land fires would be suppressed using a response guided by the objectives and strategies outlined in the Boise District Fire Management Plan.

Fires in Wilderness Study Areas (WSA) would be managed in accordance with BLM Manual 6330 — Management of Wilderness Study Areas.

Fire lines would be re-contoured/seeded with native species/water-barred if necessary.

AIR QUALITY:

Implement mitigation measures within BLM's authority to reduce emissions from current levels in the planning area and work cooperatively to encourage all permittees to adopt measures to reduce emissions.

Work cooperatively with stakeholders to reduce cumulative dust emissions and address other air quality concerns.

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.

An approved burn plan that includes information and techniques to reduce or alter smoke emission levels would be in place prior to implementing any prescribed burn.

All prescribed fire actions would be coordinated with other affected agencies through the Montana/Idaho Smoke Management Program certified by the EPA and the Idaho Department of Environmental Quality.

Suggested minimum air pollution controls for gas well operations include:

A. Tier II or better drilling rig engines.
B. Stationary internal combustion engine standard of 2 grams NO_x/breakhorse power per hour (bhp-hr) for engines under 300 horsepower (HP) and 1 gram NO_x/bhp-hr for engines above 300 HP.
C. Low bleed or no bleed pneumatic pump valves.
D. Dehydrator VOC emission controls to +95% efficiency.
E. Tank VOC emission controls to +95% efficiency.

VISUAL RESOURCES:

All proposals to develop public land or construct improvements would be evaluated to ensure compliance with VRM classifications.

FORESTRY:

Wildlife habitat would be protected in forested areas where projects are proposed using sensitive species surveys, timing restrictions, timber harvest boundaries and harvest methods. Favor thin from below methods and minimize or eliminate clear cuts and road construction to reduce fragmentation.

Utilize existing roads to the extent possible within special status species key habitat and corridors. Minimize or eliminate clear cuts and road construction to reduce fragmentation. Utilize existing roads to the extent possible within special status species key habitat and corridors.

Tractor and tractor/jammer would be the predominant logging system employed. Skyline and helicopter logging would be employed on steep slopes, fragile/erosive soils, unique/sensitive habitats, and inaccessible forest stands. Due to the wide variability within each of these individual characteristics, use of skyline and helicopter would be determined by the project specific analysis.

Maintain adequate snags across the landscape to provide habitat for cavity nesting birds and other snag-dependent species. Strive for an average minimum of 2 per acre, of the greatest diameter available Provide green trees near snags for perches and cover. Strive for an average minimum of 2 disease-free green trees per acre among the largest diameter class available to provide for snag recruitment. Maintain sufficient coarse woody debris to provide for habitat of ground dwelling animals and nutrient recycling. Strive for a range of 5 to 10 tons per acre of coarse woody debris of various decomposition classes per acre, with the majority being in the 1,000 hour fuel category. Where fuel loading is of serious concern, strive for 2-5 tons per acre, with the majority being in the 1,000 hour fuel category

Stringers of trees of sufficient size will be used as sight barriers between cutting areas.

Adequate hiding and thermal cover along major roads will be provided.

After wildfires, timber salvage harvest may be performed following site specific analysis. Site specific analysis would weigh the positive economic/social and fire hazard mitigation effects against potential negative effects to other resource values.

LIVESTOCK GRAZING:

Lands available for livestock grazing would be managed through the Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management.

Grazing permits would be revised or developed where evaluations show that the Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management are not being met and livestock grazing is a causal factor.

Livestock grazing would be designed and scheduled to ensure long-term success of vegetation management projects, e.g., restoration, fuels, and Emergency Stabilization and Rehabilitation (ESR) projects.

Grazing in areas that might contain sensitive, threatened or endangered species would be managed under applicable Conservation Agreement(s).

Manage livestock grazing in riparian areas to minimize damage to woody and herbaceous species and provide cover and forage to big game (Mule Deer Working Group, 2004) and a variety of birds and other wildlife.

Limit grazing intensity, frequency, or alter season of use to encourage riparian plant vigor, regrowth, and energy storage and minimize compaction of riparian soils.

Adjust the timing of livestock grazing to minimize damage to streambanks and wet meadows in spring, when these areas are most vulnerable to trampling and soil compaction.

Temporary Non-Renewable Use (TNR)

An application for TNR should not be approved if a permittee fails to comply with the Terms and Conditions of his/her BLM grazing authorization(s) during the grazing season in which the application was made. TNR should not be approved until such time as all Terms and Conditions of a permittees' authorization have been adhered to.

TNR should only be approved if:

- The area does not include lands managed under special designations such as wilderness, WSA's, ACEC/RNA's, administratively suitable or designated NWSR's;
- The area does not include riparian communities where PFC assessment is functional at risk with a static or downward trend or nonfunctional, or similar outcomes of other approved riparian assessment techniques, due to livestock grazing;
- The pasture is not scheduled to be rested during the subject grazing year.
- There are no pastures or portions of the allotment that were over utilized by the applicant in the same year as the TNR application.
- The applicate has not had a willful or repeated willful trespass within three years prior to the application.

Percent Public Land on Grazing Authorizations

BLM animal unit months (AUMs) on grazing authorizations are calculated using livestock numbers, number of grazing days (within specific calendar dates) and % Public Land. Percent Public is used in the calculation because grazing on BLM allotments often incorporates unfenced acres of non-public lands which are owned or controlled by the grazing permittee. In essence the % Public Land calculation gives a permittee credit for forage being used on the non-public lands and can result in an increase in permitted livestock numbers. Should the non-public lands (private, State Lands) within an allotment be fenced out or otherwise acquired by a third party through lease or change in ownership such that the permittee no longer owns or controls them in conjunction with the public lands, the % Public Land should be changed to reflect an increase in the ratio of public to non-public lands acreage (which will decrease the number of livestock permitted) and a new permit issued to reflect the administrative change. Conversely, if a permittee gains ownership or control of non-public unfenced lands within an allotment, the % Public Land should be changed to reflect a decrease in the ratio of public to non-public lands acreage (which will increase the number of livestock permitted) and a new authorization would be issued to reflect the administrative change. No changes to BLM Active AUMs on an authorization should occur when making these adjustments.

Management of Lands not under the jurisdiction of the BLM

When it is mutually beneficial to both the BLM and another land managing agency, for BLM to manage the lands within an allotment, an agreement will be entered into by both parties. The agreement must include how grazing fees will be applied, who will collect the grazing fees, how those fees will be distributed, and under which agency's administrative and resource management rules and/or regulations the lands will be administered.

Forage Allocation on Newly Acquired Lands

Forage allocation for newly acquired lands should consider physical suitability of lands for grazing, Ecological Site Descriptions (ESDs), Rangeland Health Assessments, neighboring/similar allotment

stocking rates and management, forage production sampling (if economically feasible), and compatibility with other resources.

Trailing/Crossing

All applicable Terms and Conditions listed in the "Four Rivers Field Office Livestock Trailing Environmental Assessment" should be included on newly issued crossing permits. Additional Terms and Conditions not found in this environmental assessment would be added to new crossing permits as necessary. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=33752

Reserve Common Allotments

When a reserve common allotment (RCA) is established, a management plan will be developed concurrent with the creation of the RCA to ensure maintenance of or movement towards meeting Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management. Prior to making a RCA available for application. Considerations for selecting areas to be used as RCAs include whether the area has special management concerns, such as habitat for Type 1 BLM sensitive species, slickspot peppergrass, or redband trout; noxious weeds/invasive plants; or wild horses; whether the area has intermingled private or State lands; and whether the area can sustain grazing use without significant resource impacts.

Priority order for using reserve common allotments will be as follows:

- Permittees within the FRFO Planning Area will have the highest priority for using reserve common allotments; permittees within the Boise District Field Offices would have second priority (as determined by the District Manager); and other District permittees will have third priority.
- Permittees and lessees whose normally permitted allotments are under an approved vegetation treatment project (e.g., restoration, fuels treatments) and they are unable to make use of their permitted AUMs during the treatment period;
- Permittees and lessees whose normally permitted allotments are temporarily unavailable due to wildland fire; and
- Permittees and lessees whose normally permitted allotments are temporarily unavailable due to insect outbreaks.

Range Improvements

Placement of supplements, salt, minerals, new troughs, reservoirs, storage tanks, holding facilities etc., are located to avoid conflicts with cultural resources, AND at least 300 feet from canyon rims and playas.

Surface-disturbing activities associated with project implementation will be held to the minimum necessary to complete the project. Disturbed soil will be rehabilitated to blend into surrounding soil surfaces and vegetated as needed with adapted perennial species to stabilize soils and preclude invasion and dominance by undesirable and weedy species.

All seedings and plantings (including those areas rehabilitated following wildland fire), will be deferred from livestock grazing until site specific Emergency Stabilization and Rehabilitation (ESR) or restoration plan resource objects (natural recovery) are met or the seeding/planting has been determined to be unsuccessful. Seedlings should be established and have adequate health and vigor to survive grazing use.

The existing road and trail system will be utilized to provide access for rangeland project construction and maintenance. Unimproved trails and tracks may be developed to reach construction sites unless this action is inconsistent with the management of Special Management Areas/Designations. Any new authorized road construction will be in accordance with standard operating procedures and BMP's for road construction.

Reservoirs

Pits will be constructed in playas, dry lake-beds, and other natural depressions. Dams will be constructed in drainages. Water storage capacity of pits or reservoirs would generally be less than 2.0 acre-feet. Reservoirs and pits may be excluded from livestock use through fencing or other means.

Stock pond dams would be maintained and repaired as necessary to retain their water storage capability. Maintenance could include dredging of sediment, dam repair, and fencing.

Wells

All new well heads should be fitted with a removable cover to prevent ground water contamination and protect wildlife. A safety device will be installed on new power lines to the well to prevent electrocution of raptors. Consistent with VRM objectives of the area and where feasible, new wells and associated structures should be located where topographic features or vegetation would serve to screen associated structures and disturbances from the casual observer.

Springs

New spring developments and modifications of existing spring developments should ensure adequate water to maintain associated wetlands and riparian areas by returning overflow to the same channel the water was diverted from. Development should involve digging or drilling to intercept naturally occurring water flow. Perforated pipe and/or collection boxes should be utilized to collect and divert water through a pipeline to troughs and/or tanks away from vegetation communities associated with spring areas. The spring source should be fenced to prevent livestock grazing and trampling impacts to riparian vegetation communities. Spring exclosures should have gates installed and should be left open during the grazing off season to make water available for wildlife.

Spring developments including stock tanks, supply lines, spring boxes, protective fences, would be maintained and repaired as necessary to retain their functioning condition for stock-watering purposes.

Pipelines

Pipelines should be constructed to convey water from wells, springs, reservoirs, and other water sources to troughs or tanks in areas lacking adequate water, to maintain appropriate animal distribution. Pipelines should utilize existing trails or roads to the maximum extent possible. Two inch diameter plastic pipe should be used and buried to a depth that adequately prevents damage from grazing animals (i.e. 12-30 inches) and freezing. Where obstructions prohibit pipeline burial, the pipe may be laid on the ground surface and covered with borrow soil. At times, reservoirs and other storage facilities may be constructed along pipelines to provide temporary emergency water for livestock in the event of equipment failure.

Pipelines, including stock tanks, supply lines, spring boxes, protective fences, will be maintained and repaired as necessary to retain their functioning condition for stock-watering purposes.

Troughs, Tanks, and Guzzlers

All troughs and tanks (temporary or permanent) will be equipped with bird/animal escape ladder(s). Where feasible, troughs and tanks should be placed in upland vegetation communities less vulnerable to livestock impacts and soil compaction.

Guzzlers will be constructed in locations with limited water available for wildlife use, primarily lower elevation desert habitats. Guzzlers should be fenced or designed to exclude livestock access. Projects will be designed to blend with the surrounding landscape and be consistent with the VRM class of the area.

Fences

Surface disturbance associated with fence construction and maintenance should be minimized. Though the canopy of vegetation along fence lines can be removed and scattered, no blading or scraping of the soil surface should be authorized to clear routes for fence construction. All fences will be consistent with the VRM class of the area. Gates should be located and constructed at appropriate locations, road crossings, and adjacent to cattleguards, to provide for livestock and heavy equipment passage. In those areas that receive recreation use, access via a stile (stairs/ladder over a fence line) or a walk-through device specifically designed to preclude livestock passage should be considered.

Exclosure fencing at wetlands streams, or spring developments will be routinely maintained.

Flag fencing where there is higher potential for collisions.

Where fences need maintenance, improve to wildlife standards and modify to drop down fences in winter range and important wildlife areas.

When water gaps are necessary, locate water gaps in rocky areas (natural or manmade) to minimize trampling damage to streambanks and streambeds. Use narrow water gaps to discourage livestock from loafing at the water source.

Range Improvement Maintenance

Normal maintenance of existing projects will occur, as consistent with original design, through the life of the plan in order to support authorized uses of public land. Maintenance includes activities such as replacement of pipeline sections, fence posts and wire replacement, cleaning of reservoirs (within the original disturbance area), repair of reservoir dikes and dams, replacement of water troughs, cleaning and maintenance of spring boxes, cleaning or resetting of cattleguards, removal of encroaching or invasive trees/shrubs, and maintenance of livestock handling facilities. While maintenance of existing facilities may occur in Special Management Areas, there may be further mitigation actions required to ensure that resource values are not impaired or impacted.

Wildlife Mitigation

Bighorn sheep observations in domestic sheep allotments would immediately trigger a risk assessment for disease transmission to the bighorn sheep herd if bighorn sheep and domestic sheep are observed in proximity to each other or when bighorn sheep are observed in an active domestic sheep allotment.

RECREATION:

Recreation would be managed consistent with existing policies, guidelines, and budgetary constraints, recognizing that some level of regulation and limits are necessary.

Special Recreation Permits (SRPs) would be issued as a discretionary action. At the time of issuance, all SRPs would include standard stipulations and could include other special stipulations necessary to protect land or resources, reduce user conflicts or minimize health and safety hazards.

TRAVEL AND TRANSPORTATION MANAGEMENT:

Temporary closures will be considered in accordance with 43 CFR subpart 8364 (Closures and Restrictions); 43 CFR subpart 8351 (Designated National Area); 43 CFR subpart 6302 (Use of Wilderness Areas, Prohibited Acts, and Penalties); 43 CFR subpart 8341 (Conditions of Use) and other applicable law and policy.

Where motorized vehicles are causing or could potentially cause considerable adverse effects on soil, vegetation, wildlife, wildlife habitat, cultural resources, historical resources, threatened or endangered species, wilderness suitability, other authorized uses, or other resources, the affected areas shall be immediately closed to the type(s) of vehicle causing the adverse effect until the adverse effects are eliminated and measures implemented to prevent recurrence.

Seek to provide family friendly OHV riding opportunities close to metropolitan areas.

Seasonal closures would be implemented, where necessary, to protect designated roads and trails from resource damage.

LANDS AND REALTY:

Exclusion and Avoidance Areas

Land use applications in Avoidance areas will be evaluated on a case-by-case basis and may require special terms, conditions, stipulations and bonding. Documented evidence will be required that reasonable alternatives were considered and rejected based on sound rationale. Authorizations within Avoidance areas will incorporate conditions of approval commensurate with resource concerns.

Emergency or nonstandard maintenance activities may be authorized during seasonal closure periods. These activities would be restricted to the existing ROW, permit, or lease boundary, would require no longer than 72 hours to complete, and the authorized officer would be notified within 24 hours following completion.

Rights-Of-Way and Corridors

ROWs will be granted for the minimum necessary length and width, and will be collocated with other compatible ROWs to the extent feasible.

Communication sites will be collocated within existing facilities wherever feasible.

ROWs will be located so as to minimize safety or incompatibility issues.

New ROWs will be prohibited within Exclusion areas.

ROW applications within Avoidance areas will be analyzed on a case-by-case basis.

The Idaho Department of Transportation will be encouraged to relinquish Material Site ROWs (Title 23 of the Federal Highway Act) that are no longer being utilized.

The West Wide Energy Corridor (WWEC) will be carried forward in each alternative as the only designated ROW corridor in the Planning Area. No other corridors are proposed in this plan due to an apparent lack of public interest and the overall fragmentation of public land ownership in the Planning Area.

Land use authorizations that are temporary (less than 3 years) in nature and are not otherwise excluded or restricted will be subject to seasonal or timing restrictions and mitigation requirements regarding habitat loss as needed.

New ROW applications for water facilities (ditches, canals, pipelines), or amendments to existing water facilities which include additional structures to improve fish passage or benefits to fisheries (new diversions, fish screens) will be allowed on a case-by-case basis subject to RDFs to reduce impacts on greater sage-grouse habitat and mitigation requirements regarding greater sage-grouse habitat loss as needed.

When a ROW grant expires and is not requested to be renewed, is relinquished, or terminated, the lease holder will be required to reclaim the site by removing overhead lines and other infrastructure and to eliminate avian predator nesting opportunities provided by anthropogenic development on

public lands associated with the now void ROW grant (e.g., remove power line and communication facilities no longer in service).

Restoration, stabilization and reclamation of public land would be required following termination or expiration of land use authorizations.

Effects of infrastructure projects, including siting, will be minimized using the best available science, updated as monitoring information on current infrastructure projects becomes available.

Power lines would be constructed in accordance with standards outlined by the Avian Power Line Interaction Committee [APLIC 2006].b

Renewable Energy

Renewable energy applications will be analyzed on a site specific basis consistent with existing laws, regulations, Bureau policy, and NEPA requirements.

Authorizations for energy development may provide for concurrent or sequential development with other resource uses, provided that appropriate stipulations or conditions are incorporated into the authorizations to prevent unnecessary or undue degradation and environmental impacts.

Land Use Permits

Land use permits may be issued for the use, development or occupancy of public lands, provided that the proposed use: (1) is in the public interest, (2) is compatible with and/or enhances resource values, and (3) is consistent with existing laws, regulations and land use planning.

Land use permits may be issued to provide adequate time for unauthorized improvements or facilities to be removed from public land, or to provide sufficient time to complete a land tenure adjustment.

Leases

Leases will be considered only when they are compatible with and/or enhance resource values and are consistent with current laws and regulations.

Recreation and Public Purposes (R&PP) Lease and Sales

R&PP applications will be accepted only for lands meeting one or more of the disposal criteria.

Lands managed for ESA listed and/or BLM Types 2-3 (special status species) habitat will not be available for R&PP lease or patent unless the proposed use would enhance the special status species habitat. Allegation, hypothesis or speculation that habitat would be enhanced by a proposed use shall not be sufficient basis for approving a proposal. R&PP applications shall be rejected if they lack convincing evidence that habitat enhancement would occur.

No more land shall be conveyed than is reasonably necessary for a proposed use.

R&PP applications that would restrict public land access will be rejected.

Unauthorized Use (Trespass)

Unauthorized use may be resolved: 1) by removal and restoration of the trespass, 2) through issuance of a long-term ROW or lease, or 3) through a land tenure adjustment.

Short-term authorizations may be issued only if the authorized officer has agreed to a feasible long-term resolution.

Unauthorized use in Exclusion areas shall not be resolved by issuance of a long-term authorization.

Unauthorized use that meets one or more of the following criteria warrants immediate removal and restoration of the land to the Authorized Officer's satisfaction.

- Trespass that affects specially designated areas.

- Trespass that occurs in areas where the specific type of unauthorized use, occupancy, or development is specifically prohibited or excluded.
- Trespass was voluntary or conscious or was committed with criminal or malicious intent; and includes a consistent pattern of actions, even if those actions were taken in the belief that the conduct was reasonable or legal.
- Resolution of trespass through issuance of a land use authorization is not in the public interest, as determined solely by the Field Manager.

If the trespass situation does not warrant immediate cessation, the BLM will prioritize the resolution according to the following order:

1. Situations involving specially designated areas, sensitive ecosystems, and resources of Regional or National significance.
2. New activities or uses where prompt action could minimize damage to public resources.
3. Situations where delay would likely be detrimental to other resources or authorized users.

Land Classifications and Withdrawals

Process classifications and withdrawals from the public land and/or mineral laws to protect important resources and values.

Propose whole or partial revocation of withdrawals that no longer serve the purpose(s) for which they were established.

Rights-of-way for development of new or amended ROWs and land use authorizations (including permits and leases) in IHMA can be considered consistent with the IHMA Anthropogenic Disturbance Development Criteria.

Process unauthorized use. If the unauthorized use is subsequently authorized, it will be authorized consistent with direction from this plan including RDFs and buffers. If the use is not subsequently authorized the site will be reclaimed by removing these unauthorized (trespass) features and rehabilitating the habitat.

MINERAL RESOURCES:

Mineral leasing is a discretionary action subject to an environmental analysis and may include stipulations to protect other resources.

Areas that do not require special stipulations would be leased subject to the terms and conditions of the standard lease form and conditions as described in Appendix L.

Once a mineral lease has been issued, any proposed activities would be subject to additional site and project specific NEPA analysis and additional Conditions of Approval may be applied.

All applicable geothermal lease stipulations, as set forth in the ROD for Geothermal Leasing [BLM 2008g], would be included in all future lease offers in addition to stipulations, as applicable, as found in Appendix L.

Lands acquired by other federal agencies may be leased with concurrence of these agencies.

Fluid mineral leasing activities within WSAs would be managed in accordance with BLM Manual 6330 — Management of Wilderness Study Areas.

Locatable Minerals:

Public land is available for location of mining claims unless withdrawn from mineral entry. Location of mining claims in accordance with State and federal mining laws and regulations is

nondiscretionary. Recommendations by BLM for withdrawal are subject to final consideration by the Secretary of the Interior.

Withdrawals would require Secretarial and/or Congressional approval, and be for a maximum of 20 years, subject to review at the end of that period to determine the necessity of continuance.

Salable Minerals:

Exploration for new sites would be the responsibility of the applicant. Exploration would be allowed, where appropriate, under a letter of authorization from the Field Office Manager. Sale approval would be subject to environmental analysis, and include stipulations to protect other resources.

The BLM would ensure reclamation (see Appendix B, Acronyms and Glossary) of mineral material sites per the terms and conditions of the permit or sale contract. The BLM Field Office Manager has the discretion to require a reclamation bond, however bonding is required for a sale over $2000.

Mineral material disposals are discretionary actions. The general policy shall be to promote the use of existing sites.

Geological resources will be managed in accordance with all applicable laws, regulations and policies.

HAZARDOUS MATERIALS AND PUBLIC SAFETY:

Hazardous materials incidences would be responded to in a timely and efficient manner, as outlined in the Boise District Contingency Plan, to ensure public safety and decrease the potential for environmental damage.

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Appendix H - Travel Management

43 CFR 8342.1 – Designation criteria – OHV Area Designations

The authorized officer shall designate all public lands as either open, limited, or closed to off-road vehicles. All designations shall be based on the protection of the resources of the public lands, the promotion of the safety of all the users of the public lands, and the minimization of conflicts among various uses of the public lands; and in accordance with the following criteria:

(a) Areas and trails shall be located to minimize damage to soil, watershed, vegetation, air, or other resources of the public lands, and to prevent impairment of wilderness suitability.

(b) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats. Special attention will be given to protect endangered or threatened species and their habitats.

(c) Areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.

(d) Areas and trails shall not be located in officially designated wilderness areas or primitive areas. Areas and trails shall be located in natural areas only if the authorized officer determines that off-road vehicle use in such locations will not adversely affect their natural, esthetic, scenic, or other values for which such areas are established.

OHV Area Designations

All public lands are required to be designated as either "open," "closed," or "limited" to motorized vehicle use (43 CFR 8342.1). These designations identify where, when, and how motorized vehicle use can occur; commonly known as the OHV area designations. "Open" areas allow any type of vehicle to travel anywhere at any time (cross-country travel). "Limited" designations restrict vehicles to season or type of use or limit use to designated or existing roads, trails or ways. In areas designated as closed, motorized use is prohibited.

The following Play Areas were evaluated during the RMP process as Open for OHV Use:

Weiser Dunes: 100 acres
Parma Play Area: 70 acres
Dewey Play Area: 30 acres
Clay Peak Cycle Park: 340 acres
Little Gem Cycle Park: 1,750
Big Willow: 130 acres
A "rock crawling" route south of I-84 along Indian Creek: 560 acres

The following areas were evaluated during the RMP process as Closed for OHV use:

Clay Peak Cycle Park Buffer: 620 acres
Big Willow: 5,620 acres
Blacks Creek Reservoir: 260 acres
Wild and Scenic Rivers: 4,090 acres
Wilderness Study Areas: 23,270 acres
Lands with Wilderness Characteristics: 7,940 acres
Bannister Basin ACEC: 5,840 acres
Boise Front ACEC: 120 acres

Buckwheat Flats ACEC: 200acres
Goodrich Creek ACEC: 360 acres
King Hill Creek ACEC: 2,840 acres
Lost Basin Grassland ACEC: 60 acres
Mountain Home ACEC: 520 acres
Rebecca Sandhill ACEC: 1,250 acres
Sand-capped Knob ACEC: 40 acres
Sand Hollow ACEC: 1,330 acres
Summer Creek ACEC: 240 acres
Willow Creek ACEC: 1,120 acres
Woods Gulch ACEC: 40 acres
4th of July Meadow: 110 acres
Chief Parrish Reccreation Site: 5 acres
Sagebrush Hil:l 10 acres
Peraphyllum Rock: 40 acres

Travel and Transportation Management Planning

During subsequent travel and transportation management planning, BLM will use criteria from 43 CFR 8342.1 to guide the designation of individual routes. The PA has tentatively been divided into Travel Management Areas (Map H-1). Identification of TMAs is done only to identify how implementation level travel planning efforts will be approached. TMAs can be changed at any time as needed to focus TTM efforts appropriately in the future.

Environmental Conditions

1. General - Does access on the route promote resource damage/concerns? Is the route causing resource damage?
2. Soil stability - Is the route within a highly erosive soils area? Does the route cross slopes of 50 percent or greater?
3. Wildlife habitat (winter range, nesting/brooding and rearing habitat, calving/fawning areas) - Is the route a known issue within seasonally important wildlife habitat?
4. Special Status Species habitat - Is the route a known issue within special status species habitat?
5. Proximity to riparian areas and/or 303(d) (list of impaired) streams - Is the route causing damage to water quality? Does the route negatively impact wetlands/riparian/fens/mires?
6. Visual resources - Does the route conflict with VRM Class objectives?
7. Cultural/paleontological resources - Is the route creating an issue for any historic properties? Is the route creating an issue for any areas of Native American concern? Does the route cross significant paleontological areas?
8. Special Management Areas - Is the route within a WSA? Is the route within an area determined to contain wilderness characteristics? Does the route conflict with Special Recreation Management Area (SRMA) objectives? Does the route conflict with Area of Critical Environmental Concern (ACEC) objectives?
9. Road and Trail Density - Do routes support goals related to conservation of scenic quality or sensitive habitat management; or accommodate certain uses. For sensitive habitat, limit road and trail density (for example, an average of 0.5 mile of road per square mile). In areas identified for specific recreation uses, a high density might be allowed (exceeding 2 miles of road/trail per square mile).

Route Conditions

1. General - Is the route a BLM-maintained route? Is the road condition poor and/or unsustainable? Is the route unsafe (is it steep; have no turn-around)?
2. Parallel routes - Does the route run parallel to another existing route?

3. Spurs - Are there spurs?
4. Dead end - Is it a dead-end route (0.5-mile or less)? Does the route end at private property?
5. Access - Is there legal public access? Is there an existing ROW?

User Conflicts

1. Is it motorized versus non-motorized?
2. Is it motorized/mechanized versus non-mechanized?

Administrative Purposes

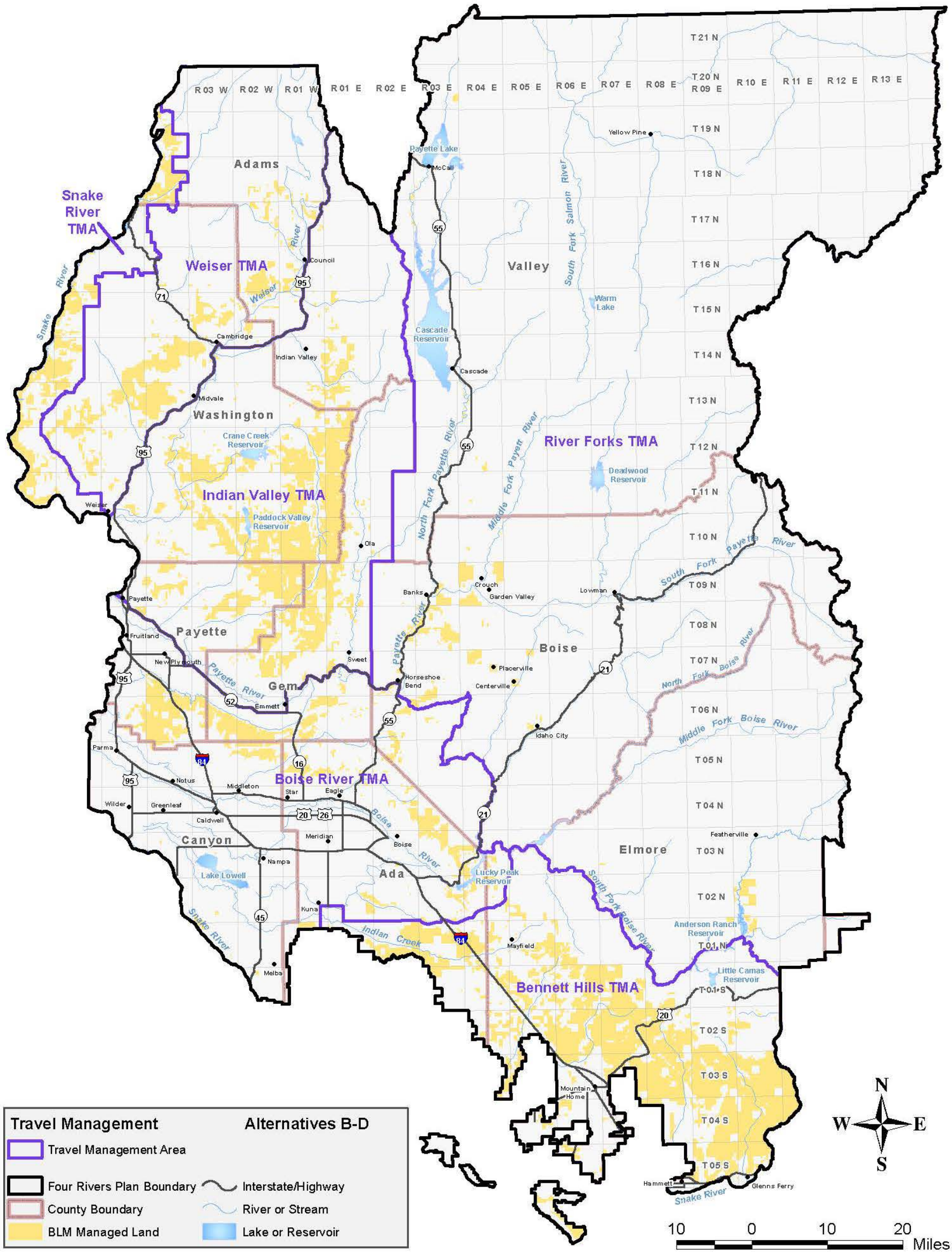
1. Is the route necessary for rangeland activities?
2. Is the route necessary for wildland fire suppression activities?
3. Is the route necessary for safety?
4. Is the route necessary for resource management and permitted activities?

Public Purposes

1. Does the route access public or private land?
2. Is the route used as a destination route for specific activities?
3. Does the route have recreational value (no special destination)?
4. Does the route involve types of desired use (motorized, mechanized, non-motorized/non-mechanized)?

Vehicle Type and Route Limitations

1. Is it a 50-inch wheel base or larger (UTVs, full-size vehicles)?
2. Is it less than 50-inch wheel base (ATVs)?
3. Is it a single-track (motorcycles/mountain bikes)?



Map H-1. Proposed Travel Management Areas

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Appendix I - Land Tenure

The BLM develops most RMPs to guide management of land over 20 or more years. The Secretary's policy is, generally, not to dispose of public lands. However, for long term planning purposes, the situation may arise, especially in areas where public land tracts are isolated and difficult to manage, where it is useful for BLM to identify these areas as suitable for leaving public ownership. Any decision regarding whether or not to dispose of a particular parcel under any particular authority, whether by sale under section 203 of FLPMA; exchange under section 206 of FLPMA; or patent under the Recreation and Public Purposes Act of 1926, as amended, would require site-specific consideration and analysis, including, but not limited to considerations of access, popular recreational uses, the existence of cultural resources or habitat for species, and whether or not such a parcel, isolated from the rest of the public lands, might be better suited for private ownership.

The RMP determination that a particular tract meets one or more of the criteria for disposal through sale does not necessarily mean the BLM will sell or dispose of the land by another means. Rather, the process for disposing of public lands under FLPMA Section 203 (Sales) or any other authority is a lengthy multi-decisional process requiring comprehensive site-specific analysis, and cadastral, cultural and other resource surveys, when necessary, prior to the sale or disposition of a tract of public land. BLM bases the determination whether a tract meets one or more of the section 203 disposal criteria on its ongoing inventory of all public lands and their resources conducted pursuant to section 201 of FLPMA. The requirement under section 203 that this determination be made through land use planning is consistent with the section 202 requirement to manage public lands under land use plans, where these represent a broader scope, longer-term approach to management of public lands in an entire planning area that takes into account a wide variety of possible uses of the public lands.

Section 203 of FLPMA specifies that BLM may only sell a tract of public land if the tract is identified through the land use planning process, pursuant to section 202 of FLPMA, as meeting one or more of the disposal criteria listed in section 203. In preparation for this land use planning initiative, the BLM conducted an inventory of the public land in the planning area to determine whether there are any tracts that meet one or more of the FLPMA section 203 criteria for disposal out of Federal ownership:

(1) Such tract because of its location or other characteristics is difficult and uneconomic to manage as part of the public lands, and is not suitable for management by another Federal department or agency; or

(2) Such tract was acquired for a specific purpose and the tract is no longer required for that or any other Federal purpose; or

(3) Disposal of such tract will serve important public objectives, including but not limited to, expansion of communities and economic development, which cannot be achieved prudently or feasibly on land other than public land and which outweigh other public objectives and values, including, but not limited to, recreation and scenic values, which would be served by maintaining such tract in Federal ownership.

The BLM has identified three categories of public land in the planning area that meet one or more of these disposal criteria. First, there are the 96 remaining "scattered tracts" identified for disposal by the BLM Director in 1988 (as amended in 2013, BLM 2013c). The phrases "isolated tracts," "isolated parcels," and "scattered surface tracts" are used interchangeably throughout the document, and were identified in the previous RMP as meeting the FLPMA disposal criterion (1), because they are surrounded on four sides by state and/or private land or are 160 acres or smaller. These acres, therefore, appear in the No Action Alternative, as well as in each of the Action Alternatives as

meeting the criteria for potential disposal out of Federal ownership, under the sales authority of section 203 of FLPMA, or other applicable authorities.

For Alternatives B-D, BLM applied the following guidelines in identifying lands available for disposal under FLPMA section 203:

Alternative B: Parcels less than 80 acres in size and located more than 1 mile from other public lands

Alternative C: Parcels less than 320 acres in size and located more than 0.25 miles from other public lands

Alternative D: Parcels less than 160 acres in size and located more than 0.5 miles from other public lands.

Lands adjacent to Federal lands and State Fish and Game lands will be retained unless they can be exchanged for lands containing equal or greater resource or recreational values, resulting in larger, contiguous blocks or reducing fragmentation. Additionally, the following lands will be retained unless they can be exchanged for lands containing equal or greater resource or recreational values, resulting in larger, contiguous blocks or reducing fragmentation:

- Lands occupied by ESA-listed and/or BLM Types 2 and 3 special status species,
- Riparian-wetland areas and designated floodplains,
- Parcels that provide access to larger blocks of public lands,
- Lands with special designation or management emphasis,
- Recreation opportunities and benefits,
- Oregon National Historic Trail.

Parcels available for disposal under FLPMA section 203 and associated legal land descriptions are identified in Table I-1. Prior to any sale or conveyance of lands identified by sale under section 203 of FLPMA, or by any other applicable authority, the BLM would review the legal land description, conduct a resurvey if necessary, and conduct a site-specific NEPA review of potential impacts of disposal. During the site specific NEPA review, potential impacts to natural and cultural resources, including recreational opportunities and public access will be considered prior to any decision to dispose of public lands.

In addition to lands classified as potentially suitable for disposal under FLPMA section 203, the manager may exchange other Federal lands, on a case-by-case basis, where the exchange proposal has been determined to fulfill important management objects and meets the public interest requirements of 43 CFR 2200.0-6(b), including, but not limited to: 1) consolidating Federal lands for more efficient and cost-effective management, 2) acquiring public access to Federal lands for recreational purposes, 3) acquiring important and/or critical wildlife or riparian habitat, 4) acquisition of non-Federal in-holdings within specially-designated areas (i.e., wilderness area, ACEC, wild and scenic river corridor, etc.).

The following tables describes the surface tracts that BLM has identified as meeting the disposal criteria in section 203 of FLPMA (Table I-1) or available for exchange under 43 CFR 2200 (Table I-2).

Table I-1 Lands Available for Disposal (FLPMA Section 203)

Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**	**Alt A**	**Alt B**	**Alt C**	**Alt D**
T1N R1E	2	S1/2SE		80	X			
T1N R1E	6		L6,L7	77	X			
T1N R2E	18	SWNE		40	X		X	

Township	Section	Aliquot	Lot/Tract	Acres	Alt A	Alt B	Alt C	Alt D
T1N R3E	5	SENW		40	X			
T1N R3W	25	SWNW		40	X	X	X	X
T1N R4E	1	SWSE	L1	80	X		X	X
T1N R4E	4	SENW	L3	83	X		X	
T1N R4E	25	NENE		40	X	X	X	X
T1N R5E	4	NWSW,SWSW		80	X		X	
T1N R5E	7	SESE		40	X			
T1N R5E	18	SENE		40	X			
T1S R2W	4	NWSE,SWSE,SESW,NESW		158	X		X	
T1S R3E	24	SWNE		40	X			
T1S R4E	34	NENW, NWNW		80	X		X	
T1S R4E	35	N1/2NE		80	X		X	X
T1S R5E	26	E1/2SW		79			X	
T1S R5E	35	NW		168			X	
T1S R8E	27	NENE,NENW,NWNE, NWNW		198.6	X			
T2N R2E	11	SWNE		39.9	X			
T2N R2E	14	SENE		40.8	X			
T2N R2E	21	NESE,SESE, NWSE		121.2			X	
T2N R3E	5		L4	43.8	X			
T2N R3E	25		L1,L2	80.9	X		X	
T2N R3E	35	NESE, S1/2SE,SESW		149	X		X	
T2N R4E	15	SESE		40.1	X			
T2N R4E	24		L5,L6,L15	49.4	X			
T2S R4E	1	N1/2SE		80.5	X			
T2S R4E	11	SE		159.9	X			
T2S R5E	17	NWSE,SWSE		80.5	X			
T2S R6E	5	SWNE		40			X	
T2S R8E	1	SESE		39.4			X	
T2S R8E	11	SWSE		39.8			X	
T2S R8E	12	NE, NENW		199			X	
T2S R10E	4	NESE		40.2			X	
T2S R10E	10	N1/2NW		79			X	
T2S R10E	12	NESW		39.7	X	X	X	X
T3N R2E	27	N1/2SW	L2	68	X			
T3N R2E	28		L1	5.5	X			
T3N R3W	15	SWNW	L2,L3	39.5			X	
T3N R4E	27	SWSE,SESW,NESW, SENW		156.9	X			
T3N R4E	32	SESE		39.4	X			
T3N R4E	33	SWNW		39.4	X			
T3N R4W	8	NENE,SENE		80.7			X	X
T3S R6E	10	NENE,SENE		80.3	X		X	X
T3S R6E	17	SESE,NESE, SENE, SWNE		155	X			
T3S R10E	4	NWSW		40	X			
T4N R1E	11		L1	40.1	X			
T4S R5E	15	NE, S1/2SW		240.6	X			

Township	Section	Aliquot	Lot/Tract	Acres	Alt A	Alt B	Alt C	Alt D
T4S R5E	19	NESE		10	X			
T4S R6E	17	N1/2NW		79.9	X		X	
T4S R6E	18	NENW	L1	83.4	X			
T4S R7E	17	NWSW		40	X		X	
T4S R7E	18	NESW,NWSE	L3,L4	159.2	X		X	
T4S R9E	6	SWNE,SESE	L2,L3	81	X			
T4S R9E	21	NESW,SWSW, NWSW		117	X			
T4S R9E	32	SENW,SWNW		80.1	X			
T5N R1E	5		L5,L6	71.3			X	X
T5N R1E	7	SENE,SESE,NWSE		114.4			X	
T5N R1E	18	NENE		38.5			X	
T5N R1W	1		L4	37.5			X	
T5N R1W	2		L1	37.7			X	
T5N R1W	31	NESE,NWSE		81.1			X	X
T5N R3W	33	SWNE,NWSE,NESE	L1	15.5	X	X	X	X
T5S R4E	33		L3	14.9	X			
T5S R4E	34		L2	36.8	X			
T5S R9E	13		L1	24.3	X			
T5S R9E	25	SESE		40.3	X			
T6N R1E	21	NWNW		39.4			X	X
T6N R2E	6	NENW,SWNW,NWNW,SENW		83.2			X	
T6N R3E	21	NESE		39.4			X	
T6N R5E	23	NENE, W1/2SESE	L7	60.9	X		X	
T6N R5E	26		L13,L14	3.5	X			
T7N R1W	15	SWSW		38.3			X	
T7N R1W	21	SENE,NESE,SESE		122.6			X	
T7N R1W	22	SWSW,NWSW, SWNW, NWNE		153.5			X	
T7N R2E	3	SWNE,NWSE		79.6			X	X
T7N R2E	31	NESW,SESW,SWSW, NWSW	L12	44.1			X	
T7N R2W	6		L5	35.5			X	
T7N R2W	7		L1	38.5	X		X	
T7N R2W	8	NENW		40	X			
T7N R3W	12	NWSE		40.1	X			
T8N R1E	20	NESW		39.9		X	X	X
T8N R2E	7		L1,L2,L3	76.6		X	X	
T8N R2W	2	SWSE,SESW		75.8			X	
T8N R2W	11	NENW,NWNW		77.6			X	
T8N R2W	31		L2	39.1	X		X	
T8N R2W	32	NESW,NWSW,SWNE		120.2	X			
T8N R3W	4		L4	25.1			X	
T8N R3W	5	SENE,SWNE	L1	103.7			X	
T8N R3W	32	NWSE,NESE,SESE, SWSE,NWSW,NESW		277.7	X		X	
T8N R4W	1	SENW,SWNW	L3,L4	143.8			X	X
T8N R4W	27		L1	3.4		X	X	X

Township	Section	Aliquot	Lot/Tract	Acres	Alt A	Alt B	Alt C	Alt D
T9N R1E	3	NESE		39.9			X	X
T9N R1E	9	SWSE,SESW,SWSW		120.2			X	
T9N R1E	11	SENW,SWNW		79.7	X		X	X
T9N R2E	8	NENE		39.5		X	X	X
T9N R2E	35	NESW		40		X	X	
T9N R3W	18	SESE		37.1	X			
T9N R3W	32	SESE,NWNE		79			X	
T10N R1E	12	NENE,SENE,NESE		118.3			X	X
T10N R1E	14	SENW,SWNW, NWNW		118			X	
T10N R1E	15	NENE		40.5			X	
T10N R2E	30	NESE,SESW	L3,L4	158.4			X	
T10N R3E	6	E1/2W1/2SENW	L1,L2,L12	58.3			X	
T10N R4E	29	NENW,SENW,NWNW		119.7			X	
T10N R4E	10	SESW		39.9	X			
T11N R1E	24	NESE		39.2			X	
T11N R1E	34	NWSE		39.8			X	
T11N R1W	30		L3	38.3			X	
T11N R2W	6	SENE	L7	74.1			X	X
T11N R2W	17	NESW,SENW		79.4			X	
T11N R3W	25	SW		159.3			X	
T11N R5W	5	SESE		39.9	X			
T11N R5W	6		L6	40	X			
T11N R5W	8	NENE		38.1	X			
T11N R5W	9	NWNW,NENW		79.1	X			
T11N R6W	6	NESW		40			X	X
T11N R7W	1	SENW,NESW,SESW	L3,L4	197.4			X	
T11N R7W	2	SWNE,NWSE,SWSE		118.9			X	
T11N R7W	11	NWNE		39.7			X	
T12N R3W	5	NESE		39.9		X	X	X
T12N R3W	12	NWSE,SENW	L3	118	X			
T12N R3W	13	NWNE,SESE		40	X			
T12N R3W	15	SENW,SWNW		79.8			X	
T12N R3W	22	NENE,NWNE		79.9			X	X
T12N R4E	7	SESE		38.1			X	
T12N R4E	28	SWNE,NWNE		79.9			X	X
T12N R4W	9	SENW		39.5			X	
T12N R5W	3	SENW		39.4			X	X
T12N R5W	30	SWSE		37.6			X	
T12N R5W	31	NESW,SESW		79	X			
T12N R6W	19	NENW,SENW,	L5,L6	154			X	X
T12N R6W	29	SWNW,NWNW		80.2			X	X
T12N R7W	22	SWSE,NWSE		80.3			X	
T12N R7W	24	SWNW		39.2			X	
T13N R1W	17	SESE		39.9	X			
T13N R1W	20	NENW		39.9	X			
T13N R2W	6	SENW		40		X	X	X
T13N R2W	18		L1,L2	66	X		X	X
T13N R3W	13	SENE		40.7	X		X	X

Township	Section	Aliquot	Lot/Tract	Acres	Alt A	Alt B	Alt C	Alt D
T13N R4E	7		L3	17.7			X	
T13N R4W	11	NENE,NWNE,SENE		120.1	X		X	
T13N R4W	12	SWNW		39	X		X	
T13N R5W	27	NESW		39.9			X	X
T13N R7W	26	SWSW		40			X	
T13N R7W	27	SESE		39.5			X	
T13N R7W	34	NENE		39.7			X	
T13N R7W	35	NWNW		41.7			X	
T14N R1E	34	SENW		40			X	X
T14N R2W	3	NWSW		40	X	X	X	X
T14N R4W	4	SWNW		40			X	
T15N R1E	18	NESW,SENW,SWNE		120.9			X	X
T15N R1E	20	SWSW,NWSW		81.5			X	
T15N R1E	29	NWNW		39.2			X	
T15N R1W	2		L2	39.3		X	X	X
T15N R1W	9	SENW,SWNW		78.8	X		X	X
T15N R1W	11	NESE,SESE,SWSE		120.7			X	X
T15N R1W	24	E1/2NW		80			X	X
T15N R1W	26	NENW		39.9			X	X
T15N R2W	8	NESE,NWNW		79.6			X	
T15N R2W	9	SWSE,SESE		81.9			X	
T15N R2W	13	N1/2NE,N1/2NW		159	X			
T15N R2W	14	NWNE,N1/2NW		117.7	X			
T15N R2W	15	NENE		40	X			
T15N R2W	23	NESE,S1/2SE,SESW		162.8			X	
T15N R2W	24	SWSW		37.8			X	
T15N R2W	26	N1/2NE,NENW		118.6			X	
T15N R3W	11	NESE,SESE,SWSE,SESW		154.5			X	
T15N R3W	14	NENW		41.5			X	
T15N R4W	4	NWSW,SWNE		79.8			X	X
T15N R4W	23	SESW		40			X	
T15N R4W	34	SWSW		40			X	
T15N R6W	20	NESE		38.3			X	
T15N R6W	21	NWSW		40.1			X	
T15N R6W	29	SENE,SWNE		79.9			X	X
T16N R1W	33	W1/2SWSE,SWSW,SESW		98	X		X	X
T16N R4E	33	S1/2S1/2SE		40.3		X	X	X
T16N R4W	28	SESE		41.3			X	
T16N R4W	33	NWNW,NENW,NENE,NWNE		155			X	
T17N R1W	5	SENE	L1	74.8			X	
T17N R1W	8	NESE,SENE		81.7			X	X
T17N R1W	17	SENE		40.1			X	
T17N R5W	1	W1/2SWSW		19.5			X	
T18N R1W	32	NENE,NESW,NWSW,SENE,SESE,SENW,SWNW		198.3			X	

Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**	**Alt A**	**Alt B**	**Alt C**	**Alt D**
T18N R2W	23	SWSE		39.9			X	
T19N R4W	9	NENE		39.2			X	

Table I-2 Lands Available for Exchange (43 CFR 2200)

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T1N R1E	6	SWSE		29.24
T1N R1E	13	NESW, NWSE, NWSW, SENW, SESE, SESW, SWNW, SWSE, SWSW		361.75
T1N R1E	24	NENE, NWNE, SENE, SWNE		159.77
T1N R1W	2	NESW, NWSW, SESW,SWNW,SWSE,SWSW	L4	282.35
T1N R1W	3	NESE,NESW,NWSE,NWSW,SENE,SENW,SESE, SESW,SWNE,SWNW,SWSE,SWSW	L1,L2 L3,L4	650.09
T1N R1W	4	NESE,NESW,NWSE,SENE,SENW,SESE,SESW, SWNE, SWSE	L1,L2L3,L4,L5,L6,L7	655.75
T1N R3E	5	SENW		38.90
T1N R3W	5	NESW,NWSE,SENW,SESW,SWNW,SWSE	L3, L4	238.99
T1N R3W	6	SENE	L8, L9	106.42
T1N R4E	3	NESE,NWSE,SENE,SESE,SWNE,SWSE		243.00
T1N R4E	9	NESE,SESE		81.29
T1N R4E	10	NENE,NESW,NWSE,SWSE,SWSW,SENE,SENW, SWNE,SWSE,SWSW		402.02
T1N R4E	14	NENW,NWNW,NWSE,SENE,SENW,SWNE,SWNW, SWSE		318.33
T1N R4E	15	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SESW,SWNE,SWNW,SWSE, SWSW		597.56
T1N R4E	26	SESW		39.45
T1N R4E	32	NESE,NWSE,SENE,SESE,SWNE		200.01
T1N R4E	33	SESW,SWSE,SWSW		120.26
T1N R4E	35	NENE,NENW,NESE,NWNE,NWSE,SENE,SENW, SESE, SWNE,SWSE		399.56
T1N R5E	10	SENE,SWNE	L1,L2	157.21
T1N R5E	20	SESE,SWSE		79.69
T1N R5E	28	NENW,NESW,NWNW,NWSW,SENW,SWNW		240.44
T1N R5E	29	NENE,NWNE		80.07
T1N R6E	6	NESW,SENW,SESW	L3,L4,L5,L6, L7	311.15
T1N R6E	7	NENW,NESW,SENW,SESW	L1	201.16
T1N R6E	20	NENE,NWNE,SWNE		117.41
T1N R9E	1	NESE,NESW,NWSE,NWSW,SENE,SENW,SESE, SESW,SWNE,SWNW,SWSE,SWSW	L1,L2,L3,L4	641.66
T1N R9E	12	NENW,NWNW		80.19
T1N R10E	4	NESE,NWSE,SENE,SESE,SESW,SWNE,SWNW, SWSE		317.30
T1N R10E	5	NESE,SENE,SWNE	L1, L2	199.70
T1N R10E	8	NESE	L5	45.16

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T1N R10E	9	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SESE,SESW,SWNE,SWNW,SW SE,SWSW		633.65
T1S R2W	4	NESW		38.49
T1S R4E	2	SWNW		39.84
T1S R4E	3	NWSW,SWNW,SWSW		117.71
T1S R4E	4	NESE,NWSE,SENE,SENW,SESE,SWNE,SWNW, SWSE	L1,L2,L3,L4	443.16
T1S R4E	5	NESE,NWSE,NWSW,SENE,SENW,SWNE,SWNW, SWSW	L1,L2	382.48
T1S R4E	28	NENE,NENW,NWNE,NWNW,SENE,SENW,SWNE, SWNW		319.90
T1S R5E	3	NESW,NWSW,SESW,SWSW		159.51
T1S R5E	4	SESE,SWSE		78.90
T1S R5E	9	NENE,NESE,NWNE,NWSE,SENE,SWNE		234.50
T1S R5E	10	NENE,NENW,NWNE,NWNW,SENE,SENW,SWNE, SWNW		315.48
T1S R5E	12	SENE,SENW,SWNE		117,71
T1S R5E	13	NENE		35.94
T1S R5E	15	NENE,NENW,NESE,NWNE,NWNW,NWSE,SENE, SENW, SWNE,		357.60
T1S R5E	20	NWNW		39.60
T1S R5E	30	SWSE		39.42
T1S R5E	31	NESE,NWSE		79.01
T1S R5E	32	NESW,NWSW,SESW,SWSW		157.90
T1S R6E	7	NESW,SESW	L3,L4	151.91
T1S R6E	17	NESE		38.29
T1S R7E	13	NENE,NENW,NESE,NESW,NWNW,NWSE,NWSW, SENE,SENW,SESE,SESW,SWNE,SWNW,SWSE		551.63
T1S R7E	14	NENE,SENE		79.28
T1S R7E	23	NENE,NESE,NWSE,SENE,SESE,SWNE,SWSE		279.14
T1S R7E	24	NENE,NESW,NWNE,NWSE,NWSW,SENE,SESW, SWNW,SWSE,SWSW		394.37
T1S R7E	25	NENW,NESW,NWNE,NWNW,NWSE,NWSW,SENW, SESW,SWNE,SWNW,SWSE,SWSW		474.96
T1S R7E	26	NENE,NESE,SWNE,SENE,SESE		198.63
T1S R8E	27	NWNW		39.68
T2N R1E	13	NESE,NESW,NWNW,NWSE,NWSW,SESE,SESW, SWNW,SWSE,SWSW		408.04
T2N R1E	14	NESE,NWSE,SENE,SENW,SESE,SWNE		242.67
T2N R1E	24	NENE,NESW,NWNE,NWSW,SENE,SESE,SESW, SWSE,SWSW		366.61
T2N R1E	25	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSWSENE,SENW,SESE,SESW,SWNE,SWNW, SWSE,SWSW		649.98
T2N R2E	11	SWNE		39.90
T2N R2E	14	SENE		40.08
T2N R2E	18		L4	43.40
T2N R2E	19	NENW,NESE,NESW,NWSE,SENW,SESE,SWNE	L1, L2	361.56
T2N R2E	20	SESE,SESW,SWSE,SWSW		159.76
T2N R2E	30		L2, L3, L4	129.43
T2N R3E	3		L5,L6,L7,L8	124.63

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T2N R3E	10		L5	38.74
T2N R3E	11		L12, L13	79.23
T2N R3E	13		L5,L6,L7,L8, L10,L11,L12	277.21
T2N R3E	14		L9	39.89
T2N R3E	15		L5,L6,L7	119.70
T2N R3E	25		L1	40.29
T2N R3W	31	NENW,NESE,NESW,NWSE,SENW,SESE,SWNE, SWSE		321.15
T2N R3W	32	NWSW,SESW,SWSW		120.94
T2N R4E	6	NESW,SENE,SENW,SWNE	L1,L2,L3,L4, L5	302.34
T2N R4E	18	NENW,NESW,SENW,SESW,SWNE	L1,L2,L3,L4	359.49
T2N R4E	19		L5,L6,L7	120.53
T2N R4E	24	NESE,NWSE,SESE,SWSE	L12,L13,L16, L17	278.85
T2N R4E	25	NENE,NWNE,NWSE,SWNE,SWSE		198.74
T2N R4E	29	NENW,NESW,NWNW,NWSW,SENW,SESW, SWNW,SWSW		320.35
T2N R4E	30	NENE,NENW,NWNE,NWNW,SENE		199.15
T2N R4E	31	NENE,NENW,NWNE,NWNW,SENE,SENW,SWNE, SWNW		318.74
T2N R4E	32	NENE,NENW,NESE,NWNE,NWNW,SENE,SENW, SESE, SWNE,SWNW		400.13
T2N R4E	33	NWNW,NWSW,SWNW,SWSW		159.80
T2N R6E	2	SWNE		39.18
T2N R10E	8		L2	6.94
T2N R10E	18		L8	30.24
T2N R10E	32		L4,L5,L6	119.63
T2N R10E	33		L4	39.69
T2S R4E	2	NESW,NWSE,NWSW,SESW,SWSE,SWSW		238.32
T2S R4E	12	NESE,NWSE,SESE,SWSE		159.22
T2S R4E	13	NENE,NENW,NWNE,NWNW,SENE,NENW,SWNE, SWNW		319.86
T2S R4E	21	NENE,NENW,NESW,NWNE,NWNW,NWSW,SENE, SENW,SESW,SWNE,SWNW,SWSW		480.38
T2S R5E	5	SENE,SWNE	L1, L2	137.85
T2S R5E	7	NENW,NESW,NWNW,NWSW,SENW,SESW,SWNW, SWSW		318.45
T2S R5E	8	NENW,NESE,NESW,NWNW,NWSE,NWSW,SENW, SESE,SESW,SWNW,SWSE,SWSW		478.68
T2S R5E	10	NENE,NENW,NWNE,NWNW,SENE,SENW,SWNE, SWNW		318.36
T2S R5E	11	NENW,NESW,NWNW,NWSW,SENW,SESW,SWNW, SWSW		317.32
T2S R5E	17	NWNW,NWSW,SWNW,SWSW		158.97
T2S R5E	18	NESE,NESW,NWSE,NWSW,SESE,SESW,SWSE, SWSW		319.30
T2S R5E	19	NESE,NWSE,SESE,SWSE		158.55
T2S R5E	20	NENW,NWNW,SENW,SWNW		159.59
T2S R5E	29	NENW,NWNW,SENW,SWNW		158.53
T2S R5E	30	NENE		39.98

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T2S R5E	32	NESW,NWSE,NWSW,SENW	L2,L3,L4	295.12
T2S R9E	13	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SWNE,SWNW		475.52
T2S R9E	24	NENW,NESE,NESW,NWNE,NWNW,NWSE,NWSW, SENE,SENW,SESW,SWNE,SWNW,SWSW		518.13
T2S R9E	25	NENW,NESW,NWNW,NWSW,SENW,SESW,SWNW, SWSE,SWSW		359.40
T2S R10E	7	NESW,SESW		78.71
T2S R10E	17	NENW,NESE,NESW,NWNW,NWSE,NWSW,SENE, SENW,SESE,SESW,SWNE,SWNW,SWSE,SWSW		559.77
T2S R10E	18	NENE,NENW,NESE,NESW,NWNE,NWSE,SENE, SENW,SESE,SESW,SWNE,SWSE	L2,L3,L4	597.45
T2S R10E	19		L2,L3	82.05
T3N R3E	36	NENE,NESE,NWNE,NWSE,SENE,SESE,SWNE,SWSE		273.62
T3N R4E	22	NESE,NESW,NWSE,SESE,SWNE		174.24
T3N R4E	23	NESW,NWSW,SESW,SWSW		156.49
T3N R4E	26	NENW,NWNW,SENW		117.60
T3N R4E	27	NENE		38.45
T3N R4E	30		L5,L6	72.16
T3N R4E	31	NENE,NENW,NESE,NESW,NWNE,NWSE,SENE, SENW,SESE,SESW,SWNE,SWSE	L1,L2,L3,L4	568.45
T3S R4E	1	NWSE,SWNE,SWSE	L6,L7	224.93
T3S R4E	12	NENW,NWNE,NWNW,NWSE,SENW,SWNE,SWNW, SWSE	L1,L2,L3,L4	534.48
T3S R4E	13	NWNE		40.00
T3S R4E	24	NESW,NWNE,NWSE,NWSW,SESW,SWNE,SWSE, SWSW	L1,L2,L3,L4	538.05
T3S R4E	25	NENW,NESW,NWNE,NWNW,NWSE,NWSW,SENW, SESW,SWNE,SWNW,SWSE,SWSW	L1,L2,L3,L4	699.90
T3S R4E	26	NESE,SESE		79.39
T3S R4E	35	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SWNE,SWNW	L1,L2,L3,L4	614.48
T3S R5E	5	NESW,NWSE,NWSW,SENE,SENW,SESW,SWNE, SWNW,SWSE,SWSW	L1,L2,L3,L4	545.27
T3S R5E	7	NENE,NESE,NWNE,SENE,SESE,SWNE	L3,L4	330.36
T3S R5E	8	NENW,NESW,NWNW,NWSW,SENW,SESW,SWNW, SWSW		317.44
T3S R5E	18	NENE,NESW,NWNE,NWSE,SESW,SWNE,SWSE	L3,L4	368.34
T3S R5E	19	NENW,NESW,SENW,SESW	L1,L2,L3,L4	341.14
T3S R6E	17	NESE,SENE,SWNE		116.43
T3S R6E	21	NENW,NESW,NWNE,NWNW,NWSE,NWSW,SENW, SWNW,SWSW		357.99
T4N R2E	1	SENW,SWNW	L3,L4	137.31
T4N R2E	2	NWSE,SENE,SESW,SWNE,SWSE	L2	241.34
T4N R2E	13	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SWNE,SWNW		472.20
T4N R2E	14	NENW,SWNW		79.14
T4N R2E	16	NENE,NENW,NESE,NWNE,NWNW,NWSW,SENE, SESE,SWNW		361.38
T4S R5E	15	SESE		39.91
T4S R5E	23	NENE,NENW,NESW,NWNE,NWNW,NWSW,SENE, SENW,SESW,SWNE,SWNW,SWSW		481.55

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T4S R5E	24	NENW,NWNW,SENW,SWNW		159.33
T4S R6E	5	NESE,NESW,NWSE,NWSW,SENE,SENW,SESE, SESW,SWNE,SWNW,SWSW	L1,L2,L3,L4	648.74
T4S R6E	6	NESE,NESW,NWSE,SENE,SESE,SESW,SWNE,SWSE	L1,L2,L6,L7	483.90
T4S R6E	7	NENW,SENW	L1,L2	165.57
T4S R6E	8	NENE,NWNE,SENE,SWNE		159.71
T4S R7E	18	NESW,NWSE		79.68
T4S R8E	1	NESE,SENE,SESE	L1	159.28
T4S R8E	15	NENW,NESW,NWNW,NWSW,SENW,SESW,SWNW		317.27
T4S R8E	22	NENW,NESW,NWNW,NWSE,NWSW,SENW,SESW, SWNW,SWSE,SWSW		399.16
T4S R8E	27	NENW,NESW,NWNW,NWSW,SENW,SESW,SWNW, SWSW		320.98
T4S R8E	34	NENW,NWNW,SENW,SWNW		159.91
T4S R9E	6	SESE,SESW	L7	113.53
T4S R9E	7	NENE,NENW,NESE,NWNE,SENW,SESE	L1,L2	305.73
T4S R9E	8	NENW,NWNW,SENW,SWNW		158.99
T4S R9E	17	NESE,NESW,NWSE,NWSW,SENE,SENW,SESE, SESW,SWNE,SWNW,SWSE,SWSW		476.28
T4S R9E	18	NENE,NESE,SENE,SESE		156.98
T4S R9E	19	NENE,NENW,NESE,NWNE,SENE,SENW,SESE, SWNE		311.33
T4S R9E	20	NENW,NWNE,NWNW,SENW,SWNE,SWNW		239.60
T4S R9E	31	NESW,SESW,SWSE	L3,L4	188.10
T4S R9E	32	SENW,SWNW		79.48
T5N R1E	4	L 7		36.26
T5N R1E	7	NESE		39.53
T5N R1E	20	NESE, SESE	L1	118.02
T5N R1E	21	NWNW,NWSW,SENW,SWNW		158.75
T5N R1E	30	NENE,SENE	L2	111.41
T5N R1E	36	SESW		40.16
T5N R1W	1	NWSW,SWNW		78.68
T5N R1W	2	SENE		39.98
T5N R1W	4	L 1	L1,L2,L3,L4	131.42
T5N R1W	5	SENE,SESE,SWNE	L1,L2	181.26
T5N R1W	15	NENW,NWNW,SENW,SWNW		157.07
T5N R1W	23	SESE		39.30
T5N R1W	24	NWSW,SESE,SESW,SWSE,SWSW		196.93
T5N R1W	25	NENE,NENW,NWNE,NWNW,NWSE,SENW,SWNE, SWNW		316.17
T5N R1W	26	NENE,NENW,NESE,NWNE,NWSE,SENE,SENW, SWNE		316.89
T5N R1W	27	SESW,SWSE		79.39
T5N R1W	34	NENW,NWNW		79.56
T5S R6E	4	NESE,NESW,NWSE,NWSW,SESE,SESW,SWSE, SWSW		325.00
T5S R6E	5	NESE,NESW,NWSE,NWSW,SENW,SESE,SESW, SWNW,SWSE,SWSW	L3,L4	490.97
T5S R6E	6	SENE,SWNE	L1,L2	165.13
T5S R6E	9	NENW,NESE,NESW,NWNW,NWSE,NWSW,SENW, SESE,SESW,SWNW,SWSE,SWSW		489.36
T5S R8E	25		L5,L6	79.67

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T5S R9E	5	SWSW		39.97
T5S R9E	6	NESW,SENW,SESE,SESW,SWSE	L3,L4,L5,L6, L7	377.97
T5S R9E	7	NENE,NENW,NESE,NESW,NWNE,NWSE,SENE, SENW,SESE,SESW,SWNE,SWSE	L1,L2,L3,L4	617.85
T5S R9E	8	NESW,NWNW,NWSW,SESW,SWNW,SWSW		239.91
T5S R9E	17	NENW,NWNW,SENW,SWNW		159.75
T5S R9E	18	NENE,NWNE,SENE,SWNE		159.14
T5S R9E	19	NWSE,SENW,SWNE,SWSE	L2,L3,L4	262.74
T5S R9E	25	SESE		40.27
T5S R9E	30	NENW,NESW,NWNE,NWSE,SENW,SESW,SWNE, SWSE	L1,L2,L3,L4	459.33
T5S R9E	31	NENW,NWNE,SENW	L6,L7,L8	193.61
T6N R1W	10		L4,L5	75.56
T6N R1W	14		L1,L2,L3,L4, L5,L6,L7	275.33
T6N R1W	15	NWSE	L1,L2,L3,L4	194.22
T6N R1W	21		L1,L2,L3,L4, L5,L6,L7,L8, L9,L10,L11	335.32
T6N R1W	22		L1,L2,L3,L4, L5,L6,L7,L8, L9,L10,L11, L12,L13,L14, L15,L16	623.84
T6N R1W	23		L1,L2,L3,L4, L5,L6,L7	279.48
T6N R1W	26		L1,L2,L3,L5, L6,L7	279.48
T6N R1W	27		L1,L2,L3,L4, L5,L6	235.93
T6N R1W	28		L4,L5,L6	118.69
T6N R1W	33		L2,L3,L4,L5, L8,L9,L10	269.17
T6N R1W	34	NENE	L1,L2,L5,L6, L7,L8	267.01
T6N R1W	35		L1, L2	74.08
T6N R5E	27	NENW,NESE,NESW,NWNW,NWSE,NWSW,SENE, SENW, SWNE,SWSE		341.96
T6S R5E	1	SWSW		41.63
T6S R5E	3	SESW,SWSW		81.86
T6S R5E	4		L7	40.29
T6S R5E	10	NESE,NESW,NWSE,NENE,NESW,NWSW		247.29
T6S R5E	11	SENE,SENW,SWNE		124.85
T6S R5E	12	NENW,NESW,NWNW,SENW,SESW,SWNE,SWNW		290.93
T6S R5E	13	NENW,NWSE,SENW,SWNE,SWSW		205.60
T7N R1E	7	NENE,NESE,NESW,NWSE,SENE,SENW,SESE, SESW,SWNE,SWSE		397.18
T7N R1E	8	NWNW,SWSW		76.95
T7N R1E	17	NENW,NWNW,NWSW,SENW,SWNW		191.81
T7N R1E	18	NENE,NENW,NESE,NESW,NWNE,NWSE,SENE, SENW,SWNE	L1,L2,L3,L4	494.63
T7N R1E	19		L10	36.44

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T7N R1E	28	NESW,NWSW,SESW,SWSW		155.63
T7N R1E	29	NESE,NWSE,SENE		119.34
T7N R1E	32	NENE,NENW,NESW,NWNW,NWSW		196.50
T7N R1E	33	SENW		39.43
T7N R2E	14		L1	22.22
T7N R2W	4	NESW,NWSW,SESW,SWSW		157.27
T7N R2W	5	NESE,SENE,SESE,SWNE	L1,L2	241.70
T7N R2W	6	SENW		38.89
T7N R3W	12	NWSE		38.15
T7N R4E	14		L12,L13,L14, L15,L16,L17, L18,L19,L23, L24,L25,L26	357.19
T7N R5E	3	NESE,NESW,NWSE,NWSW,SENE,SENW,SESE, SWNE,SWNW,SWSW	L3,L4,L14, L15,L16,L18	541.23
T7N R5E	29	NENW,NWNW,NWSW,SENW,SWNW	L3,L4,L8,L9, L10,L12,L14	384.86
T7N R5W		L 11	L11	4.20
T8N R1E	3	NESW,NWSW,SENW,SESW,SWNW,SWSW	L3,L4	296.32
T8N R1E	4		L1,L2,L3,L4, L5	149.15
T8N R1E	5		L1	25.89
T8N R1E	10	NENW,NESW,NWNE,NWSE,SENW,SWNE		238.26
T8N R1E	29	SESW,SWSE,SWSW		118.20
T8N R1E	30	SESE		39.71
T8N R1E	31	NENE,NESE,SENE,SESE,SESW,SWSE	L2,L3,L4	338.61
T8N R1E	32	NWNE		39.04
T8N R2E	23	SESE		39.21
T8N R2E	24	NWSW,SENE,SWSW	L1,L2,L3,L4	216.18
T8N R2E	25		L2	4.57
T8N R2E	26		L1,L2,L5	80.56
T8N R2W	2		L3	33.18
T8N R2W	10	SESE,SWSE		77.50
T8N R2W	11	NWNE,SWSW		75.11
T8N R2W	12	NENW		36.46
T8N R2W	14	NENW,NESW,NWNE,NWNW,NWSE,NWSW,SENW, SESW,SWNE,SWNW,SWSE,SWSW		465.78
T8N R2W	15	NENE,NWNE,SENE,SWNE		157.08
T8N R2W	32	SWNE		38.50
T8N R3E	7	SESE,SWSE		78.27
T8N R3E	8		L3,L4	60.48
T8N R3E	17		L1,L2	23.90
T8N R3E	18	NENE,NESW,NWSE,SENE,SWNE	L5,L6,L7,L11	319.64
T8N R3E	19	NENE,NESE,NWSE,SENE,SWNE	L1,L2	236.95
T8N R3E	20	NENE,NENW,NESE,NESW,NWNE,NWSE,SENE, SENW,SWNE,SWSE	L1,L2,L3	477.51
T8N R3E	21	NWNW,SESW		79.63
T8N R5E	34		L1	0.39
T8N R5W	1	NESE,NESW,NWSE,NWSW,SENE,SESE,SESW, SWNE,SWNW,SWSE,SWSW	L1,L2,L3,L4	567.04
T8N R5W	2	NESE,NWSE,SENE,SWNE	L1,L2	207.32
T8N R5W	12	NENE,NENW,NWNE,NWNW,SENW,SENW	L1	181.39

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T9N R1E	27	NESW,NWSE,SENW,SESW,SWNE,SWSE,SWSW		276.52
T9N R1E	28	SESE,SWSE		78.56
T9N R1E	32	NESE,NWSE,SESE,SWS		158.26
T9N R1E	33	NENE,NESE,NWSW,SENE,SWNW		196.43
T9N R1E	34	NENW,NESW,NWNE,NWNW,NWSE,SENW,SESW, SWNE,SWNW,SWSE		393.48
T9N R1E	35	NESE,NESW,NWNE,NWSE,SENE,SESE,SESW, SWNE,SWSE		347.76
T9N R3E	22	NENW,NESW,NWNE,SWNE	L3,L4,L5,L7, L8,L9,L10	393.25
T9N R3E	27		L2	41.02
T9N R3W	18	SESE		35.95
T9N R4W	11	NESW,SESW,SWSE		113.50
T9N R4W	18	NENW,NESW,NWSE,SENW,SESW	L1,L2,L3,L4	377.92
T9N R4W	19		L1,L2	89.77
T9N R4W	28	SWNE		38.75
T9N R5W	13	NENE,NESE,NWSE,SENE,SESE,SWSE		234.37
T9N R5W	24	NENE,NWNE		77.66
T10 N R1W	2		L4	41.26
T10N R2W	4	NESW,NWSE,NWSW,SENW,SESW,SWNE,SWNW, SWSE,SWSW	L2,L3,L4	479.27
T10N R2W	5	SENE	L1	78.79
T10N R2W	9	NENW,NWNE		78.78
T10N R4E	13		L6	38.08
T10N R4W	10	SESW		38.57
T10N R4W	17	NWNE		39.30
T10N R4W	20	NESE,SENW,SWNE	L2,L3	198.61
T10N R4W	21		L2	39.16
T10N R4W	22	NESE,NWSE,SENE,SESE,SWNE,SWSE		236.00
T10N R4W	25	SESW,SWSE,SWSW		116.70
T10N R4W	26	NENW,NESE,NWNE,NWNW,SENE,SENW,SWNE, SWNW,SWNW		315.18
T10N R4W	27	NENE,NENW,NWNE,SENE		155.81
T10N R5W	24	NENE		38.34
T11N R1W	35	NESW,NWNE,NWSE,SENW,SESW,SWNE,SWSW		278.65
T11N R2W	13	NWSE,SESE,SWSE		117.68
T11N R2W	20	NESE,NESW,NWSE,NWSW,SENE,SENW,SESE, SWNE,SWNW		339.45
T11N R2W	24	NENE,NESE,NWNE,NWSE,SENE,SWNE		237.65
T11N R2W	28	SWSW		40.04
T11N R2W	29	NENE,SENE,SWSW		114.47
T11N R2W	32	NESE,SENE,SESE,SWSE		156.51
T11N R2W	33	NESW,NWNW,NWSW,SESW,SWNW,SWSE,SWSW		276.96
T11N R3W	19	SESW	L4	73.51
T11N R3W	30	NENW,NESW,SENW	L1,L2,L3	220.72
T11N R4W	11	SWSE,		39.12
T11N R4W	13	NESW,NWSE,NWSW,SWSE,SWSW		198.32
T11N R4W	14	NESE,NWSE,NWSW,SESE,SWNW,SWSE,SWSW		276.21
T11N R4W	15	NESE,SENE		77.29
T11N R4W	22	SENE		38.27
T11N R4W	23	NENE,NENW,NWNE,NWNW,NWSW,SENE,SENW, SESW,SWNW,SWSE		394.87

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T11N R4W	24	NESW,NWNW,SESE		118.65
T11N R4W	25	NESE,NESW,NWSE,NWSW,SENW,SESE,SESW, SWNE,SWSE,SWSW		395.39
T11N R4W	26	NESE,NWNE,NWSE,SENE,SESE,SWNE,SWSE		276.30
T11N R4W	28	NENW,NESW,SENW,SWNE	L1,L2,L3,L4	318.81
T11N R4W	29	NENE,NESE,NWNE,NWSE,SENE,SESE,SESW, SWNE,SWSE		351.52
T11N R4W	32	NENE,NENW,NWNE,NWNW,SENE,SENW,SWNE, SWNW		315.39
T11N R5W	6		L6	38.29
T11N R5W	8	NESW,NWSE		78.05
T11N R5W	9	NENW		39.47
T11N R5W	17	NENW,NWNW,SENW		116.57
T11N R5W	26	NESW,NWSW,SENW,SESE,SESW,SWNW,SWSW		275.04
T11N R5W	27	NESE,NESW,NWSE,NWSW,SENE,SENW,SESE, SWNE		309.99
T11N R5W	35	NENW,NESE,NESW,NWNW,NWSE,SENW,SWNW		272.51
T11N R6W	1	SENW,SWNW	L3,L4	160.00
T11N R6W	2	SENE,SWNE	L1,L2,L3	198.48
T12N R1W	4		L2,L3	77.47
T12N R1W	7	NENE,NESE,NWSE,SENE,SENW,SWNE		238.68
T12N R1W	8	NWNW,NWSW,SWNW		119.16
T12N R2W	19	NESW,NWSE,SESE,SESW,SWSE	L2,L3,L4	296.46
T12N R2W	20	SESE,SWSW		77.69
T12N R2W	23	NENE,NENW,NESE,NWNE,SENE,SWNE		237.16
T12N R2W	24	NESW,NWNW,NWSW,SENW,SWNW		198.16
T12N R2W	28	NENW,NESW,NWNE,NWNW,NWSE,NWSW,SENW, SESE,SESW,SWNE,SWNW,SWSE,SWSW		511.49
T12N R2W	29	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SESE,SESW,SWNE,SWNW, SWSE		600.25
T12N R2W	31	NESE,NESW,NWSE,SENE,SESE,SESW,SWNE,SWSE	L3,L4	383.14
T12N R2W	32	NENE,NESW,NWNW,NWSW,SENE,SENW,SESW, SWNW,SWSE,SWSW		390.24
T12N R2W	33	NENW,NESW,NWNW,NWSW,SENW,SWNW		235.39
T12N R4E	27	SESE		39.01
T12N R4E	34	NENE,NESE,NESW,NWSE,SENE,SENW,SESE, SWNE,SWSE		355.49
T12N R5W	31	NESW,SESW		76.57
T12N R6W	24	SWSW		37.40
T12N R6W	25	NENW,NESW,NWNE,NWNW,NWSE,NWSW,NWSE, SENW, SWNE,SWNW,SWSE,SWSW		473.46
T12N R6W	26	NESE,NESW,NWNW,NWSE,NWSW,SESE,SESW, SWNW,SWSE,SWSW		392.95
T12N R6W	27	NESE		37.09
T12N R6W	35	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SESE,SESW,SWNE,SWNW, SWSE		592.46
T12N R7W	2	NWSW,SWSW		78.09
T12N R7W	26	NESE,SENE,SESE,SESW,SWSE,SWSW		238.73
T12N R7W	35	NENE,NENW,NWNE,NWNW		159.77
T13N R1E	30	SESW,SWSE	L4	107.97

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T13N R1E	31	NENW,NWNE,SENW,SWNE	L1,L2	216.35
T13N R1W	1	NWSW,SESW,SWSW		117.71
T13N R1W	2	NESE,NESW,NWSE,SESW		157.37
T13N R1W	10	NENE		39.33
T13N R1W	11	NENW,NWNW		79.31
T13N R1W	12	NWNW		39.90
T13N R1W	13	NESW,NWSW,SESW,SWSW		159.91
T13N R1W	14	NESE,NESW,NWSE,SENW,SESE,SWSE		239.07
T13N R1W	23	NENE,NESE,NWNE,NWSE,SENE,SESE,SWNE		280.02
T13N R1W	24	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SESE,SESW,SWNE,SWNW, SWSE,SWSW		641.07
T13N R1W	25	NENE,NENW,NWNE,NWNW,NWSW,SENW,SESW, SWNW,SWSW		359.08
T13N R1W	26	NENE,NESE,SENE,SESE,SWSE		199.75
T13N R1W	28	SESW,SWSE		79.49
T13N R1W	32	NESE,SESE		79.02
T13N R1W	33	NENW,NESW,NWNE,NWSE,NWSW,SENW,SESW, SWNE,SWNW,SWSE,SWSW		436.79
T13N R4E	29		L10	41.28
T13N R4E	30		L7	27.08
T13N R4W	21	SESE		39.48
T13N R4W	22	SWSW		38.84
T13N R4W	28	NENE		38.89
T13N R5W	36	SESE		39.24
T13N R7W	9	NWSE,SESE,SESW,SWSE		160.65
T13N R7W	14	NESW,NWSE,NWSW,SENW,SESE,SESW,SWNE, SWSE,SWSW		356.26
T13N R7W	16	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SESE,SESW,SWNE,SWNW, SWSE,SWSW		638.52
T14N R1E	4	NESE,NESW,NWSE,SENE,SENW,SESE,SESW, SWNE,SWSE	L1,L2,L3	446.78
T14N R1E	5	NWSW,SWSW		78.35
T14N R1E	6	NESE,NESW,NWSE,SESE,SESW,SWNE,SWSE	L6,L7	345.71
T14N R1E	7	NENE,NESE,NWNE,NWSE,SENE,SESE,SWNE		281.28
T14N R1E	8	NWNW,NWSE,NWSW,SENW,SESW,SWNW,SWSE, SWSW		316.16
T14N R1E	18	NENE,NESW,NWSE,SENW,SESW,SWNE,SWSE	L2,L3,L4	383.51
T14N R1E	19	NENE,NENW,NESW,NWNE,SENW,SWNE	L1,L2,L3	346.57
T14N R1W	1	NESE,NWSE,SESE		119.94
T14N R1W	13	NESE,NWSE,SENE,SESE,SWNE,SWSE		240.63
T14N R1W	24	NENE,NESE,NWNE,SENE		160.95
T14N R3W	4		L3,L4	81.34
T14N R3W	5		L 1	41.14
T14N R3W	15	NESW,NWSE,NWSW,SESE,SESW,SWNW,SWSE, SWSW		315.74
T14N R3W	20	NENE,NESE,SENE,SESE		160.63
T14N R3W	21	NENE,NWNW,NWSW,SWNW,SWSW		195.53
T14N R3W	22	NWNW		39.14
T14N R6W	3		L 1	36.97
T14N R6W	8	SESE,SWSE,SWSW		118.64

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T14N R6W	17	NENW,NWNE,NWNW,SENW,SWNE,SWNW		235.01
T14N R6W	18	NENE,SENE		76.46
T15N R1E	5	NESW,NWSW,SENW,SESW,SWNE,SWNW,SWSW	L2,L3,L4	421.80
T15N R1E	8	NENE,NENW,NWNE,NWNW,NWSW,SENW,SWNE, SWNW		316.36
T15N R1E	29	NWSE,SESE,SESW,SWNE,SWSE,SWSW		237.50
T15N R1E	30	SESE,SWSE,		79.36
T15N R1E	32	NWNW		39.32
T15N R1W	5		L3,L4	74.78
T15N R1W	6		L1,L2	78.17
T15N R2W	28	NESW,NWNW,NWSW,SENW,SESW,SWNW,SWSW		277.42
T15N R2W	29	NENE,NESE,NWNE,NWSE,SENE,SESE,SESW, SWNE,SWSE		359.45
T15N R2W	32	NENE,NENW,NESE,NWNE,SENE		198.94
T15N R2W	33	NWNW,SWNW		78.35
T15N R3W	13	NESW,NWSE,NWSW,SESE,SESW,SWSE,SWSW		273.13
T15N R3W	14	SESE,SESW,SWSE		117.50
T15N R3W	23	NENE,NESE,NESW,NWNE,NWSE,NWSW,SENE, SESE,SESW,SWNE,SWNW,SWSE,SWSW		513.79
T15N R3W	24	NENE,NENW,NESW,NWNE,NWNW,NWSW,SENW, SWNE,SWNW,SWSW		392.22
T15N R3W	26	NENE,NENW,NWNE,NWNW,NWSW,SENE,SWNE, SWNW		315.30
T15N R3W	27	SENE,SWNE		78.14
T15N R4W	13	SENE		39.96
T15N R6W	1	NESE,NESW,NWSE,NWSW,SENE,SENW,SESE, SESW,SWNE,SWNW,SWSE,SWSW	L1,L2,L3,L4	649.45
T15N R6W	2	SENE	L1	81.14
T15N R6W	32	NWSW		36.38
T15N R6W	33	NWSW,SENE		75.34
T15N R6W	34	SENW,SWNW		77.48
T16N R1W	5	SENE	L1,L2,L3	158.50
T16N R1W	17	NESE,NESW,NWSE,NWSW,SENE,SENW,SESE, SESW,SWNE,SWNW,SWSE,SWSW		472.08
T16N R1W	28	SWNW		38.56
T16N R1W	29	NESE,NESW,NWSE,NWSW,SENE,SENW,SESW, SWNE,SWNW,SWSW		393.48
T16N R1W	30	NESE,NWSE,SENE,SESE,SWNE	L4	234.2
T16N R1W	31	NENE,NESE,NWSE,SENE,SESE,SWNE,SWSE	L1,L2,L3,L4	427.86
T16N R1W	32	NESW,NWNW,NWSW,SENW,SESW,SWNW,SWSW		272.01
T16N R2W	13	NENW,NESW,NWNW,NWSW,SENW,SWNW		237.01
T16N R2W	14	NENE,NESE,NWNE,NWSE,SENE,SESE,SWNE,SWSE		311.45
T16N R2W	23	SESE		39.03
T16N R2W	25	NENW,NESE,NESW,NWNW,NWSE,NWSW,SENW, SESE,SESW,SWNW,SWSE,SWSW		478.16
T16N R2W	26	NENE,SENE		80.06
T16N R2W	30	SESE,SWSE		51.62
T16N R2W	31	NENE,NESE,NWNE,NWSE,SENE,SWNE	L6,L7	338.76
T16N R6W	35	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SESE,SWNE,SWNW,SWSE		553.07

Lands Available for Exchange (43 CFR 2200)				
Township	**Section**	**Aliquot**	**Lot/Tract**	**Acres**
T16N R6W	36	NENE,NENW,NESE,NESW,NWNE,NWNW,NWSE, NWSW,SENE,SENW,SESE,SESW,SWNE,SWNW, SWSE,SWSW		638.97
T17N R1W	1	NESE		40
T17N R1W	3	NESW,NWSW,SESW		114.53
T17N R1W	10	NENW,NESE,NWNE,NWSE,SESE,SWNE		233.02
T17N R1W	11	NESE,NWSE,SENE,SENW,SESE,SESW,SWNE, SWSE,SWSW		353.93
T17N R1W	13	NWNW		37.11
T17N R1W	14	NENE,NENW,NWNE,NWNW,SENE,SWNE		229.82
R17N R1W	31	NESW,SENW		78.03
R17N R1W	32	NESW,NWSE,SESE,SESW,SWSE		197.48
T17N R2E	12		L10	12.65
T17N R2W	2	NESW,NWSE,SENE,SESW,SWNE,SWSE	L1,L2,L3,L4	393.98
T17N R2W	3	NWSW,SESW,SWSW		117.75
T17N R2W	4	NESE,NESW,NWSE,SENE,SENW,SESE,SWNE	L1,L2,L3	400.53
T17N R2W	11	NENW,NESW,NWNE,NWSE,SENW,SESW,SWNE, SWSE		313.77
T17N R2W	13	NENE,NWSE,SENE,SESE,SWNE,SWSE		226.65
T17N R2W	14	NENW,NWNE,NWNW,NWSE,SENW,SWNE,SWNW		272.34
T17N R2W	24	NENE,NWNE,SENE,SWNE		153.53
T17N R5W	14		L2	38.32
T17N R5W	23	SESW		4.92
T17N R5W	27	NWNE		37.17
T17N R5W	28		L2	16.47
T17N R5W	32		L1	40.05
T18N R1W	30	NENE,NENW,NESW,NWNE,NWSE,SENE,SENW, SESW,SWNE	L1,L2,L3,L4	510.83
T18N R1W	31	NENW		38.06
T18N R2E	36		L11	38.19
T18N R2W	24	NESE,NWSE,SENE,SESE,SWNE,SWSE		235.06
T18N R2W	25	NENE,NESE,NWNE,SENE		160.86
T18N R2W	27	NESW,NWSW		80.11
T18N R2W	28	NENE,NENW,NESE,NWNE,NWNW,NWSW,SENE, SWNW,SWSW		357.17
T18N R2W	33	NWNW		39.78
T18N R2W	35	NESW,NWSW,SESE,SWSW		155.65
T18 N R4W	24	SWNW		7.27
T19N 4W	4	NESW,NWSW,SENW,SWNW	L3,L4,L5,L6	301.84
T19N 4W	5		L1,L2,L3,L4	144.60
T19N 4W	8		L1,L2,L3,L4	127.07
T19N 4W	9		L 2	1.36
T19N R4W	10	NWNW		39.76
T19N R4W	17		L1,L2,L4,L5	185.57
T19N R4W	20		L2,L4	58.44
T19N R4W	26	SESW,SWSE,SWSW		118.84
T19N R4W	34	NENE,NESE,SESE,SWSE		157.43
T19N R4W	35	NENW,NWNE,NWNW,NWSW,SESW,SWNW,SWSE, SWSW		315.93
T20N R4W	32		L1,L2	79.67
T20N R4W	33	SENW	L1,L2	112.01

Appendix J – Vegetation Resources

Fire (58% of annual disturbance):
Periodic fires were once a natural part of the evolution of sagebrush steppe vegetation. Over the past 150 years, changes to the fuel structure have changed the vegetation and the fire regime. The current fire return interval is too short in many areas now to support sagebrush-steppe vegetation, and maintains exotic annual grasses instead (Reisner et al. 2013). Exotic annual grasses, like cheatgrass, first began filling the vegetation voids created by other severe disturbances and then fires accelerated the invasion and magnified the problem. One major disturbance that initially opened habitat for invasive plants was the clearing of rangeland vegetation to cultivate WWI and WWII era wheat fields. When these farms were abandoned in the Snake River Plain after the wars ended, exotic species began filling the empty spaces. Another extensive disturbance, which began much earlier, during the Oregon Trail days, was from unregulated grazing that degraded the rangelands (Platt and Jackman 1946, Stark et al. 1946, Stewart and Hull 1949, Yensen 1981, Condon and Pyke 2018).

Disturbances to native perennial vegetation can provide habitat for exotic annual grasses to establish. Their presence can then propagates fires which leads to further expansion of exotic annual grasses. Exotic annual grasses, such as cheatgrass, then maintain control of these spaces by overwhelming the seed bank and usurping water resources. However, cheatgrass is not the first species to fill such voids. Exotic annual forbs (e.g. Russian thistle and tall tumble mustard) first colonize these voids, and then after a few years, cheatgrass displaces the annual forbs and can outcompetes most native seedlings. Fire then follows cheatgrass fuels into courser native vegetation (Stewart and Hull 1949, D'Antonio et al. 1999). These conditions lead to a self-perpetuating "grass/fire cycle" characterized by greatly reduced fire-free intervals, which promote further dominance and spread of invasive annual species (D'Antonio and Vitousek 1992). The annual grass-fire cycle results in changes to the resistance and resilience of plant communities (Chambers et al. 2014). Exotic annual grasses change the fire regime by filling interspaces between native perennial plants, senescing earlier than many native perennial bunchgrasses, changing the packing ratio, and providing contiguous swaths of dried, fine fuels. These factors can increase ignition rates and facilitate rapid fire spread (Whisenant 1990, Brooks et al. 2004).

Before the fuels and fire regimes were transformed by disturbances and invasions, throughout the west, Wyoming big sagebrush communities had a fire return interval of 171-347 years. Mountain big sagebrush maintains its historic 137-217 year fire return interval (Bukowski and Baker 2013). Today, the most highly transformed vegetation in the Four Rivers Field Office occurs north of I-84, between Glenns Ferry and Hammett, and this area burns every few years. Most areas in the field office do not burn that often, but exotic annual grasses are usually the primary fuel type for rapid fire spread and early season burning.

Grazing, browsing, and trampling (40% of annual disturbance):
Spring grazing: Severe or persistent grazing during the growing season tends to release unpalatable or invasive species and may transform plant communities (Ellison 1960, Mueggler 1975). Though palatable, exotic annual grasses, such as cheatgrass and medusahead, often overwhelm such areas, as described above. Conversely, grazing has not been shown to effectively control exotic annual grasses (Vallentine and Stevens 1992). A confounding aspect of attempting to control exotic annual grasses in the spring when mixed with desirable perennials, is that the timing of grazing overlaps the critical growth periods for perennials. Repeated critical-season grazing can be harmful or fatal to perennial bunchgrasses (Burkhardt and Sanders 2012). Utilization when bunchgrasses are withdrawing reserves from roots for growth, regrowth, or seed formation can retard growth for years or kill plants outright (Mueggler 1975, Miller et al 1986, Mack 1989, Anderson 1991, Brewer et al. 2007). However, early season grazing may enable regrowth before the critical boot stage (Burkhardt and Sanders 2012) when

the apical meristem is elevated (Mack and Thompson 1982, Anderson 1991). In the late spring through early summer, cattle seek out more succulent and palatable bunchgrasses, concentrating the impact on those plants (Murray and Klemmedson 1968).

In order to alleviate repeated critical season grazing, Burkhardt and Sanders (2012) noted that sheep should be herded to follow the green without doubling back on grazed vegetation. In contrast, back-to-back spring/fall sheep grazing in the upper Snake River Plain caused shrubs to increase while forbs and grasses decreased (Mueggler 1950). For cattle, Burkhardt and Sanders (2012) recommend rotating use in three or more pastures at the same elevation, so that no single pasture is grazed during two consecutive critical growing periods. In contrast, persistent heavy cattle grazing generally increases shrubs, decreases palatable grasses, and decreases biological soil crusts through crushing and pulverizing, eventually leading to exotic annual grass invasions and annual grass-fueled fires (Briske and Richards 1995, Condon and Pyke 2018). Sustainable spring grazing seems to depend on the avoidance of overstocking and removing livestock in time for the most palatable plants to regrow and reproduce. Plant phenology and growth rates are tied to weather, past disturbances, and species interactions. These complex relationships are still poorly understood. Therefore, determining the carrying capacity and timing for benign spring grazing is difficult to apply consistently across years.

Sustainable pre- and post-fire grazing examples: Rose et al. (1994) compared vegetation inside and outside of livestock exclosures constructed to rest overgrazed areas consisting of Wyoming big sagebrush with an understory of Sandberg bluegrass. After 57 years, exclosures contained more biological soil crust and sagebrush. Areas outside the exclosures that received 30-40% utilization under rest-rotation had more annual forbs and rabbitbrush than the exclosures. Cheatgrass was an equal and minor component both inside and outside the exclosures. After a two-year rest from grazing, the areas were burned and moderate grazing continued outside the exclosures. Before the prescribed fire, herbaceous litter in the exclosures was double that of the grazed areas and herbaceous vegetation was 13% higher inside the exclosures. Pre-fire grazing reduced pre-burn fuel loads, which likely reduced fire intensity.

Davies et al. (2016) then compared the 19th-22nd year post-fire response in the grazed and un-grazed areas. They found that both areas still had low cheatgrass cover (2% in the grazed area and 4% in the un-grazed), but biological soil crust cover was now greater in the grazed area and the biomass of large perennial bunchgrasses was 47% higher in the grazed area. Another study found that post-fire grazing can safely resume the year after a low intensity burn in a relatively intact state without damaging perennial vegetation (Bates et al. 2009). In summary, moderate grazing and prescribed burning can be compatible with the long-term retention of native perennial vegetation, at least in areas without a major exotic annual grass component. In the absence of dense annual grass, long-term exclusion of livestock can result in greater biological soil crust cover and fewer exotic annual forbs. Fire intensity seems to be the overriding factor affecting survival and post-fire recovery of biological soil crusts and perennial bunchgrasses. While dormant season grazing has the lowest impact on perennial bunchgrasses, hoof action from dormant season grazing can increase the damage to biological soil crusts in dry conditions (Belnap and Gillette 1998). Land management practices that maintain perennial bunchgrasses and biological soil crusts can help protect against the annual grass-fire cycle.

Vulnerabilities and compounding stressors: Grazing during a drought increases the risk of damaging perennial plants and opening habitat for invasives. During a drought, the phenological cycle is compressed, overall growth is retarded, and energy reserves are reduced, exacerbating a plant's vulnerability to damage from livestock grazing. Loeser et al. (2007) conducted an eight-year experiment that tracked the effects of two treatments; a) high intensity/low duration/low frequency grazing (200 cow/calf pairs for 12 hours per year in 2.5 acre enclosures), and b) grazing exclusion, to c) moderate grazing control. The control was a continuation of the grazing practice that occurred over the entire study area prior to the experiment (50% utilization in a rest-rotation). Native cover did not vary

between the exclosures and moderately grazed controls. Both varied annually with precipitation. By comparison, high impact grazing caused a decline in native cover most years and was more pronounced during drought. Initially, the areas chosen for exclosures contained three times more cheatgrass cover than the high impact and control (15% vs. 5% cover). Non-native cover remained higher in the exclosures than the control and the difference between the two did not widen. In contrast, non-native cover increased with the high intensity grazing treatment, especially after the drought decreased native cover. Interestingly, cheatgrass frequency increased by about the same amount in both the exclosures and the intensively grazed enclosures, relative to the moderately grazed controls. After the drought; however, cheatgrass frequency increased dramatically in the high intensity grazing enclosures only. In summary, the study demonstrated that cumulative stressors of intensive use and drought caused rapid changes in the plant community, but grazing exclusion after long-term moderate use did not cause a rapid improvement. Furthermore, removing moderate grazing resulted in an increase in cheatgrass frequency, but because perennials were not adversely impacted by cattle removal, this did not translate to an increase in cheatgrass cover. Cumulative stressors tend to drive rapid degradation.

Grazing soon after high severity burning and post-fire seeding is another cumulative stressor. The stress on vegetation is amplified under these conditions; because, young perennial plants with shallow roots and small crowns are more vulnerable to overgrazing and uprooting than well-established plants.

Restoration and prevention other than forestry (1.4% of annual disturbance):
Herbicide, drilling, mowing, planting, tumbleweed burning. Fragmentation cause and cure. Weeds.

Logging and forestry projects for forest health (0.1% of annual disturbance):
Thinning, harvest, firewood.

Rights of way (0.1% of annual disturbance):
Temporary vs permanent ground disturbance and vegetation removal.

New mineral extraction and new road construction (0.003% of annual disturbance): Pits and soil removal.

OHVs (disturbance area unknown):
Crushing, breaking, compaction, and channeling water.

Long Term Cumulative Impacts: Shifts would eventually occur in all vegetation types (as per Whitlock et al. 2003). It is impossible to know how soon this would happen, but it would enable shrub-steppe revegetation activities to occupy more mesic areas which are currently forests and woodlands. Areas along ecotone boundaries would likely be subjected to larger and more aggressive fuel reduction treatments to try to resist the change, causing intense localized disturbance along these plant community boundaries, but also delaying transformations. This may also result in cheatgrass and medusahead shifting upslope, while species such as red brome[1] (*Bromus madritensis* subsp. *rubens*) may begin occupying the drier sites, as it is known to occur just outside the PA. Larger, more aggressive species, such as ripgut brome[2] (*Bromus diandrus*), wild oats[3] (*Avena fatua*), and foxtail barley[4] (*Hordeum murinum*) would likely colonize the seasonally moist low-elevation uplands as the growing season lengthens. Riparian and wetland species would also shift up in elevation. As stream-flows decrease and fires increase, due to less snowpack, obligate wet species would be replaced by facultative wet and upland species, including escaped agricultural and horticultural plants.

Literature cited:

Anderson, L.D. 1991. Bluebunch wheatgrass defoliation effects and recovery a review. BLM Tech Bull. 91-2.

Bates, J.D., E.C. Rhodes, K.W. Davies and R. Sharp. 2009. Postfire succession in big sagebrush steppe with livestock grazing. Rangeland Ecology & Management, 62(1), 98-110.

Belnap, J. and D.A. Gillette. 1998. Vulnerability of desert biological soil crusts to wind erosion: the influences of crust development, soil texture, and disturbance. Journal of arid environments, 39(2), 133-142.

Beschta, R.L., D.L. Donahue, D.A. DellaSala, J.J. Rhodes, J.R. Karr, M.H. O'Brien, T.L. Fleischner, and C.D. Williams. 2013. Adapting to climate change on western public lands: addressing the ecological effects of domestic, wild, and feral ungulates. Environmental Management, 51(2), 474-491.

Brewer, T.K., J.C. Mosley, D.E. Lucas, and L.R. Schmidt. 2007. Bluebunch wheatgrass response to spring defoliation on foothill rangeland. Rangeland Ecology & Management, 60(5), 498-507.

Briske, D.D. and J.H. Richards. 1995. Plant responses to defoliation: a physiological, morphological and demographic evaluation. Wildland plants: physiological ecology and developmental morphology, 635-710.

BLM 2015; National Seed Strategy

Brooks, M.L., C.M. D'antonio, D.M. Richardson, J.B. Grace, J.E. Keeley, J.M. DiTomaso, R.J. Hobbs, M. Pellant, and D. Pyke. 2004. Effects of invasive alien plants on fire regimes. BioScience, 54(7), 677-688.

Bukowski, B. E., & Baker, W. L. 2013. Historical fire regimes, reconstructed from land-survey data, led to complexity and fluctuation in sagebrush landscapes. Ecological applications, 23(3), 546-564.

Burkhardt, J.W. and K. Sanders. 2012. Management of growing-season grazing in the sagebrush steppe: a science review of management tools appropriate for managing early-growing-season grazing. Rangelands, 34(5), 30-35.

Chambers, J.C., B.A.Bradley, C.S. Brown, C. D'Antonio, M.J. Germino, J.B. Grace, S.P. Hardegree, R.F. Miller, and D.A. Pyke. 2014. Resilience to stress and disturbance, and resistance to *Bromus tectorum* L. invasion in cold desert shrublands of western North America. Ecosystems, 17(2), 360-375.

Condon, L.A. and D.A. Pyke. 2018. Fire and grazing influence site resistance to Bromus tectorum through their effects on shrub, bunchgrass and biocrust communities in the Great Basin (USA). Ecosystems, 1-16.

D'Antonio, C.M., T.L. Dudley, and M. Mack. 1999. Disturbance and biological invasions: Direct effects and feedbacks. Pages. 143-452. in Walker L, ed. Ecosystems of Disturbed Ground. Amsterdam: Elsevier.

D'Antonio, C. M., and P. M. Vitousek. 1992. Biological Invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23, 63–87.

Davies, K.W., J.D. Bates, C.S. Boyd and T.J. Svejcar. 2016. Prefire grazing by cattle increases postfire resistance to exotic annual grass (*Bromus tectorum*) invasion and dominance for decades. Ecology and evolution, 6(10), 3356-3366.

Ellison, L., 1960. Influence of grazing on plant succession of rangelands. The Botanical Review, 26(1), 1-78.

Loeser, M.R., T.D. Sisk and T.E. Crews. 2007. Impact of grazing intensity during drought in an Arizona grassland. Conservation Biology, 21(1), 87-97.

Mack, R.N. 1989. Temperate grasslands vulnerable to plant invasions: characteristics and consequences in Drake, J.A., H.A. Mooney, F. Di Castri, R.H. Groves, F.J. Kruger, and M. Williamson. Biological invasions: a global perspective.

Mack, R. N. and J.N. Thompson. 1982. Evolution in steppe with few large, hooved mammals. The American Naturalist, 119(6), 757-773.

Miller, R. F., J.M. Seufert, and M.R. Haferkamp. 1986. The ecology and management of bluebunch wheatgrass (*Agropyron spicatum*): A review. Station bulletin/Oregon State University. Agricultural Experiment Station (USA).

Mueggler, W.F. 1950. Effects of spring and fall grazing by sheep on vegetation of the Upper Snake River Plains. Journal of Range Management, 3(4), 308-315.

Mueggler, W.F. 1975. Rate and pattern of vigor recovery in Idaho fescue and bluebunch wheatgrass. Journal of Range Management, 198-204.

Murray, R. B. and J.O. Klemmedson. 1968. Cheatgrass range in southern Idaho: seasonal cattle gains and grazing capacities. Journal of Range Management, 308-313.

Platt, K., & Jackman, E. R. (1946). The cheatgrass problem in Oregon. Extension Bulletin 668, Oregon State College, Corvallis, OR.

Pyke, D. A., D.S. Pilliod, J.C. Chambers, M.L. Brooks, and J. Grace. 2013. Fire rehabilitation effectiveness: a chronosequence approach for the Great Basin. Final report for the Joint Fire Science Program.

Reisner, M. D., J. B. Grace, D. A. Pyke, and P. S. Doescher. 2013. Conditions favoring *Bromus tectorum* dominance of endangered sagebrush steppe ecosystems. Journal of Applied Ecology 50, 1039–1049.

Rose, J.A., R.F. Miller and T. Svejcar. 1994. Vegetation and livestock exclusion in the sagebrush steppe. Management of Great Basin rangelands. OR State Univ., Agric. Exp. Sta. Special Rep, 935, 53-59.

Scott, J. H. and R.E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Stark, R. H., J. L. Toevs and A.L. Hafenrichter. 1946. Grasses and cultural methods for reseeding abandoned farm lands in southern Idaho. Bulletin No 267, University of Idaho, Moscow, ID.

Stewart, G. and A.C. Hull. 1949. Cheatgrass (Bromus tectorum L.)--an ecologic intruder in southern Idaho. Ecology, 30(1), 58-74.

Vallentine, J. F. and A.R. Stevens. 1994 . Use of livestock to control cheatgrass-a review. Proceedings–Ecology and Management of Annual Rangelands'.(Eds SB Monsen, SG Kitchen) USDA Forest Service, Intermountain Research Station, General Technical Report INT-313, 202-206.

Whisenant, S.G. 1990. Changing fire frequencies on Idaho's Snake River Plains: ecological and management implications. In McArthur, E. Durant; Romney, Evan M.; Smith, Stanley D (1990): 5-7.

Whitlock, C., S.L. Shafer, and J. Marlon. 2003. The role of climate and vegetation change in shaping past and future fire regimes in the northwestern US and the implications for ecosystem management. Forest Ecology and Management, 178(1-2), 5-21.

Yensen, D.L. 1981. The 1900 invasion of alien plants into southern Idaho. The Great Basin Naturalist, 176-183.

[1] Red brome occurs at Bigfoot Butte in Ada County, Idaho and in Huntington, Oregon. This species forms near monocultures in burned areas near Joshua Tree N.M. in Southern California.
[2] Ripgut brome occurs in Boise and Riggins, Idaho, where higher winter temperatures extend the growing season. This species is one of the dominant exotic annuals in the western central Sierra Nevada foothills, below the elevations where cheatgrass occurs.
[3] Wild oats occur in Cambridge and Twin Falls, Idaho, and co-dominate exotic annual grasslands with ripgut brome in the California central valley and foothills.
[4] Foxtail barley occurs in Boise, Nampa, and Riggins, Idaho and is common in low elevation exotic grasslands in California's Central Valley.

Appendix K - Special Status Wildlife

National policy instructs BLM State Directors to designate sensitive species in cooperation with state fish and wildlife agencies (BLM 2009a). Idaho designations are used for species that occur on BLM land and for which BLM has the capability to affect conservation status through management. BLM policy for special status species is to conserve federally listed, proposed, candidate, and bureau designated sensitive species. The BLM also cooperates with the State of Idaho in designating sensitive species, some of which may be recognized by the State as "Species of Greatest Conservation Need." This ensures that the actions authorized by BLM are consistent with the conservation of such species and do not contribute to the need to list any special status species under provisions of the ESA, or designate additional sensitive species under State policy.

Table K-1. Idaho BLM Special Status Animals in the Planning Area

Common Name	Scientific Name	BLM Status	Habitat
Mammals			
Bighorn Sheep	*Ovis canadensis*	Type 2	Canyon/Cliff/Rock
Coast Mole	*Scapanus orarius scheffer*	Type 2	Semi-desert
Northern Idaho ground squirrel[c]	*Spermophilus brunneus*	Type 1: Threatened	Forest (montane meadows)
Southern Idaho ground squirrel[c]	*Spermophilus endemicus*	Type 2	Semi-desert grassland
Piute Ground Squirrel	*Urocitellus mollis*	Type 2	Semi-desert
Wolverine[c]	*Gulo gulo luscus*	Type 2	Forest
Gray wolf	*Canus lupus*	Type 2	Forest, Semi-desert grassland and shrub
Pygmy rabbit[c]	*Brachylagus idahoensis*	Type 2	Semi-desert shrub
Fisher[c]	*Martes pennanti*	Type 2	Forest
Big Brown Bat	*Eptesicus fuscous*	Type 2	Canyon/Cliff/Rock
Canyon Bat	*Prastrellus hesperus*	Type 2	Canyon/Cliff/Rock
Fringed myotis[c]	*Myotis thysanodes*	Type 2	Canyon/Cliff/Rock, Semi-desert shrub
Hoary Bat	*Lasiurus cinerus*	Type 2	Canyon/Cliff/Rock
Little Brown Bat	*Myotis lucifugus*	Type 2	Canyon/Cliff/Rock
Long-eared Myotis	*Myotis evotis*	Type 2	Semi-desert
Long-legged Myotis	*Myotis Volans*	Type 2	Semi-desert
Spotted bat[c]	*Euderma maculatum*	Type 2	Canyon/Cliff/Rock
Silver-haired bat	*Lasionycteris noctivagans*	Type 2	Semi-desert
Pallid Bat	*Antrozous pallidus*	Type 2	Canyon/Cliff/Rock
Townsend's big-eared bat[c]	*Corynorhinus townsendii*	Type 2	Canyon/Cliff/Rock
Western Small-footed Myotis	*Myotis ciliolabrum*	Type 2	Semi-desert
Yuma Myotis	*Myotis yumanensis*	Type 2	Semi-desert shrub
Birds			
Greater sage-grouse	*Centrocercus urophasianus*	Type 2	Semi-desert shrub
Yellow-billed cuckoo	*Coccyzus americanus*	Type 1: Threatened	Riparian, Deciduous woodland
Bald eagle[c]	*Haliaeetus leucocephalus*	Type 2	Riparian
Black Tern	*Chlidonias niger*	Type 2	Riparian
Brewer's sparrow[c]	*Spizella breweri*	Type 2	Semi-desert shrub
Burrowing Owl	*Athene cunicularia*	Type 2	Semi-desert shrub
Cassin's Finch	*Carpodacus cassinii*	Type 2	Semi-desert shrub
Columbian sharp-tailed grouse[c]	*Tympanuchus phasianellus columbianus*	Type 2	Semi-desert shrub
Ferruginous hawk[c]	*Buteo regalis*	Type 2	Semi-desert shrub
Flammulated owl[c]	*Otus flammeolus*	Type 2	Forest

Common Name	Scientific Name	BLM Status	Habitat
Grasshopper Sparrow	*Ammondramus savannarum*	Type 2	Semi-desert shrub
Green-tailed Towhee	*Pipilo chlorurus*	Type 2	Semi-desert grassland
Golden Eagle	*Aquila chrysaetos*	Type 2	Canyon/Cliff/Rock
Lewis' woodpecker[c]	*Melanerpes lewis*	Type 2	Forest
Long-billed Curlew	*Numenius americanus*	Type 2	Semi-desert grassland
Loggerhead shrike	*Lanius ludovicianus*	Type 2	Semi-desert shrub
Mountain quail[c]	*Oreortyx pictus*	Type 2	Riparian
Northern goshawk	*Accipiter gentilis*	Type 2	Forest
Olive-sided flycatcher	*Contopus cooperi*	Type 2	Forest
Short-eared Owl	*Asio flammeus*	Type 2	Forest
Sage Thrasher	*Oreoscoptes montanus*	Type 2	Semi-desert shrub
Sagebrush sparrow	*Amphispiza belli*	Type 2	Semi-desert shrub
Willow flycatcher	*Empidonax traillii*	Type 2	Riparian, Semi-desert grassland
Black-throated sparrow	*Amphispiza bilineata*	Type 2	Semi-desert shrub
White-headed woodpecker[c]	*Picoides albolarvatus*	Type 2	Forest
Amphibians and Reptiles			
Northern leopard frog[c]	*Lithobates pipiens*	Type 2	Riparian
Idaho giant salamander[c]	*Dicamptodon aterrimus*	Type 2	Riparian
Long-nosed snake[c]	*Rhinocheilus lecontei*	Type 2	Semi-desert shrub
Great Basin black-collard lizard[c]	*Crotaphytus bicinctores*	Type 2	Canyon/Cliff/Rock
Ground snake	*Sonora semiannulata*	Type 2	Canyon/Cliff/Rock
Western/Boreal Toad	*Anaxyrus boreaus*	Type 2	Riparian
Woodhouse's toad[c]	*Anaxyraus woodhousi*	Type 2	Semi-desert grassland
Fish			
Bull trout[c]	*Salvelinus confluentus*	Type 1: Threatened	Riparian
Redband trout[c]	*Oncorhynchus mykiss gairdneri*	Type 2	Riparian
White sturgeon[c]	*Acipenser transmontanus*	Type 2	Riparian
Invertebrates			
Ashley Pebblesnail	*Fluminicola fuscus*	Type 2	Semi-desert grasslands
Bliss Rapids snail[c]	*Taylorconcha serpenticola*	Type 1: Threatened	Riparian
California Floater	*Anodonta californiensis*	Type 2	Riparian
Snake River physa	*Physa natricina*	Type 1: Endangered	Riparian

[c]Identified as a Species of Greatest Conservation Need in the Idaho State Wildlife Action Plan (IDFG 2017a)

Life History and Status of Special Status Wildlife in the Planning Area

Southern Idaho Ground Squirrel

Current information indicates the southern Idaho ground squirrel populations have been declining across their range since 1985. The USFWS determined the species was a candidate for listing under the ESA in 2001. Since the majority of known occupied locations occur on private land a Candidate Conservation Agreement with Assurances (IDFG 2005b) was developed with landowners and the BLM to conserve the species and avoid the need for ESA listing. In 2015 southern Idaho ground squirrels were removed from the ESA candidate species list. Zoo Boise and the College of Idaho have been working together to trap southern Idaho ground squirrels from ranches and golf courses where they are often considered a nuisance and release them near Horseshoe Bend, and possibly at other future locations in the PA in an effort to increase population distribution.

Northern and southern Idaho ground squirrels are both endemic to Idaho. While the northern Idaho ground squirrel inhabits higher elevation deserts and open ponderosa pine forest, the southern species is found in lower elevation dessert plant communities dominated by big sagebrush, bitterbrush, native forbs, and bunchgrasses. The advent of annual grasses and associated increased fire frequency has

caused much of their historical habitat to be converted to annual grasslands scattered with relic big sagebrush and bunchgrasses. Yensen (1981) suggested that these animals prefer areas with a high percentage of native cover types, especially big sagebrush to provide for their high nutritional needs for a long hibernation, often from July through February. The species prefers the rich bottom land soil that is usually developed by farmers. Anthropogenic features such as alfalfa fields, haystacks or fence lines may account for their persistence in areas now dominated by annual grasses and agricultural development.

Recent surveys and information collected through several years of research indicate the primary southern Idaho ground squirrel habitat in the PA extends from Emmett northwest to Henley Basin and Indian Valley (USFWS 2008b). Currently, the species distribution is patchy throughout Gem, Payette and Washington Counties, with areas of localized abundance and large areas of apparently suitable habitat that is unoccupied, or sparsely occupied. As of 2005, there were over 500 documented observations of the species within the PA, of which nearly half occurred on BLM-managed lands (Holderman 2005).

Wolverine

In December 2010, the USFWS announced that the contiguous U.S. population of wolverines are a distinct population segment and listing was warranted, but precluded by higher priority actions (75 FR 78030). The species was designated as a candidate for listing at that time. In 2013, wolverines were again proposed for listing as threatened (78 FR 65248–65249), and then withdrawn in 2014 (79 FR 47521–47545).

In Idaho, wolverines (*Gulo gulo luscus*) primarily occur in high elevation alpine habitats that receive enough winter precipitation to reliably maintain snow levels required for denning into the warmer season of late April to early May (75 FR 78031). These habitats occur on lands managed by the USFS within the PA. Due to lack of snow, cover, and preferred prey wolverines are a rare visitor to public lands in the PA. Based on occupied habitat, it is estimated that the wolverine population in the United States is roughly 250 to 300 individuals. Climate change may render remaining wolverine habitat smaller and more fragmented in the future (McKelvey et al. 2011).

Gray Wolf

In 1973, gray wolves were listed under the ESA and protected as an endangered species in the continental United States. The USFWS created a recovery plan for the species and developed an EIS for the reintroduction of gray wolves designating central Idaho and Yellowstone National Park as recovery areas in 1994. In 1995, 35 gray wolves were reintroduced into central Idaho by the USFWS. At that time they were considered a non-essential experimental population, a lesser protective classification under Section 10(j) of the ESA. By the end of 2002, the requirements for wolf recovery had been met in Idaho, Montana, and Wyoming.

The Idaho wolf population has expanded in numbers since initial reintroductions with a 2011 population estimate of 746 wolves (IDFG and Nez Perce Tribe 2012). A Final Rule was posted by the USFWS that announced the removal of the gray wolves from the list of endangered and threatened wildlife in Idaho and Montana, as well as portions of eastern Oregon, eastern Washington, and north-central Utah (USFWS 2011c). Currently, gray wolves in the PA are no longer subject to the ESA provisions of experimental population regulations, but remain a BLM Type 2 sensitive species. Generally species that are removed from listing are classified as BLM sensitive for a minimum of 5 years following delisting while they are monitored by the USFWS.

The USFWS continues to monitor wolves in the western United States even though the 5 year plan for delisting the species has expired. Idaho Department of Fish and Game is currently managing wolf populations under its 2002 Wolf Conservation and Management Plan. Findings of the 2017 Idaho Wolf Monitoring Progress Report show that wolf numbers in Idaho have stabilized to between 684 and 786 based on estimates from 2010 – 2015. Thirty wolf packs were documented in the PA in 2009 including

parts of the Boise and Payette National Forest. In 2009, a controlled hunt was established for the species with about 20 wolves killed in the PA outside of USFS-managed lands annually. The number of wolves hunted, or killed for depredation purposes, was 40 in 2017.

Bald Eagle

This species is still considered a Sensitive Species by BLM, and remains protected under the Bald and Golden Eagle Protection Act of 1962, and the Migratory Bird Treaty Act of 1972.

Bald eagles occupy riparian and lacustrine habitat almost exclusively during the breeding season but occasionally use upland areas for foraging and roosting sites. They require large open areas for foraging, such as lakes, rivers, shorelines, and gravel bars. Fish are the primary food source during the breeding season, although they will also eat waterfowl, upland birds, small mammals, and carrion. Foraging areas are enhanced by the presence of nesting, perching, and roosting trees. Territory size and configuration are influenced by a variety of habitat characteristics, including availability and location of perch trees for foraging, quality of foraging habitat, and distance of nests from waters supporting adequate food supplies. Bald eagle winter range usually includes areas of open water, such as lakes or major river systems.

The North Fork Payette River drainage, including Cascade Reservoir, contains a significant concentration of nesting bald eagles (Sallabanks 2006). These areas occur primarily on Forest Service, private and Bureau of Reclamation land in the Planning Area. Use of public lands by wintering and nesting bald eagles occurs along the South Fork of the Boise River and along the Snake River through several reservoirs from CJ Strike west to Hells Canyon. Nesting eagles have been documented at Crane Creek Reservoir and Hells Canyon.

Greater Sage-grouse

Greater sage-grouse (hereafter "sage-grouse") are a BLM sensitive species that represents sagebrush-obligate wildlife throughout the desert plant communities of the PA. Sage-grouse use upland sagebrush for breeding and winter habitat, and riparian areas for brood rearing. Once abundant throughout sagebrush habitats in the western U.S., the number of sage-grouse has continued to decline across their range, although population trends appear to have stabilized in recent years. Reasons for declines in sage-grouse numbers and distribution differ across the range, but loss, degradation, and fragmentation of sagebrush habitats are the overall causes (Knick and Connelly 2011).

Annual home range size varies (from 4 to 615 km_2). Sage-grouse populations may be either migratory or non-migratory. Average movements between seasonal ranges are generally between 32 km and 10 km, with distances varying between sex of individuals and locations of populations (Connelly et al. 2011) with recorded migratory movements exceeding 75 km (Connelly et al. 2000). Sage-grouse have high fidelity to seasonal habitats; males are known to return to their display sites (leks) each year and females commonly return to the same nesting areas. The large home range size, seasonal habitat needs, and site fidelity contribute to their need for large, undisturbed tracts of sagebrush over the landscape to maintain population size and distribution.

Habitat for the sage-grouse consists of breeding, summer or late brood-rearing, autumn, and winter habitats. Breeding habitat includes areas where lek attendance, nesting, and early brood-rearing occur (Connelly et al. 2011b). Leks are breeding display sites where males congregate in spring in an open area in or adjacent to sagebrush-dominated habitats, often near nesting habitats. Leks are considered "occupied" when they have been "active" during at least one of the past five breeding seasons, "unoccupied" if they have not been active during at least one of the past five breeding seasons, and are "undetermined" status when there is insufficient information to designate it as inactive (IDFG 2011). Structural diversity of sagebrush is important, with most nests located under sagebrush plants that provide overhead cover, with 15 percent to 25 percent canopy cover preferred (Connelly et al. 2000). Early brood-rearing areas ranged from 0.2 to 5.0 km from the nest and often includes riparian areas.

Riparian meadows, springs, and streams produce the forbs and insects necessary for juvenile birds. Summer or late brood-rearing habitats have less sagebrush canopy cover compared to nesting habitat and a higher proportion of grasses and forbs in the understory.

Autumn is a transitional period for sage-grouse when their diets change from a variety of forbs, insects, and sagebrush, to predominantly sagebrush. Autumn habitats vary widely, and in addition to sagebrush, may include mountain upland meadows, riparian areas, greasewood bottoms, alfalfa fields, and irrigated hay pastures (Connelly et al. 2011b). During the winter, sage-grouse feed almost exclusively on sagebrush leaves and buds, so exposure above the snow with 10 to 30 percent canopy cover is suggested (Connelly et al. 2000).

The PA is within the Great Basin Sage-Grouse planning region. The USFWS has identified a number of threats to sage-grouse in this region, the major ones being wildfire, loss of native habitat to invasive species, and habitat fragmentation (BLM and USFS 2013). Additionally, the PA is within Management Zone IV – the Snake River Plain, which is one of seven sage-grouse management zones that the Western Association of Fish and Wildlife Agencies (WAFWA) delineated based on ecological and biological attributes (Stiver et al. 2006). From 1965 – 2007, Management Zone IV had a 54 percent decrease in male lek attendance, and is considered to be in a long-term population decline (Garton et al. 2011; Connelly et al. 2004).

Sage-grouse were petitioned for listing under the ESA and in a 2010 finding, the USFWS determined that listing of the species was "warranted, but precluded." The USFWS identified primary threats to the species as loss of native habitat from wildfire, expansion of invasive species and development. The decision to preclude sage-grouse from listing was based in large part on a collaborative effort between state and federal agencies, private landowners and other stakeholders to respond to the identified threats to sage-grouse habitat across the west.

In 2015, BLM completed a targeted, multi-tiered, coordinated and collaborative landscape-level management strategy for sage-grouse in coordination with the US Forest Service. The ROD for the 2015 BLM National Greater Sage-Grouse Conservation Strategy and ARMPAs for the Great Basin Region including the Greater Sage-Grouse Sub-Regions of Idaho and Southwestern Montana, Nevada and Northeastern California, Oregon, and Utah (BLM 2015a) were published in September 2015. The ARMPAs provide protective land use allocations in habitat management areas to avoid and minimize additional disturbance in sage-grouse habitat management areas. The ARMPAs include a suite of management actions, such as establishing disturbance limits, habitat objectives, mitigation requirements, monitoring protocols, and adaptive management triggers and responses. With the publication of the ROD for this strategy and the ARMPAs, the USFWS determined in September 2015 that listing of the sage-grouse was not warranted (80 FR 59858-59942).

The ARMPA addresses threats to sage-grouse and its habitat by establishing objectives, management decisions, buffers, and required design features to protect sage-grouse habitat. The document identified sage-grouse habitat management areas within Greater Sage-Grouse Conservation Areas (CA). The Mountain Valleys CA and the Idaho Desert CA both fall within the PA.

The PA contains year-around habitat for two identified sage-grouse populations: the North Side Snake Population (NSSP) and the Weiser Population (WP) (Connelly et al. 2004; BLM and USFS 2013). The NSSP is a large population on the north side of Snake River occurring partly within the PA. The WP is completely within the PA and is considered a relatively isolated population with the mountains to the north and east, the Snake River to the west and several small cities along the I-84 corridor to the south. Recently, some connection with the Baker population in Oregon has been documented across the Snake River.

Biologically significant units (BSUs) have been designated in the Idaho and Southwestern Montana Greater Sage-grouse ARMPA. BSUs are geographical/spatial areas within sage-grouse habitat that

contains relevant and important habitats. BSU extents are used as the basis for comparative calculations to support evaluation of changes to habitat. Two BSUs, the Idaho Desert Conservation Area and the Idaho Mountain Valleys Conservation Area, occur within the PA.

Within each Conservation Area, sage-grouse habitat consists of lands designated as Priority Management Areas (PHMA), Important Habitat Management Areas (IHMA), and General Habitat Management Areas (GHMA). PHMA have the greatest value for providing intact sage-grouse habitat. IHMA encompass areas of high conservation value habitat, and GHMA are areas of occupied seasonal or year-round habitat outside of PHMA or IHMA where some special management would apply to sustain sage-grouse populations. Currently there are no PHMAs in the PA.

In March 2019, BLM issued an Amendment to the ARMPA that refined some of the decisions from the 2015 planning effort related to Greater Sage-Grouse habitat management and left in place the majority of the decisions.

In addition to the ARMPAs, several conservation plans and technical references are available to inform the conservation and management of sage-grouse habitats including the Conservation Plan for the Greater Sage-grouse in Idaho (ISAC 2006), Idaho Sage-grouse Management Plan (IDFG 1997), West-central Idaho Local Sage-grouse Working Group and Candidate Conservation Agreement with Assurances (NNRG 2010), Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats (Connelly et al. 2004), and BLM National Sage-grouse Conservation Strategy (WO IM 2012–044). Management actions and required design features outlined in the text and appendices of this document incorporate the management objectives, adaptive management strategies, anthropogenic disturbance caps, monitoring requirements, and resource-specific management measures from the ARMPA for Idaho and Southwestern Montana relevant to the PA.

Redband Trout

Redband trout are found in a range of stream habitats including desert areas in southwestern Idaho. They prefer cool streams with temperatures less than 70° F.; however, they can survive daily cyclic temperatures up to 80° F. for a short period of time (IDFG 2005a). Spawning depends on temperature and location, but typically takes place between February and June. Their diet consists of invertebrates, both terrestrial and aquatic and other fish.

In 2005 BLM began a systematic survey to determine redband trout presence, in combination with performing PFC field assessments on individual stream reaches. The summary data showed that redband trout were present in 176 miles of stream in the PA. Functioning condition of redband trout occupied streams reach was 73% proper functioning condition (PFC), and 27% functional-at risk condition (FAR).

Populations of redband trout in Idaho are managed by IDFG. A range-wide status assessment for redband trout is currently being undertaken (May et al. 2012). Oregon Department of Fish and Wildlife has taken the lead on this assessment with support from USFS, BLM, tribes, and other state and wildlife agencies. A redband trout conservation agreement and strategy will be developed after the completion of the range-wide status assessment.

The BLM is required to identify essential fish habitat (EFH) for federally managed species and consult with the National Oceanic and Atmospheric Administration (NOAA) - Fisheries Service on any action that may impact EFH. Essential fish habitat is defined as waters and substrates necessary for spawning, feeding, breeding or growth to maturity (Magnuson-Stevens Act 1976). For Chinook salmon (*Oncorhynchus tshawytscha*), EFH has been designated in the Little Salmon River sub-basin of the PA, which contains less than 1,000 acres of public land. These scattered BLM parcels are not located along perennial streams, and no existing or proposed management actions would affect these lands or the designated EFH.

Appendix L - Special Status Plants

Special status plants (SSP) include all vascular and non-vascular plants and lichens that are ESA-listed threatened or endangered species, species proposed for or candidates for listing, and sensitive species designated by the BLM State Director (BLM 2011b). The BLM manages SSP under the policy established in BLM Manual 6840 (BLM 2009a), in addition to requirements set forth under the ESA. National policy directs State Directors to designate BLM sensitive species in cooperation with state fish and wildlife agencies (BLM 2009a). The Idaho BLM State Office updated their SSP designations in 2014. The sensitive species designation is normally used for species that occur on public lands for which the BLM has the capability to affect the conservation status of the species through management. Based upon numerous criteria, such as risk of extinction, population size, distribution, and trend, SSP are assigned a 'Type' number.

Type 1 species are those that are listed as threatened, endangered, or candidates under the ESA; Type 2 species are those that are range-wide or globally imperiled with a high risk of endangerment; Type 3 species are range-wide or globally imperiled species with a moderate risk of endangerment; Type 4 species are species of concern, including species that are generally rare in Idaho with currently low endangerment threats (BLM 2011b). SSP occurrences are referred to as an element occurrence (EO). An EO is defined as "an area of land and/or water in which a species or natural community is, or was, present" (NatureServe 2002).

BLM Special Status Plant Species Known to Occur on Public Lands within the Planning Area

Scientific Name	Common Name	BLM Status	General Habitat Description
Allium aaseae	Aase's onion	Type 2	Coarse sandy soil, most commonly on steep southerly exposures, on or near ridgetops in sagebrush communities often with three-awn grass and bitterbrush, from 2,620-4,940 feet.
Allium tolmiei var. *persimile*	Tolmie's onion	Type 4	Rocky, gravelly or clay soils; from 2,300-2,620 feet.
Astragalus atratus var. *inseptus*	Mourning milkvetch	Type 4	Thin soil of stony basalt flats with spring moisture, in sagebrush/grass communities, below 4,920 feet.
Astragalus cusickii var. *packardiae*	Packard's milkvetch	Type 2	Sparsely vegetated, light colored soils, associated with Wyoming big sagebrush, about 2,790 feet.
Astragalus mulfordiae	Mulford's milkvetch	Type 2	Mostly south-facing sandy slopes and ridges; with needle-and-thread grass, Indian ricegrass, and bitterbrush, from 2,130-3,530 feet.
Astragalus purshii var. *ophiogenes*	Snake River milkvetch	Type 4	Barren sites with big sagebrush, Indian ricegrass, needle-and-thread grass, and four-wing saltbush; 2,300-3,530 feet.
Camassia cusickii	Cusick's camas	Type 4	Steep moist slopes and terraces of spring fed areas or slow moving water.
Carex parryana var. *brevisquama* (*C. aboriginum*)	Indian Valley sedge	Type 2	Dry gumbo or gravelly soils.
Catapyrenium congestum (*Heteroplacidium congestum*)	Earth lichen	Type 4	Sagebrush or shadscale steppe, restricted to barren, slightly natric soil sites.
Ceanothus prostratus	Mahala mat	Type 3	Ponderosa pine/shrub community in clay loam soils.
Cyperus rivularis (*C. bipartitus*)	Shining flat sedge	Type 4	Wet ground, stream margins, pond shores, and ditches.
Dermatocarpon lorenzanium	Silver-skin lichen	Type 3	Found on rocks in heavy clay, shallow, stony basalt soil in *Eriogonum thymoides* plant community.

Scientific Name	Common Name	BLM Status	General Habitat Description
Dowingia bacigalupii	Bacigalupi's dowingia	Type 4	Drying mud of vernal pools, muddy margins of lakes, wet meadows, roadsides, irrigation ditches and streambanks; 2,950-6,230 feet.
Eriogonum ochrocephalum var. *calcareum*	Calcareous buckwheat	Type 3	Rolling, sparsely vegetated, clay hills with four-wing saltbush; 2,620-2,950 feet.
Glyptopleura marginata	White-margined wax plant	Type 4[1]	Dry, sandy-gravelly or loose ash soils; in salt desert shrub communities; 2,620-3,940 feet.
Lepidium davisii (*L. montanum*)	Davis' peppergrass	Type 3	Hard bottom playas, mostly barren, though occasionally with a few shadscale and silver sagebrush surrounded by Wyoming big sagebrush habitat, 2,900-5,900 feet.
Lepidium papilliferum	Slickspot peppergrass	Type 1	Bare slickspot soils within Wyoming big sagebrush habitat.
Lomatium packardiae	Packard's desert parsley	Type 2	Volcanic ash, rhyolite, and rocky clay soils in the sagebrush zone; 2,950-4,270 feet.
Mimulus clivicola (*Eunanus clivicola*)	Bank monkeyflower	Type 4	Pockets of moist, exposed mineral soil or fine gravel in moist to moderately dry slopes and rocky, talus outcrops in the foothills and valleys; almost exclusively on southern aspects.
Mimulus washingtonensis (*M. patulus*)	Stalk-leaved monkeyflower	Type 2	Ephemeral seeps, moist basalt, and very fine gravel on top of bedrock; 980-1,970 feet.
Pediocactus simpsonii	Simpson's hedgehog cactus	Type 4	Rocky or sandy benches and canyon rims in low sagebrush, bud sage, and Sandberg bluegrass communities; often associated with *Erigeron bloomeri*, from 2,950-5,910 feet.
Peraphyllum ramosissimum	Indian apple	Type 3	Heavy clay soils, often as small inclusions in sagebrush/bunchgrass or mountain shrub communities, 3,280-4,920 feet.
Primula cusickiana A/complex	Cusick's primrose	Type 4	Steep north-facing slopes; often in snowbank areas on moss mats, big sagebrush-Idaho fescue communities, and bitterbrush; 2,950-4,270 feet.
Pyrrocoma radiata (*Haplopappus radiatus*)	Snake River goldenweed	Type 3	Loamy soils on steep, rocky hillsides; in big sagebrush/bluebunch wheatgrass/arrowleaf balsamroot/Idaho fescue communities; 2,130-4,920 feet.
Texosporium sancti-jacobi (*Cyphellium sancti-jacobi*)	Woven-spore lichen	Type 2	Well decomposed humus, especially old clumps of Sandberg bluegrass; on flat or north-facing slopes; 2,890-3,280 feet.
Trifolium douglasii	Douglas' clover	Type 2	Usually within open ponderosa pine to Douglas-fir forests, in moist meadows and along stream courses where moisture is abundant in spring and early summer.
Trifolium plumosum var. *amplifolium*	Plumed clover	Type 3[1]	Dry mesic, mid- to upper-slope Idaho fescue – bluebunch wheatgrass Palouse prairies.

[1] Historic Occurrences

In addition to the 27 SSP known from public land, several other sensitive plants occur within the Planning Area on non-public land. The greatest numbers of these sensitive species are known from Valley County. These sensitive plants have the potential to occur on public land and are reported below. Global, State, and Idaho Native Plant Society (INPS) rankings are included, as few of these species occur on public land to date; therefore, they have not been given BLM status designations.

Sensitive Plants Known to Occur on Non-public Land in the Planning Area

Scientific Name	Common Name	BLM Status	Rank[a]
Allium madidum	Swamp onion	NA	G3/S3 (GP3)
Allium validum	Tall swamp onion	NA	G4/S3 (S)
Allotropa virgata	Candystick	Type 4	G4/S3 (S)
Astragalus vexilliflexus var.*vexilliflexus*	Bent-flowered milkvetch	NA	G4T4/S1 (1)

Scientific Name	Common Name	BLM Status	Rank[a]
Botrychium crenulatum	Crenulate moonwort	NA	G3/S1 (GP3)
Botrychium simplex	Least moonwort	NA	G5/S2 (2)
Bryum calobryoides	Beautiful bryum	NA	G3/SH (GP3)
Buxbaumia viridis	Green bug-on-a-stick	NA	G3G4/S3 (M)
Carex flava	Yellow sedge	NA	G5/S3 (M)
Carex livida	Pale sedge	Type 4	G5/S2 (S)
Carex straminiformis	Mt. Shasta sedge	NA	G5/S2 (S)
Chaenactis cusickii	Cusick's false yarrow	Type 2	G3/S2 (GP3)
Chrysothamnus nauseosus ssp. *nanus*	Dwarf gray rabbitbrush	NA	G5T4/S3 (M)
Cicuta bulbifera	Bulb-bearing waterhemlock	Type 4	G5/S2 (S)
Douglasia idahoensis	Idaho douglasia	NA	G2/S2 (GP2)
Epilobium palustre	Swamp willow-herb	Type 4	G5/S3 (M)
Epipactis gigantea	Chatterbox orchid	Type 3	G3G4/S3 (2)
Erigeron salmonensis	Salmon River fleabane	NA	G3/S3 (GP3)
Eriophorum viridicarinatum	Green keeled cotton-grass	NA	G5/S2 (1)
Hackelia cronquistii (*H. patens*)	Cronquist's forget-me-not	Type 3	G3/S1 (GP3)
Hackelia davisii	Davis' stickseed	NA	G3/S3 (GP3)
Helodium blandowii	Blandow's helodium	NA	G5/S2 (1)
Hierochloe odorata	Sweetgrass	Type 2	G5/S1 (1)
Lewisia sacajaweana	Sacajawea's bitterroot	Type 4	G2/S2 (GP3)
Pogogyne floribunda	Profuseflower mesamint	NA	G3/S1 (1)
Polystichum kruckebergii	Kruckeberg's sword-fern	NA	G4/S2 (S)
Pyrrocoma insecticruris (*Haplopappus insecticruris)*	Bugleg goldenweed	Type 3	G3/S3 (GP3)
Rhynchospora alba	White beakrush	NA	G5/S2 (1)
Ribes wolfii	Wolf's currant	NA	G4/S2 (M)
Sanicula graveolens	Sierra sanicle	NA	G4G5/S1 (S)
Saxifraga bryophora var. *tobiasiae*	Tobias' saxifrage	NA	G5T2/S2 (GP2)
Scheuchzeria palustris	Pod grass	NA	G5/S2 (2)
Schistostega pennata	Schistostega	NA	G3G5/S1 (S)
Schoenoplectus subterminalis (Scripus subterminalis)	Water clubrush	NA	G4G5/S3 (S)
Sedum borschii	Borsch's stonecrop	NA	G4?/S2 (M)
Stanleya confertiflora	Malheur princesplume	Type 2	G1/S1 (GP3)
Sullivantia hapemanii var. *hapemanii*	Hapeman's sullivantia	NA	G3T3/S2 (GP3)
Teucrium canadense var. *occidentale*	American wood sage	Type 4	G5T5?/S2 (1)
Triantha occidentalis ssp. *brevistyla*	Short-style tofieldia	NA	G5T4/S1 (1)

[a]**G** = Global rank indicator; denotes rank based on rangewide status (1-critically imperiled, 2-imperiled, 3-vulnerable,4-apparently secure, 5-secure, ?-uncertain about stated rank). **T** = Trinomial rank indicator; denotes global status of infraspecific taxa (1-critically imperiled, 2-imperiled, 3-vulnerable, 4-apparently secure, 5-secure). **S** = State rankindicator; denotes rank based on status within Idaho (1-critically imperiled, 2-imperiled, 3-vulnerable, 4-apparentlysecure, 5-secure). INPS = **GP**-global priority 1 through 3, 1-State priority – in danger of extinction of/extirpation from Idaho in the foreseeable future, 2-State priority – likely to become priority 1 in the foreseeable future, S-sensitive, M-monitor. [IFWIS 2010].

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BLM MOU ID-SO-2014-08

CONSERVATION AGREEMENT

U.S. Bureau of Land Management - Idaho State Office

U.S. Fish and Wildlife Service -

Idaho Fish and Wildlife Office

September 2014

Idaho Bureau of Land Management Existing Land Use Plans and On-going Actions Affecting Slickspot Peppergrass

I. INTRODUCTION

This Conservation Agreement updates the January 2013 agreement between the Idaho State Office Bureau of Land Management (BLM) and the Idaho Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS) to provide for the conservation of slickspot peppergrass related to existing Idaho BLM Land Use Plans (LUPs) and a subset of ongoing actions. The Conservation Agreement and associated conservation measures guide the BLM management actions and serve as a basis for consultation or conference on these LUPs between the BLM and the USFWS regarding slickspot peppergrass, a species proposed for listing under the Endangered Species Act (ESA) of 1973, as amended.

Land use plans provide guidance and direction for managing public lands administered by the BLM. They ensure that public land is managed in accordance with the intent of Congress as stated in the Federal Land Policy Management Act (FLPMA) (43 U.S.C. 1701 et seq.). Resource management planning is used by the BLM to allocate resources and select appropriate uses for public land. There are three LUPs that are addressed under the scope of this Conservation Agreement. The LUPs include the 1983 Kuna Management Framework Plan, the 1987 Jarbidge Resource Management Plan (RMP), and the 1988 Cascade RMP. At the time these LUPs were prepared, there was no requirement to consult with the USFWS on slickspot peppergrass. Currently LUP revisions are in progress for the Jarbidge Field Office and the Four Rivers Field Office that will update and replace these three LUPs. 'The BLM and the USFWS will consult on these revised LUPs when they are at the appropriate state of development and depending on the outcome of the proposed reinstatement of slickspot peppergrass as a threatened species under the ESA.

This Conservation Agreement also addresses on-going actions currently authorized by the BLM including livestock grazing, rights-of-way activities, and military training.

II. OBJECTIVE AND INTENT

This Conservation Agreement is intended to promote the conservation of slickspot peppergrass, a species proposed for listing which has not yet undergone consultation or conference at the LUP level or for ongoing actions. The conservation measures describe desired recovery and conservation objectives with corresponding implementation actions and will be analyzed in the associated Biological Assessment (BA). These conservation measures replace or create guidance within the LUPs regarding programmatic management direction for slickspot peppergrass. It is the intent of the BLM and the USFWS that specific conservation measures will be fully implemented and that this Conservation Agreement will remain in effect and binding on both parties until such time as new LUPs or amendments are prepared with completed section 7 compliance as appropriate, and Records of Decision signed. At that time, programmatic management direction for slickspot peppergrass will be included in the new or revised LUP or amendment, and this Conservation Agreement, or portions thereof in the case of programmatic amendments, will no longer apply to the planning area. For example, this Conservation Agreement is not applicable to the Snake River Birds of Prey planning area as section 7 consultation bas been completed on the 2008 Snake River Birds of Prey RMP, which contains management direction for slickspot peppergrass similar to what is found within Appendix A of the 2006 version of this Conservation Agreement. Additionally, the conservation measures associated with this agreement may be modified based on the current USFWS analysis of new information and assessment of threats being conducted as part of the listing determination process. Any additional information which becomes available prior to completion of the LUPs that may enhance conservation of the species, such as new information provided when the species is listed, critical habitat is designated, and/or a recovery plan completed; may trigger an update of conservation measures within this agreement.

While a high priority for the BLM, both the BLM and the USFWS recognize that funding constraints may affect the ability to implement specific conservation measures as planned. BLM will work to leverage stakeholder partnerships to allow for flexible cost recovery associated with conservation actions. Where funding is lacking, the BLM and the USFWS will cooperate to set priorities and adjust dates for accomplishment. In addition, minor modifications to conservation measures may be necessary as the conference process progresses. Any modification must be agreed to by the BLM and the USFWS, and shall not materially alter the meaning or intent of a conservation measure as stated at the time of signature of this agreement.

III. PARTIES TO THE CONSERVATION AGREEMENT

U.S. Bureau of Land Management, Idaho; and
U.S. Fish and Wildlife Service, Idaho Fish and Wildlife Office

IV. AUTHORITY FOR CONSERVATION AGREEMENTS

The commitments and actions in this Conservation Agreement are within existing authorities of the signatory agencies. The primary authority for the USFWS and the BLM to enter into this Conservation Agreement derives from the ESA.

The primary purpose of the ESA is to provide a means whereby ecosystems upon which endangered and threatened species depend may be conserved. Section 7(a) directs Federal agencies to utilize their authorities (e.g., FLPMA) in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species. Further, under Section 7(b), each Federal agency is expected to, in consultation and with the assistance of the USFWS, ensure that any action authorized, funded or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species. Section 3 of the ESA includes the following definition for conservation as is intended under this Conservation Agreement:

> The terms "conserve," "conserving," and "conservation" mean to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Additional authorities for the USFWS derive from the Fish and Wildlife Act of 1956, as amended; and the Fish and Wildlife Coordination Act, as amended.

In addition to the ESA, FLPMA (43 U.S.C. 1701 et. seq) provides the BLM with the authorities required for this Conservation Agreement:

> The public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use.

The BLM Special Status Species Management Manual 6840 provides specific policy guidance as it pertains to the ESA, FLPMA and this Conservation Agreement. For listed species, the policy states the following:

1. Actions authorized by the BLM shall further the conservation and/or recovery of federally listed species and conservation of Bureau sensitive species.

2. The BLM shall retain in Federal ownership those habitats essential for the conservation of any listed species, particularly those that are part of a broader, logical public land ownership management unit. The BLM may dispose of lands providing habitat for listed species, including critical habitat, only following consultation with the USFWS or the National Marine Fisheries Service (NMFS) and upon a determination that such action is consistent with relevant law.

3. Ensure that all actions authorized, funded, or carried out by the BLM are in compliance with the ESA. To accomplish this, the BLM shall:

    a. Evaluate all proposed actions to determine if individuals or populations of listed species or their habitat may be affected.

    b. Initiate consultation with the USFWS, including preparation of biological assessments, as appropriate, for those actions that may affect listed species or their habitats.

    c. Until the consultation proceedings are completed and a final biological opinion has been issued, the BLM shall not carry out any action that would cause an irreversible or irretrievable commitment of resources such that it would foreclose the formulation or implementation of any reasonable and prudent alternative measure that might avoid jeopardy to listed species and/or prevent the adverse modification of critical habitat.

    d. Ensure that BLM actions will not reduce the likelihood of survival and recovery of a listed species.

4. Cooperate with the USFWS in planning and providing for the recovery of listed species. To accomplish this, the BLM shall:

    a. Develop and implement activities that provide for the conservation and recovery of species listed pursuant to the ESA.

    b. Undertake actions designed to maintain the integrity of the primary constituent elements of federally designated critical habitat on BLM-administered lands.

c. Ensure that BLM actions are not likely to jeopardize the continued existence of any endangered species or threatened species or destroy or adversely modify designated critical habitat.

d. Determine, to the extent practicable, the occurrence, distribution, population, and habitat condition of all ESA-listed species on BLM-administered lands, and evaluating the significance of BLM-administered lands in the conservation of those species.

e. Develop and implement agency land use plans, implementation plans, and actions in a manner consistent with conservation and/or recovery of listed species.

f. Monitor and evaluate ongoing management activities to ensure conservation objectives for listed species are being met.

g. Cooperate with the USFWS and/or NMFS and other interested parties in species recovery and conservation as provided in species recovery plans. Such actions may include species reintroductions, which shall be carried out in conformance with BLM Manual 1745.

h. Implement conservation recommendations included in biological opinions if they are consistent with relevant law and policy and are technologically and economically feasible.

For species that are candidates for listing, the policy states the following:

> States or offices may wish to seek technical assistance from the USFWS and/or NMFS when it is determined to be advantageous to a species' conservation or BLM management options.

VI. CONSERVATION MEASURES

Conservation measures were developed for each LUP program and sub-program covered by this Conservation Agreement (See Appendix A). They are discussed specifically for each Planning Area in the associated Biological Assessment. Each conservation measure describes a goal or general action and includes one or more specific BLM action required to implement it. As mentioned previously, the conservation measures associated with this agreement may be modified based on the current USFWS analysis of new information and assessment of threats being conducted as part of the listing determination process. Responsibilities for implementing the actions are indicated, along with time frames for implementation. Most of the conservation

measures will be implemented as standard operating actions conducted during day-to-day management activities. In addition, LUP conservation measure guidance and direction will be applied to ongoing actions. However, as site-specific information will be available for the ongoing actions, additional conservation measures may be considered.

Part 1: Programmatic Planning

Programmatic planning conservation measures include those that are needed for consultation at all planning levels including future LUPs, ongoing activities and proposed projects. In addition to the existing LUP conference activities, the BLM will complete all necessary section 7 compliance for new or revised LUPs that may affect this species and its habitat.

Part 2: Projects/Activity Plans - Planning and Implementation

A. Ongoing Actions

This category includes all activities currently ongoing and permitted on BLM land. These include actions that have gone through the agency planning process and have a documented agency decision (decision memorandum, decision notice, or record of decision). The BLM will complete section 7 compliance for ongoing activities that have the potential to directly affect an element occurrence and associated occupied slickspot peppergrass habitat concurrent with the conference effort for existing LUPs. The BLM will also adaptively manage all ongoing activities as described in the associated Biological Assessment, and adjust the action as appropriate to ensure management objectives for slickspot peppergrass are met.

B. Proposed Actions

This category includes all new proposed projects or activities as well as all renewal actions. Project-level inventories will be completed as appropriate during project planning if inventory information is not available or adequate to determine if impacts to the species or habitat may occur. If direct or indirect negative impacts to the species or its habitats are anticipated as a result of new BLM actions, the activity will be modified to avoid or minimize anticipated negative impacts. The BLM will complete all necessary section 7 compliance for new activities that may affect this species and its habitat.

Part 3: Monitoring

Conservation measures for slickspot peppergrass include a provision to implement adaptive management as needed to achieve conservation objectives. At the project level, this will be accomplished by conducting site-specific implementation and effectiveness monitoring to track progress toward achieving the conservation measures. The BLM and the USFWS Level 1 Teams

will meet annually to review the implementation and effectiveness monitoring results for projects of concern, determine if current management actions are on a trajectory toward meeting management goals within the established time frames, and modify management actions as needed if progress toward goals is inadequate. Implementation of the programmatic and on-going actions conservation measures will be monitored through the reporting and monitoring requirements of this Conservation Agreement (Section VII).

VII. CONSERVATION AGREEMENT MONITORING AND REPORTING

The agencies agree to a joint, annual review in October of each year to assess progress in implementing this Conservation Agreement. In addition, monitoring specific to forage kochia use will be assessed by BLM and FWS every 5 years to inform future use of this species as a tool and determine if changes to conservation measures (e.g. buffer widths) regarding use of this species are appropriate. Any recommendations will be presented to the Idaho BLM State· Director and the USFWS Field Office Supervisor by November of each year. This review could lead to the modification and exceptions discussed in Section VIII below. These modifications or exceptions will be formalized within the scope of this Conservation Agreement.

VIII. AMENDMENTS, EXCEPTIONS, AND DURATION OF AGREEMENT

Exceptions or amendments to this agreement may be jointly agreed to by the signatories on a case-by-case basis, where such changes would better provide for protection and conservation of species, where conflicts must be resolved between species, where priorities need to be adjusted due to funding constraints, or, when new, relevant scientific information becomes available. Such exceptions or amendments shall be agreed to by modification. All modifications within the scope of this agreement shall be made by issuance of a modification executed by all parties prior to any changes being performed.

This agreement shall be considered fully executed when all signatories have signed. The agreement shall remain in effect and binding on both parties until such time as new land use plans or amendments are completed which contain programmatic management direction for slickspot peppergrass, when section 7 compliance under the Endangered Species Act of 1973, as amended, is completed, and when Records of Decision are signed.

IX. QUALIFICATIONS AND CONTACTS

This agreement in no way restricts any of the signatories from participating in similar activities with other public or private agencies, organizations, and individuals. This agreement is neither a fiscal nor a funds obligations document. Any endeavor involving reimbursement or contribution of funds between the parties to this agreement will be handled in accordance with applicable laws, regulations, and procedures including those for government procurement and printing. Such endeavors will be outlined in separate agreements that shall be made in writing by

representatives of the parties and shall be independently authorized by appropriate statutory authority. This agreement does not provide such authority. Specifically, this agreement does not establish authority for non-competitive award to the cooperator of any contract or other agreement. Any contract or agreement for training or other services must fully comply with all applicable requirements for competition.

The principal contacts for this agreement are:

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X. SIGNATURES

/s/ Timothy M Murphy _____ 09.11.2014 _____

Timothy Murphy
Idaho State Director
Bureau of Land Management

Date

/s/ Michael Carrier _____ 9.15.14 _____

Michel Carrier
Idaho State Supervisor
U.S. Fish and Wildlife Service

Date

September 2014. Appendix A. Slickspot peppergrass (Lepidium papilliferum): Conservation Measures and Implementation Actions for the Jarbidge and Four Rivers FOs.

LUP Programs Evaluated	Conservation Measures	BLM Implementation Actions
Special Status Animal and Plant Management Note: Common to All Programs	The conservation measures contained throughout this table implement important elements included in the Candidate Conservation Agreement (CCA) for slickspot peppergrass. The conservation measures reflect BLM's commitment to support species conservation. **1)** In cooperation with Idaho Department of Fish and Game (IDFG) Idaho Natural Heritage Program (INHP), U.S. Fish and Wildlife Service (USFWS), Idaho Army National Guard (IDARNG), the U.S. Air Force (USAF), and others: a) Develop and use survey protocols consistent with the USFWS Rare Plant Survey Guidelines to conduct Stage 1, 2, and 3 surveys (see Figure 2 at the end of this table for the general survey process). b) Cooperate to refine slickspot peppergrass habitat and potential habitat maps (Stage 1 survey, Figure 2), and to identify and map slickspot peppergrass occurrences (Stage 2 survey, Figure 2).	The implementation actions reflect BLM's commitment to support species conservation and meet ESA objectives. Actions apply to BLM lands and activities only. Habitat terms used throughout this document are defined in **Appendix B: Definitions.** **1)** Following actions to be completed in cooperation with others: a) Apply current survey methods, and assure that inventories are done at the appropriate time of the year by qualified botanists, or by persons who are under the guidance of botanists. b) Surveys, mapping, and data management (refer to Figure 2 , *Inventory Flowchart for Slickspot Peppergrass*, at the end of this table): *i)* Cooperate with IDFG, INHP, and USFWS to record, refine, and map all habitat features including potential habitat, slickspot peppergrass habitat, non-habitat, occupied habitat, and element occurrences (EOs), for BLM lands (see Appendix B, *Definitions).* Use current GIS standards for mapping and database management. In cooperation with INHP, maintain a spatial database of species population and habitat information for BLM lands. *ii)* BLM will continue to conduct Stage 1 and 2 surveys, report survey information to the INHP, and incorporate the information into the adaptive management strategy.

September 2014. Appendix A. Slickspot peppergrass (Lepidium papilliferum): Conservation Measures and Implementation Actions for the Jarbidge and Four Rivers FOs.

LUP Programs Evaluated	Conservation Measures	BLM Implementation Actions
		iii) BLM's intent will be to continue to conduct Stage 1 and Stage 2 surveys concurrently with the goal of completing these surveys within 10 years. BLM will work collaboratively with USFWS to prioritize new survey areas based on areas that have a high likelihood of species occurrence, or that are needed for BLM project purposes. The amount of habitat to be surveyed each year will be based on available annual funding and staffing. As of 2013, approximately 10,000 acres have had three years of surveys completed and are now classified as unoccupied slickspot peppergrass habitat (see Figure 2). *iv)* Prioritize Stage 2 surveys to address slickspot peppergrass habitat with a high likelihood of species occurrence. Surveys should be scheduled to complement other program needs. Coordinate surveys annually with USFWS.
	c) Cooperate in regular monitoring of slickspot peppergrass population trends and land health conditions on BLM lands, and follow current monitoring protocols. Land health conditions include forb diversity to support pollinators and habitat for slickspot peppergrass.	c) Follow the Habitat Integrity and Population (HIP) monitoring protocol or other accepted methodology. BLM will cooperate with others to conduct annual monitoring within all EOs on BLM lands to assess the effectiveness of the conservation measures as part of the adaptive management strategy. *i)* Establish permanent ecological reference areas (ERAs) in selected EOs to evaluate land health conditions associated with slickspot peppergrass. *ii)* Use data from the ERAs to assist in completing land health assessments. This information will be used to evaluate permitted management actions and to design restoration projects for slickspot peppergrass.

September 2014. Appendix A. Slickspot peppergrass (Lepidium papilliferum): Conservation Measures and Implementation Actions for the Jarbidge and Four Rivers FOs.

LUP Programs Evaluated	Conservation Measures	BLM Implementation Actions
	d) Participate in research essential to conservation of the species	d) BLM will participate in research as funding allows. Areas to focus on include, but are not limited to, the following: *i)* Elimination and control of invasive species. *ii)* Effects of ground disturbance (including fire) and seed predation on the species. iii*)* Determination of specific limiting factors in terms of habitat needs and characteristics. iv) Population viability analyses.
	e) Continue to support seed banks in a long-term seed storage facility.	e) As needed, provide funding to a suitable repository to support a seed bank.
	f) Support the establishment and maintenance of new populations in habitat categories for slickspot peppergrass. The goal of these activities is to maintain or enhance viable populations.	f) Reintroduce slickspot peppergrass at selected experimental reintroduction or historic sites as funding allows.
	2) Ensure that ongoing Federal actions support or do not preclude species conservation in habitat categories for slickspot peppergrass.	**2)** Ongoing BLM authorized activities: a) Based on the results of annual Stage 1 and 2 surveys, review ongoing activities in habitat categories for slickspot peppergrass. The Level I Team will conduct these reviews in a manner consistent with streamlining procedures where local section 7 compliance activities with USFWS (if necessary) have not yet been completed. b) If reviews indicate that direct or indirect negative impacts to the species or its habitat are occurring as a result of ongoing discretionary BLM actions, the activity will be modified to avoid or minimize anticipated negative impacts and, where feasible, promote species conservation.

September 2014. Appendix A. Slickspot peppergrass (Lepidium papilliferum): Conservation Measures and Implementation Actions for the Jarbidge and Four Rivers FOs.

LUP Programs Evaluated	Conservation Measures	BLM Implementation Actions
		c) Where needed, complete Section 7 compliance for ongoing activities that may affect this species and its habitat. Following the annual review of Stage 1 and 2 surveys outlined in **(2)**(a) above, initiate section 7 compliance activities for ongoing actions, as appropriate. d) Where habitat categories for slickspot peppergrass exists, BLM will conserve remaining stands of sagebrush and native vegetation in making activity plan and project level decisions.
	3) Ensure that new Federal actions support or do not preclude species conservation in habitat categories for slickspot peppergrass.	**3)** New proposed BLM authorized activities: a) Consistent with streamlining procedures, BLM will require project-level inventory data for any project in slickspot peppergrass habitat and in potential habitat during project planning if inventory information is not available or adequate. BLM will use the protocols described in **(1)**(a). b) If direct or indirect negative impacts to the species or its habitat are anticipated as a result of new BLM actions, the activity will be modified to avoid or minimize negative impacts and, where feasible, promote species conservation. c) Where needed, complete section 7 compliance for new activities that may affect this species and its habitat. d) Where habitat categories for slickspot peppergrass exists, BLM will conserve remaining stands of sagebrush and native vegetation in making activity plan and project level decisions.

September 2014. Appendix A. Slickspot peppergrass (Lepidium papilliferum): Conservation Measures and Implementation Actions for the Jarbidge and Four Rivers FOs.

LUP Programs Evaluated	Conservation Measures	BLM Implementation Actions
	4) Implement adaptive management as needed to achieve conservation objectives.	**4)** Conduct site-specific implementation and effectiveness monitoring of management actions. Adjust management as needed to ensure that management objectives are met. See additional details within other programs.
	5) Support programs to conserve and enhance slickspot peppergrass on non-Federal lands.	**5)** Take advantage of opportunities to support conservation of slickspot peppergrass through easements, cooperative management efforts, and other programs.
	6) Include language in all use authorizations to require rehabilitation of habitat categories for slickspot peppergrass and in the case of trespass or permit violations, if damage occurs.	**6)** As a part of use authorizations / violations (to include but not limited to rights-of-way, grazing and off highway vehicle (OHV) trespass), require rehabilitation to native vegetation in habitat categories for slickspot peppergrass if trespass or permit violation occurs and the habitat is damaged. If ecological site conditions preclude the use of native species, use non-invasive, non-native plant species for rehabilitation in trespass or permit violation situations.
Air Resources	None	None
Soil and Water Resources: Riparian/ Wetland Areas (includes weed management)	None	None
Upland Vegetation Management: Rangelands (includes weed management)	**1)** Activities within the **Upland Vegetation Management: Rangelands (includes weed management)** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. As a part of promoting conservation, the goals are to promote habitat conservation, to avoid negative impacts, or to minimize impacts if avoidance is not possible.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table.
	2) Although non-chemical methods will be the preferred approach in occupied habitat,	**2)** Site-specific stipulations will be developed locally using these criteria:

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	when appropriate, projects involving the application of pesticides (including herbicides, fungicides, and other related chemicals) in habitat categories for slickspot peppergrass that may affect the species will be analyzed at the project level and designed such that pesticide applications will support conservation and minimize risks of exposure.	a) Evaluate the benefits and risks of vegetation treatment including the following: application methods; pesticides, carriers, and surfactants used; needed treatment buffers; and use of non- chemical weed control (for example, bio- controls, hand pulling). b) Apply appropriate spatial and temporal buffers to avoid species' exposure to harmful chemicals. c) Explore opportunities to eradicate competing non-native invasive plants in habitat categories for slickspot peppergrass where slickspots are being invaded by such plants. d) Implement appropriate revegetation and weed control measures to reduce the risks of non-native invasive plant infestations following ground/soil disturbing actions in habitat categories for slickspot peppergrass. e) BLM will provide USDA APHIS with the location of habitat categories of slickspot peppergrass. Mormon cricket, grasshopper, or other insect control in habitat categories for slickspot peppergrass will only include those methods that minimize impacts to the plant's pollinators.
	3) Where needed and feasible, coordinate with adjacent land owners and local governments regarding control of noxious weeds in upland areas through cooperative weed management programs. One of BLM's priorities within the cooperative weed management program is the protection of special status plants on BLM lands.	**3)** Take advantage of coordination opportunities as they arise.

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	4) BLM will promote diversity, richness, and health of native plant communities to support pollinators and habitat for slickspot peppergrass.	**4)** BLM will focus slickspot peppergrass habitat conservation and restoration efforts in habitat categories for slickspot peppergrass to encourage connectivity among populations through the following measures: a) Where habitat categories for slickspot peppergrass exist, BLM will conserve remaining stands of sagebrush and native vegetation in making activity plan and project level decisions. b) Vegetation treatment projects undertaken in habitat categories for slickspot peppergrass will be compatible with species habitat restoration objectives, as described in item (d) below. c) BLM will select and implement specific projects to restore habitat categories for slickspot peppergrass in degraded areas as funding allows, s4ch as planting shrubs and forbs and controlling weeds, within and adjacent to occupied habitat. Apply methods described in item (d) below. d) When conducting vegetation treatment projects in habitat categories for slickspot peppergrass, BLM will use seeding techniques that minimize soil disturbance such as minimum-till drills and rangeland drills equipped with depth bands, use native plant materials and seed during restoration activities, and select native forbs that benefit slickspot peppergrass insect pollinators.
Forest and Woodland Management (includes weed management)	None	None
Wildlife and Wildlife Habitat	**1)** Activities within the **Wildlife and Wildlife Habitat Management** program will	**1)** Apply relevant conservation measures from the **Special Status Animal and**

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Management	implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. **2)** Manage facilities installed for wildlife to promote maintenance of habitat categories for slickspot peppergrass. **3)** Restore wildlife habitat while promoting slickspot peppergrass conservation.	**Plant Management** program section at the beginning of this table. **2)** For review of ongoing actions, see **Special Status Animal and Plant Management** program section item **(2).** For new actions, see **Special Status Animal and Plant Management** program section item **(3).** As appropriate to avoid or minimize negative impacts, modify existing and avoid placement of new wildlife facilities in occupied habitat. **3)** Any restoration efforts for wildlife within habitat categories for slickspot peppergrass will be compatible with the species' habitat requirements.
Fish and Aquatic Habitat Management	None	None
Livestock Grazing Management: Permits and Leases	**1)** Activities within the **Livestock Grazing Management: Permits And Leases** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. **2)** Manage livestock grazing and trailing to conserve suitable habitat conditions for slickspot peppergrass while implementing rangeland health standards and guidelines (S&Gs). Apply the *Implementation of Annual Grazing Adaptive Management* (Figure III.C- 2), located at the end of this conservation measures table, to adjust livestock use as appropriate.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table **2)** Permit or lease renewal actions and annual authorizations: a) For review of ongoing actions, see **Special Status Animal and Plant Management** program section item **(2)**. b) Schedule surveys in habitat categories for slickspot peppergrass as needed for S&G assessments associated with permit and lease renewals. Use survey procedures and flowchart **(Figure 2,** *Inventory Flowchart for Slickspot Peppergrass)* referenced in **Special Status Animal and Plant Management** program section l(b).

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		c) For new actions, see **Special Status Animal and Plant Management** program section item **(3).** d) As part of adaptive management to avoid or minimize negative impacts, modify livestock grazing activities as outlined in **Figure 1.** *Implementation of Annual Grazing Adaptive Management*, located at the end of this conservation measures table. In addition, the following measures will be implemented, as appropriate: *i)* As part of range readiness assessments, delay livestock turnout when saturated soils are a negative factor in slickspot peppergrass species conservation. *ii)* Minimize gathering livestockin element occurrences (EOs). *iii)* Avoid impacts to EOs from herd movement through rested and deferred pastures. *iv)* Trailing permits will not be authorized through EOs unless conducted on existing roads in accordance with FWS 2012 Letter of Concurrence. In the Jarbidge FO of the Twin Falls District, no livestock trailing will be authorized through EOs, proposed critical habitat, or occupied habitat. In the Four Rivers FO of the Boise District, livestock trailing permits will not be authorized through EOs, proposed critical habitat, or occupied habitat unless conducted on existing roads or historic routes described within the Four Rivers FO 2012 livestock trailing consultation with FWS (FWS tracking number 01EIFW00-2012-I-0206). *v)* Sheep grazing permits will be modified to restrict bedding, trailing, or watering herds within 1/2 mile of EOs.

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		vi) Supplements will be placed at least 1/2 mile from EOs. Supplements will be placed so that livestock are drawn away from the EO and avoid trailing through the EO en route to the supplement or a water source. Management requirements will be adjusted to maintain an appropriate distance between supplements and existing EOs to avoid impacts. *vii)* No new domestic horse AUMs will be authorized in pastures containing EOs to avoid trampling impacts.
	3) As part of adaptive management, BLM will conduct scheduled compliance inspections in pastures with occupied habitat as part of BLM range use supervision to minimize impacts.	**3)** BLM, in coordination with the USFWS, will create a schedule to prioritize compliance inspections associated with livestock grazing permits in occupied habitat areas. These compliance inspections are a complement to the HIP monitoring listed under Special Status Animal and Plant Management and where practical the efforts may be combined. BLM staff will conduct inspections as determined by the schedule. a) BLM range staff will conduct pre- season range readiness checks for soil moisture conditions in allotments with occupied habitat. b) BLM will conduct post-use monitoring for trampling in slickspots within EOs (could be done in conjunction with utilization compliance checks). c) Monitoring results will be documented in a standard format (to be developed by BLM) in the grazing allotment files. Copies will be provided to the USFWS as completed.

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		d) Apply Grazing Adaptive Management Implementation Flowchart as outlined in Figure 1.
	4) Provide adequate rest from livestock use for areas treated after major disturbances in habitat categories for slickspot peppergrass. Major disturbances may include fire, fire rehabilitation, or other soil-disturbing occurrences.	**4)** Protect treated areas by using temporary livestock closures or other measures. The length of rest will be determined by achieving certain goals associated with plant establishment outlined in the restoration, fire rehabilitation, or other plan.
	5) BLM will work cooperatively with the livestock permittees to promote slickspot peppergrass conservation.	**5)** BLM will train permittees on slickspot peppergrass plant and habitat recognition. BLM will also work with permittees to use the INHP rare plant observation form to report survey information in a standard format.
Livestock Grazing Management: Livestock Management Facilities	**1)** Activities within the **Livestock Grazing Management: Livestock Management Facilities** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table.
	2) Manage livestock facilities to promote slickspot peppergrass conservation while implementing rangeland health S&Gs.	**2)** For review of ongoing actions, see **Special Status Animal and Plant Management** program section item **(2).** For new actions, see **Special Status Animal and Plant Management** program section item **(3).** As appropriate to avoid or minimize negative impacts, modify existing and avoid placement of new livestock facilities in occupied habitat areas. a) Within pastures, place water facilities to support slickspot peppergrass conservation: *i)* Existing water troughs (includes troughs that are tied into pipelines, as well as both permanent and movable troughs to which water is delivered throughout the grazing season) will be

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		moved at least 1/2 mile from EOs, when feasible. Where troughs cannot be moved (for example, because of topographical constraints, additional disturbance, or impacts to sensitive species), management will be adjusted to mitigate the impacts during the periods of critical concern for slickspot peppergrass (such as when soils are saturated and subject to trampling impacts). Management adjustments could include shutting the water off seasonally, changing pasture boundary fences, or other appropriate measures. *ii)* New water troughs (not including existing water troughs moved in **(2)**(a)*(i),* above) will be placed at least 1 mile from EOs. A deviation from this standard may be developed on a case-by-case basis through collaboration with the USFWS. New water troughs will be placed so that cattle are drawn away from the EO and avoid trailing through an EO en route to a water source. *iii)* Temporary water troughs (short-term, emergency, or single-season use) will be located at least 1 mile from EOs. A deviation to this standard may be developed on a case-by-case basis through collaboration with the USFWS. New water troughs will be placed so that cattle are drawn away from the EO and avoid trailing through an EO en route to a water source. b) Placement of new livestock infrastructure will be compatible with slickspot peppergrass habitat conservation. ESA consultation is required if new fencing is proposed in EOs.
Wild Horse Management	**1)** Activities within the **Wild Horse Management** program will implement relevant conservation measures as described in the **Special Status Animal and Plant**	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table.

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	Management program section to promote conservation. **2)** If the range of wild horses and slickspot peppergrass occupied habitat overlaps now or in the future, protect these areas from wild horses by including applicable conservation measures in herd management plans.	 **2)** Manage wild horse herd size to minimize conflicts with slickspot peppergrass. Limit trampling in occupied habitat by implementing appropriate range management practices, such as fencing and water trough placement.
Recreation Management	**1)** Activities within the **Recreation Management** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. **2)** Developed facilities (paved campgrounds, vault toilets, interpretive kiosks, etc.): Manage existing and new recreation facilities to promote conservation of species habitat.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table. **2)** Management of existing and new facilities: a) For review of **existing facilities,** see **Special Status Animal and Plant Management** program section item **(2).** As appropriate to avoid or minimize negative impacts, modify existing facilities. b) For **new facilities,** or for expansion of uses at existing facilities, see **Special Status Animal and Plant Management** program section item **(3).** In addition, avoid development of new recreation facilities or expansion of existing facilities in habitat categories of slickspot peppergrass if negative impacts are anticipated. c) BLM will educate recreationists on special status species and invasive weeds, focusing on occupied and selected habitat areas. BLM will develop and install educational signage at entry points and key recreational points regarding the biology and conservation of this species and other special status species.

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	3) Dispersed use areas (informal areas, including camping areas and tie-up areas for pack animals): Manage dispersed use sites to promote conservation of species habitat. This includes limiting disturbances to the species resulting from human uses.	**3)** For review of ongoing activities, see **Special Status Animal and Plant Management** program section item **(2).** In addition, minimize human activity in and adjacent to occupied habitat if negative impacts are occurring. Close areas, either seasonally or year-round, as needed to protect the species and its habitat.
	4) Commercial and noncommercial recreation permits, including hunting guides and outfitter camps: issue commercial and noncommercial recreation permits to promote conservation of habitat categories for slickspot peppergrass. This includes management of physical facilities (such as camps), as well as disturbances to habitat categories for slickspot peppergrass resulting from human uses.	**4)** Issuance and review of existing and new permits: a) For review of existing permits, see Special Status Animal and Plant Management program section item **(2).** If needed, modify existing permits that negatively impact habitat for this species. b) For new permits, see Special **Status Animal and Plant Management** program section item **(3).** Avoid issuing recreation permits in habitat categories of slickspot peppergrass if negative impacts are expected. In particular, avoid permitting new recreation activities in and adjacent to occupied habitat. If a recreation permit is to be issued, apply stipulations to the permit to support or to not preclude species conservation and educate permit holders about species' biology and needs. c) BLM will not authorize organized recreation activities in habitat categories for slickspot peppergrass if negative impacts are anticipated (for example, OHV races, equestrian events, and other events).
Recreation Management: Travel Management	**1)** Activities within the **Recreation Management: Travel Management** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table.

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	2) Manage roads, OHV routes and areas, as well as non-motorized trails, to promote species habitat conservation. This includes management of roads and trails, as well as ground disturbance resulting from human uses. **3)** Perform compliance checks on OHV closures toprotect occupied habitat, identify problems as soon as possible, and take immediate corrective measures.	**2)** Review of existing and new roads, OHV routes and areas, and non-motorized trails: a) For existing roads, designated OHV routes and areas, and designated non-motorized trails, see **Special Status Animal and Plant Management** program section item **(2).** Modify roads and routes in and adjacent to habitat categories for slickspot peppergrass if negative impacts are occurring. Implement restrictions to reduce ground disturbance. Seek opportunities to close and revegetate roads, OHV routes, or non-motorized trails and use areas in and adjacent to habitat if negative impacts are occurring. b) For new roads, OHV routes and areas, and non-motorized trails, see **Special Status Animal and Plant Management** program section item **(3).** Avoid creating new roads, trails, routes, and areas if negative impacts are expected in and adjacent to habitat categories of slickspot peppergrass c) Evaluate off-road vehicle use in occupied habitat, and where needed, limit access or close areas to motorized and mechanical vehicles to promote species conservation. **3)** See **Special Status Animal and Plant Management** program section item **(2).**
Visual Resource Management	None	None
Special Designation Area Management	**1)** Activities within the **Special Designation Area Management** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table.

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	2) Explore the potential for new designations that would enhance species conservation.	**2)** Evaluate establishing ACECs for several stronghold populations of slickspot peppergrass during land use plan amendments or revisions.
Fire Management: Fire Suppression	**1)** Activities within the **Fire Management: Fire Suppression** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. Human life and firefighter safety and property take priority over species protection. Fire suppression efforts will be conducted, as possible, to protect habitat categories for slickspot peppergrass. Place a high priority on protecting habitat categories for slickspot peppergrass.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table. **2)** Fire management activities: a) Fire Management Plans will include Standard Operating Procedures (SOP's) that address conservation of slickspot peppergrass. *i)* BLM will provide adequate fire suppression coverage at all stations to meet management objectives with the intent to suppress 90% of fires to the acreages specified in the fire management plans for slickspot peppergrass. As funding allows, BLM will maintain existing remote fire guard stations easily accessible to occupied habitat (for example, Juniper Butte fire guard station) and explore opportunities to establish additional stations to provide better initial attack and reduced response times for wildfires in slickspot peppergrass habitat. *ii)* Apply minimum impact suppression tactics (MIST) in habitat categories for slickspot peppergrass, as appropriate. Consult with resource advisors to determine where MIST tactics should be applied to avoid or minimize negative impacts. *iii)* Although MIST are preferred, aggressive fire suppression tactics (e.g.,

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		blade lines, back fires, etc. in habitat) may be applied if EO's are threatened. b) Do not locate fire base camps, staging areas, and fueling areas within occupied habitat.
	3) As needed, coordinate with appropriate agency personnel regarding fire suppression activities in or adjacent to habitat categories for slickspot peppergrass	**3)** Ongoing interagency coordination. a) BLM and cooperators will expand on and continue to provide special status plant and habitat awareness training to fire resource advisors, Incident Commanders, Engine Operators, and Fire Operations Supervisors. b) BLM and cooperators will distribute maps and inform fire crews on locations of the EOs to maximize fire protection and to avoid or minimize impacts from fire suppression activities.
Fire Management: Emergency Stabilization and Rehabilitation	**1)** Activities within the **Fire Management: Emergency Stabilization and Rehabilitation** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. **2)** Implement Emergency Stabilization and Rehabilitation (ES&R) activities to consider slickspot peppergrass in and adjacent to slickspot peppergrass habitat rehabilitation.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table. **2)** The following measures will be applied: a) Wildfires within habitat categories for slickspot peppergrass will be evaluated for ES&R treatments, regardless of size with an emphasis on retaining native plant resiliency including early seral native grasses, forbs, and biological soil crusts. b) As needed, protect disturbed and recovering areas using temporary closures or other measures. BLM will continue to rest areas from land use

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		activities to meet ES&R objectives as defined through ES&R plans. c) BLM ES&R efforts for slickspot peppergrass, subject to funding availability, should enhance shrub establishment and forb diversity. BLM will implement the following measures during fire ES&R efforts: *i)* BLM will use seeding techniques that minimize soil disturbance; such techniques may include minimum-till drills and rangeland drills equipped with depth bands when ES&R projects have the potential to impact occupied or proposed critical habitat categories for slickspot peppergrass. Based on ES&R monitoring data, if these methods prove to be unsuccessful, other methods willbe evaluated to maximize success. *ii)* BLM will use native plant materials and seed during ES&R activities. BLM will include native forbs in seed mixtures that will benefit slickspot peppergrass insect pollinators commensurate with ES&R program policy. *iii)* If native plant materials and seed are not available, or where site capability precludes the use of natives due to past disturbances, non-invasive, non-native species may be used for stabilization activities in habitat categories for slickspot peppergrass. *iv)* In slickspot peppergrass habitat and potential habitat, non-native species are acceptable for stabilization activities capability for extant native vegetation to regenerate. Potentially invasive non-native species such as intermediate wheatgrass and forage kochia will not be used within 1.5 miles of EOs. Within

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		slickspot peppergrass habitat and potential habitat, potentially invasive non-native species such as intermediate wheatgrass and forage kochia may be used for stabilization activities that are specifically designed as greenstrip fuel break projects, if an environmental analysis determines that the benefits of their use outweigh the risk of invasion to slickspot peppergrass and its habitat relative to other alternative fuel break methods. For these projects, environmental analyses will use the best available scientific and biological information, current BLM and USFWS guidance, and incorporate a comprehensive monitoring strategy. These site specific treatments will also be reviewed via the Level 1 streamlining process. When used in ESR fuel break projects, control measures for intermediate wheatgrass and forage kochia will be incorporated into project design features. Control measures will be informed by a comprehensive monitoring strategy that triggers subsequent adaptive management actions. *v*) Apply conservation measure (3), Implementation Action (ii) in Fire Management: Non-Fire Fuels Management. Program to ESR actions
	3) Fire rehabilitation projects involving the application of pesticides in slickspot peppergrass habitat will be analyzed and implemented in accordance with the approach described in the **Upland Vegetation Management: Rangelands (includes weed management)** program section.	**3)** See **Upland Vegetation Management: Rangelands (includes weed management)** program section.
Fire Management: Wildland Fire Use	**1)** Wildland fire use projects will not be allowed in habitat categories for slickspot peppergrass.	**1)** When developing wildland fire use plans, do not allow wildland fire use in habitat categories for slickspot peppergrass.

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Fire Management: Prescribed Fire	**1)** Activities within the **Fire Management: Prescribed Fire** program will implement relevant conservation measures asdescribed in the **Special Status Animal and Plant Management** program section to promote conservation. **2)** Prescribed fire projects will be designed to conserve and enhance habitat categories for slickspot peppergrass.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table. **2)** Prescribed fire in habitat categories for slickspot peppergrass will only be used as a tool for assisting with species conservation (for example, a burn in preparation to decrease cheatgrass litter before herbicide application, or to clear fencelines of accumulated windblown weeds).
Fire Management: Non-Fire Fuels Management	**1)** Activities within the **Fire Management: Non-Fire Fuels Management** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. **2)** Implement projects involving the application of pesticides in accordance with the approach described in the **Upland Vegetation Management: Rangelands (includes weed management)** program section. **3)** Fuels management projects conducted in habitat categories for slickspot peppergrass should have long-term benefits to slickspot peppergrass.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table. **2)** See **Upland Vegetation Management: Rangelands (includes weed management)** program section. **3)** Avoid fuels management projects in occupied and critical habitat, unless such projects would enhance species conservation or are necessary for hazardous fuels reduction near the urban interface. Implement protection measures to avoid or minimize negative impacts to the species. In critical and occupied habitat categories for slickspot peppergrass, design native seed mixes that emphasize locally adapted plant material that will promote species conservation. When appropriate, use native plant materials and seed during project activities, and select species that

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		benefit slickspot peppergrass insect pollinators. a) Because of potential negative impacts to habitat categories for slickspot peppergrass from linear fuel breaks, which can act as weed dispersal corridors, the following measures will be applied in habitat categories for slickspot peppergrass: *i)* BLM will monitor the effectiveness of existing fuel breaks (location, dry fuel load, and weed composition) in protecting habitat categories for slickspot peppergrass. *ii)* BLM may create and maintain fuel breaks where frequent fires can threaten habitat categories for slickspot peppergrass. New fuel breaks in habitat categories for slickspot peppergrass will be designed to conserve and/or enhance species habitat. Where appropriate and where objectives will be met, native vegetation should be emphasized in the creation of new fuel breaks. Other fuel break methods may include mowing or brown strips. If native vegetation or seed will not meet objectives, or site disturbance or site conditions preclude their use, fuel breaks may include non-native, non-invasive, species that will not invade slickspots. In slickspot peppergrass habitat all ESR implementation actions/methods in conservation measure (2) and all upland vegetation management implementation actions/methods in conservation measure (4) that are also applicable will be implemented for non-fire fuels management program projects. Potentially invasive non-native species such as intermediate wheatgrass and

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		forage kochia will not be used within 1.5 miles of EOs. When used in fuel break projects, control measures for potentially invasive non-native species such as intermediate wheatgrass and forage kochia will be incorporated into project design features. Control measures will be informed by a comprehensive monitoring strategy that triggers subsequent adaptive management actions. These site specific treatments will also be reviewed via the Level I streamlining process. All fuel breaks located in habitat categories for slickspot peppergrass will have a robust, project specific monitoring strategy that shall include implementation monitoring, effectiveness monitoring, and specific hard and soft triggers for implementation of vegetation control measures, fuel break maintenance, and fuel break modification actions specific to slickspot peppergrass conservation. *iii)* Consider actions to repair or restore fuel breaks so they function as desired. Apply conservation measure (2) in the **Fire Management: Emergency Stabilization and Rehabilitation** program section and conservation measure (4) in the **Upland Vegetation Management** program. b) In addition to the reduction in fuels associated with appropriately managed livestock grazing (see relevant conservation measures from **Livestock Grazing Management** section of this table), BLM may create fuel breaks using techniques such as mowing or targeted grazing to strategically reduce fuel loads where frequent fires can threaten habitat categories for slickspot peppergrass if the benefit of these actions can be demonstrated to outweigh the risks to slickspot peppergrass and its habitat.

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Fire Management: Community Assistance	**1)** Activities within the **Fire Management: Community Assistance** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. **2)** Follow all measures included throughout the Fire Management program sections.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table. **2)** See actions within Fire Management program sections. Incorporate into community assistance agreements.
Lands and Realty Management: Land Tenure Adjustment (land sale, exchanges, withdrawals, etc.)	**1)** Activities within the **Lands and Realty Management: Land Tenure Adjustment (land sale, exchanges, withdrawals, etc.)** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation **2)** Where feasible and funding is available, acquire through land exchange or purchase private lands that contain habitat categories for slickspot peppergrass. **3)** Retain occupied slickspot peppergrass habitat in Federal ownership unless such a transfer would result in a net benefit to the species.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table. **2)** As feasible depending on funding and other factors, BLM will opportunistically acquire habitat categories for slickspot peppergrass, particularly occupied habitat and critical habitat, in land exchanges and purchases. **3)** Review each land tenure decision in terms of species habitat. Avoid the loss of occupied habitat and critical habitat from Federal ownership. If property with occupied habitat or critical habitat is being considered for transfer out of Federal ownership, ensure that the action will result in a greater net benefit for this species. BLM will coordinate with USFWS as early as possible to discuss methods to assure that the proposed land tenure adjustment benefits the species.
Lands and Realty Management: Land Use Permits and Leases	**1)** Activities within the **Lands and Realty Management: Land Use Permits and Leases** program will implement relevant conservation measures as described in the Special Status Animal and Plant	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table.

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LUP Programs Evaluated	Conservation Measures	BLM Implementation Actions
	Management program section to promote conservation. **2)** Issue new land use permits and leases and review existing permits and leases at renewal to conserve species habitat. This includes management of physical facilities, as well as ground disturbance resulting from human uses.	**2)** For new authorizations, as well as those being renewed, see **Special Status Animal and Plant Management** program section item **(3).** Avoid issuing new authorizations, or renewing existing authorizations, in or adjacent to habitat categories for slickspot peppergrass if negative impacts are expected. If an authorization is to be issued or re-issued in such areas, apply stipulations to the authorization that support species conservation and that avoid or minimize negative impacts. BLM will require control of noxious weed species on new, renewing, or amending land use permits. In addition, BLM will require control of invasive, non-native species on new, renewing, or amending land use permits within the ground disturbance footprint within (INHP) B- or C-ranked EOs and critical habitat. a) Conduct periodic project compliance inspections during implementation of projects involving soil disturbance. BLM may require a qualified botanist to monitor slickspots to avoid impacts during ground disturbing activities in habitat categories for slickspot peppergrass. b) BLM will require that new or renewing permit or lease holders establish at least 50% perennial cover after all ground disturbing activities, unless ecological site conditions preclude that level of cover. If a native species component existed prior to the ground disturbance, then the native species component of the perennial cover should be restored.
Lands and Realty Management: Rights-of-Way	**1)** Activities within the **Lands and Realty Management: Rights-of-Way** program will implement relevant conservation measures as	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at

September 2014. Appendix A. Slickspot peppergrass (Lepidium papilliferum): Conservation Measures and Implementation Actions for the Jarbidge and Four Rivers FOs.

LUP Programs Evaluated	Conservation Measures	BLM Implementation Actions
	described in the **Special Status Animal and Plant Management** program section to promote conservation.	the beginning of this table.
	2) Issue new rights-of-way and review existing rights-of-way at renewal to conserve species habitat. This includes management of physical facilities, as well as disturbances to the species resulting from human uses.	**2)** For new rights-of-way and renewal of existing rights-of-way, see **Special Status Animal and Plant Management** program section item **(3)** Avoid issuing new rights-of-way, or renewing rights-of-way, in or adjacent to habitat categories for slickspot peppergrass if negative impacts are expected. In habitat categories for slickspot peppergrass, only issue or re-issue rights-of-way with stipulations to avoid negative impacts to the habitat. BLM will require control of noxious weed species on new, renewing, or amending rights-of-way authorizations. In addition, BLM will require control of invasive, non-native species on new, renewing, or amending rights-of-way authorizations within the rights-of-way footprint, and an additional width on each side of the rights-of -way within (INHP) B- or C-ranked EOs and critical habitat. a) BLM will require that new or renewing permit or lease holders establish at least 50% perennial cover after all ground disturbing activities, unless ecological site conditions preclude that level of cover. If a native species component existed prior to the ground disturbance, then the native species component of the perennial cover should be restored.
	3) As appropriate, require a qualified botanist to monitor slickspots to avoid or minimize impacts during BLM authorized activities in habitat categories for slickspot peppergrass	**3)** BLM may require a qualified botanist to monitor slickspots to avoid impacts during soil disturbing activities in habitat categories for slickspot peppergrass.
Mineral	**1)** Activities within the **Mineral**	**1)** Apply relevant conservation measures

September 2014. Appendix A. Slickspot peppergrass (Lepidium papilliferum): Conservation Measures and Implementation Actions for the Jarbidge and Four Rivers FOs.

LUP Programs Evaluated	Conservation Measures	BLM Implementation Actions
Management: Locatable Minerals	**Management: Locatable Minerals** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. **2)** Approve plans of operations or allow notice level operations so as not to preclude species habitat conservation. This includes management of physical facilities, as well as disturbances to the species resulting from human uses.	from the **Special Status Animal and Plant Management** program section at the beginning of this table. **2)** Approval of plans of operations and notice-level operations: a) For review of existing plans of operation and notice-level operations, see **Special Status Animal and Plant Management** program section item **(2).** To the extent allowed by law, modify plans of operation or notice-level operations that may have negative impacts on the species or its habitat. For notice-level operations, notify the operator that modifications to proposed activities will be required to avoid negative impacts. b) For new plans of operation and notice-level operations, see **Special Status Animal and Plant Management** program section item **(3).** To the extent allowed by law, avoid approving plans of operation or notice-level operations that may have negative impacts on the species or its habitat. For notice-level operations, notify the operator that modifications to proposed activities will be required to avoid negative impacts. If a plan of operations is to be approved in or adjacent to habitat categories for slickspot peppergrass, apply stipulations to support or to not preclude species conservation. A notice will require modification by the operator until BLM determines that it will not result in undue or unnecessary degradation.
Mineral Management: Saleable and Leasable Minerals	**1)** Activities within the **Mineral Management: Saleable and Leasable Minerals** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation. **2)** Approve development of saleable or	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table. **2)** Approval of saleable and leasable

September 2014. Appendix A. Slickspot peppergrass (Lepidium papilliferum): Conservation Measures and Implementation Actions for the Jarbidge and Four Rivers FOs.

LUP Programs Evaluated	Conservation Measures	BLM Implementation Actions
	leasable minerals so as not to preclude species habitat conservation. This includes management of physical facilities, as well as disturbances to the species resulting from human uses.	minerals: a) For review of existing mineral leases, see **Special Status Animal and Plant Management** program section item **(2).** Modify existing mineral leases if negative impacts are occurring. b) For new sales or leases, see **Special Status Animal and Plant Management** program section item **(3).** Avoid development of saleable or leasable minerals in or adjacent to habitat categories for slickspot peppergrass if negative impacts are expected. If a minerals lease or sale is to be issued in or adjacent to habitat, apply stipulations to support or to not preclude species conservation.
Cultural Management	**1)** Activities within the **Cultural Management** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table.
Paleontology	**1)** Activities within the **Paleontology** program will implement relevant conservation measures as described in the **Special Status Animal and Plant Management** program section to promote conservation.	**1)** Apply relevant conservation measures from the **Special Status Animal and Plant Management** program section at the beginning of this table.

APPENDIX B

Definitions

Adaptive Management	A type of natural resource management that implies making decisions as part of an ongoing process. Monitoring the results of actions will provide a flow of information that may indicate the need to change a course of action. Scientific findings and the needs of society may also indicate the need to adapt resource management to new information.
Adjacent	The area outside of a mapped habitat area, but within a zone of influence to the habitat area for which a BLM activity may affect the species. Some activities, such as those that can affect watershed conditions and erosion, can have wide zones of influence for aquatic species. Other activities, such as those that do not affect the slickspot peppergrass habitat but can affect use of that habitat, can have a narrower zone of influence. Thus, this adjacent zone of influence will vary among species and land use activities. The species-specific and land use-specific application of this term will be determined at the local level.
Avoid	To the extent possible do not implement the action indicated. If the action needs to take place, then add stipulations or take additional steps to minimize impacts. Avoidance is the preferred management approach in the identified habitats for species conservation.
Best Management Practices	Generally accepted state-of-the-art techniques and procedures used in project-level operations to avoid or minimize impacts to species and their habitats.
Conserve	The terms "conserve," "conserving," and "conservation" mean to use all methods and procedures that are necessary for species recovery. For project management, the priority for conservation is to avoid impacts, then to minimize and mitigate if adverse impacts are unavoidable.
Element Occurrence	An area of land in which a species like slickspot peppergrass is or was present (NatureServe 2002 as cited in Colket et al. 2006, page 1). EO features are designated by the Idaho Conservation Data Center as separate EOs if they are>l km apart (Colket et al. 2006, page 2).

Habitat

The habitat definitions for slickspot peppergrass are divided into six classifications that meet certain site characteristics and resource conditions, including the presence of slickspots and/or slickspot peppergrass plants. Each classification may have different management strategies in the conservation measures.

- **Non-habitat:** Areas that do not contain slickspots, or slickspots do not have the proper soil characteristics to support slickspot peppergrass.
- **Surrounding habitat:** Landscape-scale matrices of vegetation communities that may influence adjacent slickspot peppergrass occupied habitat.
- **Potential habitat:** Areas within the known range of slickspot peppergrass that have certain general soil and elevation characteristics that indicate the potential for the area to support slickspot peppergrass, although the presence of slickspots or the plant is unknown. These areas meet the following criteria:
  - Natric and natric-like soils forming "slickspots," and associated soil series, or phases thereof, which support Loamy 7- to 10-inch and 10- to 13-inch Wyoming big sagebrush Ecological Sites (Major Land Resource Areas 11-Snake River Plains, and 25 Owyhee High Plateau) and have a aridic bordering on xeric soil moisture regime; and
  - 2,200 to 5,400 feet elevation.

  The use of the term "potential habitat" acknowledges the potential for an area to support slickspot peppergrass based on general characteristics even though uncertainty remains because of the lack of site-specific habitat information.
- **Slickspot Peppergrass Habitat:** Potential habitat areas with Wyoming big sagebrush ecological sites that through Stage 1 surveys have documented slickspot microsites (natric and natric-like soil types) within 2,200 feet and 5,400 feet elevation in Southwest Idaho. Slickspot peppergrass habitat includes areas with slickspots of unknown occupancy and in some cases may be dominated by non-native vegetation such as annual grasses or crested wheatgrass. In addition, to maintain ecological continuity, if there is less than 0.5 miles between areas defined as slickspot peppergrass habitat, then the entire area is considered slickspot peppergrass habitat. Surveyed potential habitat not meeting these criteria will no longer be considered habitat for

	slickspot peppergrass. • **Occupied habitat:** The term "occupied habitat" refers to areas where slickspot peppergrass has been documented or identified as an element occurrence (BO) and includes the area generally within 0.5 mile of that occurrence that is important to maintain or improve habitat integrity and pollinator populations necessary for species conservation. For analysis purposes, a generalized area delineated by a 0.5 mile radius circle was drawn around each EO (this circle may include areas of non-habitat). This area identified as occupied habitat may or may not include additional slickspots or slickspot peppergrass plants beyond the EO. Further refinement of occupied habitat may be accomplished through field surveys considering existing resource conditions as well as specific habitat quality and integrity. • **Unoccupied Habitat:** Slickspots that have the proper soil characteristics to support slickspot peppergrass, but Stage 2 surveys 3 out of 12 years did not indicate that a seedbank is present.
Livestock Gathering	Collecting scattered livestock into a group for management purposes.
Livestock herding	Moving a herd of livestock within or between pastures of an allotment. Permits are not required and it is part of the grazing plan.
Livestock Trailing	An activity involving moving a livestock herd across allotment(s) where the trailing party has no grazing permit.
Minimize	To reduce to the smallest possible amount, extent, size, or degree as is feasible from a technical or management standpoint.
Modify	To "modify" a management activity could have a wide variety of site- specific actions, ranging from eliminating the activity, to changing seasonal use, or to minor operational changes. The goal of modifying an activity is to meet the intent of a specific conservation measure or its implementing action
Penetrating Trampling	Breaking of the restrictive layer underneath the silt surface area during saturated conditions exposing the clay layer of a slickspot. The restrictive layer of a slickspot is the heavy clay (35-45% clay content) prismatic structured subsoil layer (Btnl horizon) below the salty vesicular surface layer (E horizon) and above the lighter textured (25- 35% clay content) blocky structured clayey layer (Btn2horizon).

Figure 1. Implementation of Annual Grazing Adaptive Management

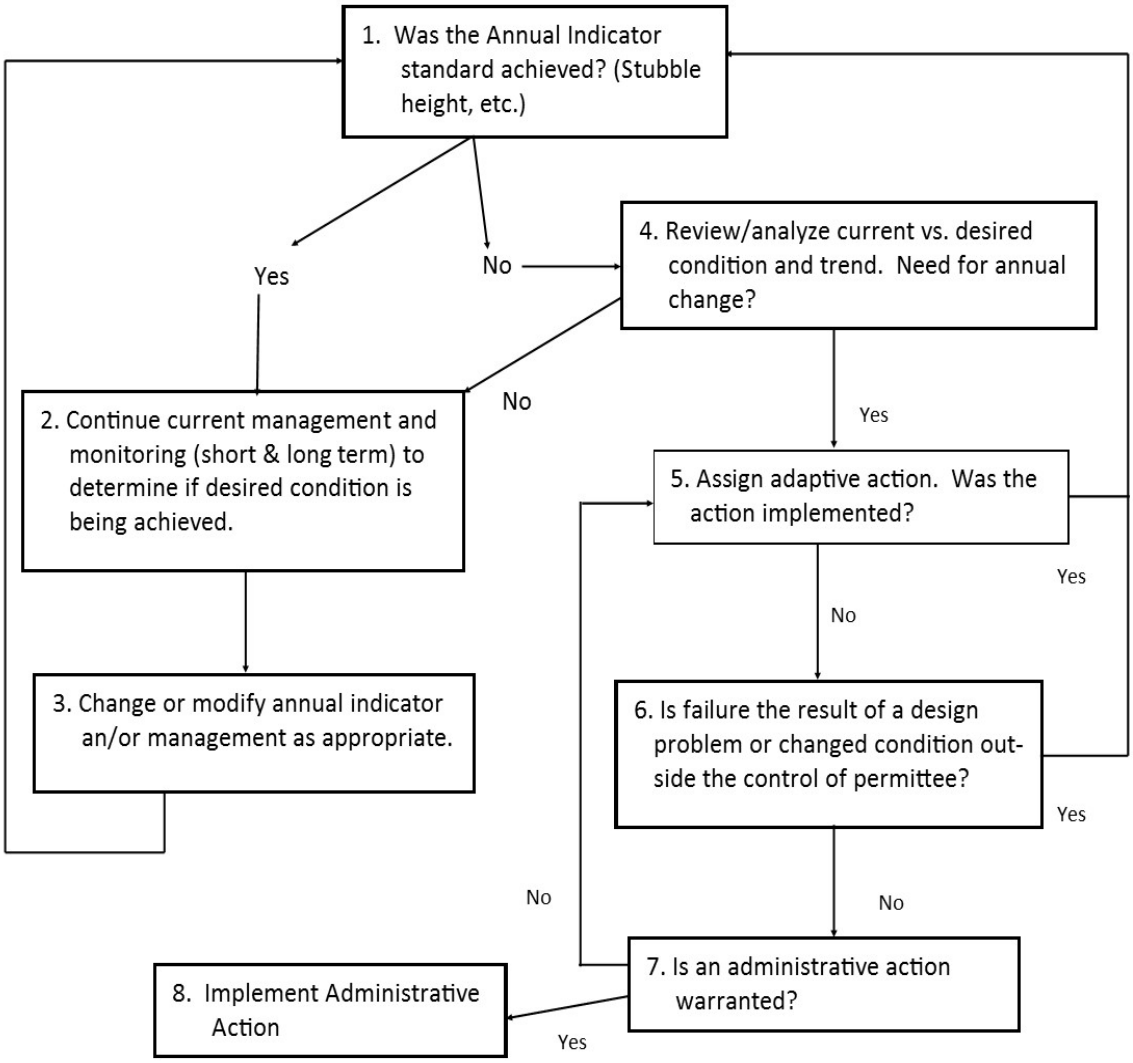
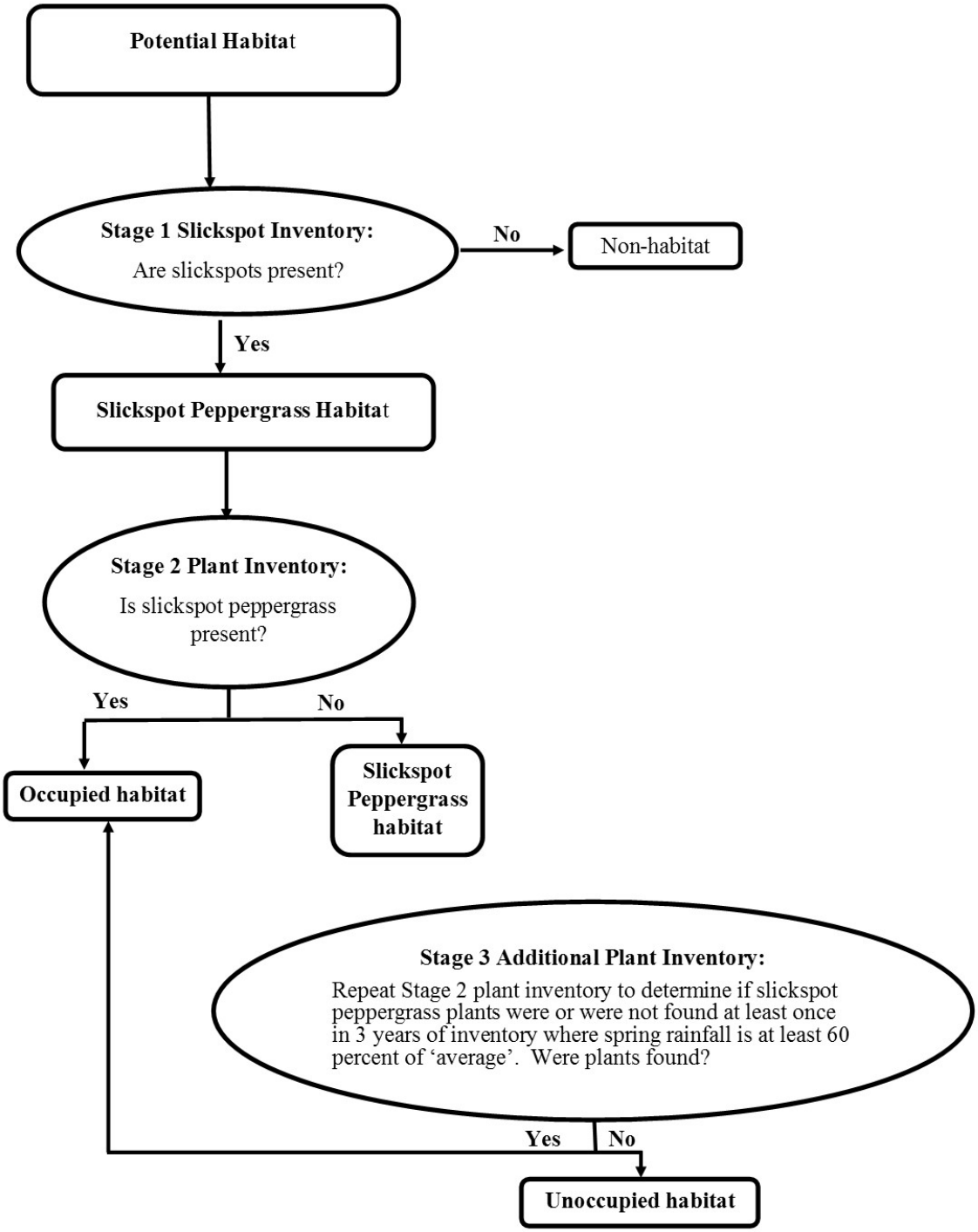


Figure 2. Inventory flowchart for slickspot peppergrass.



Appendix M - FRFO Bighorn Sheep Environmental Analysis

Intent:
The intent of this document is to describe the analysis methodology and rationale for domestic sheep grazing management actions relative to bighorn sheep in the Hells Canyon area.

Analysis Methods:

- Relied on the Final Supplement to the Final Environmental Impact Statement for the Southwest Idaho Ecogroup Land and Resource Management Plans (FSEIS) (2010a).
  - The FSEIS essentially overlapped RMP analysis area (Cumulative Impacts analysis).
  - Incorporated habitat models and bighorn sheep distribution and movement data.
- Incorporated the Bighorn Sheep Risk of Contact Tool (2013).

Modeling Potential for Contact
This analysis of allotments in the FRFO RMP relies on updated models originally designed for use in the 2010 PNF FSEIS, developed to address, among other issues, bighorn sheep viability and the potential for disease transmission on domestic sheep grazing allotments. In order to corroborate the analysis, we used the Bighorn Sheep Risk of Contact Tool (RCT) (O'Brien et al. 2013); a geospatial application based on the concepts used in the PNF analyses for application on other National Forest and BLM lands. The 2013 tool calculates the probability and rates of contact between foraying bighorn sheep and domestic sheep grazing allotments. The model does not consider the attraction between domestic sheep and bighorn sheep, travel distances of stray domestic sheep and potential contact with bighorn sheep, transmission of disease after contact, or the overlap of bighorn sheep forays from multiple core herd home ranges (CHHR). The RCT model user guide are available from the BLM Four Rivers Field Office upon request.

The tool provides a framework for addressing the potential of contact. While the model provides relevant information concerning the general risk of contact between bighorn sheep and domestic sheep allotments it is limited, and professional opinions and observations relevant to the analysis area were also considered and used to corroborate our analysis.

The summer source habitat and risk of contact models are incorporated into the Bighorn Sheep Risk of Contact Tool. The following is a brief description of each analysis component:

CHHR - Several bighorn sheep CHHR, using information through 2013, were developed for this analysis and were used as part of the RCT model analysis.

- Sheep Mountain and Upper Hells Canyon (Idaho and Oregon) - Long-term bighorn population/herd data collected by the Hells Canyon Initiative (a coalition of state wildlife departments, federal agencies, and non-governmental organizations) provided the best CHHRs for the Sheep Mountain and Upper Hells Canyon populations.
- Lookout Mountain - The ODFW provided the best available CHHR based on monitoring data, site-specific observations, and the expert opinion of bighorn sheep biologists.
- Hells Canyon PMU - This CHHR was developed for the PNF FEIS, using a database of telemetry and observational data collected in Oregon, Idaho, and Washington between 1997 and 2006 (USFS 2010a). In our analysis, we used the CHHR to represent the broader home range of several interacting populations in the southern portion of the Hells Canyon PMU as delineated by IDFG.

Foray Analysis - This component calculates the probability that a foraying bighorn sheep will reach each point on the landscape surrounding the herd's CHHR.

Contact Analysis - This component returns the probability that bighorn sheep on a foray will come into contact with a domestic sheep allotment and the rate of contact for rams, ewes, and the entire herd (entire herd probability values were used in this analysis).

Two RCT model scenarios were run to determine risk of contact with allotments and domestic sheep trailing routes. The Current Herd scenario determines risk of contact to the nearest existing bighorn sheep herds that have the greatest potential to make contact with the allotments. These include the Sheep Mountain, Upper Hells Canyon Idaho, Upper Hells Canyon Oregon, and Lookout Mountain herds. The Potential Population scenario determines risk of contact with the Hells Canyon PMU, assuming the PMU is at carrying capacity for bighorn sheep. The Hells Canyon PMU CHHR encompasses the current herd boundaries of the Sheep Mountain and Upper Hells Canyon herds. IDFG has determined that the estimated carrying capacity for the entire PMU is approximately 1,550 bighorn sheep; a population size of 500 animals was used in the RCT to represent relatively healthy bighorn sheep populations in the southern portion of the PMU.

Quantifying disease transmission and disease outbreaks in bighorn sheep populations following contact with domestic sheep, and the subsequent ability of a population to recover are essential to interpreting the RCT model results. The BLM relied on the following assumptions to assist with data interpretation:

- One in four contacts between foraying bighorn sheep and a domestic sheep allotment would result in a disease outbreak in the bighorn sheep herd.
- If a bighorn herd/population suffers a disease outbreak more frequently than once every 50 years, the herd/population may not fully recover which may lead to extirpation.

The rate of disease transmission from domestic sheep to bighorn sheep depends on a variety of factors that cannot be easily predicted or modelled. In the PNF FSEIS (USFS 2010a), disease modeling was conducted assuming that disease outbreak would occur under the following range of probabilities: disease would be transmitted 0.05, 0.10, 0.25, 0.5, 0.75, or 1.0 times per contact between bighorn sheep and a domestic sheep allotment (USFS 2010a). Probabilities of a disease outbreak given contact are considered low (0.05 or 1 in 20 contacts leads to a disease outbreak), moderate (0.25 or 1 in 4 contacts lead to a disease outbreak), or high (1.0 or every contact results in a disease outbreak); however, these are relative terms.

Based on disease model runs at the 0.25 disease transmission probability level, bighorn herds could survive disease return intervals of once every 46 years or longer (USDA 2010a, pp. 3-80). Outbreaks more frequently than once every 46 years would mean that the population is consistently exposed to ongoing disease transmission and would likely be extirpated as a result of consistent exposure to interspecies contact. Although we still lack empirical data to make recommendations on the periodicity of outbreaks, and the effects on bighorn sheep, this is a good benchmark to ensure population persistence until better data is available.

The "moderate" disease outbreak (1 in 4 contacts leads to disease outbreak) and interval between outbreaks (46 years) were used in the PNF ROD rationale (USFS 2010b). The Payette National Forest analyses incorporated a large amount of scientific literature, input from many bighorn sheep experts, and modeling that incorporates current best science analysis for interspecies contact (USFS 2010a; USFS 2010b). Recognizing the uncertainty regarding contact and disease outbreak, this threshold provides for low to very low risk to bighorn sheep populations not recovering from potential disease outbreak and provides for population persistence. The Payette assumptions and associated analyses are appropriate to use for this document because the three allotments are within 0-8 miles of the PNF lands evaluated. For this document, a rate of contact >4 contacts/50-year period would likely result in bighorn

herd extirpation, whereas herds would remain viable over the long term with ≤4 contacts/50-year period.

Risk of Contact Tool Results: Environmental Consequences

Contact with Allotments - The expected number of contacts (rate of contact) between Current Herds (Sheep Mountain, Lookout Mountain) and any of the allotments is very low, ranging from less than 1 to 2.5 over a 50-year period (Table 1). The Sheep Mountain herd consists of ewes (eight animals in 2013), which are less likely to make foray movements in comparison to long distance and more frequent foray behavior of rams. The Lookout Mountain herd is a large population composed of rams and ewes (approximately 150 animals in 2013); therefore, the herd is more likely to make long distance foray movements.

Table 1. Annual risk of contact and expected number of contacts in a 50-year period for the Current Herd scenario (Sheep Mountain, Idaho and Lookout Mountain, Oregon herds) with three allotments, Washington County, Idaho.

Allotment	Model	Annual Risk of Contact (%)[1]	Expected # of Contacts/50-year Period
West Pine Creek	Sheep Mountain Herd	0.03	<1
	Lookout Mountain Herd	5.0	2.5
Cambridge	Sheep Mountain Herd	0.007	<1
	Lookout Mountain Herd	0.07	<1
Boyd Individual	Sheep Mountain Herd	0.0002	<1
	Lookout Mountain Herd	0.03	<1

[1] These risk of contact values are for allotments that are grazed and therefore represent the probability of a bighorn sheep transecting a domestic sheep grazing allotment.

The Upper Hells Canyon Idaho and Oregon herds were analyzed using the RCT. West Pine Creek, Cambridge, and Boyd Individual allotments were determined to be beyond foray distances of these herds; therefore, a rate of contact value was not generated. These populations have been suppressed by past pneumonia outbreaks (first observed in 2000) and are not expected to survive in the long term. Impacts to these individual herds are not discussed further in the analysis.

Under the Potential Population scenario, the rate of contact between a bighorn sheep and any of the allotments would be substantially greater (Table 2). A large population (500 animals), composed of rams and ewes, and proximity between the allotments and the Hells Canyon PMU are the primary factors influencing the annual risk of contact. A foraying bighorn sheep would be expected to contact the West Pine Creek Allotment annually, and approximately two contacts could occur every 10 years with the Cambridge Allotment.

Table 2. Annual risk of contact and expected number of contacts in a 50-year period for the Potential Population scenario (Hells Canyon PMU) with three allotments, Washington County, Idaho.

Allotment	Model	Annual Risk of Contact (%)[1]	Expected # of Contacts/50-year Period
West Pine Creek	Hells Canyon PMU	100.0	50
Cambridge	Hells Canyon PMU	24.0	12
Boyd Individual	Hells Canyon PMU	4.0	2

[1] These risk of contact values are for allotments that are grazed and therefore represent the probability of a bighorn sheep transecting a domestic sheep grazing allotment.

Contact with Domestic Sheep Trailing Routes - The rate of contact would be less than 1 over a 50-year period with Current Herds (Sheep Mountain and Lookout Mountain) and 12.5 over a 50-year period with the Potential Population (Hells Canyon PMU; Table 3). The trailing route was determined to be beyond foray distances of the Upper Hells Canyon (Idaho and Oregon) herds; therefore, a risk of contact value was not generated. The route is within 1 mile of the Hells Canyon PMU, 13 miles of the Sheep Mountain CHHR, and 18 miles from the Lookout Mountain CHHR.

Table 3. Annual risk of contact and expected number of contacts in a 50-year period for the Current Herd (Sheep Mountain, Idaho and Lookout Mountain, Oregon herds) and Potential Population (Hells Canyon PMU) scenarios with a domestic sheep trailing route., Washington County, Idaho.

Trailing Route (number)	Model	Annual Risk of Contact (%)	Expected # of Contacts/50-year Period
Shirts Sheep Trailing Route (04-02)	Sheep Mountain Herd	0.008	<1
	Lookout Mountain Herd	0.6	<1
	Hells Canyon PMU	25.0	12.5

Cumulative Impacts

Three pastures (Lawrence, Upper East, and Upper West) in the Pritchard Creek Allotment (Vale District BLM, Oregon) are permitted for domestic sheep grazing (May 1 to June 15; 201 AUMs) and are located approximately 12 miles from the Lookout Mountain herd. The pastures were analyzed separately as the use varies annually. Between 2011 and 2013, the Lawrence Pasture was used two years and Upper East and Upper West were used one year. Sheep also graze on private lands in the town of Durkee Oregon, west of Interstate-84. A polygon was generated 0.5 miles around the town in order to delineate an "allotment" for analysis. The RCT tool was used to analyze the risk of contact between these allotments and the Lookout Mountain herd. The annual risk of contact with the Lookout Mountain herd and the Pritchard Creek Allotment is 10.5 percent (~1 contact in a 10-year period) and the risk is less than 1 percent for the private land within Durkee, Oregon (Table 5). Pritchard Creek pastures and Durkee Private were determined to be beyond foray distances of the Sheep Mountain, Upper Hells Canyon Idaho, Upper Hells Canyon Oregon, and Hells Canyon PMU herds; therefore, a rate of contact value was not generated for these herds.

Table 4. Annual risk of contact and expected number of contacts in a 50-year period for the Lookout Mountain herd with a BLM domestic sheep allotment and private land, Baker County, Oregon.

Allotment/Pasture		Model	Annual Risk of Contact (%)	Expected # of Contacts/50-year Period
Prichard Creek	East Upper	Lookout Mountain Herd	0.54	<1
	Lawrence	Lookout Mountain Herd	10.6	5.3
	West Upper	Lookout Mountain Herd	1.47	<1
Durkee Private		Lookout Mountain Herd	0.2	<1

Two BLM-administered allotments in the Goodrich MA, Rush Creek (00169) and Cow Creek (00046), are authorized for domestic sheep grazing. The allotments are 16 (Cow Creek) to 17 (Rush Creek) miles from the Sheep Mountain herd CHHR. This EA would not amend any terms or conditions to those permits, but they are included in the cumulative effects analysis area and the RCT was used to analyze potential impacts to bighorn sheep for the allotments. The annual risk of contact with Current Herds (Sheep Mountain and Lookout Mountain) and the Cow Creek or Rush Creek allotments is less than 1 percent and 37 percent for the Potential Population (Hells Canyon PMU; Table 5).

Three private and two State pastures occur within 25 miles of the CHHR. The annual risk of contact with Current Herds (Sheep Mountain, Upper Hells Canyon Idaho, Upper Hells Canyon Oregon, and Lookout Mountain) and the private (except Pasture 2) and State pastures is less than 1 percent (Table 5). With the exception of the Upper Hells Canyon Idaho herd, the annual risk of contact with Current Herds would be less than 1 percent for Private Pasture 2. The Upper Hells Canyon Idaho CHHR overlaps the pasture; therefore, annual risk of contact would 100 percent. The annual risk of contact with the Potential Population (Hells Canyon PMU) ranges from less than 1 percent (Private Pasture 2) to 100 percent (private pastures 1 and 3; Table 5).

Table 5. Annual risk of contact and expected number of contacts in a 50-year period for the Current Herd (Sheep Mountain, Idaho and Lookout Mountain, Oregon herds) and Potential Population (Hells Canyon PMU) with two BLM domestic sheep allotments and domestic sheep on private pastures, Adams and Washington counties, Idaho.

Allotment/Pasture		Model	Annual Risk of Contact (%)	Expected # of Contacts/50-year Period
Cow Creek		Sheep Mountain Herd	0.008	<1
		Lookout Mountain Herd	N/A[1]	N/A[1]
		Hells Canyon PMU	26.8	13.4
Rush Creek		Sheep Mountain Herd	0.0003	<1
		Lookout Mountain Herd	0.007	<1
		Hells Canyon PMU	10.3	5.2
Private and State Pastures, Idaho [2]	Private Pasture [1]	Sheep Mountain Herd	0.02	<1
		Lookout Mountain Herd	N/A[1]	N/A[1]
		Upper Hells Canyon Idaho	0.12	<1
		Upper Hells Canyon Oregon	0.1	<1
		Hells Canyon PMU	100.03	50
	Private Pasture [2]	Sheep Mountain Herd	0.02	<1
		Lookout Mountain Herd	N/A[1]	N/A[1]
		Upper Hells Canyon Idaho	100.03	50
		Upper Hells Canyon Oregon	0.8	<1
		Hells Canyon PMU	100.03	50
	Private Pasture [3]	Sheep Mountain Herd	0.05	<1
		Lookout Mountain Herd	N/A[1]	N/A[1]
		Upper Hells Canyon Idaho	0.2	<1
		Upper Hells Canyon Oregon	0.2	<1
		Hells Canyon PMU	100.03	50
	State Pasture [1]	Sheep Mountain Herd	N/A[1]	N/A[1]
		Lookout Mountain Herd	N/A[1]	N/A[1]
		Upper Hells Canyon Idaho	0.09	<1
		Upper Hells Canyon Oregon	0.006	<1
		Hells Canyon PMU	7.1	3.5
	State Pasture [2]	Sheep Mountain Herd	0.004	<1
		Lookout Mountain Herd	N/A[1]	N/A[1]
		Upper Hells Canyon Idaho	N/A[1]	N/A[1]
		Upper Hells Canyon Oregon	N/A[1]	N/A[1]
		Hells Canyon PMU	14.4	7.2

[1] The allotment is beyond the typical foray distance of bighorn sheep, therefore the RCT did not calculate a risk of contact value.

[2] Private lands within the Boyd Individual, Cambridge, and West Pine Creek allotments are not included.

[3] Pasture falls within the CHHR; therefore, annual contact between bighorn sheep and the pasture would be expected.

Conclusions:

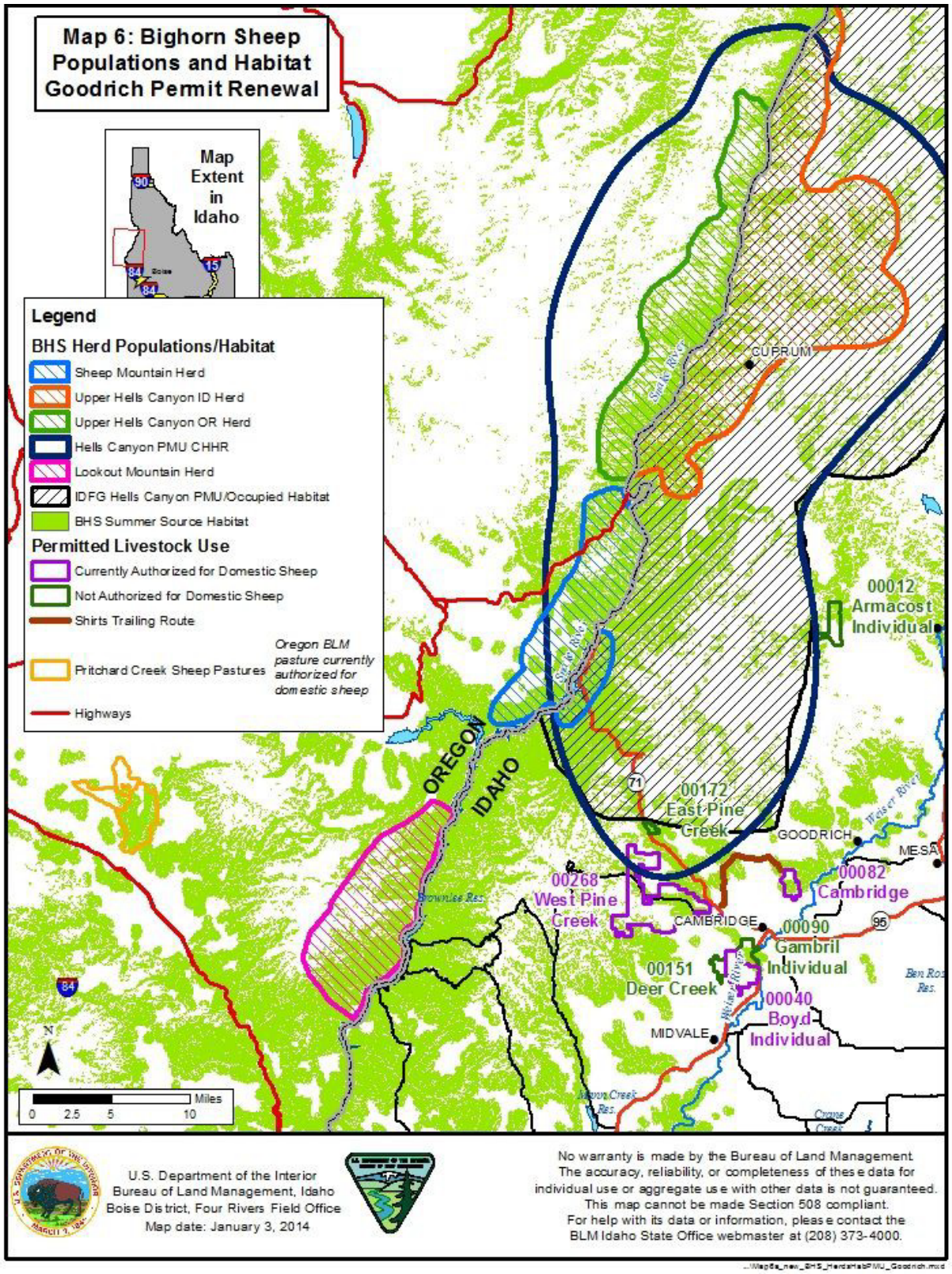
Based on the analysis above:

Domestic sheep and goat grazing in bighorn sheep habitat poses a risk of disease transmission. Restricting domestic sheep and goat grazing in bighorn sheep habitat provides the least risk of disease transmission and would be most beneficial to bighorn sheep populations.

Disease transmission risk could be mitigated through an adaptive management scenario. For example, BLM could determine that, based on bighorn sheep population levels, distributions, and foray sightings, domestic sheep grazing would present an unacceptable risk to bighorn. Therefore, the permittee and BLM would meet annually prior to turnout to discuss livestock kind and numbers as outlined in 43 CFR 4160 through issuance of a proposed and final decision. This scenario provides more risk than making allotments unavailable to sheep and goat grazing as discussed above, however the risk would be below

the threshold of 4 contacts over a 50-year period, which allows herds to remain viable over the long term (see “Modeling Potential for Contact” section above).

A signed and implemented separation response plan (Attachment 1) must be in place prior to livestock turnout into the allotment. Annual meetings would be held to determine compliance with the current separation response plan and any necessary amendments to achieve compliance.


Map 6: Bighorn Sheep Populations and Habitat Goodrich Permit Renewal
Map Extent in Idaho
Legend
BHS Herd Populations/Habitat
Sheep Mountain Herd
Upper Hells Canyon ID Herd
Upper Hells Canyon OR Herd
Hells Canyon PMU CHHR
Lookout Mountain Herd
IDFG Hells Canyon PMU/Occupied Habitat
BHS Summer Source Habitat
Permitted Livestock Use
Currently Authorized for Domestic Sheep
Not Authorized for Domestic Sheep
Shirts Trailing Route
Pritchard Creek Sheep Pastures
Oregon BLM pasture currently authorized for domestic sheep
Highways
CUPRUM
00012 Armacost Individual
OREGON
IDAHO
00172 East Pine Creek
GOODRICH
MESA
00082 Cambridge
00268 West Pine Creek
CAMBRIDGE
00090 Gambril Individual
00151 Deer Creek
00040 Boyd Individual
MIDVALE
Miles
0 2.5 5 10
U.S. Department of the Interior
Bureau of Land Management, Idaho
Boise District, Four Rivers Field Office
Map date: January 3, 2014
No warranty is made by the Bureau of Land Management.
The accuracy, reliability, or completeness of these data for individual use or aggregate use with other data is not guaranteed.
This map cannot be made Section 508 compliant.
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Appendix N - Fish and Wildlife

Rocky Mountain Elk

Rocky Mountain elk (hereafter "elk") are widespread and abundant throughout Idaho. In general, populations south of the Salmon River have increased over the past 20 years (IDFG 2009a). Habitat quality and availability are essential in supporting elk herds. Seasonal habitats are important for sustainability of elk populations. The BLM manages approximately 294,180 acres of elk summer range in the PA. Overall, these areas represent less than 10 percent of summer range within the PA; with the majority being on USFS and private lands. The BLM manages 524,000 acres of elk winter range in the PA. Winter range is the most crucial element of elk habitat and the sustainability of elk populations. In a 2007 study, the BLM found that chokecherry, serviceberry, bitterbrush and four-winged salt brush showed the greatest use on winter range. Spring diets consist mainly of grasses, forbs and browse, in summer forbs often dominate elk diets.

Table N-1. Elk Harvest in Four Game Management Zones from 2005 to 2012

Year	Game Management Zone Elk Harvest					Elk Population Estimate			
	Hells Canyon GMU 11,13,18	Weiser River GMU 22,32, 32A	Boise River GMU 39	Smokey Bennett GMU 43-45, 48,52	Total	Cows	Bulls	Calves	Total
2005	235	1,250	1,000	680	3,165				
2006	390	1,300	1,000	600	3,290				
2007	470	1,325	1,345	650	3,790				
2008	460	1,200	775	700	3,135				
2009	680	1,370	830	600	3,480	3642	973	965	5,580
2010	740	1,525	700	700	3,665				
2011	640	1,300	825	700	3,465				
2012	690	1,680	1700	800	4,870				
2013						3633	1059	781	5,473

Elk harvest in four game management zones in the PA from 2005 to 2012 is shown in table O-2. Although the number of animals harvested each year has increased since 2005, Fish and Game population estimates indicate that elk populations have remained stable.

Mule Deer

Mule deer occupy nearly all habitats in the Intermountain West from dry, open country to dense forests. They are Idaho's most abundant and widely distributed big game animal, providing more recreational opportunities than any other big game species (IDFG 2009b). Densities are highest south of the Salmon River. Overall, mule deer populations statewide have declined since the 1980s (IDFG 2009b).

Habitat requirements of mule deer vary seasonally. In the spring, mule deer fawning habitat is characterized by dense stands of deciduous or coniferous trees or shrubs with a diverse herbaceous understory. Fawning generally occurs between May 1 and June 30. The winter season for mule deer generally runs from November 15 through April 30. Aspen and native riparian trees, mountain shrub communities and riparian areas are important seasonal habitats for mule deer for fawning, foraging, hiding and migrating.

Table N-2 shows mule deer harvest in four game management units in the PA. The number of deer harvested in the years reported appears to fluctuate widely which may be related to winter weather conditions and the availability of forage and cover on winter range. Elk are more generalists and can eat a variety of shrubs and grasses through the winter, while deer diets are more specific and dependent on forbs and shrubs.

Table N-2. Mule Deer Harvest in Four Game Management Zones in the PA

Year	Game Management Zone Deer Harvest				
	Hells Canyon GMU 11,13,18	Weiser River GMU 22, 32, 32A	Boise River GMU 39	Smokey Bennett GMU 43-45,48,52	Total
2017	1,200	1,134	3,428	1,535	7,297
2010	1,030	1,954	1,990	1,045	4,260
2005	870	3,937	2,959	1,929	9,695
2000	904	1,925	586	995	4,410

White-tailed Deer

White-tailed deer in Idaho are most abundant north of the Salmon River. South of the river, they are primarily restricted to riparian areas of major river systems and/or adjacent agricultural fields. Some anecdotal evidence shows that the southern populations have increased in number and distribution over the last 20 years (IDFG 2009c), but no population surveys exist for southern Idaho. White-tailed deer occupy habitats that consist of thick vegetation, resulting in surveys with low confidence and inaccurate population estimates (IDFG 2009c). White-tailed deer are rarely observed in the PA.

Pronghorn

Pronghorn are typically associated with sagebrush steppe habitats, but readily use grasslands if there are adequate amounts of forbs. In sagebrush steppe habitats, pronghorn diets consist of sagebrush and other shrubs during all seasons, but particularly in the fall and winter. Forbs are preferred when they are available from spring through fall (O'Gara & Yoakum 2004). The availability of forbs in shrub steppe habitats may have important implications for pronghorn because they are rich in nutritional values required for reproduction (Pyrah 1987). Pronghorn numbers appear to be declining in the PA potentially as a result of wildfire that eliminates shrubs and forbs.

Rocky Mountain Bighorn Sheep

Rocky Mountain bighorn sheep (bighorn sheep) on public lands in the PA primarily occur in the vicinity of the Snake River and west of McCall and Cascade where the USFS has responsibility for surface management of public lands. Disease is the greatest issue facing bighorn sheep in the PA. Outbreaks of pneumonia have resulted in low recruitment because of sporadic lamb die-offs and pneumonia in adults (BLM 2013a). Bighorn die-offs typically follow known or suspected contact with domestic sheep and goats, but have also occurred in the absence of known association with domestic sheep and goats (Aune et al. 1998). IDFG considers disease risk reduction (specifically transmission from domestic sheep and goat to bighorn sheep) and population growth as the most important issues driving bighorn sheep management (IDFG 2010). Research shows that domestic sheep and goats should be kept separated (both temporally and spatially) from wild bighorn sheep to maintain healthy populations (WSWG 2012).

Rocky Mountain Bighorn Sheep/Domestic Sheep Interactions: Risk Assessment and Separation Response Plans in the PA

Due to the potential for domestic sheep to spread pathogens to bighorn sheep, and the possibility of the pneumonia negatively affecting local populations of bighorn, the following discussion further details this issue in the PA.

Rocky Mountain bighorn sheep are native to Hells Canyon, but were extirpated in the early part of the 20th century due to over-hunting and disease outbreaks associated with domestic sheep contact (Rohlman et al. 2007; IDFG 2010). Reintroduction of bighorn sheep into Hells Canyon began in 1975. Translocations were conducted in 1975-1976 and 1979 to reestablish populations, and augmented in 1990 to offset substantial 1983 losses, resulting from a disease outbreak (Rohlman et al. 2007). Sheep were translocated from the upper Salmon River with the last translocation of bighorn sheep occurring in 2002. The BLM Hells Canyon MA encompasses the lower portion of hunt area 11 for bighorn sheep and includes at least 4 populations. Bighorn sheep habitat in Hells Canyon MA consists of dry bunchgrass vegetation and rocky cliffs along the Snake River and tributaries. In 1993, hunting was initiated in hunt

area 11 with 1 to 2 tags issues each year. The largest bighorn sheep ever recorded in Idaho was found in this area, and most hunting tags go to nonresident applicants.

It is BLM policy to complete separation response plans for all grazing allotments and other areas where bighorn sheep may come into contact with domestic sheep and goats on public lands. Separation response plans are cooperative agreements between the BLM, IDFG, and the permittee with a protocol that ensures a timely and appropriate response when bighorn sheep/domestic sheep are likely to or have come into contact. This protocol would include immediate communication with IDFG when bighorn sheep and domestic sheep come into contact or have the potential to come into contact. The problem with the response plan is that generally bighorn sheep have already come into contact with domestic sheep when the situation, or risk, is reported.

A healthy herd, composed of mixed age-classes that include young rams, would likely exhibit a higher frequency and probability of foray movements from home ranges and into the Goodrich allotments, which are the allotments closest to the Hells Canyon PMU. Rams are known to make long distance exploratory forays, in particular during the fall rut, ranging from 30-40 miles beyond their core herd home range (IDFG 2010). While both rams and ewes make annual foray movements, forays by ewes are typically less frequent and shorter distances. Approximately 14 percent of rams and 1.5 percent of ewes are known to make foray movements on an annual basis. Twenty-five percent of foray movements by Hells Canyon rams reach a distance of at least 9.3 miles (BLM 2013a).

The modeled bighorn sheep habitat and risk assessment criteria described in the Goodrich EA were used to determine which allotments in the PA were at risk for contact between wild and domestic sheep. There are currently 14 permitted domestic sheep allotments that are either within bighorn sheep habitat, in proximity to habitat, in proximity to known bighorn sheep occurrences, or in areas where there is a level of habitat connectivity that provides for some potential of contact. These allotments represent a risk for disease transmission between domestic and wild sheep. The level of risk may vary among these allotments based on the current and future distribution of bighorn sheep. The allotments include Black Canyon, Boise Front, Cambridge, Cove Creek, Crane Creek, East Garden Valley, Hammett Livestock Company, No Unit (allotment number 00311), Packer John, Paddock Valley, Rush Creek, Spring Valley, Sunnyside Spring/Fall, and West Pine Creek.

Furbearers

The following tables summarize information on harvest of furbearers and big game in the PA. BLM manages habitat on public lands and the Idaho Department of Fish and Game manages populations of game species. Harvest through hunting and trapping has an impact on populations of small mammals, upland game, waterfowl and big game in the PA. This information is provided to for context, relative to the importance of recreational hunting and trapping in the PA. Harvest information is based on reports submitted by licensed hunters and trappers. IDFG estimates that these reports account for about 76% of the furbearers actually harvested. The estimated total accounts for the 24% of unreported harvest. These numbers do not include Washington, Adams or Valley County, which are within the northern sections of the PA where habitat is primarily managed by the USFS.

Harvest of furbearers in the PA has fluctuated, but overall stayed about the same in each of the five southern counties in the PA between 2010 and 2016. In comparison, harvest of furbearers in the state from 2010 to 2016 has increased substantially for some species like coyotes, and decreased for mink, muskrat and beaver. However, state harvest of furbearers since 2002 has increased for all species.

Table N-3. Furbearer Harvest for Counties in the PA in 2010 and 2016.

	Furbearer Harvest By County within the PA 2010 and 2016											
	Elmore		Boise		Ada		Gem		Canyon		Payette	
Year 2010/2016	`10	`16	`10	`16	`10	`16	`10	`16	`10	`16	`10	`16
Species												
Badger	17	11	1		28	64	5	29	10	12	7	1
Marten	55	16	56	36			2					
Mink	9	11	1	1	144	56	18	6	247	67	6	9
Bobcat	9		3	18	0	3	1	8		1		1
Coyote	71	145	43	40	124	185	9	4	38	105	33	4
Weasel			42	12	5	1						
Muskrat	375	696		6	1051	716	465	68	1114	991	51	174
Beaver	108	53	43	63	106	73	116	33	142	95	72	42
River Otter	2	2	1	2	1		3	2	5		1	
Raccoon	24	8		5	167	35	21	11	69	29	6	4
Red Fox	70	31	51	74	88	47	6	6	42	60	13	3
Striped Skunk	8	10		7	131	111	11	7	66	102	3	1
Spotted Skunk	8		1									
Reported Total	**756**	**983**	**242**	**264**	**1845**	**1291**	**657**	**174**	**1733**	**1462**	**192**	**239**
Estimated Total	**945**	**1229**	**302**	**330**	**2306**	**1613**	**821**	**217**	**2166**	**1827**	**240**	**300**

Table N-4. Furbearer Harvest in the State of Idaho from 2001 through 2016

Species	State of Idaho Furbearer Harvest by Year						
	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2009-2010	2015-2016
Badger	65	40	57	70	83	189	238
Marten	332	295	342	266	745	967	893
Mink	252	76	175	230	206	964	477
Bobcat	59	132	90	90	104	715	575
Coyote	424	651	396	533	898	2303	4584
Weasel	4	11	5	1	19	114	118
Muskrat	1,730	911	1,648	2,150	2,034	19,026	11,979
Beaver	368	294	439	453	472	3,054	2,155
Red Fox	540	490	411	372	490	752	719
River Otter	23	21	21	25	16	102	143
Raccoon	198	217	237	366	241	1332	869
Striped Skunk	224	303	466	369	168	660	778
Spotted Skunk	0	0	2	3	10	44	15
Total	**4,219**	**3,441**	**4,289**	**4,928**	**5,486**	**30,222**	**23,677**
Estimated Total	**5,273**	**4,301**	**5,361**	**6,160**	**6,657**	**37,777**	**29,596**

Migratory Birds

The 1988 amendment to the Fish and Wildlife Conservation Act mandated that the U.S. Fish and Wildlife Service (USFWS) "identify species, subspecies, and populations of all migratory non-game

birds that without additional conservation actions are likely to become candidates for listing under the Endangered Species Act." The report, Birds of Conservation Concern BCC (USFWS 2008a), is intended to prevent listing by implementing proactive management and conservation actions, in accordance with Executive Order 13186. Non-game birds include raptors, owls, shorebirds, woodpeckers, and a variety of gallinaceous, and neo-tropical migratory birds.

Long-billed Curlews

In the early 1970s, BLM personnel began recognizing that a large population of long-billed curlews were nesting in the short-grass rangelands within the Black Canyon Planning Unit (BCPU) of the Four Rivers Field Office. As a result, a study was contracted by the BLM with the University of Montana to research habitat relationships of curlews in the area. Findings published in the early 1980s estimated 1,000 breeding pairs in the BCPU (Jenni et al. 1981). This population represented a substantial portion of the 3,000 or more pairs estimated to occur in all of southern Idaho (IDFG 2015).

Studies of curlews in the Curlew Habitat ACEC have been ongoing since the early 1980s. For over 40 years curlews in the ACEC have been monitored by Montana State University, the College of Idaho and several contractors. More recently the BLM has been working with Boise State University's Intermountain Bird Observatory (IBO) and the Idaho Department of Fish and Game (IDFG) to monitor curlew populations and nesting success in the Curlew ACEC. This effort has documented a declining curlew population in the Curlew Habitat ACEC with numbers down from an estimated 1,000 pairs in the early 1980s to 160 - 300 individuals in 2012. Since then the population appears to have slowed its decline. Being unable to find any obvious factors contributing to the declining numbers such as breeding habitat quality, nesting success or winter range condition, in the last few years, IBO has fitted some birds with tracking devices to gain more information about the species and their habitat.

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Appendix O – Wild Horses

The BLM protects, manages, and controls wild horses under the authority of the Wild Free-Roaming Horses and Burros Act of 1971 (Public Law 92-195) to ensure herds are healthy and thriving in a natural ecological balance on public land. These animals have virtually no natural predators and their population can double every four years. As such, the Field Office periodically gathers wild horses and offers them for adoption or sale to individuals and groups willing and able to provide humane, long-term care. No wild burro population exists in the Planning Area.

The Cascade RMP identified two wild horse areas, West Crane Creek Herd Area (HA), and Fourmile Herd Management Area (HMA). An HA is a geographic area identified as having been used by a herd as its habitat in 1971. An HMA is an area established for the long-term management of wild horses. Based on the habitat requirements of the animals, and the relationships with other public and private land uses, managers established an appropriate management level (AML) for the HMA. It is a dynamic figure associated with rangeland health, as determined by monitoring studies. Indicators for wild horse management include population inventory and projection data, rangeland health evaluations, stream and vegetation monitoring, horse gather data, and other field observations.

The West Crane Creek HA currently supports no wild horses. They were removed in the early 1980s, in accordance with the Wild Free-Roaming Horses and Burros Act, due to uncontrollable horse use in the West Crane Allotment that was incompatible with elk winter range.

Attachment 1: Scientific Literature Review of Population Growth Suppression Impacts Effects of Fertility Control Vaccines, Sex Ratio Manipulation, Spaying, and Neutering

Various forms of fertility control can be used in wild horse and burro herd management. These can help with the goals of maintaining herds at or near AML, reducing fertility rates, and reducing the frequency of gathers and removals. The WFRHBA of 1971 specifically provides for contraception and sterilization (16 U.S.C. 1333 section 3.b.1). Fertility control measures have been shown to be a cost-effective and humane treatment to slow increases in wild horse herds or, when used in combination with gathers, to reduce herd size (Bartholow 2004, de Seve and Boyles-Griffin 2013, Fonner and Bohara 2017).

An extensive body of peer-reviewed scientific literature details the expected impacts of various fertility control methods on wild horses and burros. No finding of excess animals is required for BLM to pursue sterilization in wild horses or wild burros, but NEPA analysis has been required. The Verification Report details some of the many NEPA analyses related to projects with fertility control, but this review focuses on peer-reviewed scientific literature. The summary that follows examines effects of fertility control vaccines, sex ratio manipulation, spaying females, and neutering males. It concludes with an analysis of literature examining the genetic effects of fertility control vaccines, neutering, and spaying, and effects of handling and marking animals for fertility control. Cited studies are generally limited to those involving horses and burros, except where including studies on other species helps in making inferences about physiological or behavioral questions not yet addressed in horses or burros specifically. While most studies reviewed here refer to horses, burros are extremely similar in terms of physiology, such that expected effects are comparable, except where differences between the species are noted.

Although fertility control treatments may be associated with a number of potential physiological, behavioral, demographic, and genetic effects, those impacts are generally minor and transient, do not prevent overall maintenance of a self-sustaining population, and do not generally outweigh the potential benefits of using contraceptive treatments in situations where it is a management goal to reduce population growth rates (Garrott and Oli 2013). Fertility control that affects individual horses and burros does not prevent BLM from ensuring that there will be self-sustaining populations of wild horses and burros in single herd management areas (HMAs), in complexes of HMAs, and at regional scales of multiple HMAs and complexes. Under the WFRHBA of 1971, BLM is charged with maintaining self-reproducing populations of wild horses and burros. The National Academies of Sciences (2013) encouraged BLM to manage wild horses and burros at the spatial scale of “metapopulations” – that is, across multiple HMAs and complexes in a region. In fact, many HMAs have historical and ongoing genetic and demographic connections with other HMAs, and BLM routinely moves animals from one to another to improve local herd traits and maintain high genetic diversity. Some HMAs may be managed as non-reproducing, in whole or in part. Thus, although treated individuals may experience long-lasting effects, such as sterility, that does not of itself cause significant impacts at the level of populations, which are the object of BLM management.

Discussions about herds that are ‘non-reproducing’ in whole or in part are in the context of this ‘metapopulation’ structure, where self-sustaining herds are not necessarily at the scale of single HMAs. So long as the definition of what constitutes a self-sustaining population includes the larger set of HMAs that have past or ongoing demographic and genetic connections – as is recommended by the NAS 2013 report – it is clear that single HMAs can be managed as non-reproducing in whole or in part while still allowing for a self-sustaining population of wild horses or burros at the broader spatial scale. Wild horses are not an endangered species (USFWS 2015), nor are they rare. Nearly 67,000 adult wild horses and nearly 15,000 adult wild burros roam BLM lands as of March 1, 2018, and those numbers do not include at least 10,000 WH&B on US Forest Service lands, and at least 50,000 feral horses on tribal lands in the Western United States.

Population growth suppression becomes less expensive if fertility control is long-lasting (Hobbs et al. 2000), such as with spaying and neutering. In this review, 'spaying' is defined to be the sterilization of a female horse (mare) or burro (jenny). Usually this is accomplished by removal of the ovaries, but other methods such as tubal ligation that lead to sterility may also be considered a form of spaying. Unlike in dog and cat spaying, spaying a horse or burro does not entail removal of the uterus. Here, 'neutering' is defined to be the sterilization of a male horse (stallion) or burro (jack), either by removal of the testicles (castration, also known as gelding) or by vasectomy, where the testicles are retained but no sperm leave the body, as a result of severing or blocking the vas deferens or epididymis.

In the context of BLM wild horse and burro management, fertility control vaccines, sex ratio manipulation spaying and neutering are successful to the extent that they reduce the number of reproducing females. Taking into consideration available literature on the subject, the National Academies of Sciences concluded in their 2013 report that forms of fertility control vaccines were two of the three 'most promising' available methods for contraception in wild horses and burros (NAS 2013). That report also noted that sex ratio manipulations where herds have approximately 60% males and 40% females can expect lower annual growth rates, simply as a result of having a lower number of reproducing females. By definition, spaying females is 100% effective as a fertility control method for that female. Neutering males can be effective in one of two ways. First, neutered males may continue to guard fertile females, preventing the females from breeding with fertile males. Second, if neutered males are included in a herd that has a high male-to-female sex ratio, then the neutered males may comprise some of the animals within the appropriate management level (AML) of that herd, which would effectively reduce the number of females in the herd.

All fertility control methods affect the behavior and physiology of treated animals (NAS 2013), and are associated with potential risks and benefits, including effects of handling, frequency of handling, physiological effects, behavioral effects, and reduced population growth rates (Hampton et al. 2015). Contraception methods alone do not remove excess horses from an HMA's population, so one or more gathers are usually needed in order to bring the herd down to a level close to AML. Horses are long-lived, potentially reaching 20 years of age or more in the wild. Except in cases where extremely high fractions of mares are rendered infertile over long time periods of (i.e, 10 or more years), fertility control methods such as immunocontraceptive vaccines and sex ratio manipulation, and even spaying and neutering, are not very effective at reducing population growth rates to the point where births equal deaths in a herd. However, even modest levels of fertility control activities can reduce the frequency of horse gather activities, and costs to taxpayers. Bartholow (2007) concluded that the application of 2-year or 3-year contraceptives to wild mares could reduce operational costs in a project area by 12-20%, or up to 30% in carefully planned population management programs. Population growth suppression becomes less expensive if fertility control is long-lasting (Hobbs et al. 2000), such as with spaying and neutering. Because spaying and neutering animals requires capturing and handling, the risks and costs associated with capture and handling of horses may be comparable to those of gathering for removal, but with expectedly lower adoption and long-term holding costs.

A principle motivation for use of contraceptive vaccines, sex ratio manipulation, spaying, or neutering is to reduce population growth rates and maintain herd sizes at AML. Where successful, this should allow for continued and increased environmental improvements to range conditions within the project area, which would have long-term benefits to wild horse and burro habitat quality, and well-being of animals living on the range. As the population nears or is maintained at the level necessary to achieve a thriving natural ecological balance, vegetation resources would be expected to recover, improving the forage available. With rangeland conditions more closely approaching a thriving natural ecological balance, and with a less concentrated distribution of wild horses and burros across the HMA, there should also be less trailing and concentrated use of water sources. Lower population density should lead to reduced competition among wild horses using the water sources, and less fighting among horses accessing water

sources. Water quality and quantity would continue to improve to the benefit of all rangeland users including wild horses. Wild horses would also have to travel less distance back and forth between water and desirable foraging areas. Among mares in the herd that remain fertile, a higher level of physical health and future reproductive success would be expected in areas where lower horse and burro population sizes lead to increases in water and forage resources. While it is conceivable that widespread and continued treatment with fertility control methods could reduce the birth rates of the population to such a point that birth is consistently below mortality, that outcome is not likely unless a very high fraction of the adults present are all treated.

Fertility Control Vaccines

Fertility control vaccines (also known as (immunocontraceptives) meet BLM requirements for safety to mares and the environment (EPA 2009a, 2012). Because they work by causing an immune response in treated animals, there is no risk of hormones or toxins being taken into the food chain when a treated mare dies. The BLM and other land managers have mainly used three fertility control vaccine formulations for fertility control of wild horse mares on the range: ZonaStat-H, PZP-22, and GonaCon-Equine. As other formulations become available they may be applied in the future.

In any vaccine, the antigen is the stimulant to which the body responds by making antigen-specific antibodies. Those antibodies then signal to the body that a foreign molecule is present, initiating an immune response that removes the molecule or cell. Adjuvants are additional substances that are included in vaccines to elevate the level of immune response. Adjuvants help to incite recruitment of lymphocytes and other immune cells which foster a long-lasting immune response that is specific to the antigen.

Liquid emulsion vaccines can be injected by hand or remotely administered in the field using a pneumatic dart (Roelle and Ransom 2009, Rutberg et al. 2017, McCann et al. 2017) in cases where mares are relatively approachable. Use of remotely delivered (dart-delivered) vaccine is generally limited to populations where individual animals can be accurately identified and repeatedly approached within 50 m (BLM 2010). Booster doses can be safely administered by hand or by dart. Even with repeated booster treatments of the vaccines, it is expected that most mares would eventually return to fertility, though some individual mares treated repeatedly may remain infertile. Once the herd size in a project area is at AML and population growth seems to be stabilized, BLM can make adaptive determinations as to the required frequency of new and booster treatments.

BLM has followed SOPs for fertility control vaccine application (BLM IM 2009-090). Herds selected for fertility control vaccine use should have annual growth rates over 5%, have a herd size over 50 animals, and have a target rate of treatment of between 50% and 90% of female wild horses or burros. The IM requires that treated mares be identifiable via a visible freeze brand or individual color markings, so that their vaccination history can be known. The IM calls for follow-up population surveys to determine the realized annual growth rate in herds treated with fertility control vaccines.

Vaccine Formulations: Porcine Zona Pellucida (PZP)

PZP vaccines have been used on dozens of horse herds by the National Park Service, US Forest Service, Bureau of Land Management, and Native American tribes and PZP vaccine use is approved for free-ranging wild and feral horse herds in the United States (EPA 2012). PZP use can reduce or eliminate the need for gathers and removals, if very high fractions of mares are treated over a very long time period (Turner et al. 1997). PZP vaccines have been used extensively in wild horses (NAS 2013), and in feral burros on Caribbean islands (Turner et al. 1996, French et al. 2017). PZP vaccine formulations are produced as ZonaStat-H, an EPA-registered commercial product (EPA 2012, SCC 2015), as PZP-22, which is a formulation of PZP in polymer pellets that can lead to a longer immune response (Turner et al. 2002, Rutberg et al. 2017), and as Spayvac, where the PZP protein is enveloped in liposomes (Killian et al. 2008, Roelle et al. 2017, Bechert and Fraker 2018). ‘Native’ PZP proteins can be purified from pig

ovaries (Liu et al. 1989). Recombinant ZP proteins may be produced with molecular techniques (Gupta and Minhas 2017, Joonè et al. 2017a, Nolan et al. 2018a).

When advisories on the product label (EPA 2015) are followed, the product is safe for users and the environment (EPA 2012). In keeping with the EPA registration for ZonaStat-H (EPA 2012; reg. no. 86833-1), certification through the Science and Conservation Center in Billings Montana is required to apply that vaccine to equids.

For maximum effectiveness, PZP is administered within the December to February timeframe. When applying ZonaStat-H, first the primer with modified Freund's Complete adjuvant is given and then the booster with Freund's Incomplete adjuvant is given 2-6 weeks later. Preferably, the timing of the booster dose is at least 1-2 weeks prior to the onset of breeding activity. Following the initial 2 inoculations, only annual boosters are required. For the PZP-22 formulation, each released mare would receive a single dose of the two-year PZP contraceptive vaccine at the same time as a dose of the liquid PZP vaccine with Freund's modified complete adjuvant. The pellets are applied to the mare with a large gauge needle and jab-stick into the hip. Although PZP-22 pellets have been delivered via darting in trial studies (Rutberg et al 2017), BLM does not plan to use darting for PZP-22 delivery until there is more demonstration that PZP-22 can be reliably delivered via dart.

Vaccine Formulations: Gonadotropin Releasing Hormone (GnRH)

GonaCon (which is produced under the trade name GonaCon-Equine for use in feral horses and burros) is approved for use by authorized federal, state, tribal, public and private personnel, for application to free-ranging wild horse and burro herds in the United States (EPA 2013, 2015). GonaCon has been used on feral horses in Theodore Roosevelt National Park and on wild horses administered by BLM (BLM 2015). GonaCon has been produced by USDA-APHIS (Fort Collins, Colorado) in several different formulations, the history of which is reviewed by Miller et al. (2013). GonaCon vaccines present the recipient with hundreds of copies of GnRH as peptides on the surface of a linked protein that is naturally antigenic because it comes from invertebrate hemocyanin (Miller et al 2013). Early GonaCon formulations linked many copies of GnRH to a protein from the keyhole limpet (GonaCon-KHL), but more recently produced formulations where the GnRH antigen is linked to a protein from the blue mussel (GonaCon-B) proved less expensive and more effective (Miller et al. 2008). GonaCon-Equine is in the category of GonaCon-B vaccines.

As with other contraceptives applied to wild horses, the long-term goal of GonaCon-Equine use is to reduce or eliminate the need for gathers and removals (NAS 2013). GonaCon-Equine contraceptive vaccine is an EPA-approved pesticide (EPA, 2009a) that is relatively inexpensive, meets BLM requirements for safety to mares and the environment, and is produced in a USDA-APHIS laboratory. GonaCon is a pharmaceutical-grade vaccine, including aseptic manufacturing technique to deliver a sterile vaccine product (Miller et al. 2013). If stored at 4° C, the shelf life is 6 months (Miller et al 2013).

Miller et al. (2013) reviewed the vaccine environmental safety and toxicity. When advisories on the product label (EPA 2015) are followed, the product is safe for users and the environment (EPA 2009b). EPA waived a number of tests prior to registering the vaccine, because GonaCon was deemed to pose low risks to the environment, so long as the product label is followed (Wang-Cahill et al., *in press*).

GonaCon-Equine can safely be reapplied as necessary to control the population growth rate; booster dose effects may lead to increased effectiveness of contraception, which is generally the intent. Even after booster treatment of GonaCon-Equine, it is expected that most, if not all, mares would return to fertility at some point. Although it is unknown what would be the expected rate for the return to fertility rate in mares boosted more than once with GonaCon-Equine, a prolonged return to fertility would be consistent with the desired effect of using GonaCon (e.g., effective contraception).

The adjuvant used in GonaCon, Adjuvac, generally leads to a milder reaction than Freund's Complete Adjuvant (Powers et al. 2011). Adjuvac contains a small number of killed *Mycobacterium avium* cells (Miller et al. 2008, Miller et al. 2013). The antigen and adjuvant are emulsified in mineral oil, such that they are not all presented to the immune system right after injection. It is thought that the mineral oil emulsion leads to a 'depot effect' that is associated with slow or sustained release of the antigen, and a resulting longer-lasting immune response (Miller et al. 2013). Miller et al. (2008, 2013) have speculated that, in cases where memory-B leukocytes are protected in immune complexes in the lymphatic system, it can lead to years of immune response. Increased doses of vaccine may lead to stronger immune reactions, but only to a certain point; when Yoder and Miller (2010) tested varying doses of GonaCon in prairie dogs, antibody responses to the 200µg and 400µg doses were equal to each other but were both higher than in response to a 100µg dose.

Direct Effects: PZP Vaccines

The historically accepted hypothesis explaining PZP vaccine effectiveness posits that when injected as an antigen in vaccines, PZP causes the mare's immune system to produce antibodies that are specific to zona pellucida proteins on the surface of that mare's eggs. The antibodies bind to the mare's eggs surface proteins (Liu et al. 1989), and effectively block sperm binding and fertilization (Zoo Montana, 2000). Because treated mares do not become pregnant but other ovarian functions remain generally unchanged, PZP can cause a mare to continue having regular estrus cycles throughout the breeding season. More recent observations support a complementary hypothesis, which posits that PZP vaccination causes reductions in ovary size and function (Mask et al. 2015, Joonè et al. 2017b, Joonè et al. 2017c, Nolan et al. 2018b). PZP vaccines do not appear to interact with other organ systems, as antibodies specific to PZP protein do not crossreact with tissues outside of the reproductive system (Barber and Fayrer-Hosken 2000).

Research has demonstrated that contraceptive efficacy of an injected liquid PZP vaccine, such as ZonaStat-H, is approximately 90% or more for mares treated twice in the first year (Turner and Kirkpatrick 2002, Turner et al. 2008). The highest success for fertility control has been reported when the vaccine has been applied November through February. High contraceptive rates of 90% or more can be maintained in horses that are given a booster dose annually (Kirkpatrick et al. 1992). Approximately 60% to 85% of mares are successfully contracepted for one year when treated simultaneously with a liquid primer and PZP-22 pellets (Rutberg et al. 2017). Application of PZP for fertility control would reduce fertility in a large percentage of mares for at least one year (Ransom et al. 2011). The contraceptive result for a single application of the liquid PZP vaccine primer dose along with PZP vaccine pellets (PZP-22), based on winter applications, can be expected to fall in the approximate efficacy ranges as follows (based on figure 2 in Rutberg et al. 2017). Below, the approximate efficacy is measured as the relative decrease in foaling rate for treated mares, compared to control mares:

Year 1	Year 2	Year 3
0 (developing fetuses come to term)	~30-75%	~20-50%

If mares that have been treated with PZP-22 vaccine pellets subsequently receive a booster dose of either the liquid PZP vaccine or the PZP-22 vaccine pellets, the subsequent contraceptive effect is apparently more pronounced and long-lasting. The approximate efficacy following a booster dose can be expected to be in the following ranges (based on figure 3 in Rutberg et al. 2017).

Year 1	Year 2	Year 3	Year 4
0 (developing fetuses come to term)	~50-90%	~55-75%	~40-75%

The fraction of mares treated in a herd can have a large effect on the realized change in growth rate due to PZP contraception, with an extremely high portion of mares required over many years to be treated to totally prevent population-level growth (e.g., Turner and Kirkpatrick 2002). Gather efficiency does not usually exceed 85% via helicopter, and may be less with bait and water trapping, so there will almost always be a portion of the female population uncaptured that is not treated in any given year. Additionally, some mares may not respond to the fertility control vaccine, but instead will continue to foal normally.

Direct Effects: GnRH Vaccines

GonaCon-Equine is one of several vaccines that have been engineered to create an immune response to the gonadotropin releasing hormone peptide (GnRH). GnRH is a small peptide that plays an important role in signaling the production of other hormones involved in reproduction in both sexes. When combined with an adjuvant, a GnRH vaccine stimulates a persistent immune response resulting in prolonged antibody production against GnRH, the carrier protein, and the adjuvant (Miller et al., 2008). The most direct result of successful GnRH vaccination is that it has the effect of decreasing the level of GnRH signaling in the body, as evidenced by a drop in luteinizing hormone levels, and a cessation of ovulation.

GnRH is highly conserved across mammalian taxa, so some inferences about the mechanism and effects of GonaCon-Equine in horses can be made from studies that used different anti-GnRH vaccines, in horses and other taxa. Other commercially available anti-GnRH vaccines include: Improvac (Imboden et al. 2006, Botha et al. 2008, Janett et al. 2009a, Janett et al. 2009b, Schulman et al. 2013, Dalmau et al. 2015), made in South Africa; Equity (Elhay et al. 2007), made in Australia; Improvest, for use in swine (Bohrer et al. 2014); Repro-BLOC (Boedeker et al. 2011); and Bopriva, for use in cows (Balet et al. 2014). Of these, GonaCon-Equine, Improvac, and Equity are specifically intended for horses. Other anti-GnRH vaccine formulations have also been tested, but did not become trademarked products (e.g., Goodloe 1991, Dalin et al 2002, Stout et al. 2003, Donovan et al. 2013, Schaut et al. 2018, Yao et al. 2018). The effectiveness and side-effects of these various anti-GnRH vaccines may not be the same as would be expected from GonaCon-Equine use in horses. Results could differ as a result of differences in the preparation of the GnRH antigen, and the choice of adjuvant used to stimulate the immune response. For some formulations of anti-GnRH vaccines, a booster dose is required to elicit a contraceptive response, though GonaCon can cause short-term contraception in a fraction of treated animals from one dose (Powers et al. 2011, Gionfriddo et al. 2011a, Baker et al. 2013, Miller et al 2013).

GonaCon can provide multiple years of infertility in several wild ungulate species, including horses (Killian et al., 2008; Gray et al., 2010). The lack of estrus cycling that results from successful GonaCon vaccination has been compared to typical winter period of anoestrus in open mares. As anti-GnRH antibodies decline over time, concentrations of available endogenous GnRH increase and treated animals usually regain fertility (Power et al., 2011).

Females that are successfully contracepted by GnRH vaccination enter a state similar to anestrus, have a lack of or incomplete follicle maturation, and no ovarian cycling (Botha et al. 2008). A leading hypothesis is that anti-GnRH antibodies bind GnRH in the hypothalamus – pituitary 'portal vessels,' preventing GnRH from binding to GnRH-specific binding sites on gonadotroph cells in the pituitary, thereby limiting the production of gonadotropin hormones, particularly luteinizing hormone (LH) and, to a lesser degree, follicle-stimulating hormone (FSH) (Powers et al. 2011, NAS 2013). This reduction in LH (and FSH), and a corresponding lack of ovulation, has been measured in response to treatment with anti-GnRH vaccines (Boedeker et al. 2011, Garza et al. 1986).

Females successfully treated with anti-GnRH vaccines have reduced progesterone levels (Garza et al. 1986, Stout et al. 2003, Imboden et al. 2006, Elhay 2007, Botha et al. 2008, Killian et al. 2008, Miller et al. 2008, Janett et al. 2009, Schulman et al. 2013, Balet et al 2014, Dalmau et al. 2015) and β-17 estradiol levels (Elhay et al. 2007), but no great decrease in estrogen levels (Balet et al. 2014).

Reductions in progesterone do not occur immediately after the primer dose, but can take several weeks or months to develop (Elhay et al. 2007, Botha et al. 2008, Schulman et al. 2013, Dalmau et al. 2015). This indicates that ovulation is not occurring and corpora lutea, formed from post-ovulation follicular tissue, are not being established.

Antibody titer measurements are proximate measures of the antibody concentration in the blood specific to a given antigen. Anti-GnRH titers generally correlate with a suppressed reproduction system (Gionfriddo et al. 2011a, Powers et al. 2011). Various studies have attempted to identify a relationship between anti-GnRH titer levels and infertility, but that relationship has not been universally predictable or consistent. The time length that titer levels stay high appears to correlate with the length of suppressed reproduction (Dalin et al. 2002, Levy et al. 2011, Donovan et al. 2013, Powers et al. 2011). For example, Goodloe (1991) noted that mares did produce elevated titers and had suppressed follicular development for 11-13 weeks after treatment, but that all treated mares ovulated after the titer levels declined. Similarly, Elhay (2007) found that high initial titers correlated with longer-lasting ovarian and behavioral anoestrus. However, Powers et al. (2011) did not identify a threshold level of titer that was consistently indicative of suppressed reproduction despite seeing a strong correlation between antibody concentration and infertility, nor did Schulman et al. (2013) find a clear relationship between titer levels and mare acyclicity.

In many cases, young animals appear to have higher immune responses, and stronger contraceptive effects of anti-GnRH vaccines than older animals (Brown et al. 1994, Curtis et al. 2001, Stout et al. 2003, Schulman et al. 2013). Vaccinating with GonaCon at too young an age, though, may prevent effectiveness; Gionfriddo et al. (2011a) observed weak effects in 3-4 month old fawns. It has not been possible to predict which individuals of a given age class will have long-lasting immune responses to the GonaCon vaccine. Gray (2010) noted that mares in poor body condition tended to have lower contraceptive efficacy in response to GonaCon-B. Miller et al. (2013) suggested that higher parasite loads might have explained a lower immune response in free-roaming horses than had been observed in a captive trial. At this time it is unclear what the most important factors affecting efficacy are.

Several studies have monitored animal health after immunization against GnRH. GonaCon treated mares did not have any measurable difference in uterine edema (Killian 2006, 2008). Powers et al. (2011, 2013) noted no differences in blood chemistry except a mildly elevated fibrinogen level in some GonaCon treated elk. In that study, one sham-treated elk and one GonaCon treated elk each developed leukocytosis, suggesting that there may have been a causal link between the adjuvant and the effect. Curtis et al. (2008) found persistent granulomas at GonaCon-KHL injection sites three years after injection, and reduced ovary weights in treated females. Yoder and Miller (2010) found no difference in blood chemistry between GonaCon treated and control prairie dogs. One of 15 GonaCon treated cats died without explanation, and with no determination about cause of death possible based on necropsy or histology (Levy et al. 2011). Other anti-GnRH vaccine formulations have led to no detectable adverse effects (in elephants; Boedeker et al. 2011), though Imboden et al. (2006) speculated that young treated animals might conceivably have impaired hypothalamic or pituitary function.

Kirkpatrick et al. (2011) raised concerns that anti-GnRH vaccines could lead to adverse effects in other organ systems outside the reproductive system. GnRH receptors have been identified in tissues outside of the pituitary system, including in the testes and placenta (Khodr and Siler-Khodr 1980), ovary (Hsueh and Erickson 1979), bladder (Coit et al. 2009), heart (Dong et al. 2011), and central nervous system, so it is plausible that reductions in circulating GnRH levels could inhibit physiological processes in those organ systems. Kirkpatrick et al. (2011) noted elevated cardiological risks to human patients taking GnRH agonists (such as leuprolide), but the National Academy of Sciences (2013) concluded that the mechanism and results of GnRH agonists would be expected to be different from that of anti-GnRH antibodies; the former flood GnRH receptors, while the latter deprive receptors of GnRH.

Injection Site Reactions

For animals treated with fertility control vaccines, injection site reactions are possible (Roelle and Ransom 2009, Bechert et al. 2013, French et al. 2017), but swelling or local reactions at the injection site are expected to be minor in nature. Roelle and Ransom (2009) found that the most time-efficient method for applying PZP is by hand-delivered injection of 2-year pellets when horses are gathered. They observed only two instances of swelling from that technique. Whether injection is by hand or via darting, GonaCon-Equine is associated with some degree of inflammation, swelling, and the potential for abscesses at the injection site (Baker et al. 2013). Swelling or local reactions at the injection site are generally expected to be minor in nature, but some may develop into draining abscesses. Use of remotely delivered vaccine is generally limited to populations where individual animals can be accurately identified and repeatedly approached. The dart-delivered PZP formulation produced injection-site reactions of varying intensity, though none of the observed reactions appeared debilitating to the animals (Roelle and Ransom 2009) but that was not observed with dart-delivered GonaCon (McCann et al. 2017). Joonè et al. (2017a) found that injection site reactions had healed in most mares within 3 months after the booster dose, and that they did not affect movement or cause fever.

Long-lasting nodules observed did not appear to change any animal's range of movement or locomotor patterns and in most cases did not appear to differ in magnitude from naturally occurring injuries or scars. Mares treated with one formulation of GnRH-KHL vaccine developed pyogenic abscesses (Goodloe 1991). Miller et al. (2008) noted that the water and oil emulsion in GonaCon will often cause cysts, granulomas, or sterile abscesses at injection sites; in some cases, a sterile abscess may develop into a draining abscess. In elk treated with GonaCon, Powers et al. (2011) noted up to 35% of treated elk had an abscess form, despite the injection sites first being clipped and swabbed with alcohol. Even in studies where swelling and visible abscesses followed GonaCon immunization, the longer term nodules observed did not appear to change any animal's range of movement or locomotor patterns (Powers et al. 2013, Baker et al. 2017). The result that other formulations of anti-GnRH vaccine may be associated with less notable injection site reactions in horses may indicate that the adjuvant formulation in GonaCon leads a single dose to cause a stronger immune reaction than the adjuvants used in other anti-GnRH vaccines. Despite that, a booster dose of GonaCon-Equine appears to be more effective than a primer dose alone (Baker et al. 2017). Horses injected in the hip with Improvac showed only transient reactions that disappeared within 6 days in one study (Botha et al. 2008), but stiffness and swelling that lasted 5 days were noted in another study where horses received Improvac in the neck (Imboden et al. 2006). Equity led to transient reactions that resolved within a week in some treated animals (Elhay et al. 2007). Donovan et al. noted no reactions to the canine anti-GnRH vaccine (2013). In cows treated with Bopriva there was a mildly elevated body temperature and mild swelling at injection sites that subsided within 2 weeks (Balet et al. 2014).

Reversibility and Effects on Ovaries: PZP Vaccines

In most cases, PZP contraception appears to be temporary and reversible, with most treated mares returning to fertility over time (Kirkpatrick and Turner 2002). The ZonaStat-H formulation of the vaccine tends to confer only one year of efficacy per dose. Some studies have found that a PZP vaccine in long-lasting pellets (PZP-22) can confer multiple years of contraception (Turner et al. 2007), particularly when boostered with subsequent PZP vaccination (Rutberg et al. 2017). Other trial data, though, indicate that the pelleted vaccine may only be effective for one year (J. Turner, University of Toledo, Personal Communication to BLM).

The purpose of applying PZP vaccine treatment is to prevent mares from conceiving foals, but BLM acknowledges that long-term infertility, or permanent sterility, could be a result for some number of individual wild horses receiving PZP vaccinations. The rate of long-term or permanent sterility following vaccinations with PZP is hard to predict for individual horses, but that outcome appears to increase in likelihood as the number of doses increases (Kirkpatrick and Turner 2002). Permanent

sterility for mares treated consecutively in each of 5-7 years was observed by Nuñez et al. (2010, 2017). In a graduate thesis, Knight (2014) suggested that repeated treatment with as few as three to four years of PZP treatment may lead to longer-term sterility, and that sterility may result from PZP treatment before puberty. Repeated treatment with PZP led long-term infertility in Przewalski's horses receiving as few as one PZP booster dose (Feh 2012). However, even if some number of mares become sterile as a result of PZP treatment, that potential result would be consistent with the contraceptive purpose that motivates BLM's potential use of the vaccine.

In some number of individual mares, PZP vaccination may cause direct effects on ovaries (Gray and Cameron 2010, Joonè et al. 2017b, Joonè et al. 2017c, Joonè et al. 2017d, Nolan et al. 2018b). Joonè et al. (2017a) noted reversible effects on ovaries in mares treated with one primer dose and booster dose. Joonè et al. (2017c) and Nolan et al. (2018b) documented decreased anti-Mullerian hormone (AMH) levels in mares treated with native or recombinant PZP vaccines; AMH levels are thought to be an indicator of ovarian function. Bechert et al. (2013) found that ovarian function was affected by the SpayVac PZP vaccination, but that there were no effects on other organ systems. Mask et al. (2015) demonstrated that equine antibodies that resulted from SpayVac immunization could bind to oocytes, ZP proteins, follicular tissues, and ovarian tissues. It is possible that result is specific to the immune response to SpayVac, which may have lower PZP purity than ZonaStat or PZP-22 (Hall et al. 2016). However, in studies with native ZP proteins and recombinant ZP proteins, Joonè et al. (2017a) found transient effects on ovaries after PZP vaccination in some treated mares; normal estrus cycling had resumed 10 months after the last treatment. SpayVac is a patented formulation of PZP in liposomes that led to multiple years of infertility in some breeding trials (Killian et al. 2008, Roelle et al. 2017, Bechert and Fraker 2018), but unacceptably poor efficacy in a subsequent trial (Kane 2018). Kirkpatrick et al. (1992) noted effects on horse ovaries after three years of treatment with PZP. Observations at Assateague Island National Seashore indicated that the more times a mare is consecutively treated, the longer the time lag before fertility returns, but that even mares treated 7 consecutive years did eventually return to ovulation (Kirkpatrick and Turner 2002). Other studies have reported that continued PZP vaccine applications may result in decreased estrogen levels (Kirkpatrick et al. 1992) but that decrease was not biologically significant, as ovulation remained similar between treated and untreated mares (Powell and Monfort 2001). Bagavant et al. (2003) demonstrated T-cell clusters on ovaries, but no loss of ovarian function after ZP protein immunization in macaques.

Reversibility and Effects on Ovaries: GnRH Vaccines

The NAS (2013) review pointed out that single doses of GonaCon-Equine do not lead to high rates of initial effectiveness, or long duration. Initial effectiveness of one dose of GonaCon-Equine vaccine appears to be lower than for a combined primer plus booster dose of the PZP vaccine Zonastat-H (Kirkpatrick et al. 2011), and the initial effect of a single GonaCon dose can be limited to as little as one breeding season. However, preliminary results on the effects of boostered doses of GonaCon-Equine indicate that it can have high efficacy and longer-lasting effects in free-roaming horses (Baker et al. 2017) than the one-year effect that is generally expected from a single booster of Zonastat-H.

Too few studies have reported on the various formulations of anti-GnRH vaccines to make generalizations about differences between products, but GonaCon formulations were consistently good at causing loss of fertility in a statistically significant fraction of treated mares for at least one year (Killian et al. 2009, Gray et al. 2010, Baker et al. 2013, 2017). With few exceptions (e.g., Goodloe 1991), anti-GnRH treated mares gave birth to fewer foals in the first season when there would be an expected contraceptive effect (Botha et al. 2008, Killian et al. 2009, Gray et al. 2010, Baker et al. 2013). Goodloe (1991) used an anti-GnRH-KHL vaccine with a triple adjuvant, in some cases attempting to deliver the vaccine to horses with a hollow-tipped 'biobullet,'but concluded that the vaccine was not an effective immunocontraceptive in that study.

Not all mares should be expected to respond to the GonaCon-equine vaccine; some number should be expected to continue to become pregnant and give birth to foals. In studies where mares were exposed to stallions, the fraction of treated mares that are effectively contracepted in the year after anti-GnRH vaccination varied from study to study, ranging from ~50% (Baker et al. 2017), to 61% (Gray et al. 2010), to ~90% (Killian et al. 2006, 2008, 2009). Miller et al. (2013) noted lower effectiveness in free-ranging mares (Gray et al. 2010) than captive mares (Killian et al. 2009). Some of these rates are lower than the high rate of effectiveness typically reported for the first year after PZP vaccine treatment (Kirkpatrick et al. 2011). In the one study that tested for a difference, darts and hand-injected GonaCon doses were equally effective in terms of fertility outcome (McCann et al. 2017).

In studies where mares were not exposed to stallions, the duration of effectiveness also varied. A primer and booster dose of Equity led to anoestrus for at least 3 months (Elhay et al. 2007). A primer and booster dose of Improvac also led to loss of ovarian cycling for all mares in the short term (Imboden et al. 2006). It is worth repeating that those vaccines do not have the same formulation as GonaCon.

Results from horses (Baker et al. 2017, 2018) and other species (Curtis et al. 2001) suggest that providing a booster dose of GonaCon-Equine will increase the fraction of temporarily infertile animals to higher levels than would a single vaccine dose alone.

Longer-term infertility has been observed in some mares treated with anti-GnRH vaccines, including GonaCon-Equine. In a single-dose mare captive trial with an initial year effectiveness of 94%, Killian et al. (2008) noted infertility rates of 64%, 57%, and 43% in treated mares during the following three years, while control mares in those years had infertility rates of 25%, 12%, and 0% in those years. GonaCon effectiveness in free-roaming populations was lower, with infertility rates consistently near 60% for three years after a single dose in one study (Gray et al. 2010) and annual infertility rates decreasing over time from 55% to 30% to 0% in another study with one dose (Baker et al. 2017). Similarly, gradually increasing fertility rates were observed after single dose treatment with GonaCon in elk (Powers et al. 2011) and deer (Gionfriddo et al. 2011a).

Baker et al. (2017, 2018) observed a return to fertility over 4 years in mares treated once with GonaCon, but then noted extremely low fertility rates of 0% and 16% in the two years after the same mares were given a booster dose four years after the primer dose. These are extremely promising preliminary results from that study in free-roaming horses; a third year of post-booster monitoring is ongoing in summer 2017, and researchers on that project are currently determining whether the same high-effectiveness, long-term response is observed after boosting with GonaCon after 6 months, 1 year, 2 years, or 4 years after the primer dose. Four of nine mares treated with primer and booster doses of Improvac did not return to ovulation within 2 years of the primer dose (Imboden et al. 2006), though one should probably not make conclusions about the long-term effects of GonaCon-Equine based on results from Improvac.

It is difficult to predict which females will exhibit strong or long-term immune responses to anti-GnRH vaccines (Killian et al. 2006, Miller et al. 2008, Levy et al. 2011). A number of factors may influence responses to vaccination, including age, body condition, nutrition, prior immune responses, and genetics (Cooper and Herbert 2001, Curtis et al. 2001, Powers et al. 2011). One apparent trend is that animals that are treated at a younger age, especially before puberty, may have stronger and longer-lasting responses (Brown et al. 1994, Curtis et al. 2001, Stout et al. 2003, Schulman et al. 2013). It is plausible that giving ConaGon-Equine to prepubertal mares will lead to long-lasting infertility, but that has not yet been tested.

To date, short term evaluation of anti-GnRH vaccines, show contraception appears to be temporary and reversible. Killian et al. noted long-term effects of GonaCon in some captive mares (2009). However, Baker et al. (2017) observed horses treated with GonaCon-B return to fertility after they were treated with a single primer dose; after four years, the fertility rate was indistinguishable between treated and control mares. It appears that a single dose of GonaCon results in reversible infertility. Altough it is

unknown whether long-term treatment would result in permanent infertility, such permanent infertility fertility would be consistent with the desired effect of using GonaCon (e.g., effective contraception).

Other anti-GnRH vaccines also have had reversible effects in mares. Elhay (2007) noted a return to ovary functioning over the course of 34 weeks for 10 of 16 mares treated with Equity. That study ended at 34 weeks, so it is not clear when the other six mares would have returned to fertility. Donovan et al. (2013) found that half of mares treated with an anti-GnRH vaccine intended for dogs had returned to fertility after 40 weeks, at which point the study ended. In a study of mares treated with a primer and booster dose of Improvac, 47 of 51 treated mares had returned to ovarian cyclicity within 2 years; younger mares appeared to have longer-lasting effects than older mares (Schulman et al. 2013). Joonè et al. (2017) analyzed samples from the Schulman et al. (2013) study, and found no significant decrease in anti-Mullerian hormone (AMH) levels in mares treated with GnRH vaccine. AMH levels are thought to be an indicator of ovarian function, so results from Joonè et al. (2017) support the general view that the anoestrus resulting from GnRH vaccination is physiologically similar to typical winter anoestrus. In a small study with a non-commercial anti-GnRH vaccine (Stout et al. 2003), three of seven treated mares had returned to cyclicity within 8 weeks after delivery of the primer dose, while four others were still suppressed for 12 or more weeks. In elk, Powers et al. (2011) noted that contraception after one dose of GonaCon was reversible. In white-tailed deer, single doses of GonaCon appeared to confer two years of contraception (Miller et al. 2000). Ten of 30 domestic cows treated became pregnant within 30 weeks after the first dose of Bopriva (Balet et al. 2014).

Permanent sterility as a result of single-dose or boostered GonaCon-Equine vaccine, or other anti-GnRH vaccines, has not been recorded, but that may be because no long-term studies have tested for that effect. It is conceivable that some fraction of mares could become sterile after receiving one or more booster doses of GonaCon-Equine, but the rate at which that could be expected to occur is currently unknown. If some fraction of mares treated with GonaCon-Equine were to become sterile, though, that result would be consistent with text of the WFRHBA of 1971, as amended, which allows for sterilization to achieve population goals.

In summary, based on the above results related to fertility effects of GonaCon and other anti-GnRH vaccines, application of a single dose of GonaCon-Equine to gathered or remotely-darted wild horses could be expected to prevent pregnancy in perhaps 30%-60% of mares for one year. Some smaller number of wild mares should be expected to have persistent contraception for a second year, and less still for a third year. Applying one booster dose of GonaCon to previously-treated mares should lead to two or more years with relatively high rates (80+%) of additional infertility expected, with the potential that some as-yet-unknown fraction of boostered mares may be infertile for several to many years. There is no data to support speculation regarding efficacy of multiple boosters of GonaCon-Equine; however, given it is formulated as a highly immunogenic long-lasting vaccine, it is reasonable to hypothesize that additional boosters would increase the effectiveness and duration of the vaccine.

GonaCon-Equine only affects the fertility of treated animals; untreated animals will still be expected to give birth. Even under favorable circumstances for population growth suppression, gather efficiency might not exceed 85% via helicopter, and may be less with bait and water trapping. Similarly, not all animals may be approachable for darting. The uncaptured or undarted portion of the female population would still be expected to have normally high fertility rates in any given year, though those rates could go up slightly if contraception in other mares increases forage and water availability.

Changes in hormones associated with anti-GnRH vaccination lead to measurable changes in ovarian structure and function. The volume of ovaries reduced in response to treatment (Garza et al. 1986, Dalin et al. 2002, Imboden et al. 2006, Elhay et al. 2007, Botha et al. 2008, Gionfriddo 2011a, Dalmau et al. 2015). Treatment with an anti-GnRH vaccine changes follicle development (Garza et al. 1986, Stout et al. 2003, Imboden et al. 2006, Elhay et al. 2007, Donovan et al. 2013, Powers et al. 2011, Balet et al. 2014), with the result that ovulation does not occur. A related result is that the ovaries can exhibit less

activity and cycle with less regularity or not at all in anti-GnRH vaccine treated females (Goodloe 1991, Dalin et al. 2002, Imboden et al. 2006, Elhay et al. 2007, Janett et al. 2009a, Powers et al. 2011, Donovan et al. 2013). In studies where the vaccine required a booster, hormonal and associated results were generally observed within several weeks after delivery of the booster dose.

Effects on Existing Pregnancies, Foals, and Birth Phenology: PZP Vaccines
Although fetuses are not explicitly protected under the WFRHBA of 1971, as amended, it is prudent to analyze the potential effects of fertility control vaccines on developing fetuses and foals. Any impacts identified in the literature have been found to be transient, and do not influence the future reproductive capacity of offspring born to treated females.

If a mare is already pregnant, the PZP vaccine has not been shown to affect normal development of the fetus or foal, or the hormonal health of the mare with relation to pregnancy (Kirkpatrick and Turner 2003). Studies on Assateague Island (Kirkpatrick and Turner 2002) showed that once female offspring born to mares treated with PZP during pregnancy eventually breed, they produce healthy, viable foals. It is possible that there may be transitory effects on foals born to mares or jennies treated with PZP. For example, in mice, Sacco et al. (1981) found that antibodies specific to PZP can pass from mother mouse to pup via the placenta or colostrum, but that did not apparently cause any innate immune response in the offspring: the level of those antibodies were undetectable by 116 days after birth. There was no indication in that study that the fertility or ovarian function of those mouse pups was compromised, nor is BLM aware of any such results in horses or burros. Unsubstantiated, speculative connections between PZP treatment and 'foal stealing' has not been published in a peer-reviewed study and thus cannot be verified. 'Foal stealing,' where a near-term pregnant mare steals a neonate foal from a weaker mare, is unlikely to be a common behavioral result of including spayed mares in a wild horse herd. McDonnell (2012) noted that "foal stealing is rarely observed in horses, except under crowded conditions and synchronization of foaling," such as in horse feed lots. Those conditions are not likely in the wild, where pregnant mares will be widely distributed across the landscape, and where the expectation is that parturition dates would be distributed across the normal foaling season. Similarly, although Nettles (1997) noted reported stillbirths after PZP treatments in cynomolgus monkeys, those results have not been observed in equids despite extensive use in horses and burros.

On-range observations from 20 years of application to wild horses indicate that PZP application in wild mares does not generally cause mares to give birth to foals out of season or late in the year (Kirkpatrick and Turner 2003). Nuñez's (2010) research showed that a small number of mares that had previously been treated with PZP foaled later than untreated mares and expressed the concern that this late foaling "may" impact foal survivorship and decrease band stability, or that higher levels of attention from stallions on PZP-treated mares might harm those mares. However, that paper provided no evidence that such impacts on foal survival or mare well-being actually occurred. Rubenstein (1981) called attention to a number of unique ecological features of horse herds on Atlantic barrier islands, such as where Nuñez made observations, which calls into question whether inferences drawn from island herds can be applied to western wild horse herds. Ransom et al. (2013), though, did identify a potential shift in reproductive timing as a possible drawback to prolonged treatment with PZP, stating that treated mares foaled on average 31 days later than non-treated mares. Results from Ransom et al. (2013), however, showed that over 81% of the documented births in that study were between March 1 and June 21, i.e., within the normal, peak, spring foaling season. Ransom et al. (2013) pointedly advised that managers should consider carefully before using fertility control vaccine in small refugia or rare species. Wild horses and burros managed by BLM do not generally occur in isolated refugia, nor are they at all rare species. The US Fish and Wildlife Service denied a petition to list wild horses as endangered (USFWS 2015). Moreover, any effect of shifting birth phenology was not observed uniformly: in two of three PZP-treated wild horse populations studied by Ransom et al. (2013), foaling season of treated mares extended three weeks and 3.5 months, respectively, beyond that of untreated mares. In the other

population, the treated mares foaled within the same time period as the untreated mares. Furthermore, Ransom et al. (2013) found no negative impacts on foal survival even with an extended birthing season. If there are shifts in birth phenology, though, it is reasonable to assume that some negative effects on foal survival for a small number of foals might result from particularly severe weather events (Nuñez et al. 2018).

Effects on Existing Pregnancies, Foals, and Birth Phenology: GnRH Vaccines

Although fetuses are not explicitly protected under the WFRHBA of 1971, as amended, it is prudent to analyze the potential effects of fertility control vaccines on developing fetuses and foals. Any impacts identified in the literature have been found to be transient, and do not influence the future reproductive capacity of offspring born to treated females.

GonaCon and other anti-GnRH vaccines can be injected while a female is pregnant (Miller et al. 2000, Powers et al. 2011, Baker et al. 2013) – in such a case, a successfully contracepted mare will be expected to give birth during the following foaling season, but to be infertile during the same year's breeding season. Thus, a mare injected in November of 2018 would not show the contraceptive effect (i.e., no new foal) until spring of 2020.

GonaCon had no apparent effect on pregnancies in progress, foaling success, or the health of offspring, in horses that were immunized in October (Baker et al. 2013), elk immunized 80-100 days into gestation (Powers et al. 2011, 2013), or deer immunized in February (Miller et al. 2000). Kirkpatrick et al. (2011) noted that anti-GnRH immunization is not expected to cause hormonal changes that would lead to abortion in the horse, but this may not be true for the first 6 weeks of pregnancy (NAS 2013). Curtis et al. (2011) noted that GonaCon-KHL treated white tailed deer had lower twinning rates than controls, but speculated that the difference could be due to poorer sperm quality late in the breeding season, when the treated does did become pregnant. Goodloe (1991) found no difference in foal production between treated and control animals.

Offspring of anti-GnRH vaccine treated mothers could exhibit an immune response to GnRH (Khodr and Siler-Khodr 1980), as antibodies from the mother could pass to the offspring through the placenta or colostrum. In the most extensive study of long-term effects of GonaCon immunization on offspring, Powers et al. (2012) monitored 15 elk fawns born to GonaCon treated cows. Of those, 5 had low titers at birth and 10 had high titer levels at birth. All 15 were of normal weight at birth, and developed normal endocrine profiles, hypothalamic GnRH content, pituitary gonadotropin content, gonad structure, and gametogenesis. All the females became pregnant in their second reproductive season, as is typical. All males showed normal development of secondary sexual characteristics. Powers et al. (2012) concluded that suppressing GnRH in the neonatal period did not alter long-term reproductive function in either male or female offspring. Miller et al. (2013) report elevated anti-GnRH antibody titers in fawns born to treated white tailed deer, but those dropped to normal levels in 11 of 12 of those fawns, which came into breeding condition; the remaining fawn was infertile for three years.

Direct effects on foal survival are equivocal in the literature. Goodloe (1991), reported lower foal survival for a small sample of foals born to anti-GnRH treated mares, but she did not assess other possible explanatory factors such as mare social status, age, body condition, or habitat in her analysis (NAS 2013). Gray et al. (2010) found no difference in foal survival in foals born to free-roaming mares treated with GonaCon.

There is little empirical information available to evaluate the effects of GnRH vaccination on foaling phenology, but those effects are likely to be similar to those for PZP vaccine treated mares in which the effects of the vaccine wear off. It is possible that immunocontracepted mares returning to fertility late in the breeding season could give birth to foals at a time that is out of the normal range (Nuñez et al. 2010, Ransom et al 2013). Curtis et al. (2001) did observe a slightly later fawning date for GonaCon treated deer in the second year after treatment, when some does regained fertility late in the breeding season. In

anti-GnRH vaccine trials in free-roaming horses, there were no published differences in mean date of foal production (Goodloe 1991, Gray et al. 2010). Unpublished results from an ongoing study of GonaCon treated free-roaming mares indicate that some degree of aseasonal foaling is possible (D. Baker, Colorado State University, personal communication to Paul Griffin, BLM WH&B Research Coordinator). Because of the concern that contraception could lead to shifts in the timing of parturitions for some treated animals, Ransom et al. (2013) advised that managers should consider carefully before using PZP immunocontraception in small refugia or rare species; the same considerations could be advised for use of GonaCon, but wild horses and burros in most areas do not generally occur in isolated refugia, they are not a rare species at the regional, national, or international level, and genetically they represent descendants of domestic livestock with most populations containing few if any unique alleles (NAS 2013). Moreover, in PZP-treated horses that did have some degree of parturition date shift, Ransom et al. (2013) found no negative impacts on foal survival even with an extended birthing season; however, this may be more related to stochastic, inclement weather events than extended foaling seasons. If there were to be a shift in foaling date for some treated mares, the effect on foal survival may depend on weather severity and local conditions; for example, Ransom et al. (2013) did not find consistent effects across study sites.

Indirect Effects: PZP Vaccines

One expected long-term, indirect effect on wild horses treated with fertility control would be an improvement in their overall health (Turner and Kirkpatrick 2002). Many treated mares would not experience the biological stress of reproduction, foaling and lactation as frequently as untreated mares. The observable measure of improved health is higher body condition scores (Nuñez et al. 2010). After a treated mare returns to fertility, her future foals would be expected to be healthier overall, and would benefit from improved nutritional quality in the mare's milk. This is particularly to be expected if there is an improvement in rangeland forage quality at the same time, due to reduced wild horse population size. Past application of fertility control has shown that mares' overall health and body condition remains improved even after fertility resumes. PZP treatment may increase mare survival rates, leading to longer potential lifespan (Turner and Kirkpatrick 2002, Ransom et al. 2014a) that may be as much as 5-10 years (NPS 2008). To the extent that this happens, changes in lifespan and decreased foaling rates could combine to cause changes in overall age structure in a treated herd (i.e., Turner and Kirkpatrick 2002, Roelle et al. 2010), with a greater prevalence of older mares in the herd (Gross 2000, NPS 2008). Observations of mares treated in past gathers showed that many of the treated mares were larger than, maintained higher body condition than, and had larger healthy foals than untreated mares (BLM, anecdotal observations).

Following resumption of fertility, the proportion of mares that conceive and foal could be increased due to their increased fitness; this has been called a 'rebound effect.' Elevated fertility rates have been observed after horse gathers and removals (Kirkpatrick and Turner 1991). More research is needed to document and quantify these hypothesized effects in PZP-treated herds. If repeated contraceptive treatment leads to a prolonged contraceptive effect, then that may minimize or delay the hypothesized rebound effect. Selectively applying contraception to older animals and returning them to the HMA could reduce long-term holding costs for such horses, which are difficult to adopt, and may reduce the compensatory reproduction that often follows removals (Kirkpatrick and Turner 1991).

Because successful fertility control in a given herd reduces foaling rates and population growth rates, another indirect effect should be to reduce the number of wild horses that have to be removed over time to achieve and maintain the established AML. Contraception may change a herd's age structure, with a relative increase in the fraction of older animals in the herd (NPS 2008). Reducing the numbers of wild horses that would have to be removed in future gathers could allow for removal of younger, more easily adoptable excess wild horses, and thereby could eliminate the need to send additional excess horses from this area to off-range holding corrals or pastures for long-term holding.

Indirect Effects: GnRH Vaccines

As noted above to PZP vaccines, an expected long-term, indirect effect on wild horses treated with fertility control would be an improvement in their overall health. Body condition of anti-GnRH-treated females was equal to or better than that of control females in published studies. Ransom et al. (2014b) observed no difference in mean body condition between GonaCon-B treated mares and controls. Goodloe (1991) found that GnRH-KHL treated mares had higher survival rates than untreated controls. In other species, treated deer had better body condition than controls (Gionfriddo et al. 2011b), treated cats gained more weight than controls (Levy et al. 2011), as did treated young female pigs (Bohrer et al. 2014).

Following resumption of fertility, the proportion of mares that conceive and foal could be increased due to their increased fitness; this has been called by some a 'rebound effect.' Elevated fertility rates have been observed after horse gathers and removals (Kirkpatrick and Turner 1991). More research is needed to document and quantify these hypothesized effects. If repeated contraceptive treatment leads to a prolonged contraceptive effect, then that may minimize or delay the hypothesized rebound effect. Selectively applying contraception to older animals and returning them to the HMA could reduce long-term holding costs for such horses, which are difficult to adopt, and could negate the compensatory reproduction that can follow removals (Kirkpatrick and Turner 1991).

Because successful fertility control would reduce foaling rates and population growth rates, another indirect effect would be to reduce the number of wild horses that have to be removed over time to achieve and maintain the established AML. Contraception would be expected to lead to a relative increase in the fraction of older animals in the herd. Reducing the numbers of wild horses that would have to be removed in future gathers could allow for removal of younger, more easily adoptable excess wild horses, and thereby could eliminate the need to send additional excess horses from this area to off-range holding corrals or pastures for long-term holding. Among mares in the herd that remain fertile, a high level of physical health and future reproductive success would be expected because reduced population sizes should lead to more availability of water and forage resources per capita.

Behavioral Effects: PZP Vaccines

Behavioral difference, compared to mares that are fertile, should be considered as potential results of successful contraception. The NAS report (2013) noted that all forms of fertility suppression have effects on mare behavior, mostly because of the lack of pregnancy and foaling, and concluded that fertility control vaccines were among the most promising fertility control methods for wild horses and burros. The resulting impacts may be seen as neutral in the sense that a wide range of natural behaviors is already observable in untreated wild horses, or mildly adverse in the sense that effects are expected to be transient and to not affect all treated animals.

PZP vaccine-treated mares may continue estrus cycles throughout the breeding season. Ransom and Cade (2009) delineated wild horse behaviors. Ransom et al. (2010) found no differences in how PZP-treated and untreated mares allocated their time between feeding, resting, travel, maintenance, and most social behaviors in three populations of wild horses, which is consistent with Powell's (1999) findings in another population. Likewise, body condition of PZP-treated and control mares did not differ between treatment groups in Ransom et al.'s (2010) study. Nuñez (2010) found that PZP-treated mares had higher body condition than control mares in another population, presumably because energy expenditure was reduced by the absence of pregnancy and lactation. Knight (2014) found that PZP-treated mares had better body condition, lived longer and switched harems more frequently, while mares that foaled spent more time concentrating on grazing and lactation and had lower overall body condition.

In two studies involving a total of four wild horse populations, both Nuñez et al. (2009) and Ransom et al. (2010) found that PZP vaccine treated mares were involved in reproductive interactions with stallions more often than control mares, which is not surprising given the evidence that PZP-treated females of other mammal species can regularly demonstrate estrus behavior while contracepted (Shumake and

Killian 1997, Heilmann et al. 1998, Curtis et al. 2001, Duncan et al. 2017). There was no evidence, though, that mare welfare was affected by the increased level of herding by stallions noted in Ransom et al. (2010). Nuñez's later analysis (2017) noted no difference in mare reproductive behavior as a function of contraception history.

Ransom et al. (2010) found that control mares were herded by stallions more frequently than PZP-treated mares, and Nuñez et al. (2009, 2014, 2017, 2018) found that PZP-treated mares exhibited higher infidelity to their band stallion during the non-breeding season than control mares. Madosky et al. (2010) and Knight (2014) found this infidelity was also evident during the breeding season in the same population that Nuñez et al. (2009, 2010, 2014, 2017, 2018) studied. Nuñez et al. (2014, 2017, 2018) concluded that PZP-treated mares changing bands more frequently than control mares could lead to band instability. Nuñez et al. (2009), though, cautioned against generalizing from that island population to other herds. Nuñez et al. (2014) found elevated levels of fecal cortisol, a marker of physiological stress, in mares that changed bands. The research is inconclusive as to whether all the mares' movements between bands were related to the PZP treatments themselves or the fact that the mares were not nursing a foal, and did not demonstrate any long-term negative consequence of the transiently elevated cortisol levels. Nuñez et al. 2014 wrote that these effects "…may be of limited concern when population reduction is an urgent priority." Nuñez (2018) noted (based on unpublished results) that band stallions of mares that have received PZP treatment can exhibit changes in behavior and physiology. Nuñez (2018) cautioned that PZP use may limit the ability of mares to return to fertility, but also noted that, "such aggressive treatments may be necessary when rapid reductions in animal numbers are of paramount importance…If the primary management goal is to reduce population size, it is unlikely (and perhaps less important) that managers achieve a balance between population control and the maintenance of more typical feral horse behavior and physiology."

In contrast to transient stresses, Creel et al. (2013) highlight that variation in population density is one of the most well-established causal factors of chronic activation of the hypothalamic-pituitary-adrenal axis, which mediates stress hormones; high population densities and competition for resources can cause chronic stress. Creel et al. (2013) also state that "…there is little consistent evidence for a negative association between elevated baseline glucocorticoids and fitness." Band fidelity is not an aspect of wild horse biology that is specifically protected by the WFRHBA of 1971. It is also notable that Ransom et al. (2014b) found higher group fidelity after a herd had been gathered and treated with a contraceptive vaccine; in that case, the researchers postulated that higher fidelity may have been facilitated by the decreased competition for forage after excess horses were removed. At the population level, available research does not provide evidence of the loss of harem structure among any herds treated with PZP. Long-term implications of these changes in social behavior are currently unknown, but no negative impacts on the overall animals or populations overall, long-term welfare or well-being have been established in these studies.

The National Research Council (2013) found that harem changing was not likely to result in serious adverse effects for treated mares:

> "The studies on Shackleford Banks (Nuñez et al., 2009; Madosky et al., 2010) suggest that there is an interaction between pregnancy and social cohesion. The importance of harem stability to mare well-being is not clear, but considering the relatively large number of free-ranging mares that have been treated with liquid PZP in a variety of ecological settings, the likelihood of serious adverse effects seem low."

Nuñez (2010) stated that not all populations will respond similarly to PZP treatment. Differences in habitat, resource availability, and demography among conspecific populations will undoubtedly affect their physiological and behavioral responses to PZP contraception, and need to be considered. Kirkpatrick et al. (2010) concluded that: "the larger question is, even if subtle alterations in behavior may occur, this is still far better than the alternative," and that the "…other victory for horses is that

every mare prevented from being removed, by virtue of contraception, is a mare that will only be delaying her reproduction rather than being eliminated permanently from the range. This preserves herd genetics, while gathers and adoption do not."

The NAS report (2013) provides a comprehensive review of the literature on the behavioral effects of contraception that puts research up to that date by Nuñez et al. (2009, 2010) into the broader context of all of the available scientific literature, and cautions, based on its extensive review of the literature that:

> ". . . in no case can the committee conclude from the published research that the behavior differences observed are due to a particular compound rather than to the fact that treated animals had no offspring during the study. That must be borne in mind particularly in interpreting long-term impacts of contraception (e.g., repeated years of reproductive "failure" due to contraception)."

Behavioral Effects: GnRH Vaccines

The result that GonaCon treated mares may have suppressed estrous cycles throughout the breeding season can lead treated mares to behave in ways that are functionally similar to pregnant mares. Where it is successful in mares, GonaCon and other anti-GnRH vaccines are expected to induce fewer estrous cycles when compared to non-pregnant control mares. This has been observed in many studies (Garza et al. 1986, Curtis et al. 2001, Dalin et al. 2002, Killian et al. 2006, Dalmau et al. 2015). Females treated with GonaCon had fewer estrous cycles than control or PZP-treated mares (Killian et al. 2006) or deer (Curtis et al. 2001). Thus, any concerns about PZP treated mares receiving more courting and breeding behaviors from stallions (Nuñez et al. 2009, Ransom et al. 2010) are not generally expected to be a concern for mares treated with anti-GnRH vaccines (Botha et al. 2008).

Ransom et al. (2014b) found that GonaCon treated mares had similar rates of reproductive behaviors that were similar to those of pregnant mares. Among other potential causes, the reduction in progesterone levels in treated females may lead to a reduction in behaviors associated with reproduction. Despite this, some females treated with GonaCon or other anti-GnRH vaccines did continue to exhibit reproductive behaviors, albeit at irregular intervals and durations (Dalin et al. 2002, Stout et al. 2003, Imboden et al. 2006), which is a result that is similar to spayed (ovariectomized) mares (Asa et al. 1980). Gray et al. (2009a) found no difference in sexual behaviors in mares treated with GonaCon and untreated mares. When progesterone levels are low, small changes in estradiol concentration can foster reproductive estrous behaviors (Imboden et al. 2006). Owners of anti-GnRH vaccine treated mares reported a reduced number of estrous-related behaviors under saddle (Donovan et al. 2013). Treated mares may refrain from reproductive behavior even after ovaries return to cyclicity (Elhay et al. 2007). Studies in elk found that GonaCon treated cows had equal levels of precopulatory behaviors as controls (Powers et al. 2011), though bull elk paid more attention to treated cows late in the breeding season, after control cows were already pregnant (Powers et al. 2011).

Stallion herding of mares, and harem switching by mares are two behaviors related to reproduction that might change as a result of contraception. Ransom et al. (2014b) observed a 50% decrease in herding behavior by stallions after the free-roaming horse population at Theodore Roosevelt National Park was reduced via a gather, and mares there were treated with GonaCon-B. The increased harem tending behaviors by stallions were directed to both treated and control mores. It is difficult to separate any effect of GonaCon in this study from changes in horse density and forage following horse removals.

With respect to treatment with GonaCon or other anti-GnRH vaccines, it is probably less likely that treated mares will switch harems at higher rates than untreated animals, because treated mares are similar to pregnant mares in their behaviors (Ransom et al. 2014b). Indeed, Gray et al. (2009a) found no difference in band fidelity in a free-roaming population of horses with GonaCon treated mares, despite differences in foal production between treated and untreated mares. Ransom et al. (2014b) actually found increased levels of band fidelity after treatment, though this may have been partially a result of changes in overall horse density and forage availability.

Gray et al. (2009) and Ransom et al. (2014b) monitored non-reproductive behaviors in GonaCon treated populations of free-roaming horses. Gray et al. (2009a) found no difference between treated and untreated mares in terms of activity budget, sexual behavior, proximity of mares to stallions, or aggression. Ransom et al. (2014b) found only minimal differences between treated and untreated mare time budgets, but those differences were consistent with differences in the metabolic demands of pregnancy and lactation in untreated mares, as opposed to non-pregnant treated mares.

Sex Ratio Manipulation

Skewing the sex ratio of a herd so that there are more males than females is an established BLM management technique for reducing population growth rates. As part of a wild horse and burro gather process, the number of animals returned to the range may include more males, the number removed from the range may include more females, or both. By reducing the proportion of breeding females in a population (as a fraction of the total number of animals present), the technique leads to fewer foals being born, relative to the total herd size.

Sex ratio is typically adjusted in such a way that 60 percent of the horses are male. In the absence of other fertility control treatments, this 60:40 sex ratio can temporarily reduce population growth rates from approximately 20% to approximately 15% (Bartholow 2004). While such a decrease in growth rate may not appear to be large or long-lasting, the net result can be that fewer foals being born, at least for a few years – this can extend the time between gathers, and reduce impacts on-range, and costs off-range. Any impacts of sex ratio manipulation are expected to be temporary because the sex ratio of wild horse and burro foals at birth is approximately equal between males and females (NAS 2013), and it is common for female foals to reproduce by their second year (NAS 2013). Thus, within a few years after a gather and selective removal that leads to more males than females, the sex ratio of reproducing wild horses and burros will be returning toward a 50:50 ratio.

Having a larger number of males than females is expected to lead to several demographic and behavioral changes as noted in the NAS report (2013), including the following. Having more fertile males than females should not alter the fecundity of fertile females. Wild mares may be distributed in a larger number of smaller harems. Competition and aggression between males may cause a decline in male body condition. Female foraging may be somewhat disrupted by elevated male-male aggression. With a greater number of males available to choose from, females may have opportunities to select more genetically fit sires. There would also be an increase the genetic effective population size because more stallions would be breeding and existing females would be distributed among many more small harems. This last beneficial impact is one reason that skewing the sex ratio to favor males is listed in the BLM wild horse and burro handbook (BLM 2010) as a method to consider in herds where there may be concern about the loss of genetic diversity; having more males fosters a greater retention of genetic diversity.

Infanticide is a natural behavior that has been observed in wild equids (Feh and Munktuya 2008, Gray 2009), but there are no published accounts of infanticide rates increasing as a result of having a skewed sex ratio in wild horse or wild burro herds. Any comment that implies such an impact would be speculative.

The BLM wild horse and burro management handbook (BLM 2010) discusses this method. The handbook acknowledges that there may be some behavioral impacts of having more males than females. The handbook includes guidelines for when the method should be applied, specifying that this method should be considered where the low end of the AML is 150 animals or greater, and with the result that males comprise 60-70 percent of the herd. Having more than 70 percent males may result in unacceptable impacts in terms of elevated male-male aggression. In NEPA analyses, BLM has abided by these guidelines, for example:

- In the 2015 Cold Springs HMA Population Management Plan EA (DOI-BLM-V040-2015-022), the low end of AML was 75. Under the preferred alternative, 37 mares and 38 stallions would remain on the HMA. This is well below the 150 head threshold noted above.
- In the 2017 Hog Creek HMA Population Management Plan EA (DOI-BLM-ORWA-V000-2017-0026-EA), BLM clearly identified that maintaining a 50:50 sex ratio was appropriate because the herd size at the low end of AML was only 30 animals.

It is relatively straightforward to speed the return of skewed sex ratios back to a 50:50 ratio. The BLM wild horse and burro handbook (BLM 2010) specifies that, if post-treatment monitoring reveals negative impacts to breeding harems due to sex ratio manipulation, then mitigation measures could include removing males, not introducing additional males, or releasing a larger proportion of females during the next gather.

Spaying Females

Spaying mares by removing a mare's ovaries, via colpotomy, has been an established veterinary technique since 1903 (Loesch and Rodgerson 2003, NAS 2013). Spaying via colpotomy has the advantage of not leaving any external wound that could become infected. For this reason, it has been identified as a good choice for sterilization of feral or wild mares (Rowland et al. 2018). The procedure has a relatively low complication rate, although post-surgical mortality and morbidity are possible, as with any surgery. Herd-level birth rate is expected to decline in direct proportion to the fraction of spayed mares in the herd because spayed mares cannot become pregnant. Spaying mares has already been shown to be an effective part of feral horse management that reduced herd growth rates on federal lands (Collins and Kasbohm 2016).

Current Methods of Spaying

This literature review of spay impacts focuses on 2 methods: flank laparoscopy, and colpotomy. The anticipated effects of the spay treatment are both physical and behavioral. Physical effects would be due to post-surgical healing and the possibility for complications.

Colpotomy is a surgical technique in which there is no external incision, reducing susceptibility to infection. For this reason, ovariectomy via colpotomy has been identified as a good choice for feral or wild horses (Rowland et al. 2018). Ovariectomy via colpotomy is a relatively short surgery, with a relatively quick expected recovery time. In 1903, Williams first described a vaginal approach, or colpotomy, using an ecraseur to ovariectomize mares (Loesch and Rodgerson 2003). The ovariectomy via colpotomy procedure has been conducted for over 100 years, normally on open (non-pregnant), domestic mares. It is expected that the surgeon should be able to access ovaries with ease in mares that are in the early- or mid-stage of pregnancy. The anticipated risks associated with the pregnancy are described below. When wild horses are gathered or trapped for fertility control treatment there would likely be mares in various stages of gestation. Removal of the ovaries is permanent and 100 percent effective, however the procedure is not without risk. The proposed alternative would allow for researchers to quantify the outcomes of using ovariectomy via colpotomy for mares that are in various gestational stages. The proposed alternative would also allow researchers to record in detail and test for any behavioral effects on the range.

Flank laparoscopy (Lee and Hendrickson 2008) is commonly used in domestic horses for application in mares due to its minimal invasiveness and full observation of the operative field. Ovariectomy via flank laparoscopy was seen as the lowest risk method considered by a panel of expert reviewers convened by USGS (Bowen 2015). In a review of unilateral and bilateral laparoscopic ovariectomy on 157 mares, Röcken et al. (2011) found that 10.8% of mares had minor post-surgical complications, and recorded no mortality. Mortality due to this type of surgery, or post-surgical complications, is not expected, but is a possibility. In two studies, ovariectomy by laparoscopy or endoscope-assisted colpotomy did not cause mares to lose weight, and there was no need for rescue analgesia following surgery (Pader et al. 2011, Bertin et al. 2013). This surgical approach entails three small incisions on the animal's flank, through

which three cannulae (tubes) allow entry of narrow devices to enter the body cavity: these are the insufflator, endoscope, and surgical instrument. The surgical procedure involves the use of narrow instruments introduced into the abdomen via cannulas for the purpose of transecting the ovarian pedicle, but the insufflation should allow the veterinarian to navigate inside the abdomen without damaging other internal organs. The insufflator blows air into the cavity to increase the operating space between organs, and the endoscope provides a video feed to visualize the operation of the surgical instrument. This procedure can require a relatively long duration of surgery, but tends to lead to the lowest post-operative rates of complications. Flank laparoscopy may leave three small (<5 cm) visible scars on one side of the horse's flank, but even in performance horses these scars are considered minimal. It is expected that the tissues and musculature under the skin at the site of the incisions in the flank will heal quickly, leaving no long-lasting effects on horse health. Monitoring for up to two weeks at the facility where surgeries take place will allow for veterinary inspection of wound healing. The ovaries may be dropped into the abdomen, but this is not expected to cause any health problem; it is usually done in ovariectomies in cattle (e.g., the Willis Dropped Ovary Technique) and Shoemaker et al. (2014) found no problems with revascularization or necrosis in a study of young horses using this method.

Effects of Spaying on Pregnancy and Foal

The average mare gestation period ranges from 335 to 340 days (Evans et al. 1977, p. 373). There are few peer reviewed studies documenting the effects of ovariectomy on the success of pregnancy in a mare. A National Research Council of the National Academies of Sciences (NAS) committee that reviewed research proposals in 2015 explained, "The mare's ovaries and their production of progesterone are required during the first 70 days of pregnancy to maintain the pregnancy" (NAS 2015). In female mammals, less progesterone is produced when ovaries are removed, but production does not cease (Webley and Johnson 1982). In 1977, Evans et al. stated that by 200 days, the secretion of progesterone by the corpora lutea is insignificant because removal of the ovaries does not result in abortion (p. 376). "If this procedure were performed in the first 120 days of pregnancy, the fetus would be resorbed or aborted by the mother. If performed after 120 days, the pregnancy should be maintained. The effect of ovary removal on a pregnancy at 90–120 days of gestation is unpredictable because it is during this stage of gestation that the transition from corpus luteum to placental support typically occurs" (NAS 2015). In 1979, Holtan et al. evaluated the effects of bilateral ovariectomy at selected times between 25 and 210 days of gestation on 50 mature pony mares. Their results show that abortion (resorption) of the conceptus (fetus) occurred in all 14 mares ovariectomized before day 50 of gestation, that pregnancy was maintained in 11 of 20 mares after ovariectomy between days 50 and 70, and that pregnancy was not interrupted in any of 12 mares ovariectomized on days 140 to 210. Those results are similar to the suggestions of the NAS committee (2015).

For those pregnancies that are maintained following the procedure, likely those past approximately 120 days, the development of the foal is not expected to be affected. However, because this procedure is not commonly conducted on pregnant mares the rate of complications to the fetus has not yet been quantified. There is the possibility that entry to the abdominal cavity could cause premature births related to inflammation. However, after five months the placenta should hormonally support the pregnancy regardless of the presence or absence of ovaries. Gestation length was similar between ovariectomized and control mares (Holtan et al. 1979).

Direct Effects of Spaying

Between 2009 and 2011, the Sheldon NWR in Nevada conducted ovariectomy via colpotomy surgeries (August through October) on 114 feral mares and released them back to the range with a mixture of sterilized stallions and untreated mares and stallions (Collins and Kasbohm 2016). Gestational stage was not recorded, but a majority of the mares were pregnant (Gail Collins, US Fish and Wildlife Service (USFWS), pers. comm.). Only a small number of mares were very close to full term. Those mares with late term pregnancies did not receive surgery as the veterinarian could not get good access to the ovaries

due to the position of the foal (Gail Collins, USFWS, pers. comm.). After holding the mares for an average of 8 days after surgery for observation, they were returned to the range with other treated and untreated mares and stallions (Collins and Kasbohm 2016). During holding the only complications were observed within 2 days of surgery. The observed mortality rate for ovariectomized mares following the procedure was less than 2 percent (Collins and Kasbohm 2016, Pielstick pers. comm.).

During the Sheldon NWR ovariectomy study, mares generally walked out of the chute and started to eat; some would raise their tail and act as if they were defecating; however, in most mares one could not notice signs of discomfort (Bowen 2015). In their discussion of ovariectomy via colpotomy, McKinnon and Vasey (2007) considered the procedure safe and efficacious in many instances, able to be performed expediently by personnel experienced with examination of the female reproductive tract, and associated with a complication rate that is similar to or less than male castration. Nevertheless, all surgery is associated with some risk. Loesch et al. (2003) lists that following potential risks with colpotomy: pain and discomfort; injuries to the cervix, bladder, or a segment of bowel; delayed vaginal healing; eventration of the bowel; incisional site hematoma; intraabdominal adhesions to the vagina; and chronic lumbar or bilateral hind limb pain. Most horses, however, tolerate ovariectomy via colpotomy with very few complications, including feral horses (Collins and Kasbohm 2016). Evisceration is also a possibility, but these complications are considered rare (Prado and Schumacher, 2017). Mortality due to surgery or post-surgical complications is not anticipated, but it is a possibility and therefore every effort would be made to mitigate risks.

In September 2015, the BLM solicited the USGS to convene a panel of veterinary experts to assess the relative merits and drawbacks of several surgical ovariectomy techniques that are commonly used in domestic horses for potential application in wild horses. A table summarizing the various methods was sent to the BLM (Bowen 2015) and provides a concise comparison of several methods. Of these, ovariectomy via colpotomy was found to be relatively safe when practiced by an experienced surgeon and was associated with the shortest duration of potential complications after the operation. The panel discussed the potential for evisceration through the vaginal incision with this procedure. In marked contrast to a suggestion by the NAS report (2013), this panel of veterinarians identified evisceration as not being a probable risk associated with ovariectomy via colpotomy and "none of the panel participants had had this occur nor had heard of it actually occurring" (Bowen 2015).

Most spay surgeries on mares have low morbidity[1] and with the help of medications, pain and discomfort can be mitigated. Pain management is an important aspect of any ovariectomy (Rowland et al. 2018); according to surgical protocols that would be used, a long-lasting direct anesthetic would be applied to the ovarian pedicle, and systemic analgesics in the form of butorphanol and flunixin meglumine would be administered, as is compatible with accepted animal husbandry practices. In a study of the effects of bilateral ovariectomy via colpotomy on 23 mares, Hooper and others (1993) reported that postoperative problems were minimal (1 in 23, or 4%). Hooper et al. (1993) noted that four other mares were reported by owners as having some problems after surgery, but that evidence as to the role the surgery played in those subsequent problems was inconclusive. In contrast Röcken et al. (2011) noted a morbidity of 10.8% for mares that were ovariectomized via a flank laparoscopy. "Although 5 mares in our study had problems (repeated colic in 2 mares, signs of lumbar pain in 1 mare, signs of bilateral hind limb pain in 1 mare, and clinical signs of peritonitis in 1 mare) after surgery, evidence is inconclusive in each as to the role played by surgery" (Hooper et al. 1993). A recent study showed a 2.5% complication rate where one mare of 39 showed signs of moderate colic after laparoscopic ovariectomy (Devick 2018 personal communication).

[1] Morbidity is defined as the frequency of the appearance of complications following a surgical procedure or other treatment. In contrast, mortality is defined as an outcome of death due to the procedure.

Behavioral Effects of Spaying

No fertility control method exists that does not affect physiology or behavior of a mare (NAS 2013). Any action taken to alter the reproductive capacity of an individual has the potential to affect hormone production and therefore behavioral interactions and ultimately population dynamics in unforeseen ways (Ransom et al. 2014). The health and behavioral effects of spaying wild horse mares that live with other fertile and infertile wild horses has not been well documented, but the literature review below can be used to make reasonable inferences about their likely behaviors.

Horses are anovulatory (do not ovulate/express estrous behavior) during the short days of late fall and early winter, beginning to ovulate as days lengthen and then cycling roughly every 21 days during the warmer months, with about 5 days of estrus (Asa et al. 1979, Crowell-Davis 2007). Estrus in mares is shown by increased frequency of proceptive behaviors: approaching and following the stallion, urinating, presenting the rear end, clitoral winking, and raising the tail towards the stallion (Asa et al. 1979, Crowell-Davis 2007). In most mammal species other than primates estrus behavior is not shown during the anovulatory period, and reproductive behavior is considered extinguished following spaying (Hart and Eckstein 1997). However mares may continue to demonstrate estrus behavior during the anovulatory period (Asa et al. 1980). Similarly, ovariectomized mares may also continue to exhibit estrous behavior (Scott and Kunze 1977, Kamm and Hendrickson 2007, Crabtree 2016), with one study finding that 30% of mares showed estrus signs at least once after surgery (Roessner et al 2015) and only 60 percent of ovariectomized mares cease estrous behavior following surgery (Loesch and Rodgerson 2003). Mares continue to show reproductive behavior following ovariectomy due to non-endocrine support of estrus behavior, specifically steroids from the adrenal cortex. Continuation of this behavior during the non-breeding season has the function of maintaining social cohesion within a horse group (Asa et al. 1980, Asa et al. 1984, NAS 2013). This may be a unique response of the horse (Bertin et al. 2013), as spaying usually greatly reduces female sexual behavior in companion animals (Hart and Eckstein 1997). In six ponies, mean monthly plasma luteinizing hormone[2] levels in ovariectomized mares were similar to intact mares during the anestrous season, and during the breeding season were similar to levels in intact mares at mid-estrus (Garcia and Ginther 1976).

The likely effects of spaying on mares' social interactions and group membership can be inferred from available literature, even though wild horses have rarely been spayed and released back into the wild, resulting in few studies that have investigated their behavior in free-roaming populations. Wild horses and burros are instinctually herd-bound and this behavior is expected to continue. However, no study has documented the rate at which spayed mares will continue to remain with the stallion and band from which the mare was most recently attached. Overall the BLM anticipates that some spayed mares may continue to exhibit estrus behavior which could foster band cohesion. If free-ranging ovariectomized mares show estrous behavior and occasionally allow copulation, interest of the stallion may be maintained, which could foster band cohesion (NAS 2013). This last statement could be validated by the observations of group associations on the Sheldon NWR where feral mares were ovariectomized via colpotomy and released back on to the range with untreated horses of both sexes (Collins and Kasbohm 2016). No data were collected on inter- or intra-band behavior (e.g. estrous display, increased tending by stallions, etc.), during multiple aerial surveys in years following treatment, all treated individuals appeared to maintain group associations, and there were no groups consisting only of treated males or only of treated females (Collins and Kasbohm 2016). In addition, of solitary animals documented during surveys, there were no observations of solitary treated females (Collins and Kasbohm 2016). These data help support the expectation that ovariectomized mares would not lose interest in or be cast out of the social dynamics of a wild horse herd. As noted by the NAS (2013), the ideal fertility control method would not eliminate sexual behavior or change social structure substantially.

[2] Luteinizing hormone (LH) is a glycoprotein hormone produced in the pituitary gland. In females, a sharp rise of LH triggers ovulation and development of the corpus luteum. LH concentrations can be measured in blood plasma.

A study conducted for 15 days in January 1978 (Asa et al. 1980), compared the sexual behavior in ovariectomized and seasonally anovulatory (intact) pony mares and found that there were no statistical differences between the two conditions for any measure of proceptivity or copulatory behavior, or days in estrous. This may explain why treated mares at Sheldon NWR continued to be accepted into harem bands; they may have been acting the same as a non-pregnant mare. Five to ten percent of pregnant mares exhibit estrous behavior (Crowell-Davis 2007). Although the physiological cause of this phenomenon is not fully understood (Crowell-Davis 2007), it is thought to be a bonding mechanism that assists in the maintenance of stable social groups of horses year round (Ransom et al. 2014b). The complexity of social behaviors among free-roaming horses is not entirely centered on reproductive receptivity, and fertility control treatments that suppress the reproductive system and reproductive behaviors should contribute to minimal changes to social behavior (Ransom et al. 2014b, Collins and Kasbohm 2016).

BLM expects that wild horse harem structures would continue to exist under the proposed action because fertile mares, stallions, and their foals would continue to be a component of the herd. It is not expected that spaying a subset of mares would significantly change the social structure or herd demographics (age and sex ratios) of fertile wild horses.

'Foal stealing,' where a near-term pregnant mare steals a neonate foal from a weaker mare, is unlikely to be a common behavioral result of including spayed mares in a wild horse herd. McDonnell (2012) noted that "foal stealing is rarely observed in horses, except under crowded conditions and synchronization of foaling," such as in horse feed lots. Those conditions are not likely in the wild, where pregnant mares will be widely distributed across the landscape, and where the expectation is that parturition dates would be distributed across the normal foaling season.

Indirect Effects of Spaying

The free-roaming behavior of wild horses is not anticipated to be affected by spaying, as the definition of free-roaming is the ability to move without restriction by fences or other barriers within a HMA (BLM H-4700-1, 2010). In domestic animals, spaying is often associated with weight gain and associated increase in body fat (Fettman et al 1997, Becket et al 2002, Jeusette et al. 2006, Belsito et al 2009, Reichler 2009, Camara et al. 2014). Spayed cats had a decrease in fasting metabolic rate, and spayed dogs had a decreased daily energy requirement, but both had increased appetite (O'Farrell & Peachey 1990, Hart and Eckstein 1997, Fettman et al. 1997, Jeusette et al. 2004). In wild horses, contracepted mares tend to be in better body condition that mares that are pregnant or that are nursing foals (Nuñez et al. 2010); the same improvement in body condition is likely to take place in spayed mares. In horses spaying has the potential to increase risk of equine metabolic syndrome (leading to obesity and laminitis), but both blood glucose and insulin levels were similar in mares before and after ovariectomy over the short-term (Bertin et al. 2013). In wild horses the quality and quantity of forage is unlikely to be sufficient to promote over-eating and obesity.

Coit et al. (2009) demonstrated that spayed dogs have elevated levels of LH-receptor and GnRH-receptor mRNA in the bladder tissue, and lower contractile strength of muscles. They noted that urinary incontinence occurs at elevated levels in spayed dogs and in post-menopausal women. Thus, it is reasonable to suppose that some ovariectomized mares could also suffer from elevated levels of urinary incontinence.

Sterilization had no effect on movements and space use of feral cats or brushtail possums (Ramsey 2007, Guttilla & Stapp 2010), or greyhound racing performance (Payne 2013). Rice field rats (Rattus argentiventer) tend to have a smaller home range in the breeding season, as they remain close to their litters to protect and nurse them. When surgically sterilized, rice field rats had larger home ranges and moved further from their burrows than hormonally sterilized or fertile rats (Jacob et al. 2004). Spayed possums and foxes (Vulpes vulpes) had a similar core range area after spay surgery compared to before, and were no more likely to shift their range than intact females (Saunders et al. 2002, Ramsey 2007).

The likely effects of spaying on mares' home range and habitat use can also be surmised from available literature. Bands of horses tend to have distinct home ranges, varying in size depending on the habitat and varying by season, but always including a water source, forage, and places where horses can shelter from inclement weather or insects (King and Gurnell 2005). It is unlikely that spayed mares will change their spatial ecology, but being emancipated from constraints of lactation may mean they can spend more time away from water sources and increase their home range size. Lactating mares need to drink every day, but during the winter when snow can fulfill water needs or when not lactating, horses can traverse a wider area (Feist & McCullough 1976, Salter 1979). During multiple aerial surveys in years following the mare ovariectomy study at the Sheldon NWR, it was documented that all treated individuals appeared to maintain group associations, no groups consisted only of treated females, and none of the solitary animals observed were treated females (Collins and Kasbohm 2016). Since treated females maintained group associations, this indicates that their movement patterns and distances may be unchanged.

Spaying wild horses does not change their status as wild horses under the WFRHBA (as amended). In terms of whether spayed mares would continue to exhibit the free-roaming behavior that defines wild horses, BLM does expect that spayed mares would continue to roam unhindered in the Warm Springs HMA where this action would take place. Wild horse movements may be motivated by a number of biological impulses, including the search for forage, water, and social companionship that is not of a sexual nature. As such, a spayed animal would still be expected to have a number of internal reasons for moving across a landscape and, therefore, exhibiting 'free-roaming' behavior. Despite marginal uncertainty about subtle aspects of potential changes in habitat preference, there is no expectation that spaying wild horses will cause them to lose their free-roaming nature.

In this sense, a spayed wild mare would be just as much 'wild' as defined by the WFRHBA as any fertile wild mare, even if her patterns of movement differ slightly. Congress specified that sterilization is an acceptable management action (16 USC §1333.b.1). Sterilization is not one of the clearly defined events that cause an animal to lose its status as a wild free-roaming horse (16 USC §1333.2.C.d). Any opinions based on a semantic and subjective definition of what constitutes a 'wild' horse are not legally binding for BLM, which must adhere to the legal definition of what constitutes a wild free-roaming horse[3], based on the WFRHBA (as amended). BLM is not obliged to base management decisions on personal opinions, which do not meet the BLM's principle and practice to "Use the best available scientific knowledge relevant to the problem or decision being addressed, relying on peer reviewed literature when it exists" (Kitchell et al. 2015).

Spaying is not expected to reduce mare survival rates. Individuals receiving fertility control often have reduced mortality and increased longevity due to being released from the costs of reproduction (Kirkpatrick and Turner 2008). Similar to contraception studies, in other wildlife species a common trend has been higher survival of sterilized females (Twigg et al. 2000, Saunders et al. 2002, Ramsey 2005, Jacob et al. 2008, Seidler and Gese 2012). Observations from the Sheldon NWR provide some insight into long-term effects of ovariectomy on feral horse survival rates. The Sheldon NWR ovariectomized mares were returned to the range along with untreated mares. Between 2007 and 2014, mares were captured, a portion treated, and then recaptured. There was a minimum of 1 year between treatment and recapture; some mares were recaptured a year later and some were recaptured several years later. The long-term survival rate of treated wild mares appears to be the same as that of untreated mares (Collins and Kasbohm 2016). Recapture rates for released mares were similar for treated mares and untreated mares.

[3] "wild free-roaming horses and burros" means all unbranded and unclaimed horses and burros on public lands of the United States.

Effects of Spaying on Bone Histology

The BLM knows of no scientific, peer-reviewed literature that documents bone density loss in mares following ovariectomy. A concern has been raised in an opinion article (Nock 2013) that ovary removal in mares could lead to bone density loss. That paper was not peer reviewed nor was it based on research in wild or domestic horses, so it does not meet the BLM's standard for "best available science" on which to base decisions (Kitchell et al. 2015). Hypotheses that are forwarded in Nock (2013) appear to be based on analogies from modern humans leading sedentary lives. Post-menopausal women have a greater chance of osteoporosis (Scholz-Ahrens et al. 1996), but BLM is not aware of any research examining bone loss in horses following ovariectomy. Bone loss in humans has been linked to reduced circulating estrogen. There have been conflicting results when researchers have attempted to test for an effect of reduced estrogen on animal bone loss ratesin animal models; all experiments have been on laboratory animals, rather than free-ranging wild animals. While some studies found changes in bone cell activity after ovariectomy leading to decreased bone strength (Jerome et al. 1997, Baldock et al. 1998, Huang et al. 2002, Sigrist et al. 2007), others found that changes were moderate and transient or minimal (Scholz-Ahrens et al. 1996, Lundon et al. 1994, Zhang et al. 2007), and even returned to normal after 4 months (Sigrist et al. 2007).

Consistent and strenuous use of bones, for instance using jaw bones by eating hard feed, or using leg bones by travelling large distances, may limit the negative effects of estrogen deficiency on micro-architecture (Mavropoulos et al. 2014). The effect of exercise on bone strength in animals has been known for many years and has been shown experimentally (Rubin et al. 2001). Dr. Simon Turner, Professor Emeritus of the Small Ruminant Comparative Orthopaedic Laboratory at Colorado State University, conducted extensive bone density studies on ovariectomized sheep, as a model for human osteoporosis. During these studies, he did observe bone density loss on ovariectomized sheep, but those sheep were confined in captive conditions, fed twice a day, had shelter from inclement weather, and had very little distance to travel to get food and water (Simon Turner, Colorado State University Emeritus, written comm., 2015). Dr. Turner indicated that an estrogen deficiency (no ovaries) could potentially affect a horse's bone metabolism, just as it does in sheep and human females when they lead a sedentary lifestyle, but indicated that the constant weight bearing exercise, coupled with high exposure to sunlight ensuring high vitamin D levels, are expected to prevent bone density loss (Simon Turner, Colorado State University Emeritus, written comm., 2015).

Home range size of horses in the wild has been described as 4.2 to 30.2 square miles (Green and Green 1977) and 28.1 to 117 square miles (Miller 1983). A study of distances travelled by feral horses in "outback" Australia shows horses travelling between 5 and 17.5 miles per 24 hour period (Hampson et al. 2010a), travelling about 11 miles a day even in a very large paddock (Hampson et al. 2010b). Thus extensive movement patterns of wild horses are expected to help prevent bone loss. The expected daily movement distance would be far greater in the context of larger pastures typical of BLM long-term holding facilities in off-range pastures. A horse would have to stay on stall rest for years after removal of the ovaries in order to develop osteoporosis (Simon Turner, Colorado State University Emeritus, written comm., 2015) and that condition does not apply to any wild horses turned back to the range or any wild horses that go into off-range pastures.

Neutering Males

Castration (the surgical removal of the testicles, also called gelding or neutering) is a surgical procedure for the horse sterilization that has been used for millenia. Vasectomy involves severing or blocking the vas deferens or epididymis, to prevent sperm from being ejaculated. The procedures are fairly straight forward, and have a relatively low complication rate. As noted in the review of scientific literature that follows, the expected effects of gelding and vasectomy are well understood overall, even though there is some degree of uncertainty about the exact quantitative outcomes for any given individual (as is true for any natural system).

Including a portion of neutered males in a herd can lead to a reduced population-level per-capita growth rate so long as the neutered males take some of the places that would otherwise be occupied by fertile females. By having a skewed sex ratio with fewer females than males (fertile stallions plus neutered males), the result will be that there will be a lower number of breeding females in the population. Including neutered males in herd management is not new for BLM and federal land management. Geldings have been released on BLM lands as a part of herd management in the Barren Valley complex in Oregon (BLM 2011), the Challis HMA in Idaho (BLM 2012), and the Conger HMA in Utah (BLM 2016). Vasectomized males and geldings were also included in US Fish and Wildlife Service management plans for the Sheldon National Wildlife Refuge that relied on sterilization and removals (Collins and Kasbohm 2016). Taking into consideration the literature available at the time, the National Academies of Sciences concluded in their 2013 report that a form of vasectomy was one of the three most promising methods for WH&B fertility control (NAS 2013).

Nelson (1980) and Garrott and Siniff (1992) modeled potential efficacy of male-oriented contraception as a population management tool, and both studies agreed that while slowing growth, sterilizing only dominant males (i.e., harem-holding stallions) would result in only marginal reduction in female fertility rates. Eagle et al. (1993) and Asa (1999) tested this hypothesis on herd management areas (HMAs) where dominant males were vasectomized. Their findings agreed with modeling results from previous studies, and they also concluded that sterilizing only dominant males would not provide the desired reduction in female fertility and overall population growth rate, assuming that the numbers of fertile females is not changed. While bands with vasectomized harem stallions tended to have fewer foals, breeding by bachelors and subordinate stallions meant that population growth still occurred – female fertility was not dramatically reduced. Collins and Kasbohm (2016) demonstrated that there was a reduced fertility rate in a feral horse herd with both spayed and vasectomized horses – some geldings were also present in that herd. Garrott and Siniff (1992) concluded from their modeling that male sterilization would effectively cause there to be zero population growth (the point where births roughly equal deaths) only if a large proportion of males (i.e., >85%) could be sterilized. In cases where the goal of harem stallion sterilization is to reduce population growth rates, success appears to be dependent on a stable group structure, as strong bonds between a stallion and mares reduce the probability of a mare mating an extra-group stallion (Nelson 1980, Garrott and Siniff 1992, Eagle et al. 1993, Asa 1999).

Despite these studies, neutered males can be used to reduce overall growth rates in a management strategy that does not rely on any expectation that geldings will retain harems or lead to a reduction in per-female fertility rates. The primary goal of including neutered males in a herd need not necessarily be to reduce female fertility. Rather, by including some neutered males in a herd that also has fertile mares and stallions, the neutered males would take some of the spaces toward AML that would otherwise be taken by fertile females. If the total number of horses is constant but neutered males are included in the herd, this can reduce the number of fertile mares, therefore reducing the absolute number of foals produced. Put another way, if neutered males occupy spaces toward AML that would otherwise be filled by fertile mares that will reduce growth rates merely by the fact of causing there to be a lower starting number of fertile mares.

Direct Effects of Neutering

No animals which appear to be distressed, injured, or in poor health or condition would be selected for gelding. Stallions would not typically be neutered within 72 hours of capture. The surgery would be performed by a veterinarian using general anesthesia and appropriate surgical techniques. The final determination of which specific animals would be gelded would be based on the professional opinion of the attending veterinarian in consultation with the Authorized Officer (i.e., See the SOPs for neutering in the Antelope / Triple B gather EA, DOI-BLM-NV-E030-2017-010-EA).

Though neutering is a common surgical procedure, especially gelding, some level of minor complications after surgery may be expected (Getman 2009), and it is not always possible to predict

when postoperative complications would occur. Fortunately, the most common complications are almost always self-limiting, resolving with time and exercise. Individual impacts to the stallions during and following the gelding process should be minimal and would mostly involve localized swelling and bleeding. Complications may include, but are not limited to: minor bleeding, swelling, inflammation, edema, infection, peritonitis, hydrocele, penile damage, excessive hemorrhage, and eventration (Schumacher 1996, Searle et al. 1999, Getman 2009). A small amount of bleeding is normal and generally subsides quickly, within 2-4 hours following the procedure. Some degree of swelling is normal, including swelling of the prepuce and scrotum, usually peaking between 3-6 days after surgery (Searle et al. 1999). Swelling should be minimized through the daily movements (exercise) of the horse during travel to and from foraging and watering areas. Most cases of minor swelling should be back to normal within 5-7 days, more serious cases of moderate to severe swelling are also self-limiting and are expected to resolve with exercise after one to 2 weeks. Older horses are reported to be at greater risk of post-operative edema, but daily exercise can prevent premature closure of the incision, and prevent fluid buildup (Getman 2009). In some cases, a hydrocele (accumulation of sterile fluid) may develop over months or years (Searle et al. 1999). Serious complications (eventration, anesthetic reaction, injuries during handling, etc.) that result in euthanasia or mortality during and following surgery are rare (e.g., eventration rate of 0.2% to 2.6% noted in Getman 2009, but eventration rate of 4.8% noted in Shoemaker et al. 2004) and vary according to the population of horses being treated (Getman 2009). Normally one would expect serious complications in less than 5% of horses operated under general anesthesia, but in some populations these rates have been as high as 12% (Shoemaker 2004). Serious complications are generally noted within 3 or 4 hours of surgery but may occur any time within the first week following surgery (Searle et al. 1999). If they occur, they would be treated with surgical intervention when possible, or with euthanasia when there is a poor prognosis for recovery. Vasectomized stallions may remain fertile for up to 6 weeks after surgery, so it is optimal if that treatment occurs well in advance of the season of mare fertility starting in the spring (NAS 2013). The NAS report (2013) suggested that chemical vasectomy, which has been developed for dogs and cats, may be appropriate for wild horses and burros. Since that report, Scully et al. (2015) reported that surgical and chemical vasectomy are equally effective.

For intact stallions, testosterone levels appear to vary as a function of age, season, and harem size (Khalil et al 1998). It is expected that testosterone levels will decline over time after castration. Testosterone levels should not change due to vasectomy. Vasectomized stallions should retain their previous levels of libido. Domestic geldings had a significant prolactin response to sexual stimulation, but lacked the cortisol response present in stallions (Colborn et al. 1991). Although libido and the ability to ejaculate tends to be gradually lost after castration (Thompson et al. 1980), some geldings continue to mount mares and intromit (Rios and Houpt 1995, Schumacher 2006).

Indirect Effects of Neutering

Other than the short-term outcomes of surgery, neutering is not expected to reduce males' survival rates (Collins and Kasbohm 2016). Castration is actually thought to increase survival as males are released from the cost of reproduction (Jewell 1997). In Soay sheep castrates survived longer than rams in the same cohort (Jewell 1997), and Misaki horse geldings lived longer than intact males (Kaseda et al. 1997, Khalil and Murakami 1999). Moreover, it is unlikely that a reduced testosterone level will compromise gelding survival in the wild, considering that wild mares survive with low levels of testosterone. Consistent with geldings not expending as much energy toward in attempts to obtain or defend a harem, it is expected that wild geldings may have a better body condition that wild, fertile stallions. In contrast, vasectomized males may continue to defend or compete for harems in the way that fertile males do, so they are not expected to experience an increase in health or body condition due to surgery.

Depending on whether an HMA is non-reproducing in whole or in part, reproductive stallions may or may not still be a component of the population's age and sex structure. The question of whether or not a

given neutered male would or would not attempt to maintain a harem is not germane to population-level management. It is worth noting, though, that the BLM is not required to manage populations of wild horses in a manner that ensures that any given individual maintains its social standing within any given harem or band. Neutering a subset of stallions would not prevent other fertile stallions and mares from continuing with the typical range of social behaviors for sexually active adults. For fertility control strategies where gelding is intended to reduce growth rates by virtue of sterile males defending harems, the NAS (2013) suggested that the effectiveness of gelding on overall reproductive rates may depend on the pre-castration social roles of those animals. Having a post-gather herd with some neutered males and a lower fraction of fertile mares necessarily reduces the absolute number of foals born per year, compared to a herd that includes more fertile mares. An additional benefit is that geldings that would otherwise be permanently removed from the range (for adoption, sale or other disposition) may be released back onto the range where they can engage in free-roaming behaviors.

Behavioral Effects of Neutering

Feral horses typically form bands composed of an adult male with 1 to 3 adult females and their immature offspring (Feist and McCullough 1976, Berger 1986, Roelle et al. 2010). In many populations subordinate 'satellite' stallions have been observed associating with the band, although the function of these males continues to be debated (see Feh 1999, and Linklater and Cameron 2000). Juvenile offspring of both sexes leave the band at sexual maturity (normally around two or three years of age (Berger 1986), but adult females may remain with the same band over a span of years. Group stability and cohesion is maintained through positive social interactions and agonistic behaviors among all members, and herding and reproductive behaviors from the stallion (Ransom and Cade 2009). Group movements and consortship of a stallion with mares is advertised to other males through the group stallion marking dung piles as they are encountered, and over-marking mare eliminations as they occur (King and Gurnell 2006).

In horses, males play a variety of roles during their lives (Deniston 1979): after dispersal from their natal band they generally live as bachelors with other young males, before associating with mares and developing their own breeding group as a harem stallion or satellite stallion. In any population of horses not all males will achieve harem stallion status, so all males do not have an equal chance of breeding (Asa 1999). Stallion behavior is thought to be related to androgen levels, with breeding stallions having higher androgen concentrations than bachelors (Angle et al. 1979, Chaudhuri and Ginsberg 1990, Khalil et al. 1998). A bachelor with low libido had lower levels of androgens, and two year old bachelors had higher testosterone levels than two year olds with undescended testicles who remained with their natal band (Angle et al. 1979).

Vasectomized males continue to attempt to defend or gain breeding access to females (Asa 1999). It is generally expected that vasectomized WH&B will continue to behave like fertile males, given that the only physiological change in their condition is a lack of sperm in their ejaculate. If a vasectomized stallion retains a harem, the females in the harem will continue to cycle until they are fertilized by another stallion, or until the end of the breeding season. As a result, the vasectomized stallion may be involved in more aggressive behaviors to other males through the entire breeding season (Asa 1999), which may divert time from foraging and cause him to be in poorer body condition going into winter. Ultimately, this may lead to the stallion losing control of a given harem. A feral horse herd with high numbers of vasectomized stallions retained typical harem social structure (Collins and Kasbohm 2016). Again it is worth noting that the BLM is not required to manage populations of wild horses in a manner that ensures that any given individual maintains its social standing within any given harem or band.

Neutering males by gelding adult male horses is expected to result in reduced testosterone production, which is expected to directly influence reproductive behaviors (NAS 2013). However, testosterone levels alone are not a predictor of masculine behavior (Line et al. 1985, Schumacher 2006). In domestic geldings, 20-30% continued to show stallion-like behavior, whether castrated pre- or post-puberty (Line

et al. 1985). Gelding of domestic horses most commonly takes place before or shortly after sexual maturity, and age-at-gelding can affect the degree to which stallion-like behavior is expressed later in life. In intact stallions, testosterone levels peak increase up to an age of ~4-6 years, and can be higher in harem stallions than bachelors (Khalil et al 1998). It is assumed that free roaming wild horse geldings would generally exhibit reduced aggression toward other horses, and reduced reproductive behaviors (NAS 2013). The behavior of wild horse geldings in the presence of intact stallions has not been well documented, but the literature review below can be used to make reasonable inferences about their likely behaviors.

Despite livestock being managed by neutering males for millenia, there is relatively little published research on castrates' behaviors (Hart and Jones 1975). Stallion behaviors in wild or pasture settings are better documented than gelding behaviors, but it inferences about how the behaviors of geldings will change, how quickly any change will occur after surgery, or what effect gelding an adult stallion and releasing him back in to a wild horse population will have on his behavior and that of the wider population must be surmised from the existing literature. There is an ongoing BLM study in Utah focused on the individual and population-level effects of including some geldings in a free-roaming horse population (BLM 2016), but results from that study are not yet available. However, inferences about likely behavioral outcomes of gelding can be made based on available literature.

The effect of castration on aggression in horses has not often been quantified. One report has noted that high levels of aggression continued to be observed in domestic horse geldings who also exhibited sexual behaviors (Rios and Houpt 1995). Stallion-like behavior in domestic horse geldings is relatively common (Smith 1974, Schumacher 1996), being shown in 20-33% of cases whether the horse was castrated pre- or post-puberty (Line et al. 1985, Rios and Houpt 1995, Schumacher 2006). While some of these cases may be due to cryptorchidism or incomplete surgery, it appears that horses are less dependent on hormones than other mechanisms for the maintenance of sexual behaviors (Smith 1974). Domestic geldings exhibiting masculine behavior had no difference in testosterone concentrations than other geldings (Line et al. 1985, Schumacher 2006), and in some instances the behavior appeared context dependent (Borsberry 1980, Pearce 1980).

Dogs and cats are commonly neutered, and it is also common for them to continue to exhibit reproductive behaviors several years after castration (Dunbar 1975). Dogs, ferrets, hamsters, and marmosets continued to show sexually motivated behaviors after castration, regardless of whether they had previous experience or not, although in beagles and ferrets there was a reduction in motivation post-operatively (Hart 1968, Dunbar 1975, Dixson 1993, Costantini et al. 2007, Vinke et al. 2008). Ungulates continued to show reproductive behaviors after castration, with goats and llamas continuing to respond to females even a year later in the case of goats, although mating time and the ejaculatory response was reduced (Hart and Jones 1975, Nickolmann et al. 2008).

The likely effects of castration on geldings' social interactions and group membership can be inferred from available literature. In a pasture study of domestic horses, Van Dierendonk et al. (1995) found that social rank among geldings was directly correlated to the age at which the horse was castrated, suggesting that social experiences prior to sterilization may influence behavior afterward. Of the two geldings present in a study of semi-feral horses in England, one was dominant over the mares whereas a younger gelding was subordinate to older mares; stallions were only present in this population during a short breeding season (Tyler 1972). A study of domestic geldings in Iceland held in a large pasture with mares and sub-adults of both sexes, but no mature stallions, found that geldings and sub-adults formed associations amongst each other that included interactions such as allo-grooming and play, and were defined by close proximity (Sigurjónsdóttir et al. 2003). These geldings and sub-adults tended to remain in a separate group from mares with foals, similar to castrated Soay sheep rams (Ovis aries) behaving like bachelors and grouping together, or remaining in their mother's group (Jewell 1997). In Japan, Kaseda et al. (1997) reported that young males dispersing from their natal harem and geldings moved to

a different area than stallions and mares during the non-breeding season. Although the situation in Japan may be the equivalent of a bachelor group in natural populations, in Iceland this division between mares and the rest of the horses in the herd contradicts the dynamics typically observed in a population containing mature stallions. Sigurjónsdóttir et al. (2003) also noted that in the absence of a stallion, allo-grooming between adult females increased drastically. Other findings included increased social interaction among yearlings, display of stallion-like behaviors such as mounting by the adult females, and decreased association between females and their yearling offspring (Sigurjónsdóttir et al. 2003). In the same population in Iceland Van Dierendonck et al. (2004) concluded that the presence of geldings did not appear to affect the social behavior of mares or negatively influence parturition, mare-foal bonding, or subsequent maternal activities. Additionally, the welfare of broodmares and their foals was not affected by the presence of geldings in the herd (Van Dierendonck et al. 2004). These findings are important because treated geldings will be returned to the range in the presence of pregnant mares and mares with foals of the year.

The likely effects of castration on geldings' home range and habitat use can also be surmised from available literature. Bands of horses tend to have distinct home ranges, varying in size depending on the habitat and varying by season, but always including a water source, forage, and places where horses can shelter from inclement weather or insects (King and Gurnell 2005). By comparison, bachelor groups tend to be more transient, and can potentially use areas of good forage further from water sources, as they are not constrained by the needs of lactating mares in a group. The number of observations of gelded wild stallion behavior are still too few to make general predictions about whether a particular gelded stallion individuals will behave like a harem stallion, a bachelor, or form a group with geldings that may forage and water differently from fertile wild horses.

Gelding wild horses does not change their status as wild horses under the WFRHBA (as amended). In terms of whether geldings will continue to exhibit the free-roaming behavior that defines wild horses, BLM does expect that geldings would continue to roam unhindered in the HMA(s) / Complex(es) where this action would take place. Wild horse movements may be motivated by a number of biological impulses, including the search for forage, water, and social companionship that is not of a sexual nature. As such, a gelded animal would still be expected to have a number of internal reasons for moving across a landscape and, therefore, exhibiting 'free-roaming' behavior. Despite marginal uncertainty about subtle aspects of potential changes in habitat preference, there is no expectation that gelding wild horses will cause them to lose their free-roaming nature. It is worth noting that individual choices in wild horse group membership, home range, and habitat use are not protected under the WFRHBA. BLM acknowledges that geldings may exhibit some behavioral differences after surgery, compared to intact stallions, but those differences are not be expected to remove the geldings' rebellious and feisty nature, or their defiance of man. While it may be that a gelded horse could have a different set of behavioral priorities than an intact stallion, the expectation is that geldings will choose to act upon their behavioral priorities in an unhindered way, just as is the case for an intact stallion. In this sense, a gelded male would be just as much 'wild' as defined by the WFRHBA as any intact stallion, even if his patterns of movement differ from those of an intact stallion. Congress specified that sterilization is an acceptable management action (16 USC §1333.b.1). Sterilization is not one of the clearly defined events that cause an animal to lose its status as a wild free-roaming horse (16 USC §1333.2.C.d). Several academics have offered their opinions about whether gelding a given stallion would lead to that individual effectively losing its status as a wild horse (Rutberg 2011, Kirkpatrick 2012, Nock 2017). Those opinions are based on a semantic and subjective definition of 'wild,' while BLM must adhere to the legal definition of what constitutes a wild horse, based on the WFRHBA (as amended). Those individuals have not conducted any studies that would test the speculative opinion that gelding wild stallions will cause them to become docile. BLM is not obliged to base management decisions on such opinions, which do not meet the BLM's principle and practice to "Use the best available scientific knowledge relevant to the problem or decision being addressed, relying on peer reviewed literature when it exists" (Kitchell et al. 2015).

Genetic Effects of Fertility Control Vaccines, Spaying and Neutering

It is true that effectively contracepted females, spayed females, and neutered males are unable to contribute to the genetic diversity of the herd. BLM is not obligated to ensure that any given individual in a herd has the chance to sire a foal and pass on genetic material. Management practices in the BLM Wild Horse and Burro Handbook (2010) include measures to increase population genetic diversity in reproducing herds where monitoring reveals a cause for concern about low levels of observed heterozygosity. These measures include increasing the sex ratio to a greater percentage of fertile males than fertile females (and thereby increasing the number of males siring foals), and bringing new animals into a herd from elsewhere.

In herds that are managed to be non-reproducing, it is not a concern to maintain genetic diversity because the management goal would be that animals in such a herd would not breed.

In reproducing herds where large numbers of wild horses have recent and / or an ongoing influx of breeding animals from other areas with wild or feral horses, contraception, spaying and neutering are not expected to cause an unacceptable loss of genetic diversity or an unacceptable increase in the inbreeding coefficient. In any diploid population, the loss of genetic diversity through inbreeding or drift can be prevented by large effective breeding population sizes (Wright 1931) or by introducing new potential breeding animals (Mills and Allendorf 1996). The NAS report (2013) recommended that single HMAs should not be considered as isolated genetic populations. Rather, managed herds of wild horses should be considered as components of interacting metapopulations, with the potential for interchange of individuals and genes taking place as a result of both natural and human-facilitated movements. It is worth noting that, although maintenance of genetic diversity at the scale of the overall population of wild horses is an intuitive management goal, there are no existing laws or policies that require BLM to maintain genetic diversity at the scale of the individual herd management area or complex. Also, there is no Bureau-wide policy that requires BLM to allow each female in a herd to reproduce before she is treated with contraceptives. Introducing 1-2 mares every generation (about every 10 years) is a standard management technique that can alleviated potential inbreeding concerns (BLM 2010).

In the last 10 years, there has been a high realized growth rate of wild horses in most areas administered by the BLM. As a result, most alleles that are present in any given mare are likely to already be well represented in her siblings, cousins, and more distant relatives on the HMA. With the exception of horses in a small number of well-known HMAs that contain a relatively high fraction of alleles associated with old Spanish horse breeds (NAS 2013), the genetic composition of wild horses in lands administered by the BLM is consistent with admixtures from domestic breeds. As a result, in most HMAs, applying fertility control to a subset of mares is not expected to cause irreparable loss of genetic diversity. Improved longevity and an aging population are expected results of contraceptive treatment that can provide for lengthening generation time; this result would be expected to slow the rate of genetic diversity loss (Hailer et al. 2006). Based on a population model, Gross (2000) found that a strategy to preferentially treat young animals with a contraceptive led to more genetic diversity being retained than either a strategy that preferentially treats older animals, or a strategy with periodic gathers and removals.

Even if it is the case that repeated treatment with a fertility control vaccine may lead to prolonged infertility, or even sterility in some mares, most HMAs have only a low risk of loss of genetic diversity if logistically realistic rates of contraception are applied to mares. Wild horses in most herd management areas are descendants of a diverse range of ancestors coming from many breeds of domestic horses. As such, the existing genetic diversity in the majority of HMAs does not contain unique or historically unusual genetic markers. Past interchange between HMAs, either through natural dispersal or through assisted migration (i.e., human movement of horses) means that many HMAs are effectively indistinguishable and interchangeable in terms of their genetic composition.

Roelle and Oyler-McCance (2015) used the VORTEX population model to simulate how different rates of mare sterility would influence population persistence and genetic diversity, in populations with high or low starting levels of genetic diversity, various starting population sizes, and various annual population growth rates. Although those results are specific to mares, some inferences about potential effects of stallion sterilization may also be made from their results. Roelle and Oyler-McCance (2015) showed that the risk of the loss of genetic heterozygosity is extremely low except in cases where all of the following conditions are met: starting levels of genetic diversity are low, initial population size is 100 or less, the intrinsic population growth rate is low (5% per year), and very large fractions of the population are permanently sterilized. Given that 94 of 102 wild horse herds sampled for genetic diversity did not meet a threshold for concern (NAS 2013), the starting level of genetic diversity in most wild horse herds is relatively high.

In a breeding herd where more than 85% of males in a population are sterile, there could be genetic consequences of reduced heterozygosity and increased inbreeding coefficients, as it would potentially allow a very small group of males to dominate the breeding (e.g., Saltz et al. 2000). Such genetic consequences could be mitigated by natural movements or human-facilitated translocations (BLM 2010). Garrott and Siniff's (1992) model predicts that gelding 50-80% of mature males in the population would result in reduced, but not halted, mare fertility rates. However, neutering males tends to have short-lived effects, because within a few years after any male sterilization treatment, a number of fertile male colts would become sexually mature stallions who could contribute genetically to the herd.

One concern that has been raised with regards to genetic diversity is that treatment with immunocontraceptives could possibly lead to an evolutionary increase in the frequency of individuals whose genetic composition fosters weak immune responses (Cooper and Larson 2006, Ransom et al. 2014a).Many factors influence the strength of a vaccinated individual's immune response, potentially including genetics, but also nutrition, body condition, and prior immune responses to pathogens or other antigens (Powers et al. 2013). This premise is based on an assumption that lack of response to any given fertility control vaccine is a heritable trait, and that the frequency of that trait will increase over time in a population of vaccine-treated animals. Cooper and Herbert (2001) reviewed the topic, in the context of concerns about the long-term effectiveness of immunocontraceptives as a control agent for exotic species in Australia. They argue that imunocontraception could be a strong selective pressure, and that selecting for reproduction in individuals with poor immune response could lead to a general decline in immune function in populations where such evolution takes place. Other authors have also speculated that differences in antibody titer responses could be partially due to genetic differences between animals (Curtis et al. 2001, Herbert and Trigg 2005). However, Magiafolou et al. (2013) clarify that if the variation in immune response is due to environmental factors (i.e., body condition, social rank) and not due to genetic factors, then there will be no expected effect of the immune phenotype on future generations. It is possible that general health, as measured by body condition, can have a causal role in determining immune response, with animals in poor condition demonstrating poor immune reactions (NAS 2013).

Correlations between physical factors and immune response would not preclude, though, that there could also be a heritable response to immunocontraception. In studies not directly related to immunocontraception, immune response has been shown to be heritable (Kean et al. 1994, Sarker et al. 1999). Unfortunately, predictions about the long-term, population-level evolutionary response to immunocontraceptive treatments are speculative at this point, with results likely to depend on several factors, including: the strength of the genetic predisposition to not respond to the fertility control vaccine; the heritability of that gene or genes; the initial prevalence of that gene or genes; the number of mares treated with a primer dose of the vaccine (which generally has a short-acting effect); the number of mares treated with one or more booster doses of the vaccine; and the actual size of the genetically-interacting metapopulation of horses within which the vaccine treatment takes place.

BLM is not aware of any studies that have quantified the heritability of a lack of response to immunocontraception such as PZP vaccine or GonaCon-Equine in horses or burros. At this point, there are no studies available from which one could make conclusions about the long-term effects of sustained and widespread immunocontraception treatments on population-wide immune function. Although a few, generally isolated, feral horse populations have been treated with high fractions of mares receiving PZP immunocontraception for long-term population control (e.g., Assateague Island National Park, and Pryor Mountains Herd Management Area), no studies have tested for changes in immune competence in those areas. Relative to the large number of free-roaming feral horses in the western United States, immunocontraception has not been, and is not expected to be used in the type of widespread or prolonged manner that might be required to cause a detectable evolutionary response.

Effects of handling and marking

Some degree of handling is required for most fertility control methods. Fertility control vaccines require animals to be marked for individual identification. The WFRHBA (as amended) indicates that management should be at the minimum level necessary to achieve management objectives (CFR 4710.4). Surgical sterilization techniques, while not reversible, may control horse reproduction without the kind of additional handling or darting that can be needed to administer contraceptive vaccines. In this sense, sterilization surgeries can be used to achieve herd management objectives with a relative minimum level of animal handling and management over the long term. If gelding some fraction of a managed population can reduce population growth rates by replacing breeding mares, it then follows that spaying or neutering some individuals can lead to a reduced number of handling occasions and removals of excess horses from the range, which is consistent with legal guidelines. Other fertility control options that may be temporarily effective on male horses, such as the injection of GonaCon-Equine immunocontraceptive vaccine, apparently require multiple handling occasions to achieve longer-term male infertility. There is no clear guideline to indicate whether temporary fertility control methods (such as vaccines) that require multiple capture operations to treat a given individual are more intrusive than an activity that requires only one handling occasion (such as spaying).

It is prudent for animals treated with fertility control vaccines, and spayed or neutered animals, to be readily identifiable, either via freeze brand marks or unique coloration, so that their treatment history is easily recognized (e.g., BLM 2010). Markings may also be useful into the future to determine the approximate fraction of geldings in a herd, and could provide additional insight regarding gather efficiency. BLM has instituted capture and animal welfare program guidelines to reduce the sources of handling stress in captured animals (BLM 2015). Handling may include freeze-marking, for the purpose of identifying an individual. Some level of transient stress is likely to result in newly captured horses that are not previously marked. Under past management practices, captured horses experienced increased, transient stress levels from handling (Ashley and Holcombe 2001). It is difficult to compare that level of temporary stress with long-term stress that can result from food and water limitation on the range (e.g., Creel et al. 2013), which could occur in the absence of herd management.

Most horses recover from the stress of capture and handling quickly once released back to the HMA, and none are expected to suffer serious long term effects from gelding, other than the direct consequence of becoming infertile.

Having marked animals in herds can also be useful for observing outcomes. Intensive observational studies are not typically part of management goals (with the exception of projects such as the Conger & Frisco HMA gather plan and research study, UT-W020-2015-0017-EA) but if the goal is to detect on-the-range complications from fertility control vaccines, sex ratio manipulation, or spaying and neutering, then casual observation may help BLM determine if they are occurring. Observations of long term outcomes may be recorded during routine resource monitoring work. Such observations could include but not be limited to band size, social interactions with other geldings and harem bands, distribution within their habitat, forage utilization and activities around key water sources. Periodic

population inventories and future gather statistics could provide additional anecdotal information about how logistically effective it is to manage a portion of the herd as non-breeding animals.

Literature Cited

Angle, M., J. W. Turner Jr., R. M. Kenney, and V. K. Ganjam. 1979. Androgens in feral stallions. Pages 31–38 in Proceedings of the Symposium on the Ecology and Behaviour of Wild and Feral Equids, University of Wyoming, Laramie.

Asa, C. S., D. A. Goldfoot, and O. J. Ginther. 1979. Sociosexual behavior and the ovulatory cycle of ponies (Equus caballus) observed in harem groups. Hormones and Behavior 13:49–65.

Asa, C. S., D. A. Goldfoot, M. C. Garcia, and O. J. Ginther. 1980a. Dexamethasone suppression of sexual behavior in the ovariectomized mare. Hormones and Behavior.

Asa, C., D. A. Goldfoot, M. C. Garcia, and O. J. Ginther. 1980b. Sexual behavior in ovariectomized and seasonally anovulatory pony mares (Equus caballus). Hormones and Behavior 14:46–54.

Asa, C., D. Goldfoot, M. Garcia, and O. Ginther. 1984. The effect of estradiol and progesterone on the sexual behavior of ovariectomized mares. Physiology and Behavior 33:681–686.

Asa, C. S. 1999. Male reproductive success in free-ranging feral horses. Behavioural Ecology and Sociobiology 47:89–93.

Ashley, M.C., and D.W. Holcombe. 2001. Effects of stress induced by gathers and removals on reproductive success of feral horses. Wildlife Society Bulletin 29:248-254.

Bagavant, H., C. Sharp, B. Kurth, and K.S.K. Tung. 2002. Induction and immunohistology of autoimmune ovarian disease in cynomolgus macaques (Macaca fascicularis). American Journal of Pathology 160:141-149.

Baker, D.L., J.G. Powers, M.O. Oehler, J.I. Ransom, J. Gionfriddo, and T.M. Nett. 2013. Field evaluation of the Immunocontraceptive GonaCon-B in Free-ranging Horses (Equus caballus) at Theodore Roosevelt National Park. Journal of Zoo and Wildlife Medicine 44:S141-S153.

Baker, D.L., J.G. Powers, J. Ransom, B. McCann, M. Oehler, J. Bruemmer, N. Galloway, D. Eckery, and T. Nett. 2017. Gonadotropin-releasing hormone vaccine (GonaCon-Equine) suppresses fertility in free-ranging horses (Equus caballus): limitations and side effects. Proceedings of the 8th International Wildlife Fertility Control Conference, Washington, D.C.

Baker, D.L., J.G. Powers, J.I. Ransom, B.E. McCann, M.W. Oehler, J.E. Bruemmer, N. Galloway, D. Eckery, and T. Nett. 2017. Reimmunization increases contraceptive effectiveness of gonadotropin-releasing hormone vaccine (GonaCon-Equine) in free-ranging horses (Equus caballus): Limitations and side effects. PLoS ONE 13(7): e0201570.

Baldock, P. A. J., H. A. Morris, A. G. Need, R. J. Moore, and T. C. Durbridge. 1998. Variation in the short-term changes in bone cell activity in three regions of the distal femur immediately following ovariectomy. Journal of Bone and Mineral Research 13:1451–1457.

Balet, L., F. Janett, J. Hüsler, M. Piechotta, R. Howard, S. Amatayakul-Chantler, A. Steiner, and G. Hirsbrunner, 2014. Immunization against gonadotropin-releasing hormone in dairy cattle: Antibody titers, ovarian function, hormonal levels, and reversibility. Journal of Dairy Science 97:2193-2203.

Barber, M.R., and R.A. Fayer-Hosken. 2000. Evaluation of somatic and reproductive immunotoxic effects of the porcine zone pellucida vaccination. Journal of Experimental Zoology 286:641-646.

Bartholow, J.M. 2004. An economic analysis of alternative fertility control and associated management techniques for three BLM wild horse herds. USGS Open-File Report 2004-1199.

Bartholow, J. 2007. Economic benefit of fertility control in wild horse populations. The Journal of Wildlife Management 71:2811-2819.

Bechert, U., J. Bartell, M. Kutzler, A. Menino, R. Bildfell, M. Anderson, and M. Fraker. 2013. Effects of two porcine zona pellucida immunocontraceptive vaccines on ovarian activity in horses. The Journal of Wildlife Management 77:1386-1400.

Bechert, U.S., and M.A. Fraker. 2018. Twenty years of SpayVac research: potential implications for regulating feral horse and burro populations in the United States. Human-Wildlife Interactions 12:117-130.

Beckett, T., A. E. Tchernof, and M. J. Toth. 2002. Effect of ovariectomy and estradiol replacement on skeletal muscle enzyme activity in female rats. Metabolism 51:1397–1401.

Belsito, K. R., B. M. Vester, T. Keel, T. K. Graves, and K. S. Swanson. 2008. Impact of ovariohysterectomy and food intake on body composition, physical activity, and adipose gene expression in cats. Journal of Animal Science 87:594–602.

Berger, J. 1986. Wild horses of the Great Basin. University of Chicago Press, Chicago.

Bertin, F. R., K. S. Pader, T. B. Lescun, and J. E. Sojka-Kritchevsky. 2013. Short-term effect of ovariectomy on measures of insulin sensitivity and response to dexamethasone administration in horses. American Journal of Veterinary Research 74:1506–1513.

Boedeker, N.C., L.A.C. Hayek, S. Murray, D.M. De Avila, and J.L. Brown. 2012. Effects of a gonadotropin-releasing hormone vaccine on ovarian cyclicity and uterine morphology of an Asian elephant (Elephas maximus). Journal of Zoo and Wildlife Medicine 43:603-614.

Bohrer, B.M., W.L. Flowers, J.M. Kyle, S.S. Johnson, V.L. King, J.L. Spruill, D.P. Thompson, A.L. Schroeder, and D.D. Boler. 2014. Effect of gonadotropin releasing factor suppression with an immunological on growth performance, estrus activity, carcass characteristics, and meat quality of market gilts. Journal of Animal Science 92:4719-4724.

Botha, A.E., M.L. Schulman, H.J. Bertschinger, A.J. Guthrie, C.H. Annandale, and S.B. Hughes. 2008. The use of a GnRH vaccine to suppress mare ovarian activity in a large group of mares under field conditions. Wildlife Research 35:548-554.

Bowen, Z. 2015. Assessment of spay techniques for mare in field conditions. Letter from US Geological Survey Fort Collins Science Center to D. Bolstad, BLM. November 24, 2015. Appendix D in Bureau of Land Management, 2016, Mare Sterilization Research Environmental Assessment, DOI-BLM-O-B000-2015-055-EA, Hines, Oregon.

Brown, B.W., P.E. Mattner, P.A.Carroll, E.J. Holland, D.R. Paull, R.M. Hoskinson, and R.D.G. Rigby. 1994. Immunization of sheep against GnRH early in life: effects on reproductive function and hormones in rams. Journal of Reproduction and Fertility 101:15-21.

BLM. 2010. BLM-4700-1 Wild Horses and Burros Management Handbook. Washington, D.C.

BLM. 2011. Barren Valley Complex Wild Horse gather Plan. Final Environmental Assessment. DOI-BLM-OR-V040-2011-011-EA. BLM Oregon, Vale District / Jordan Field Office.

BLM. 2012. Final Environmental Assessment Challis Wild Horse Gather Plan. DOI-BLM-ID-1030-2012-0006-EA. BLM Idaho, Challis Field Office.

BLM. 2015. Instruction Memorandum 2015-151; Comprehensive animal welfare program for wild horse and burro gathers. Washington, D.C.

BLM. 2016. Population Control Research Wild Horse Gather for the Conger and Frisco Herd Management Areas. Final Environmental Assessment. DOI-BLM-UT-W020-2015-0017-EA. BLM Utah, West Desert District.

Borsberry, S. 1980. Libidinous behaviour in a gelding. Veterinary Record 106:89–90.

Camara, C., L.-Y. Zhou, Y. Ma, L. Zhu, D. Yu, Y.-W. Zhao, and N.-H. Yang. 2014. Effect of ovariectomy on serum adiponectin levels and visceral fat in rats. Journal of Huazhong University of Science and Technology [Medical Sciences] 34:825–829.

Chaudhuri, M., and J. R. Ginsberg. 1990. Urinary androgen concentrations and social status in two species of free ranging zebra (Equus burchelli and E. grevyi). Reproduction 88:127–133.

Coit V. A., F. J. Dowell, and N. P. Evans. 2009. Neutering affects mRNA expression levels for the LH- and GnRH-receptors in the canine urinary bladder. Theriogenology 71:239-247.

Colborn, D. R., D. L. Thompson, T. L. Roth, J. S. Capehart, and K. L. White. 1991. Responses of cortisol and prolactin to sexual excitement and stress in stallions and geldings. Journal of Animal Science 69:2556–2562.

Collins, G. H., and J. W. Kasbohm. 2016. Population dynamics and fertility control of feral horses. Journal of Wildlife Management 81: 289-296.

Cooper, D.W. and C.A. Herbert. 2001. Genetics, biotechnology and population management of over-abundant mammalian wildlife in Australasia. Reproduction, Fertility and Development, 13:451-458.

Cooper, D.W. and E. Larsen. 2006. Immunocontraception of mammalian wildlife: ecological and immunogenetic issues. Reproduction, 132, 821–828.

Costantini, R. M., J. H. Park, A. K. Beery, M. J. Paul, J. J. Ko, and I. Zucker. 2007. Post-castration retention of reproductive behavior and olfactory preferences in male Siberian hamsters: Role of prior experience. Hormones and Behavior 51:149–155.

Crabtree, J. R. 2016. Can ovariectomy be justified on grounds of behaviour? Equine Veterinary Education 28: 58–59.

Creel, S., B. Dantzer, W. Goymann, and D.R. Rubenstein. 2013. The ecology of stress: effects of the social environment. Functional Ecology 27:66-80.

Crowell-Davis, S. L. 2007. Sexual behavior of mares.

Curtis, P.D., R.L. Pooler, M.E. Richmond, L.A. Miller, G.F. Mattfeld, and F.W Quimby. 2001. Comparative effects of GnRH and porcine zona pellucida (PZP) immunocontraceptive vaccines for controlling reproduction in white-tailed deer (Odocoileus virginianus). Reproduction (Cambridge, England) Supplement 60:131-141.

Curtis, P.D., R.L. Pooler, M.E. Richmond, L.A. Miller, G.F. Mattfeld, and F.W. Quimby. 2008. Physiological Effects of gonadotropin-releasing hormone immunocontraception in white-tailed deer. Human-Wildlife Conflicts 2:68-79.

Dalmau, A., A. Velarde, P. Rodríguez, C. Pedernera, P. Llonch, E. Fàbrega, N. Casal, E. Mainau, M. Gispert, V. King, and N. Slootmans. 2015. Use of an anti-GnRF vaccine to suppress estrus in crossbred Iberian female pigs. Theriogenology 84:342-347.

Dalin, A.M., Ø. Andresen, and L. Malmgren. 2002. Immunization against GnRH in mature mares: antibody titres, ovarian function, hormonal levels and oestrous behaviour. Journal of Veterinary Medicine Series A 49:125-131.

Deniston, R. H. 1979. The varying role of the male in feral horses. Pages 93–38 in Proceedings of the Symposium on the Ecology and Behaviour of Wild and Feral Equids, University of Wyoming, Laramie.

de Seve, C.W. and S.L. Boyles-Griffin. 2013. An economic model demonstrating the long-term cost benefits of incorporating fertility control into wild horse (Equus caballus) management in the United States. Journal of Zoo and Wildlife Medicine 44(4s:S34-S37).

Dixson, A. F. 1993. Sexual and aggressive behaviour of adult male marmosets (Callithrix jacchus) castrated neonatally, prepubertally, or in adulthood. Physiology and Behavior 54:301–307.

Dong, F., D.C. Skinner, T. John Wu, and J. Ren. 2011. The Heart: A Novel Gonadotrophin-Releasing Hormone Target. Journal of Neuroendocrinology 23:456-463.

Donovan, C.E., T. Hazzard, A. Schmidt, J. LeMieux, F. Hathaway, and M.A. Kutzler. 2013. Effects of a commercial canine gonadotropin releasing hormone vaccine on estrus suppression and estrous behavior in mares. Animal Reproduction Science, 142:42-47.

Dunbar, I. F. 1975. Behaviour of castrated animals. The Veterinary Record 92–93.

Duncan, C.L., J.L. King, and P. Stapp. 2017. Effects of prolonged immunocontraception on the breeding behavior of American bison. Journal of Mammalogy 98:1272-1287.

Eagle, T. C., C. S. Asa, R. A. Garrott, E. D. Plotka, D. B. Siniff, and J. R. Tester. 1993. Efficacy of dominant male sterilization to reduce reproduction in feral horses. Wildlife Society Bulletin 21:116–121.

Elhay, M., A. Newbold, A. Britton, P. Turley, K. Dowsett, and J. Walker. 2007. Suppression of behavioural and physiological oestrus in the mare by vaccination against GnRH. Australian Veterinary Journal 85:39-45.

Environmental Protection Agency (EPA). 2009a. Pesticide Fact Sheet: Mammalian Gonadotropin Releasing Hormone (GnRH), New Chemical, Nonfood Use, USEPA-OPP, Pesticides and Toxic Substances. US Environmental Protection Agency, Washington, DC

Environmental Protection Agency (EPA). 2009b. Memorandum on GonaCon ™ Immunocontraceptive Vaccine for Use in White-Tailed Deer. Section 3 Registration. US Environmental Protection Agency, Washington, DC.

Environmental Protection Agency (EPA). 2012. Porcine Zona Pellucida. Pesticide fact Sheet. Office of Chemical Safety and Pollution Prevention 7505P. 9 pages.

Environmental Protection Agency (EPA). 2013. Notice of pesticide registration for GonaCon-Equine. US Environmental Protection Agency, Washington, DC.

Environmental Protection Agency (EPA). 2015. Label and CSF Amendment. November 19, 2015 memo and attachment from Marianne Lewis to David Reinhold. US Environmental Protection Agency, Washington, DC.

Environmental Protection Agency (EPA). 2012. Porcine Zona Pellucida. Pesticide fact Sheet. Office of Chemical Safety and Pollution Prevention 7505P. 9 pages.

Evans, J. W., A. Borton, H. F. Hintz, and L. D. Van Vleck. 1977. The Horse. San Francisco, California: W.H. Freeman and Company. Pages 373–377.

Feh, C. 1999. Alliances and reproductive success in Camargue stallions. Animal Behaviour 57:705–713.

Feh, C. 2012. Delayed reversibility of PZP (porcine zona pellucida) in free-ranging Przewalski's horse mares. In International Wild Equid Conference. Vienna, Austria: University of Veterinary Medicine.

Feh, C., and B. Munkhtuya. 2008. Male infanticide and paternity analyses in a socially natural herd of Przewalski's horses: Sexual selection? Behavioral Processes 78:335-339.

Feist, J. D., and D. R. McCullough. 1976. Behavior patterns and communication in feral horses. Zietschrift für Tierpsychologie 41:337–371.

Feist, J. D., and D.R. McCullough. 1976. Behavior patterns and communication in feral horses. Zietschrift für Tierpsychologie 41:337–371.

Fettman, M. J., C. A. Stanton, L. L. Banks, D. W. Hamar, D. E. Johnson, R. L. Hegstad, and S. Johnston. 1997. Effects of neutering on bodyweight, metabolic rate and glucose tolerance of domestic cats. Research in Veterinary Science 62:131–136.

Fonner, R. and A.K. Bohara. 2017. Optimal control of wild horse populations with nonlethal methods. Land Economics 93:390-412.

French, H., E. Peterson, R. Ambrosia, H. Bertschinger, M. Schulman, M. Crampton, R. Roth, P. Van Zyl, N. Cameron-Blake, M. Vandenplas, and D. Knobel. 2017. Porcine and recombinant zona pellucida vaccines as immunocontraceptives for donkeys in the Caribbean. Proceedings of the 8th International Wildlife Fertility Control Conference, Washington, D.C.

Garcia, M. C., and O. J. Ginther. 1976. Effects of Ovariectomy and Season on Plasma Luteinizing Hormone in Mares. Endocrinology 98:958–962.

Garrott , R.A., and D.B. Siniff. 1992. Limitations of male-oriented contraception for controlling feral horse populations. Journal of Wildlife Management 56:456-464.

Garrott, R.A., and M.K. Oli. 2013. A Critical Crossroad for BLM's Wild Horse Program. Science 341:847-848.

Garza, F., D.L. Thompson, D.D. French, J.J. Wiest, R.L. St George, K.B. Ashley, L.S. Jones, P.S. Mitchell, and D.R. McNeill. 1986. Active immunization of intact mares against gonadotropin-releasing hormone: differential effects on secretion of luteinizing hormone and follicle-stimulating hormone. Biology of Reproduction 35:347-352.

Getman, L.M. 2009. Review of castration complications: strategies for treatment in the field. AAEP Proceedings 55:374-378.

Gionfriddo, J.P., A.J. Denicola, L.A. Miller, and K.A. Fagerstone. 2011a. Efficacy of GnRH immunocontraception of wild white-tailed deer in New Jersey. Wildlife Society Bulletin 35:142-148.

Gionfriddo, J.P., A.J. Denicola, L.A. Miller, and K.A. Fagerstone. 2011b. Health effects of GnRH immunocontraception of wild white-tailed deer in New Jersey. Wildlife Society Bulletin 35:149-160.

Goodloe, R.B., 1991. Immunocontraception, genetic management, and demography of feral horses on four eastern US barrier islands. UMI Dissertation Services.

Gray, ME. 2009a. The influence of reproduction and fertility manipulation on the social behavior of feral horses (Equus caballus). Dissertation. University of Nevada, Reno.

Gray, M.E. 2009b. An infanticide attempt by a free-roaming feral stallion (Equus caballus). Biology Letters 5:23-25.

Gray, M.E., D.S. Thain, E.Z. Cameron, and L.A. Miller. 2010. Multi-year fertility reduction in free-roaming feral horses with single-injection immunocontraceptive formulations. Wildlife Research 37:475-481.

Gray, M.E. and E.Z. Cameron. 2010. Does contraceptive treatment in wildlife result in side effects? A review of quantitative and anecdotal evidence. Reproduction 139:45-55.

Green, N.F. and H.D. Green. 1977. The wild horse population of Stone Cabin Valley Nevada: a preliminary report. In Proceedings, National Wild Horse Forum. University of Nevada Reno Cooperative Extension Service.

Gross, J.E. 2000. A dynamic simulation model for evaluating effects of removal and contraception on genetic variation and demography of Pryor Mountain wild horses. Biological Conservation 96:319-330.

Gupta, S., and V. Minhas. 2017. Wildlife population management: are contraceptive vaccines a feasible proposition? Frontiers in Bioscience, Scholar 9:357-374.

Guttilla, D. A., and P. Stapp. 2010. Effects of sterilization on movements of feral cats at a wildland–urban interface. Journal of Mammalogy 91:482–489.

Hall, S. E., B. Nixon, and R.J. Aiken. 2016. Non-surgical sterilization methods may offer a sustainable solution to feral horse (Equus caballus) overpopulation. Reproduction, Fertility and Development, published online: https://doi.org/10.1071/RD16200

Hailer, F., B. Helander, A.O. Folkestad, S.A. Ganusevich, S. Garstad, P. Hauff, C. Koren, T. Nygård, V. Volke, C. Vilà, and H. Ellegren. 2006. Bottlenecked but long-lived: high genetic diversity retained in white-tailed eagles upon recovery from population decline. Biology Letters 2:316-319.

Hampson, B. A., M. A. De Laat, P. C. Mills, and C. C. Pollitt. 2010a. Distances travelled by feral horses in 'outback' Australia. Equine Veterinary Journal, Suppl. 38:582–586.

Hampson, B. A., J. M. Morton, P. C. Mills, M. G. Trotter, D. W. Lamb, and C. C. Pollitt. 2010b. Monitoring distances travelled by horses using GPS tracking collars. Australian Veterinary Journal 88:176–181.

Hampton, J.O., T.H. Hyndman, A. Barnes, and T. Collins. 2015. Is wildlife fertility control always humane? Animals 5:1047-1071.

Hart, B. L. 1968. Role of prior experience in the effects of castration on sexual behavior of male dogs. Journal of Comparative and Physiological Psychology 66:719–725.

Hart, B. L., and T. O. A. C. Jones. 1975. Effects of castration on sexual behavior of tropical male goats. Hormones and Behavior 6:247–258.

Hart, B. L., and R. A. Eckstein. 1997. The role of gonadal hormones in the occurrence of objectionable behaviours in dogs and cats. Applied Animal Behaviour Science 52:331–344.

Heilmann, T.J., R.A. Garrott, L.L. Cadwell, and B.L. Tiller, 1998. Behavioral response of free-ranging elk treated with an immunocontraceptive vaccine. Journal of Wildlife Management 62: 243-250.

Herbert, C.A. and T.E. Trigg. 2005. Applications of GnRH in the control and management of fertility in female animals. Animal Reproduction Science, 88:141-153.

Hobbs, N.T., D.C. Bowden and D.L. Baker. 2000. Effects of Fertility Control on Populations of Ungulates: General, Stage-Structured Models. Journal of Wildlife Management 64:473-491.

Holtan, D. W., E. L. Squires, D. R. Lapin, and O. J. Ginther. 1979. Effect of ovariectomy on pregnancy in mares. Journal of Reproduction and Fertility, Supplement 27:457–463.

Hooper, R. N., T. S. Taylor, D. D. Varner, and B. T. L. 1993. Effects of bilateral ovariectomy via coloptomy in mares: 23 cases (1984-1990). Journal of the American Veterinary Medical Association 203:1043–1046.

Huang, R. Y., L. M. Miller, C. S. Carlson, and M. R. Chance. 2002. Characterization of bone mineral composition in the proximal tibia of Cynomolgus monkeys: effect of ovariectomy and nandrolone decanoate treatment. Bone 30:492–497.

Hsueh, A.J.W. and G.F. Erickson. 1979. Extrapituitary action of gonadotropin-releasing hormone: direct inhibition ovarian steroidogenesis. Science 204:854-855.

Imboden, I., F. Janett, D. Burger, M.A. Crowe, M. Hässig, and R. Thun. 2006. Influence of immunization against GnRH on reproductive cyclicity and estrous behavior in the mare. Theriogenology 66:1866-1875.

Jacob, J., G. R. Singleton, and L. A. Hinds. 2008. Fertility control of rodent pests. Wildlife Research 35:487.

Janett, F., U. Lanker, H. Jörg, E. Meijerink, and R. Thun. 2009a. Suppression of reproductive cyclicity by active immunization against GnRH in the adult ewe. Schweizer Archiv fur Tierheilkunde 151:53-59.

Janett, F., R. Stump, D. Burger, and R. Thun. 2009b. Suppression of testicular function and sexual behavior by vaccination against GnRH (Equity™) in the adult stallion. Animal Reproduction Science 115:88-102.

Jerome, C. P., C. H. Turner, and C. J. Lees. 1997. Decreased bone mass and strength in ovariectomized cynomolgus monkeys (Macaca fascicularis). Calcified Tissue International 60:265–270.

Jeusette, I., J. Detilleux, C. Cuvelier, L. Istasse, and M. Diez. 2004. Ad libitum feeding following ovariectomy in female Beagle dogs: effect on maintenance energy requirement and on blood metabolites. Journal of Animal Physiology and Animal Nutrition 88:117–121.

Jeusette, I., S. Daminet, P. Nguyen, H. Shibata, M. Saito, T. Honjoh, L. Istasse, and M. Diez. 2006. Effect of ovariectomy and ad libitum feeding on body composition, thyroid status, ghrelin and leptin plasma concentrations in female dogs. Journal of Animal Physiology and Animal Nutrition 90:12–18.

Jewell, P. A. 1997. Survival and behaviour of castrated Soay sheep (Ovis aries) in a feral island population on Hirta, St. Kilda, Scotland. Journal of Zoology 243:623–636.

Joonè, C.J., H.J. Bertschinger, S.K. Gupta, G.T. Fosgate, A.P. Arukha, V. Minhas, E. Dieterman, and M.L. Schulman. 2017a. Ovarian function and pregnancy outcome in pony mares following immunocontraception with native and recombinant porcine zona pellucida vaccines. Equine Veterinary Journal 49:189-195.

Joonè, C.J., H. French, D. Knobel, H.J. Bertschinger, and M.L. Schulman. 2017b. Ovarian suppression following PZP vaccination in pony mares and donkey jennies. Proceedings of the 8th International Wildlife Fertility Control Conference, Washington, D.C.

Joonè, C.J., M.L. Schulman, G.T. Fosgate, A.N. Claes, S.K. Gupta, A.E. Botha, A-M Human, and H.J. Bertschinger. 2017c. Serum anti-Müllerian hormone dynamics in mares following immunocontraception with anti-zona pellucida or -GnRH vaccines, Theriogenology (2017), doi: 10.1016/

Joonè, C.J., M.L. Schulman, and H.J. Bertschinger. 2017d. Ovarian dysfunction associated with zona pellucida-based immunocontraceptive vaccines. Theriogenology 89:329-337.

Kamm, J. L., and D. A. Hendrickson. 2007. Clients' perspectives on the effects of laparoscopic ovariectomy on equine behavior and medical problems. Journal of Equine Veterinary Science 27:435–438.

Kane, A.J. 2018. A review of contemporary contraceptives and sterilization techniques for feral horses. Human-Wildlife Interactions 12:111-116.

Kaseda, Y., H. Ogawa, and A. M. Khalil. 1997. Causes of natal dispersal and emigration and their effects on harem formation in Misaki feral horses. Equine Veterinary Journal 29:262–266.

Kaur, K. and V. Prabha. 2014. Immunocontraceptives: new approaches to fertility control. BioMed Research International v. 2014, ArticleID 868196, 15 pp. http:/dx.doi.org/10.1155/2014/868196

Kean, R.P., A. Cahaner, A.E. Freeman, and S.J. Lamont. 1994. Direct and correlated responses to multitrait, divergent selection for immunocompetence. Poultry Science 73:18-32.

Khalil, A.M., N. Murakami, and Y. Kaseda. 1998. Relationship between plasma testosterone concentrations and age, breeding season, and harem size in Misaki feral horses. Journal of Veterinary Medical Science 60:643-645.

Khalil, A. M., and N. Murakami. 1999. Effect of natal dispersal on the reproductive strategies of the young Misaki feral stallions. Applied Animal Behaviour Science 62:281–291.

Killian, G., N.K. Diehl, L. Miller, J. Rhyan, and D. Thain. 2006. Long-term efficacy of three contraceptive approaches for population control of wild horses. In Proceedings-Vertebrate Pest Conference.

Killian, G., D. Thain, N.K. Diehl, J. Rhyan, and L. Miller. 2008. Four-year contraception rates of mares treated with single-injection porcine zona pellucida and GnRH vaccines and intrauterine devices. Wildlife Research 35:531-539.

Killian, G., T.J. Kreeger, J. Rhyan, K. Fagerstone, and L. Miller. 2009. Observations on the use of GonaConTM in captive female elk (Cervus elaphus). Journal of Wildlife Diseases 45:184-188.

King, S.R.B., and J. Gurnell. 2005. Habitat use and spatial dynamics of takhi introduced to Hustai National Park, Mongolia. Biological Conservation 124:277-290.

King, S.R.B., and J. Gurnell. 2006. Scent-marking behaviour by stallions: an assessment of function in a reintroduced population of Przewalski horses (Equus ferus przewalskii). Journal of Zoology 272:30–36.

Kirkpatrick, J. 2012. Sworn statement of Dr. Jay Kirkpatrick. Unpublished record of opinion.

Kirkpatrick, J.F. and J.W. Turner. 1991. Compensatory reproduction in feral horses. Journal of Wildlife Management 55:649-652.

Kirkpatrick, J.F., I.M.K. Liu, J.W. Turner, R. Naugle, and R. Keiper. 1992. Long-term effects of porcine zonae pellucidae immunocontraception on ovarian function in feral horses (Equus caballus). Journal of Reproduction and Fertility 94:437-444.

Kirkpatrick, J.F. and A. Turner. 2002. Reversibility of action and safety during pregnancy of immunization against porcine zona pellucida in wild mares (Equus caballus). Reproduction Supplement 60:197-202.

Kirkpatrick, J.F. and A. Turner. 2003. Absence of effects from immunocontraception on seasonal birth patterns and foal survival among barrier island wild horses. Journal of Applied Animal Welfare Science 6:301-308.

Kirkpatrick, J. F., and A. Turner. 2008. Achieving population goals in a long-lived wildlife species (Equus caballus) with contraception. Wildlife Research 35:513.

Kirkpatrick, J.F., A.T. Rutberg, and L. Coates-Markle. 2010. Immunocontraceptive reproductive control utilizing porcine zona pellucida (PZP) in federal wild horse populations, 3rd edition. P.M. Fazio, editor. Downloaded from http://www.einsten.net/pdf/110242569.pdf

Kirkpatrick, J.F., R.O. Lyda, and K. M. Frank. 2011. Contraceptive vaccines for wildlife: a review. American Journal of Reproductive Immunology 66:40-50.

Kirkpatrick, J.F., A.T. Rutberg, L. Coates-Markle, and P.M. Fazio. 2012. Immunocontraceptive Reproductive Control Utilizing Porcine Zona Pellucida (PZP) in Federal Wild Horse Populations. Science and Conservation Center, Billings, Montana.

Kitchell, K., S. Cohn, R. Falise, H. Hadley, M. Herder, K. Libby, K. Muller, T. Murphy, M. Preston, M.J. Rugwell, and S. Schlanger. 2015. Advancing science in the BLM: an implementation strategy. Department of the Interior, BLM, Washington DC.

Knight, C.M. 2014. The effects of porcine zona pellucida immunocontraception on health and behavior of feral horses (Equus caballus). Graduate thesis, Princeton University.

Lee, M., and D. A. Hendrickson. 2008. A review of equine standing laparoscopic ovariectomy. Journal of Equine Veterinary Science 28:105–111.

Levy, J.K., J.A. Friary, L.A. Miller, S.J. Tucker, and K.A. Fagerstone. 2011. Long-term fertility control in female cats with GonaCon™, a GnRH immunocontraceptive. Theriogenology 76:1517-1525.

Line, S. W., B. L. Hart, and L. Sanders. 1985. Effect of prepubertal versus postpubertal castration on sexual and aggressive behavior in male horses. Journal of the American Veterinary Medical Association 186:249–251.

Linklater, W. L., and E. Z. Cameron. 2000. Distinguishing cooperation from cohabitation: the feral horse case study. Animal Behaviour 59:F17–F21.

Liu, I.K.M., M. Bernoco, and M. Feldman. 1989. Contraception in mares heteroimmunized with pig zonae pellucidae. Journal of Reproduction and Fertility, 85:19-29.

Loesch, D. A., and D. H. Rodgerson. 2003. Surgical approaches to ovariectomy in mares. Continuing Education for Veterinarians 25:862–871.

Lundon, K., M. Dumitriu, and M. Grynpas. 1994. The long-term effect of ovariectomy on the quality and quantity of cancellous bone in young macaques. Bone and Mineral 24:135–149.

Madosky, J.M., Rubenstein, D.I., Howard, J.J. and Stuska, S., 2010. The effects of immunocontraception on harem fidelity in a feral horse (Equus caballus) population. Applied Animal Behaviour Science, 128:50-56.

Magiafoglou, A., M. Schiffer, A.A. Hoffman, and S.W. McKechnie. 2003. Immunocontraception for population control: will resistance evolve? Immunology and Cell Biology 81:152-159.

Mask, T.A., K.A. Schoenecker, A.J. Kane, J.I.Ransom, and J.E. Bruemmer. 2015. Serum antibody immunoreactivity to equine zona protein after SpayVac vaccination. Theriogenology, 84:261-267.

Mavropoulos, A., S. Kiliaridis, R. Rizzoli, and P. Ammann. 2014. Normal masticatory function partially protects the rat mandibular bone from estrogen-deficiency induced osteoporosis. Journal of Biomechanics 47:2666–2671.

McDonnell, S.M. 2012. Mare and foal behavior. American Association of Equine Practitioners Proceedings 58:407-410.

McKinnon, A.O., and J.R. Vasey. 2007. Selected reproductive surgery of the broodmare. Pages 146-160 in Current therapy in equine reproduction, J.C. Samper, J.F. Pycock, and A.O. McKinnon, eds. Saunders Elsevier, St. Louis, Missouri.

Miller, R. 1983. Seasonal Movements and Home Ranges of Feral Horse Bands in Wyoming's Red Desert. Journal of Range Management 36:199–201.

Miller, L.A., J.P. Gionfriddo, K.A. Fagerstone, J.C. Rhyan, and G.J. Killian. 2008. The Single-Shot GnRH Immunocontraceptive Vaccine (GonaCon™) in White-Tailed Deer: Comparison of Several GnRH Preparations. American Journal of Reproductive Immunology 60:214-223.

Miller, L.A., K.A. Fagerstone, and D.C. Eckery. 2013. Twenty years of immunocontraceptive research: lessons learned. Journal of Zoo and Wildlife Medicine 44:S84-S96.

Mills, L.S. and F.W. Allendorf. 1996. The one-migrant-per-generation rule in conservation and management. Conservation Biology 10:1509-1518.

National Park Service (NPS). 2008. Environmental Assessment of Alternatives for Managing the Feral Horses of Assateague Island National Seashore. NPS Assateague Island National Seashore.

National Research Council of the National Academies of Sciences (NAS). 2013. Using science to improve the BLM wild horse and burro program: a way forward. National Academies Press. Washington, DC.

National Research Council of the National Academies of Sciences (NAS). 2015. Review of proposals to the Bureau of Land Management on Wild Horse and Burro sterilization or contraception, a letter report. Committee for the review of proposals to the Bureau of Land Management on Wild Horse and Burro Sterilization or Contraception. Appendix B in: BLM, 2016, Mare sterilization research Environmental Assessment DOI-BLM-OR-B000-2015-0055-EA, BLM Burns District Office, Hines, Oregon.

Nelson, K. J. 1980. Sterilization of dominant males will not limit feral horse populations. USDA Forest Service Research Paper RM-226.

Nettles, V. F. 1997. Potential consequences and problems with wildlife contraceptives. Reproduction, Fertility and Development 9, 137–143.

Nickolmann, S., S. Hoy, and M. Gauly. 2008. Effects of castration on the behaviour of male llamas (Lama glama). Tierärztliche Praxis Großtiere 36:319–323.

Nock, B. 2013. Liberated horsemanship: menopause…and wild horse management. Warrenton, Missouri: Liberated Horsemanship Press.

Nock, B. 2017. Gelding is likely to cause wild horses undo suffering. Unpublished record of opinion.

Nolan, M.B., H.J. Bertschinger, and M.L. Schulman. 2018a. Antibody response and safety of a novel recombinant Zona Pellucida vaccine formulation in mares. Journal of Equine Veterinary Science 66:97.

Nolan, M.B., H.J. Bertschinger, M. Crampton, and M.L. Schulman. 2018b. Serum anti-Müllerian hormone following Zona Pellucida immunocontraceptive vaccination of mares. Journal of Equine Veterinary Science 66:105.

Nuñez, C.M.V., J.S. Adelman, C. Mason, and D.I. Rubenstein. 2009. Immunocontraception decreases group fidelity in a feral horse population during the non-breeding season. Applied Animal Behaviour Science 117:74-83.

Nuñez, C.M., J.S. Adelman, and D.I. Rubenstein. 2010. Immunocontraception in wild horses (Equus caballus) extends reproductive cycling beyond the normal breeding season. PLoS one, 5(10), p.e13635.

Nuñez, C.M.V, J.S. Adelman, J. Smith, L.R. Gesquiere, and D.I. Rubenstein. 2014. Linking social environment and stress physiology in feral mares (Equus caballus): group transfers elevate fecal cortisol levels. General and Comparative Endocrinology. 196:26-33.

Nuñez, C.M., J.S. Adelman, H.A. Carr, C.M. Alvarez, and D.I. Rubenstein. 2017. Lingering effects of contraception management on feral mare (Equus caballus) fertility and social behavior. Conservation Physiology 5(1): cox018; doi:10.1093/conphys/cox018.

Nuñez, C.M.V. 2018. Consequences of porcine zona pellucidz immunocontraception to feral horses. Human-Wildlife Interactions 12:131-142.

O'Farrell, V., and E. Peachey. 1990. Behavioural effects of ovariohysterectomy on bitches. Journal of Small Animal Practice 31:595–598.

Pader, K., L. J. Freeman, P. D. Constable, C. C. Wu, P. W. Snyder, and T. B. Lescun. 2011. Comparison of Transvaginal Natural Orifice Transluminal Endoscopic Surgery (NOTES®) and Laparoscopy for Elective Bilateral Ovariectomy in Standing Mares. Veterinary Surgery 40:998–1008.

Payne, R. M. 2013. The effect of spaying on the racing performance of female greyhounds. The Veterinary Journal 198:372–375.

Pearce, O. 1980. Libidinous behaviour in a gelding. Veterinary Record 106:207–207.

Powell, D.M. 1999. Preliminary evaluation of porcine zona pellucida (PZP) immunocontraception for behavioral effects in feral horses (Equus caballus). Journal of Applied Animal Welfare Science 2:321-335.

Powell, D.M. and S.L. Monfort. 2001. Assessment: effects of porcine zona pellucida immunocontraception on estrous cyclicity in feral horses. Journal of Applied Animal Welfare Science 4:271-284.

Powers, J.G., D.L. Baker, T.L. Davis, M.M. Conner, A.H. Lothridge, and T.M. Nett. 2011. Effects of gonadotropin-releasing hormone immunization on reproductive function and behavior in captive female Rocky Mountain elk (Cervus elaphus nelsoni). Biology of Reproduction 85:1152-1160.

Powers, J.G., D.L. Baker, M.G. Ackerman, J.E. Bruemmer, T.R. Spraker, M.M. Conner, and T.M. Nett. 2012. Passive transfer of maternal GnRH antibodies does not affect reproductive development in elk (Cervus elaphus nelson) calves. Theriogenology 78:830-841.

Powers, J.G., D.L. Baker, R.J. Monello, T.J. Spraker, T.M. Nett, J.P. Gionfriddo, and M.A. Wild. 2013. Effects of gonadotropin-releasing hormone immunization on reproductive function and behavior in captive female Rocky Mountain elk (Cervus elaphus nelsoni). Journal of Zoo and Wildlife Medicine meeting abstracts S147.

Prado, T., and J. Schumacher. 2017. How to perform ovariectomy through a colpotomy. Equine Veterinary Education 13:doi: 10.1111/eve.12801

Ramsey, D. 2005. Population dynamics of brushtail possums subject to fertility control. Journal of Applied Ecology 42:348–360.

Ramsey, D. 2007. Effects of fertility control on behavior and disease transmission in brushtail possums. Journal of Wildlife Management 71:109–116.

Ransom, J. I., and B. S. Cade. 2009. Quantifying Equid Behavior--A Research Ethogram for Free-Roaming Feral Horses. Publications of the US Geological Survey. U.S. Geological Survey Techniques and Methods 2-A9.

Ransom, J.I., B.S. Cade, and N.T. Hobbs. 2010. Influences of immunocontraception on time budgets, social behavior, and body condition in feral horses. Applied Animal Behaviour Science 124:51-60.

Ransom, J.I., J.E. Roelle, B.S. Cade, L. Coates-Markle, and A.J. Kane. 2011. Foaling rates in feral horses treated with the immunocontraceptive porcine zona pellucida. Wildlife Society Bulletin 35:343-352.

Ransom, J.I., N.T. Hobbs, and J. Bruemmer. 2013. Contraception can lead to trophic asynchrony between birth pulse and resources. PLoS one, 8(1), p.e54972.

Ransom, J.I., J.G. Powers, N.T. Hobbs, and D.L. Baker. 2014a. Ecological feedbacks can reduce population-level efficacy of wildlife fertility control. Journal of Applied Ecology 51:259-269.

Ransom, J.I., J.G. Powers, H.M. Garbe, M.W. Oehler, T.M. Nett, and D.L. Baker. 2014b. Behavior of feral horses in response to culling and GnRH immunocontraception. Applied Animal Behaviour Science 157: 81-92.

Reichler, I. M. 2009. Gonadectomy in Cats and Dogs: A Review of Risks and Benefits. Reproduction in Domestic Animals 44:29–35.

Rios, J. F. I., and K. Houpt. 1995. Sexual behavior in geldings. Applied Animal Behaviour Science 46:133–133.

Roelle, J.E., and J.I. Ransom. 2009. Injection-site reactions in wild horses (Equus caballus) receiving an immunocontraceptive vaccine: U.S. Geological Survey Scientific Investigations Report 2009–5038.

Roelle, J. E., F. J. Singer, L. C. Zeigenfuss, J. I. Ransom, L. Coates-Markle, and K. A. Schoenecker. 2010. Demography of the Pryor Mountain Wild Horses, 1993–2007. pubs.usgs.gov. U.S. Geological Survey Scientific Investigations Report 2010-5125.

Roelle, J.E. and S.J. Oyler-McCance. 2015. Potential demographic and genetic effects of a sterilant applied to wild horse mares. US Geological Survey Open-file Report 2015-1045.

Roelle, J.E., S.S. Germaine, A.J. Kane, and B.S. Cade. 2017. Efficacy of SpayVac ® as a contraceptive in feral horses. Wildlife Society Bulletin 41:107-115.

Röcken, M., G. Mosel, K. Seyrek-Intas, D. Seyrek-Intas, F. Litzke, J. Verver, and A. B. M. Rijkenhuizen. 2011. Unilateral and Bilateral Laparoscopic Ovariectomy in 157 Mares: A Retrospective Multicenter Study. Veterinary Surgery 40:1009–1014.

Roelle, J.E. and S.J. Oyler-McCance. 2015. Potential demographic and genetic effects of a sterilant applied to wild horse mares. US Geological Survey Open-file Report 2015-1045.

Roessner, H. A., K.A. Kurtz, and J.P. Caron. 2015. Laparoscopic ovariectomy diminishes estrus-associated behavioral problems in mares. Journal of Equine Veteriniary Science 35: 250–253 (2015).

Rowland, A.L., K.G. Glass, S.T. Grady, K.J. Cummings, K. Hinrichs, and A.E. Watts. 2018. Influence of caudal epidural analgesia on cortisol concentrations and pain-related behavioral responses in mares during and after ovariectomy via colpotomy. Veterinary Surgery 2018:1-7. DOI: 10.1111/vsu.12908

Rubenstein, D.I. 1981. Behavioural ecology of island feral horses. Equine Veterinary Journal 13:27-34.

Rubin, C., A. S. Turner, S. Bain, C. Mallinckrodt, and K. McLeod. 2001. Low mechanical signals strengthen long bones. Nature 412:603–604.

Rutberg, A. 2011. Re: Modified decision record, WY-040-EA11-124. Unpublished record of opinion.

Rutberg, A., K. Grams, J.W. Turner, and H. Hopkins. 2017. Contraceptive efficacy of priming and boosting does of controlled-release PZP in wild horses. Wildlife Research: http://dx.doi.org/10.1071/WR16123

Sacco, A.G., M.G. Subramanian, and E.C. Yurewicz. 1981. Passage of zona antibodies via placenta and milk following active immunization of female mice with porcine zonae pellucidae. Journal of Reproductive Immunology 3:313-322.

Salter, R. E. Biogeography and habitat-use behavior of feral horses in western and northern Canada. in Symposium on the Ecology and Behaviour of Wild and Feral Equids 129–141 (1979).

Saltz, D., M. Rowen, and D. I. Rubenstein. 2000. The effect of space-use patterns of reintroduced Asiatic wild ass on effective population size. Conservation Biology 14:1852–1861.

Sarker, N., M. Tsudzuki, M. Nishibori, and Y. Yamamoto. 1999. Direct and correlated response to divergent selection for serum immunoglobulin M and G levels in chickens. Poultry Science 78:1-7.

Saunders, G., J. McIlroy, M. Berghout, B. Kay, E. Gifford, R. Perry, and R. van de Ven. 2002. The effects of induced sterility on the territorial behaviour and survival of foxes. Journal of Applied Ecology 39:56–66.

Schaut, R.G., M.T. Brewer, J.M. Hostetter, K. Mendoza, J.E. Vela-Ramirez, S.M. Kelly, J.K. Jackman, G. Dell'Anna, J.M. Howard, B. Narasimhan, and W. Zhou. 2018. A single dose polyanhydride-based vaccine platform promotes and maintains anti-GnRH antibody titers. Vaccine 36:1016-1023.

Scholz-Ahrens, K. E., G. Delling, P. W. Jungblut, E. Kallweit, and C. A. Barth. 1996. Effect of ovariectomy on bone histology and plasma parameters of bone metabolism in nulliparous and multiparous sows. Zeitschrift für Ernährungswissenschaft 35:13–21.

Schulman, M.L., A.E. Botha, S.B. Muenscher, C.H. Annandale, A.J. Guthrie, and H.J. Bertschinger. 2013. Reversibility of the effects of GnRH-vaccination used to suppress reproductive function in mares. Equine Veterinary Journal 45:111-113.

Schumacher, J. 1996. Complications of castration. Equine Veterinary Education 8:254-259.

Schumacher, J. 2006. Why do some castrated horses still act like stallions, and what can be done about it? Compendium Equine Edition Fall:142–146.

Science and Conservation Center (SCC). 2015. Materials Safety Data Sheet, ZonaStat-H. Billings, Montana.

Scott, E. A., and D. J. Kunze. 1977. Ovariectomy in the mare: presurgical and postsurgical considerations. The Journal of Equine Medicine and Surgery 1:5–12.

Scully, C.M., R.L. Lee, L. Pielstick, J. Medlock, K.M. Patton, G.H. Collins, and M.A. Kutzler. 2015. Comparison of chemical and surgical vasectomy on testicular activity in free-roaming horses (Equus caballus). Journal of Zoo and Wildlife Medicine 46:815-824.

Searle, D., A.J. Dart, C.M. Dart, and D.R. Hodgson. 1999. Equine castration: review of anatomy, approaches, techniques and complications in normal, cryptorchid and monorchid horses. Australian Veterinary Journal 77:428-434.

Seidler, R. G., and E. M. Gese. 2012. Territory fidelity, space use, and survival rates of wild coyotes following surgical sterilization. Journal of Ethology 30:345–354.

Shoemaker, R., Bailey, J., Janzen, E. and Wilson, D.G., 2004. Routine castration in 568 draught colts: incidence of evisceration and omental herniation. Equine Veterinary Journal, 36:336-340.

Shoemaker, R. W., E. K. Read, T. Duke, and D. G. Wilson. 2004. In situ coagulation and transection of the ovarian pedicle: an alternative to laparoscopic ovariectomy in juvenile horses. Canadian Journal of Veterinary Research 68:27-32.

Shumake, S.A. and G. Killian. 1997. White-tailed deer activity, contraception, and estrous cycling. Great Plains Wildlife Damage Control Workshop Proceedings, Paper 376.

Skinner, S.M., Mills, T., Kirchick, H.J. and Dunbar, B.S., 1984. Immunization with Zona Pellucida Proteins Results in Abnormal Ovarian Follicular Differentiation and Inhibition of Gonadotropin-induced Steroid Secretion. Endocrinology, 115:2418-2432.

Sigrist, I. M., C. Gerhardt, M. Alini, E. Schneider, and M. Egermann. 2007. The long-term effects of ovariectomy on bone metabolism in sheep. Journal of Bone and Mineral Metabolism 25:28–35.

Sigurjónsdóttir, H., M. C. Van Dierendonck, S. Snorrason, and A. G. Thorhallsdóttir. 2003. Social relationships in a group of horses without a mature stallion. Behaviour 140:783–804.

Smith, J. A. 1974. Proceedings: Masculine behaviour in geldings. The Veterinary Record 94:160–160.

Stout, T.A.E., J.A. Turkstra, R.H. Meloen, and B. Colenbrander. 2003. The efficacy of GnRH vaccines in controlling reproductive function in horses. Abstract of presentation from symposium, "Managing African elephants: act or let die? Utrecht University, Utrecht, Netherlands.

Thompson, D. L., Jr, B. W. Pickett, E. L. Squires, and T. M. Nett. 1980. Sexual behavior, seminal pH and accessory sex gland weights in geldings administered testosterone and(or) estradiol-17. Journal of Animal Science 51:1358–1366.

Turner, J.W., I.K.M. Liu, and J.F. Kirkpatrick. 1996. Remotely delivered immunocontraception in free-roaming feral burros (Equus asinus). Journal of Reproduction and Fertility 107:31-35.

Turner, J.W., I.K. Liu, A.T. Rutberg, and J.F. Kirkpatrick. 1997. Immunocontraception limits foal production in free-roaming feral horses in Nevada. Journal of Wildlife Management 61:873-880.

Turner, J.W., I.K. Liu, D.R. Flanagan, K.S. Bynum, and A.T. Rutberg. 2002. Porcine zona pellucida (PZP) immunocontraception of wild horses (Equus caballus) in Nevada: a 10 year study. Reproduction Supplement 60:177-186.

Turner, J.W., and J.F. Kirkpatrick. 2002. Effects of immunocontraception on population, longevity and body condition in wild mares (Equus caballus). Reproduction (Cambridge, England) Supplement, 60, pp.187-195.

Turner, J.W., I.K. Liu, D.R. Flanagan, A.T. Rutberg, and J.F. Kirkpatrick. 2007. Immunocontraception in wild horses: one inoculation provides two years of infertility. Journal of Wildlife Management 71:662-667.

Turner, J.W, A.T. Rutberg, R.E. Naugle, M.A. Kaur, D.R.Flanagan, H.J. Bertschinger, and I.K.M. Liu. 2008. Controlled-release components of PZP contraceptive vaccine extend duration of infertility. Wildlife Research 35:555-562.

Twigg, L. E., T. J. Lowe, G. R. Martin, A. G. Wheeler, G. S. Gray, S. L. Griffin, C. M. O'Reilly, D. J. Robinson, and P. H. Hubach. 2000. Effects of surgically imposed sterility on free-ranging rabbit populations. Journal of Applied Ecology 37:16–39.

Tyler, S. 1972. The behaviour and social organisation of the New Forest ponies. Animal Behaviour Monographs 5:85–196.

US Fish and Wildlife Service (USFWS). 2015. Endangered and Threatened Wildlife and Plants; 90-day findings on 31 petitions. Federal Register 80 (126):37568-37579.

Van Dierendonck, M. C., H. De Vries, and M. B. H. Schilder. 1995. An analysis of dominance, its behavioural parameters and possible determinants in a herd of Icelandic horses in captivity. Journal of Zoology 45:362–385.

Van Dierendonck, M. C., H. Sigurjónsdóttir, B. Colenbrander, and A. G. Thorhallsdóttir. 2004. Differences in social behaviour between late pregnant, post-partum and barren mares in a herd of Icelandic horses. Applied Animal Behaviour Science 89:283–297.

Van Dierendonck, M. C., H. De Vries, M. B. H. Schilder, B. Colenbrander, A. G. Þorhallsdóttir, and H. Sigurjónsdóttir. 2009. Interventions in social behaviour in a herd of mares and geldings. Applied Animal Behaviour Science 116:67–73.

Vinke, C. M., R. van Deijk, B. B. Houx, and N. J. Schoemaker. 2008. The effects of surgical and chemical castration on intermale aggression, sexual behaviour and play behaviour in the male ferret (Mustela putorius furo). Applied Animal Behaviour Science 115:104–121.

Wang-Cahill, F., J. Warren, T. Hall, J. O'Hare, A. Lemay, E. Ruell, and R. Wimberly. In press. Use of GonaCon in wildlife management. Chapter 24 in USDA-APHIS, Human health and ecological risk

assessment for the use of wildlife damage management methods by APHIS-Wildlife Services. USDA APHIS, Fort Collins, Colorado.

Webley, G. E., and E. Johnson. 1982. Effect of ovariectomy on the course of gestation in the grey squirrel (Sciurus carolinensis). Journal of Endocrinology 93:423–426.

Wright, S. 1931. Evolution in Mendelian populations. Genetics 16:97-159

Yao, Z., W. Si, W. Tian, J. Ye, R. Zhu, X. Li, S. Ki, Q. Zheng, Y. Liu, and F. Fang. 2018. Effect of active immunization using a novel GnRH vaccine on reproductive function in rats. Theriogenology 111:1-8. https://doi.org/10.1016/j.theriogenology.2018.01.013

Zhang, Y., W.-P. Lai, P.-C. Leung, C.-F. Wu, and M.-S. Wong. 2007. Short- to Mid-Term Effects of Ovariectomy on Bone Turnover, Bone Mass and Bone Strength in Rats. Biological and Pharmaceutical Bulletin 30:898–903.

Zoo Montana. 2000. Wildlife Fertility Control: Fact and Fancy. Zoo Montana Science and Conservation Biology Program, Billings, Montana.

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Appendix P – Air Quality

Report: Prepared for the Air Quality Memorandum of Understanding (MOU) Technical Workgroup

Technical Support Document: Prepared for the Air Quality Memorandum of Understanding (MOU) Technical Workgroup

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SECTION 1: BOISE DISTRICT OFFICE PLANNING EFFORT

The Boise District Office (BDO) initiated a land use planning revision process in February 2008 which encompasses approximately 800,000 acres of public land located in southeastern Idaho (Figure 1). This area is known as the Four Rivers planning area. The BDO currently administers the public lands under the Cascade Resource Management Plan (RMP), the Jarbidge Resource Management Plan and the Kuna Management Framework Plan (MFP). When completed, the Four Rivers RMP will replace these three existing land use plans, resulting in a single, updated source of comprehensive land use management direction for the BDO.

The land use planning process is the key tool used by the Bureau of Land Management (BLM) to manage resources and to designate and allocate uses on public lands, in coordination with state and local governments, tribal governments, land users, and interested public. RMP decisions establish goals and objectives for resource management (e.g., desired future conditions, protective measures, or best management practices), the measures needed to achieve these goals and objectives, and parameters for resources and resource uses on BLM-administered public lands.

The planning process under which this Boise District Office RMP is being developed complies with the Federal Land Policy and Management Act of 1976 (FLPMA), the National Environmental Policy Act of 1969 (NEPA), and BLM policies, manuals, and handbooks.

The BLM's Land Use Planning Handbook (H-1601-1), Appendix C (BLM 1995) identifies the broad scale decisions and land management actions to be made for ***Natural, Cultural and Biological Resources*** as well as ***Resources Uses***. Fluid mineral leasing, inclusive of oil and gas, is a resource use in which decisions are made in the RMP regarding areas open to leasing, areas open with stipulations (e.g., controlled surface use restrictions, no surface occupancy) or areas that are closed to leasing. In addition, the associated Environmental Impact Statement (EIS) completed for the RMP includes an analysis of a Reasonable Foreseeable Development Scenario (RFDS) for oil and gas leasing (BLM, 2016). The RFDS describes the level of oil and gas exploration and development from leasing that is anticipated over the next 20 years.

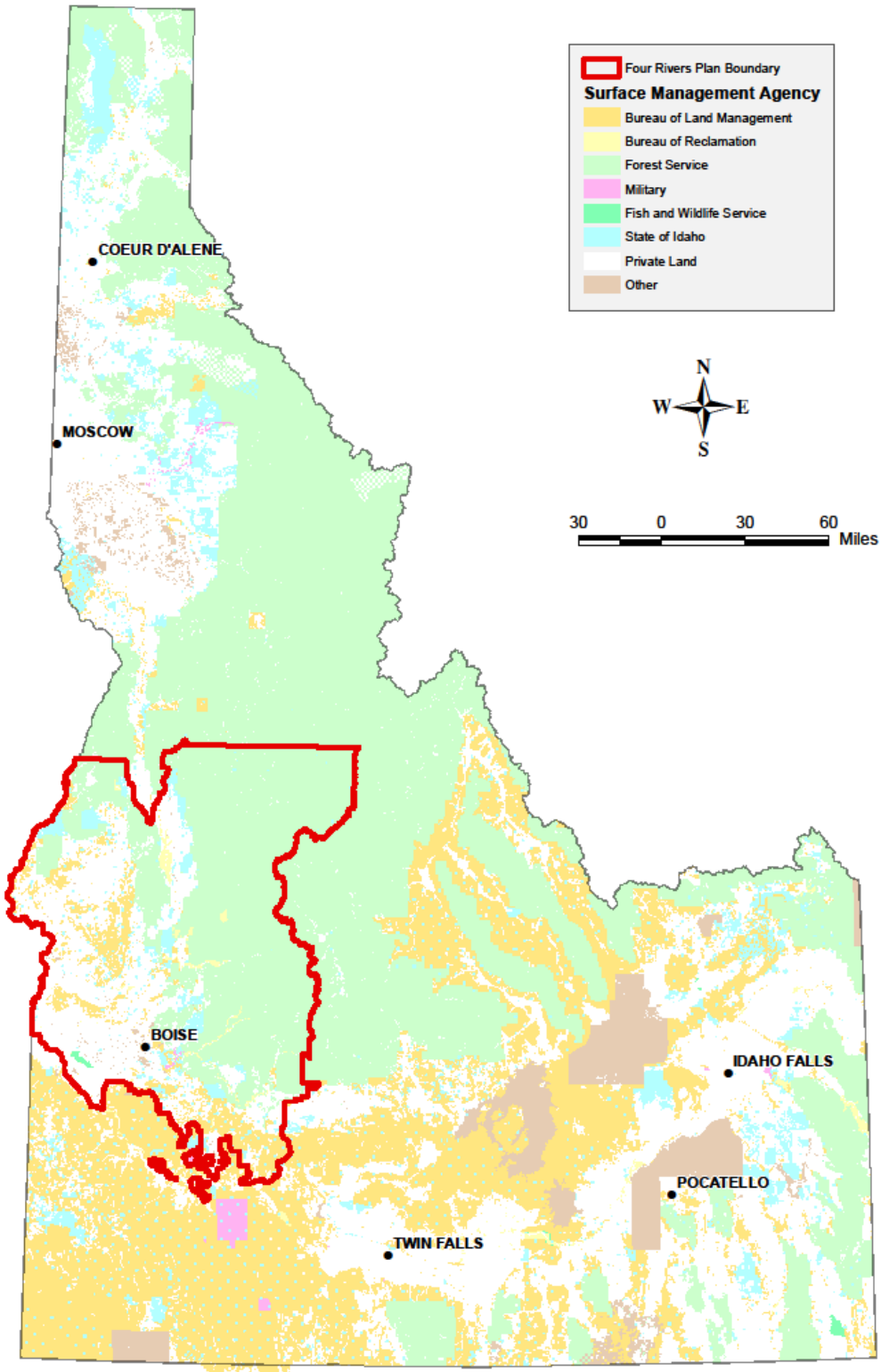


Figure 1. Four Rivers RMP Planning Area.

Boise District Office Oil and Gas Development Potential

Based on the recent discovery and successful development of a natural gas field east of Payette, Idaho, BLM amended its 2009 Reasonably Foreseeable Development Scenario (RFDS) that was written for the Four Rivers RMP revision. Since 2009, 17 wells have been drilled on private lands north of Interstate 84 east of Payette, in two areas that have been designated the Willow and Hamilton Fields. Seven wells in the Willow Field are now producing commercial quantities of natural gas and natural gas condensate.

BLM has revised its oil and gas occurrence and development potential in the western part of the planning area, based on the discovery of a commercially viable natural gas field. While very little new geologic information has been released, based on the activity described above, BLM now estimates that a total of 130 wells would be drilled and eleven natural gas fields would be developed in the planning area, regardless of land ownership, over the life of the Four Rivers RMP, disturbing approximately 975 acres.

BLM anticipates that up to 165 acres of long-term surface disturbance would occur on federal lands in the planning area over the life of the plan. Roughly half that acreage would be reclaimed on an interim basis, as once the well is drilled and put into production, a large drill pad and wide access road are no longer needed.

In summary, the revised RFDS (BLM 2016a) estimates that a total of 130 wells would be drilled in the planning area, regardless of land ownership, disturbing up to 975 acres of land, over the 20 year life of the land use plan. This activity would occur primarily in 11 natural gas fields in 11 townships. Each field is anticipated to be roughly 9 square miles in size. A total of 42 wells - 9 exploration and 33 development wells - are expected to be dry, and would be plugged and abandoned, and 315 acres of drill pads and access roads would be reclaimed within a year of drilling.

Of the 660 acres of disturbance resulting from the drilling of 88 producing wells, close to half would be reclaimed by reducing the footprint of drill pads and access roads after drilling. BLM anticipates up to 22 of the producing wells would be drilled on lands with federal minerals, resulting in short-term surface disturbance of approximately 165 acres, and long-term surface disturbance of approximately 90 acres.

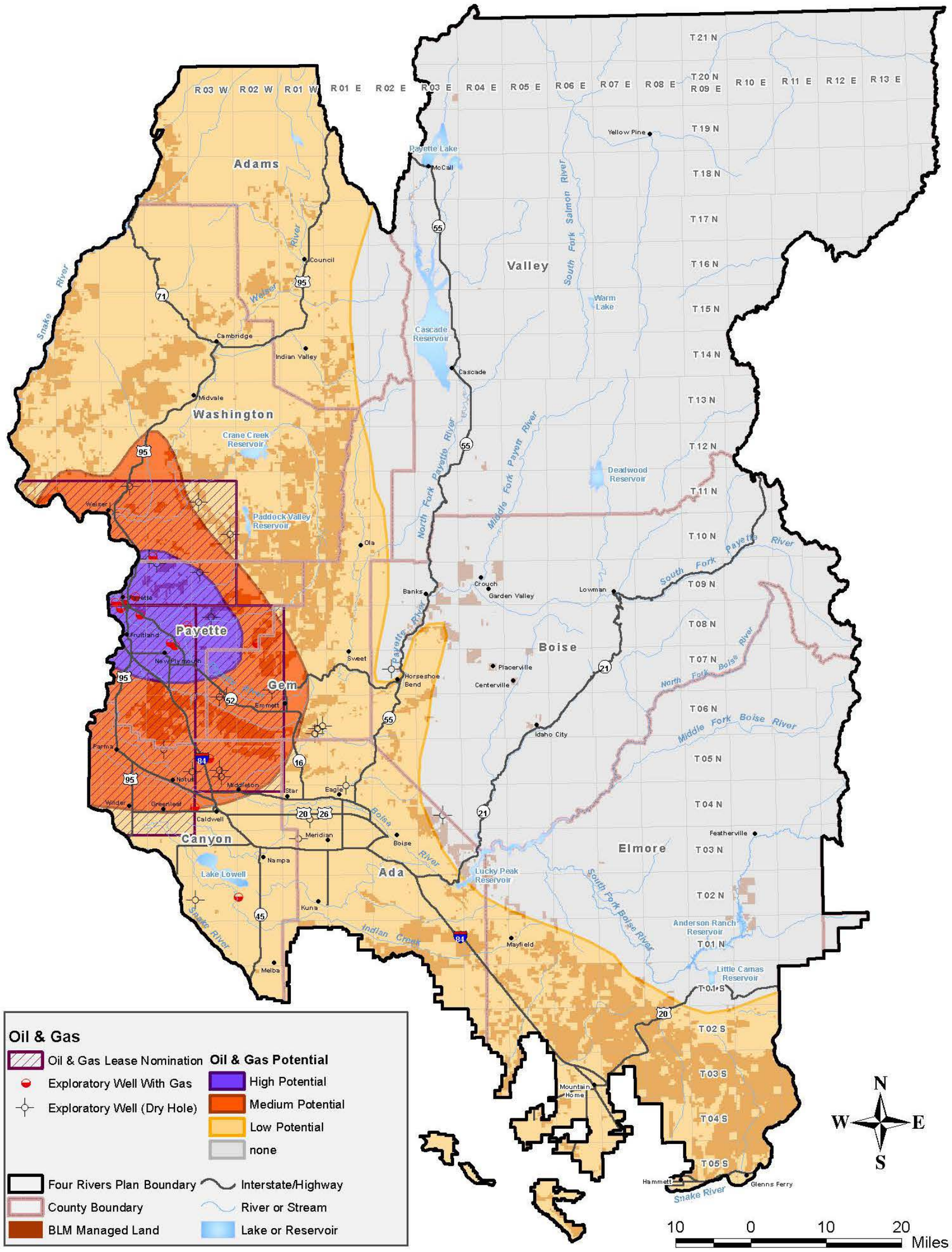


Figure 2. Four Rivers Planning Oil and Gas Potential

Description of Planning Effort Alternatives

For the FRFO planning effort, four alternatives and one sub-alternative have been developed based upon public scoping comments and issues identified by the planning team by analyzing the scoping comments. Each alternative, briefly summarized below, is a separate and distinct resource management plan and the impacts of management direction for resource and resource uses will be analyzed through the NEPA process in an accompanying EIS.

Alternative A:
Council on Environmental Quality (CEQ) regulations Section 1502.14(d) (CEQ 2005) require an EIS to analyze the "No Action" alternative. The No Action is defined as a "no change" from current management direction and will be referred to as "current management" in this document. The existing designations, allowable uses, and management actions contained in the Kuna MFP and Jarbidge and Cascade RMPs would continue to be implemented in their respective areas, unless changed by laws, regulations or policies. Land tenure adjustments would only occur on those areas identified as available for disposal in the Cascade and Jarbidge plans/amendments or Kuna MFP. Alternative A serves as the baseline when comparing the other three alternatives. Figure 3 displays oil and gas opportunities and restrictions under Alternative A.

Alternative B:
Alternative B emphasizes protecting natural resource values from potential negative impacts of population growth and increased use, and would use more protective measures for plants and wildlife. While some areas would still emphasize recreation and community development uses, the primary emphases are for conservation, reduction of habitat fragmentation and resource degradation. Land disposal/acquisition criteria focus on natural resource protection and maintenance of migratory corridors.

Over the past 20 years, natural resources have seen a marked decline in quality and quantity (e.g., to urban encroachment), increased OHV travel into previously inaccessible areas, and human-caused wildland fire. Figure 4 displays oil and gas opportunities and restrictions under Alternative B.

Alternative C:
Increased population growth is a primary factor influencing land management decisions in the Planning Area. The actions proposed in Alternative C would help accommodate growth. The Planning Area's population grew 46% from 2000 to 2017. This places a high demand on public land to accommodate recreational uses and community development.

This alternative emphasizes: (1) designating lands as "available" for disposal for local community expansion, (2) providing economic expansion through extractive and renewable energy resource use, and (3) providing recreational use diversity. Land disposal/acquisition criteria would emphasize using local community plans to achieve social and economic goals. Figure 5 displays oil and gas opportunities and restrictions under Alternative C.

Alternative D:
The emphasis of Alternative D is to manage public lands to promote economic development while conserving natural and cultural resources. Alternative D represents a mixed management approach recognizing the diversity of needs and issues throughout the PA. Concerns about wildland fire, big game winter range, migration corridors and connectivity would result in proactive management for natural and cultural resources. Figure 6 displays oil and gas opportunities and restrictions under Alternative D.

References – Section 1

BLM, 1995. United States Department of the Interior, Bureau of Land Management Land Use Planning Handbook. H-1601-1.

CEQ, 2005. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. Council on Environmental Quality, Executive Office of the President. 40 CFR Parts 1500-1508.

BLM, 2016. Oil and Gas Potential and Reasonable Foreseeable Development in the Four Rivers Field Office. BLM, Boise District Office, Boise, ID. Prepared by Karen Porter. August 10, 2016. 20 pp.

FLPMA, 1976. The Federal Land Policy and Management Act of 1976 (FLPMA). 43 U.S.C. 35 § 1701 *et seq.*

NEPA, 1969. The National Environmental Policy Act of 1969 (NEPA). 42 U.S.C. 55 § 4321 *et seq.*

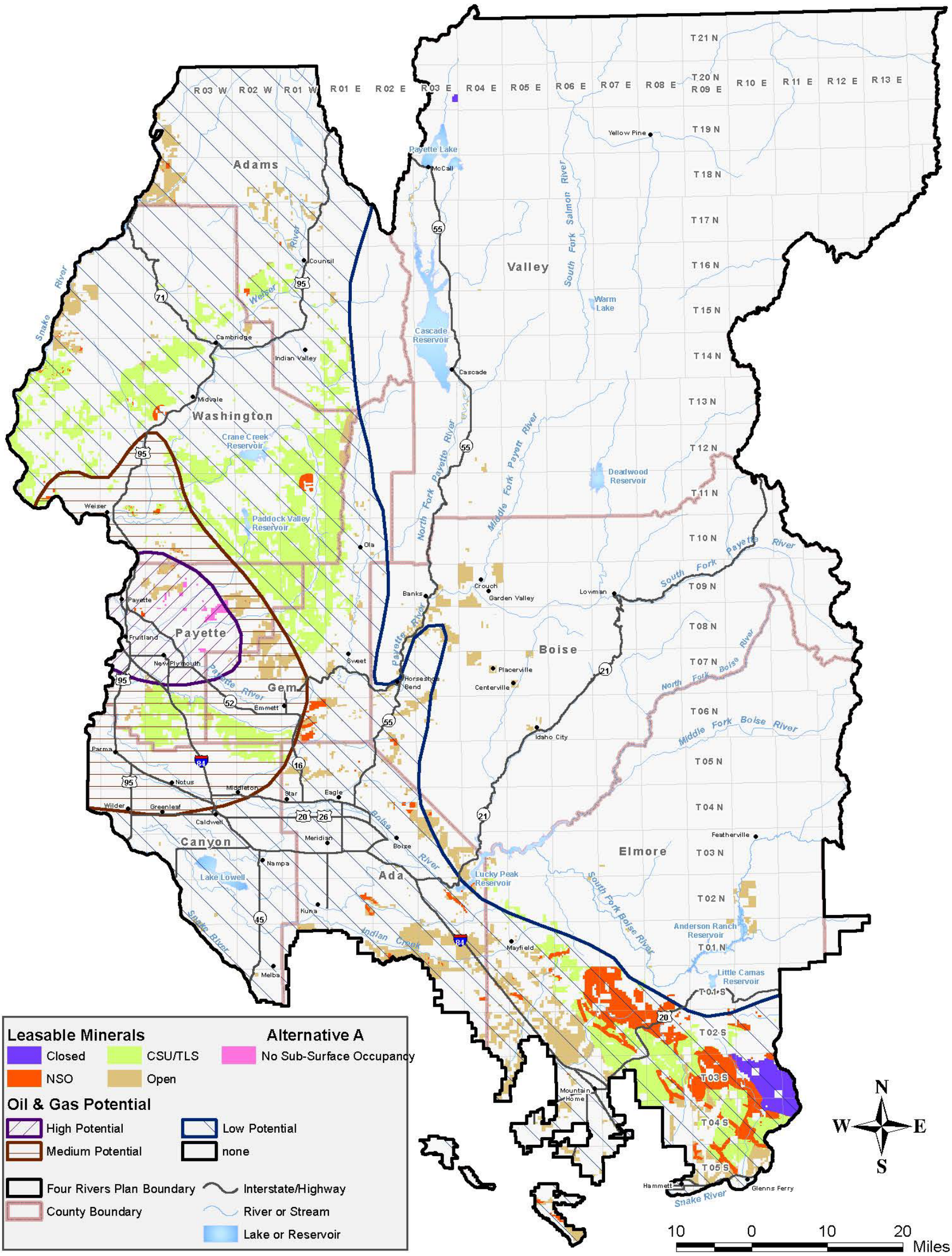


Figure 3. Alternative A Opportunities and Restrictions.

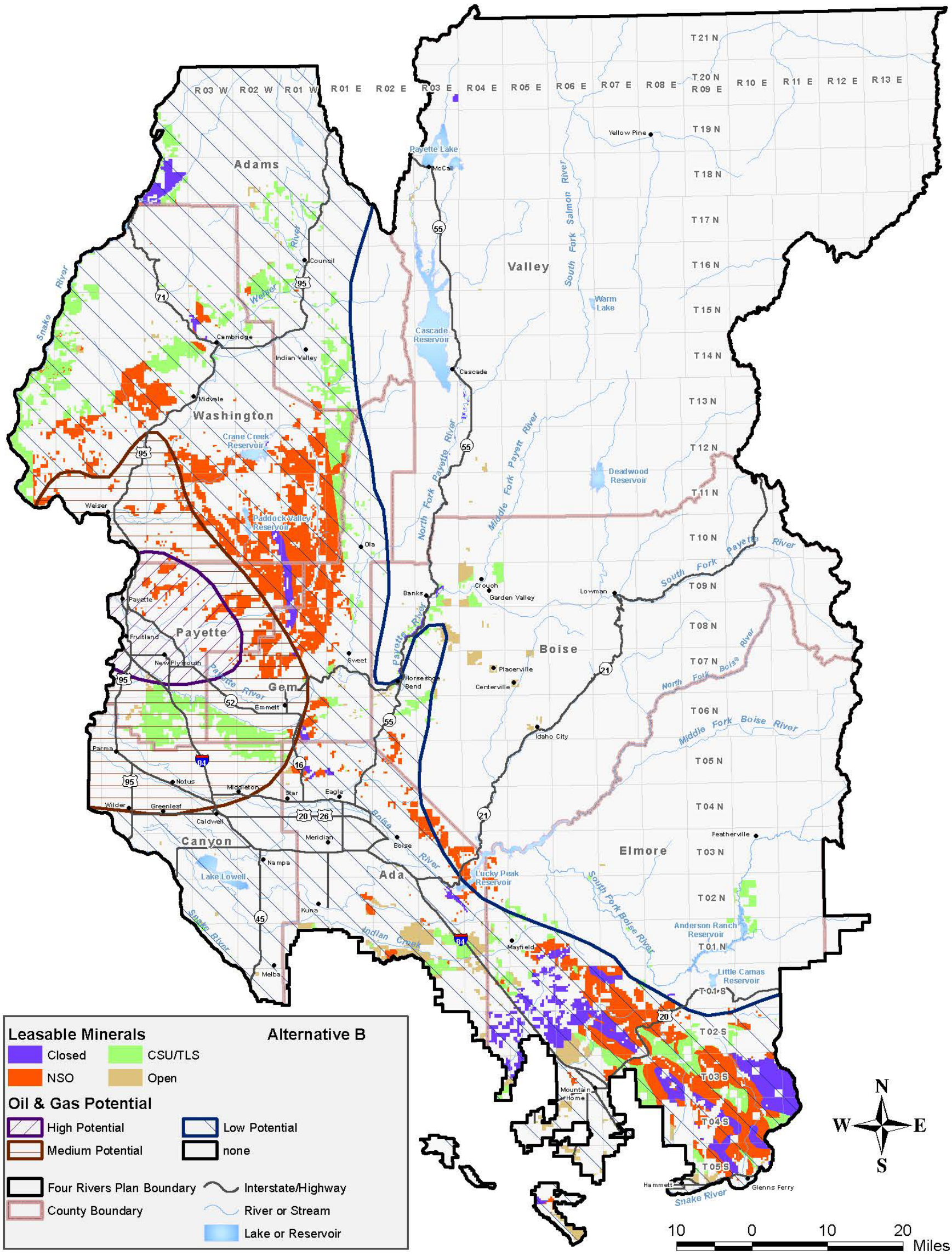


Figure 4. Alternative B Opportunities and Restrictions.

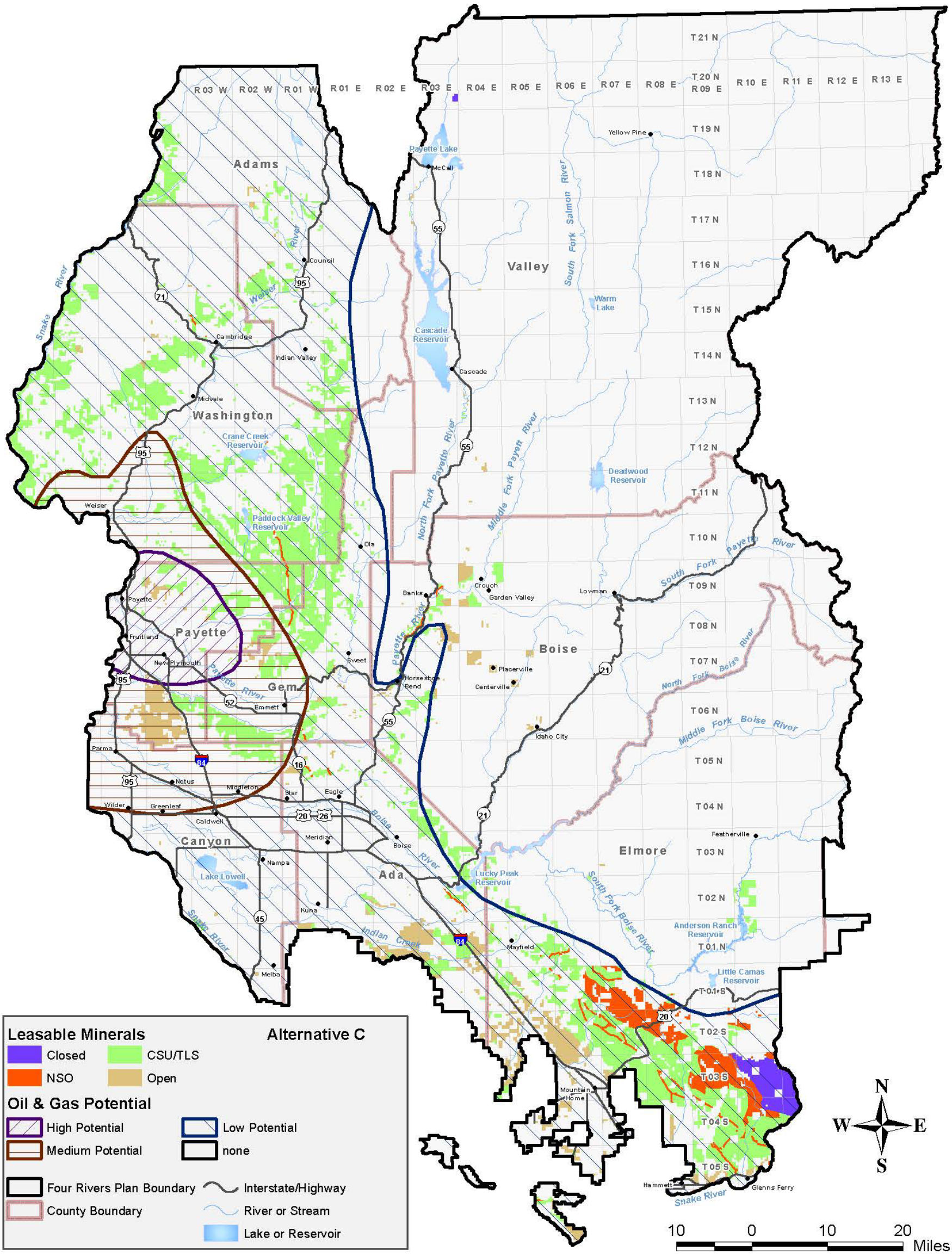


Figure 5. Alternative C Opportunities and Restrictions.

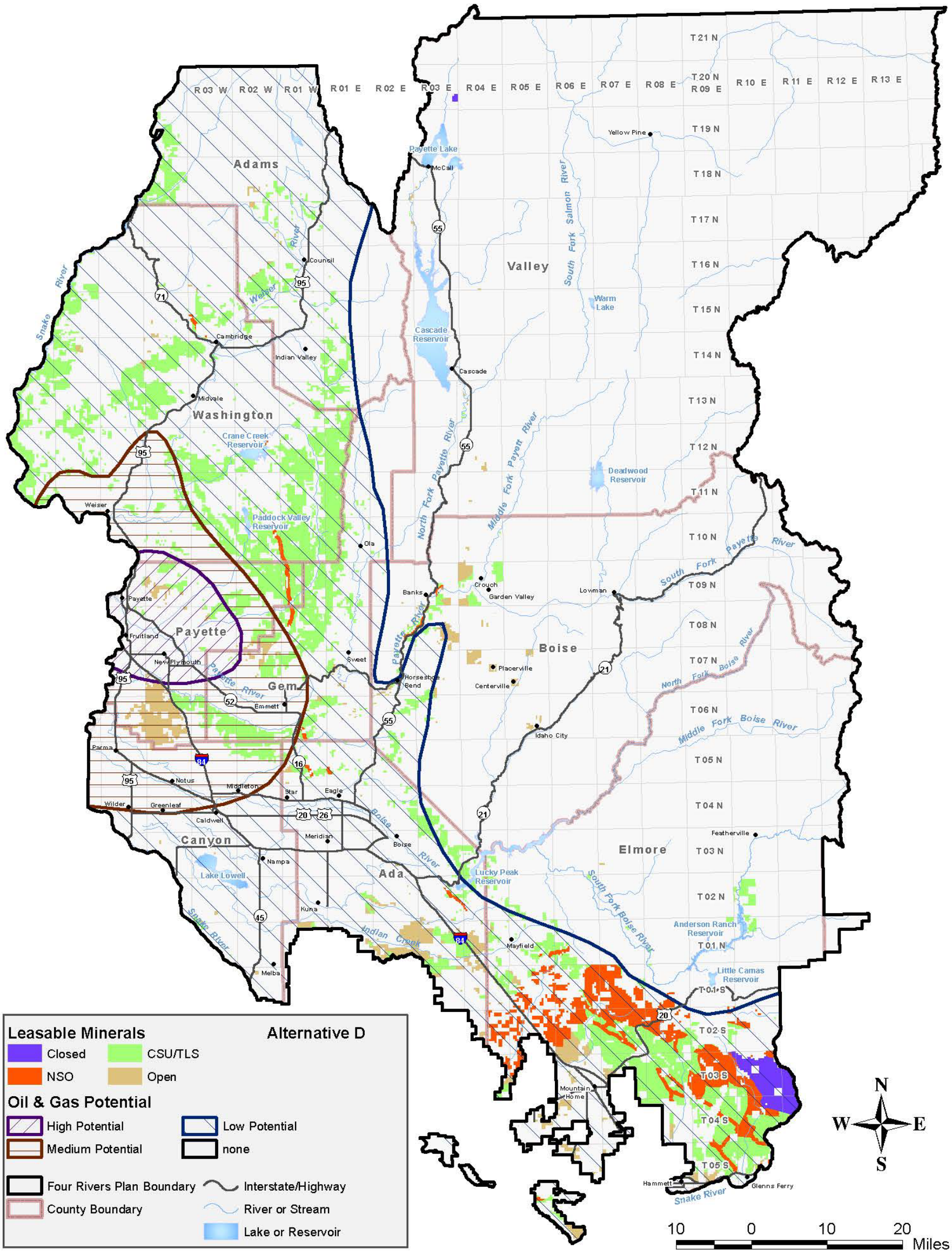


Figure 6. Alternative D Opportunities and Restrictions.

SECTION 2: EMISSIONS INVENTORY FOR A TYPICAL GAS WELL IN THE UPPER GREEN RIVER REGION

In conducting an evaluation of air quality impacts from twenty two (22) projected gas wells on separate well pads applicable for all four alternatives (BLM 2009), the BLM will follow the policy and procedures of the June 23, 2011 interagency NEPA Air Quality Memorandum of Understanding (MOU) for Federal Oil and Gas Decisions on Federal Lands (Air Quality MOU 2011). Different emission sources would result from two site-specific lease development phases: exploratory well drilling, and well field development and production.

Exploratory drilling and well field development result in emissions from earth-moving equipment required for site preparation and well pad construction, vehicle traffic, drilling, and completion activities. Criteria air pollutant gases such as oxides of nitrogen (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), and particulate matter (PM) would be emitted from vehicle tailpipes. PM is composed of particles with diameters less than or equal to 10 micrometers and 2.5 micrometers (PM_{10} and $PM_{2.5}$, respectively). Fugitive dust concentrations would increase with additional vehicle traffic on unpaved roads and from wind erosion in areas of soil disturbance. Drill rig engine operations would result mainly in NO_x and CO emissions, with lesser amounts of SO_2 and PM. These temporary emissions would be short-term during the drilling and completion times.

During well production there are continuous emissions from gas/fluid separators, condensate storage tanks, and daily tailpipe and fugitive dust emissions from operations traffic. During the operational phase of oil and gas production, NO_x, CO, volatile organic compounds (VOCs), and hazardous air pollutant (HAPs) emissions would result from the long-term operation of condensate storage tank vents, and well pad separators. Additionally, road dust consisting of PM_{10} and $PM_{2.5}$ would be produced by vehicles servicing the wells.

Project emissions of ozone precursors, whether generated by construction and drilling operations, or by production operations, would be dispersed and/or diluted to the extent that any local ozone impacts from the planning area would be indistinguishable from background or cumulative conditions. Small amounts of HAPs are emitted by construction equipment. These emissions are estimated to be less than 1 ton per year (tpy) per gas well. Based on the low amount of project-specific emissions, the development of gas wells is not likely to violate, or otherwise contribute to any violation of any applicable air quality standard, and may only contribute a small amount to any projected future potential exceedances of any applicable air quality standards.

The construction, drilling, completion, testing, and production of gas wells result in various emissions that affect air quality. Construction activities result in emissions of particulate matter (mainly PM_{10}). Well drilling activities result in engine exhaust emissions of NO_x CO, PM, and VOCs.

Completion and testing of the wells result in emissions of VOCs, NO_x, and CO. Ongoing production results in the emission of NO_x, CO, VOC, and PM_{10}.

An emissions inventory (EI) has been prepared for a “typical gas well”. This typical gas well is based upon a study prepared in 2013 and updated for the BLM in 2014 (Kleinfelder 2014) that calculated the emissions from a single representative well in five different oil and/or natural gas fields in the western U.S. The closest representative geographical region where gas well emissions were calculated is the Upper Green River in southwestern Wyoming. In this report, it is assumed that the gas well emissions data for a well drilled in the Upper Green River region are representative of the emissions for the gas wells presumed to be drilled on federal lands in southwest Idaho. Gas wells in the Upper Green River basin typically have the following characteristics: deep wells up to 15,000’), multiple devices (e.g. i.e. dehydrator, separator, line heaters, condensate tanks) per well, high condensate production, wet gas. While wells drilled in the Upper Green River are much deeper than wells that may be drilled in the Four

Rivers Planning Area, other characteristics are similar and for that reason, the Upper Green River well was selected as the most appropriate well for modelling the emissions that may be expected to occur from wells within the Four Rivers Planning Area.

This report is based on the following assumptions, some of which are from Reasonably Foreseeable Development Scenario (BLM 2016a):

- Post-construction particulate matter (dust) emissions are likely to occur on a short-term basis due to loss of vegetation within the construction and staging areas. Assuming appropriate interim reclamation, these emissions are likely to be low.
- Drilling operations would range in depth from 4,000 to 7,000 feet deep.
- It would take approximately 5 to 7 days to drill one well, and 3 to 5 days to complete the well.
- Drilling operations would occur 24 hours per day and seven days a week.
- A drill pad to accommodate the rig and equipment would be required at each well location. A drill pad is usually 2.5 acres in size, and would require approximately one to two weeks to build access roads and construct the well pad.
- Total surface disturbance associate with anticipated oil and gas-related activity in the planning area as a result of making the federal lands available for lease is 165 acres during the next 20 years. Of that total, 75 acres would be reclaimed once the well pad and access roads are no longer needed for drilling equipment.
- Off-road mobile exhaust emissions from drilling activities will be considered.
- Off-road mobile exhaust emissions from heavy equipment and on-road mobile emissions will not be considered as they are dispersed, sporadic, temporary, and not likely to cause or contribute to exceedances of the National Ambient Air Quality Standards (NAAQS).

The estimated EI for criteria air pollutants, toxic air pollutants (HAPs), organics (VOCs), and greenhouse gases (GHGs) for a "typical" gas well for the Upper Green River region are displayed in Table 1 (Kleinfelder, 2014). Air pollutants from a typical gas well include PM_{10}, $PM_{2.5}$, NO_x, CO, HAPs, VOCs, and GHGs. Emissions of SO_2 and lead (Pb) from oil and gas development activities are very low.

Emission factors for activities of the proposed action were based on information contained in the Environmental Protection Agency (EPA) Compilation of Air Pollutant Emission Factors, AP-42, Volume I, Fifth Edition (EPA, 2003). Table 1 provides a summary of emission estimates for a single gas well for the Upper Green River region.

Table 1. Summary of Air Emission Estimates for a Single Gas Well for the Upper Green River Region (tons/year).

Pollutant	Tons/Year (tpy)
NO_x (Oxides of Nitrogen)	14.6
CO (Carbon Monoxide)	3.9
SO_2 (Sulfur Dioxide)	0.0004
PM_{10} (Particulates with diameters ≤10 micrometers or ≤10 x 10^{-6} meters)	6.7
$PM_{2.5}$ (Particulates with diameters ≤ 2.5 micrometers or ≤2.5 x 10^{-6} meters)	0.8
VOCs (Volatile Organic Compounds)	5.2
HAPs (Hazardous Air Pollutants)	
Benzene	0.12
Toulene	0.22
Ethylbenezene	0.00003
Xylene	0.17
n-Hexane	0.20
Total HAPs	0.72
GHGs (Greenhouse Gases)	
CO_2 (Carbon Dioxide)	2882
CH_4 (Methane)	14.1
N_2O (Nitrous Oxide)	0.05
CO_2 eq (Global Warming Potential)*	3194

Source: Kleinfelder (2014)

*GWP (Global Warming Potential/Carbon Dioxide Equivalent [CO_2eq]) for CO_2 =1, CH_4 = 21, and N_2O = 310.

References – Section 2

Air Quality MOU, 2011. Memorandum of Understanding Among the U.S. Department of Agriculture, U.S. Department of the Interior, and U.S. Environmental Protection Agency, Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions through the National Environmental Policy Act Process, Washington, DC. June. 17 pp. (plus appendices).

Bureau of Land Management, 2009. Reasonably Foreseeable Development (RFD) Scenario for Oil and Gas Development in the Four Rivers Field Office, Idaho. Prepared by Karen Porter, October 16, 9 pages.

Environmental Protection Agency (EPA), 2003. Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. Research Triangle Park, NC. December. Available on-line at: http://www.epa.gov/tnn/chief/ap42/index.html

Kleinfelder, Inc., and Environ International Corporation, 2014. Air Emissions Inventory for a Representative Oil and Gas Well in the Western United States. Developed under contract with the Bureau of Land Management, Updated March 21, 2014; Littleton, CO. 58pp.

SECTION 3: EMISSIONS INVENTORY FOR THE BOISE DISTRICT OFFICE PLANNING AREA FOR NON-OIL WELL AND GAS WELL SOURCES

Air pollution emissions from fire management actions (prescribed fire and wildland fire), minerals management (sand and gravel operations), vegetation and forestry, trails and travel management (recreation), travel equipment usage, and livestock grazing were calculated using referenced emission factors developed applying the BLM Emission Inventory Toolkit (URS Corporation 2012). Emission factors were determined for the various management actions. Input data were obtained primarily from several resource specialists in the Boise District Office. The data were input to the emissions inventory toolkit and results presented in Tables 2 and 3. Annual emissions estimates are provided for criteria air pollutants, VOCs, and HAPs in Table 2 and GHGs in Table 3.

Other ongoing activities in the planning area that have the potential to substantially affect air quality include management of off-highway (OHV) use, temporary road construction, and heavy equipment use for sand and gravel, forestry, trails and travel management, and travel equipment-related activities. These activities could directly affect air quality in the short-term by generating fugitive dust. These activities would not likely result in long-term impacts on air quality because the BLM would implement additional management practices to reduce fugitive dust emissions.

Implementing dust suppression strategies, including best management practices (BMPs) to mitigate fugitive dust would reduce the impacts on air quality. Due to the widely varied specific conditions, timing, and scale of these activities, reliable quantitative estimates of particulate emissions from these activities have not been determined. Impacts on air quality in the various alternatives are discussed qualitatively.

Table 2. Comparison of Air Quality Indicators by Alternative for Criteria Air Pollutants, Volatile Organic Compounds (VOCs) and Hazardous Air Pollutants (HAPs)

Indicator (Tons/Year)	Alt A	Alt B	Alt C	Alt D	Average
PM_{10} from Fire[1]	8970	8970	8970	8970	8970
PM_{10} from Minerals Mining (Sand and Gravel)	1527	1527	1527	1527	1527
PM_{10} from Vegetation and Forestry	27	27	27	27	27
PM_{10} from Recreation	13	13	13	13	13
PM_{10} from Travel and Equipment Usage	6	6	6	6	6
PM_{10} Livestock Grazing	179	94	179	179	158
Total PM_{10}	**10,722**	**10,637**	**10,722**	**10,722**	**10,701**
$PM_{2.5}$ from Fire[1]	7510	7510	7510	7510	7510
$PM_{2.5}$ from Minerals Mining (Sand and Gravel)	152	152	152	152	152
$PM_{2.5}$ from Vegetation and Forestry	4	4	4	4	4
$PM_{2.5}$ from Recreation	1	1	1	1	1
$PM_{2.5}$ from Travel and Equipment Usage	1	1	1	1	1
$PM_{2.5}$ Livestock Grazing	274	80	274	274	225
Total $PM_{2.5}$	**7942**	**7748**	**7942**	**7942**	**7893**
NO_x from Fire[1]	2561	2561	2561	2561	2561
NO_x from Minerals Mining (Sand and Gravel)	542	542	542	542	542
NO_x from Vegetation and Forestry	14	13	14	14	14

Indicator (Tons/Year)	Alt A	Alt B	Alt C	Alt D	Average
NO_x from Recreation	1	1	1	1	1
NO_x from Travel and Equipment Usage	0	0	0	0	0
NO_x Livestock Grazing	3	2	3	3	3
Total NO_x	**3121**	**3119**	**3121**	**3121**	**3121**
SO_2 from Fire[1]	664	664	664	664	664
SO_2 from Minerals Mining (Sand and Gravel)	2	2	2	2	2
SO_2 from Vegetation and Forestry	0	0	0	0	0
SO_2 from Recreation	0	0	0	0	0
SO_2 from Travel and Equipment Usage	0	0	0	0	0
SO_2 Livestock Grazing	0	0	0	0	0
Total SO_2	**666**	**666**	**666**	**666**	**666**
CO from Fire[1]	86,805	86,805	86,805	86,805	86,805
CO from Minerals Mining (Sand and Gravel)	342	342	342	342	342
CO from Vegetation and Forestry	10	10	10	10	10
CO from Recreation	1	1	1	1	1
CO from Travel and Equipment Usage	2	2	2	2	2
CO Livestock Grazing	2	2	2	2	2
Total CO	**87,162**	**87,162**	**87,162**	**87,162**	**87,162**
VOCs from Fire[1]	4447	4447	4447	4447	4447
VOCs from Minerals Mining (Sand and Gravel)	90	90	90	90	90
VOCs from Vegetation and Forestry	2	2	2	2	2
VOCs from Recreation	0	0	0	0	0
VOCs from Travel and Equipment Usage	2	2	2	2	2
VOCs Livestock Grazing	1	1	1	1	1
Total VOCs	**4542**	**4542**	**4542**	**4542**	**4542**
HAPs from Fire[1]	445	445	445	445	445
HAPs from Minerals Mining (Sand and Gravel)	9	9	9	9	9
HAPs from Vegetation and Forestry	0	0	0	0	0
HAPs from Recreation	0	0	0	0	0
HAPs from Travel and Equipment Usage	0	0	0	0	0
HAPs Livestock Grazing	0	0	0	0	0
Total HAPs	**454**	**454**	**454**	**454**	**454**

Table 3. Comparison of Air Quality Indicators by Alternative for Greenhouse Gases (GHGs) Expressed in Carbon Dioxide Equivalents ($CO_{2\ eq}$)

Indicator (Tons/Year)	Alt. A	Alt. B	Alt. C	Alt. D	Average
CO_2 from Fire[1]	1,493,749	1,493,749	1,493,749	1,493,749	1,493,749
CO_2 from Minerals Mining (Sand and Gravel)	60,691	60,691	60,691	60,691	60,691
CO_2 from Vegetation and Forestry	1730	1730	1730	1730	1730
CO_2 from Recreation	141	144	141	144	143
CO_2 from Travel and Equipment Usage	54	54	54	54	54
CO_2 from Livestock Grazing	287,910	75,016	287,910	287,910	234,686
Total CO_2	**1,844,275**	**1,631,384**	**1,844,275**	**1,844,275**	**1,791,053**
CH_4 from Fire[1]	99,876	99,876	99,876	99,876	99,876
CH_4 from Minerals Mining (Sand and Gravel)	21	21	21	21	21
CH_4 from Vegetation and Forestry	0	0	0	0	0
CH_4 from Recreation	0	0	0	0	0
CH_4 from Travel and Equipment Usage	0	0	0	0	0
CH_4 from Livestock Grazing	18,354	12,810	18,354	18,354	16,968
Total CH_4	**118,251**	**112,707**	**118,251**	**118,251**	**116,865**
N_2O from Fire[1]	206,213	206,213	206,213	206,213	206,213
N_2O from Minerals Mining (Sand and Gravel)	155	155	155	155	155
N_2O from Vegetation and Forestry	0	0	0	0	0
N_2O from Recreation	0	0	0	0	0
N_2O from Travel and Equipment Usage	0	0	0	0	0
N_2O from Livestock Grazing	714	181	714	714	580
Total N_2O	**207,282**	**206,549**	**207,282**	**207,282**	**206,948**
CO_2 eq from Fire[1]	1,799,838	1,799,838	1,799,838	1,799,838	1,799,838
CO_2 eq from Minerals Mining (Sand and Gravel)	60,867	60,867	60,867	60,867	60,867
CO_2 eq from Vegetation and Forestry	1730	1730	1730	1730	1730
CO_2 eq from Recreation	141	144	141	144	143
CO_2 eq from Travel and Equipment Usage	54	54	54	54	54
CO_2 eq from Livestock Grazing	306,978	88,007	306,978	306,978	252,235
Total CO_2 eq	**2,169,608**	**1,950,640**	**2,169,608**	**2,169,608**	**2,114,867**

[1] Emissions from fire include prescribed burning and wildland fires.

PM_{10} = Particles with diameters $\leq$ 10 micrometers
$PM_{2.5}$ = Particles with diameters $\leq$ 2.5 micrometers
NO_x = Oxides of Nitrogen
SO_2 = Sulfur Dioxide
CO = Carbon Monoxide
VOCs = Volatile Organic Compounds
HAPs = Hazardous Air Pollutants
CO_2 = Carbon Dioxide
CH_4 = Methane
N_2O = Nitrous Oxide
$CO_{2\ eq}$ = Carbon Dioxide Equivalent

Methodology and Assumptions

These methods of analysis are based on the following assumptions:

1. An Emissions Inventory Toolkit was developed for the BLM by a contractor (URS 2012) to estimate air emissions from specific resources such as prescribed and wildland fire, sand and gravel operations (minerals management), vegetation and forestry, recreation, travel equipment usage, and livestock grazing. The advantage of utilizing this particular toolkit over others in estimating air emissions from various resource management activities is that GHG emissions can be calculated along with criteria air pollutants, HAPs, and VOCs. Emission factors have been developed for each activity.
2. Emissions estimates cannot be compared to air quality standards. Only concentrations can be compared with air quality standards.
3. Emissions estimates were based upon resource management activities. Input for each resource was provided by subject matter experts from the Boise District Office.
4. Emissions were not quantified for some minor sources of air pollution since it was determined that either air emissions would be negligible for a particular resource or information was not available.
5. Input data were incorporated into an emissions inventory toolkit for each of the above resources. The results of the toolkit runs are contained in Table 2 for criteria air pollutants, HAPs, and VOCs and Table 3 for GHGs. Comparison of air quality indicators by alternative for criteria pollutants, HAPs, and VOCs are provided in Table 2 and for GHGs in Table 3.
6. Emission factors utilized in the emissions inventory toolkit calculations are documented in output tables for each resource. The emission factors originate from sources such as the Environmental Protection Agency (EPA) AP-42 Emissions Factor document (EPA 2003) and American Petroleum Institute (API 2009).
7. Emissions estimates per air pollutant are useful for distinguishing between alternatives. Emissions may be quantified, but impacts based upon those emissions cannot be quantified. Emissions are a cause of impacts, but are not an indicator.
8. Short-term impacts occur only during or immediately after implementation of an action and lasts for a relatively short duration of time. The effect could last from seconds to days.
9. Long-term impacts could occur over an extended period after implementation of an alternative. The effect could last several months to years.
10. Global Warming Potential (GWP) is the value used to compare the abilities of different greenhouse gases to trap heat in the atmosphere. GWPs are based on the heat-absorbing ability of each gas relative to that of CO_2. For example, CO_2 has a GWP of 1, methane has a GWP of 21, and nitrous oxide has a GWP of 310 over a 100-year time horizon (IPCC 1996).

Table 4 compares gas well emissions with fire management emissions for criteria air pollutants, VOCs, HAPs, and GHGs. Because emissions from fires dominate emissions from within the Planning Area, it is useful to scale emissions from the oil and gas well operations to them. This scaling provides a perspective as to the relative importance of the oil and gas emissions. Results indicate that emissions from twenty two (22) oil and gas wells are projected to be under 5% of the fire management emissions for all pollutants except NO_x (12.5%) and CH_4 (6.5%) for gas wells.

Table 4. Comparison of Total Fire Emissions *vs.* Gas Well Emissions for the Four Rivers Draft Resource Management Plan (RMP)/Environmental Impact Statement (EIS).

Pollutant	22 Gas Wells Total Emissions [1] (tons/year)	Total Fire Emissions [2] (tons/year)	Percentage of Fire Emissions for 22 Gas Wells (%) [3]
PM_{10}	147.4	8,970	1.64
$PM_{2.5}$	17.6	7,510	0.23
NO_x	321.2	2,561	12.5
SO_2	0.0088	664	<0.01
CO	85.8	86,805	0.001
VOCs	114.4	4,447	2.6
HAPs	15.8	454	3.5
CO_2	63,404	1,493,749	4.2
CH_4	6512	99,876	6.5
N_2O	341	206,213	0.17
$CO_{2\ (eq)}$	70,268	1,950,640	3.6

References – Section 3

American Petroleum Institute (API). 2009. Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Gas Industry. Washington, DC. 807 pages. Available on-line at: www.api.org/ens/climate/new/upload/2009_GHG_COMPENDIUM.pdf

EPA. 2003. Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. Research Triangle Park, NC. December. Available on-line at: http://www.epa.gov/tnn/chief/ap42/index.html

IPCC. 1996. Climate Change 1995: The Science of Climate Change, Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change, Houghton, J.T., Meira Filho, L.G., Callander, B.A., Harris, N., Kattenberg, A., and K. Maskell (eds.), Cambridge University Press, Cambridge, UK and New York, NY, USA.

URS. 2012. Emissions Inventory Toolkit for Estimating Air Emissions, Developed under contract with the Bureau of Land Management, National Operations Center (NOC), Denver, CO. URS Corporation.

[1] Assumes that all 22 wells are drilled in the same year, and are operating simultaneously and at full production, i.e. worst-case scenario.

[2] Emissions from prescribed burns (*vs.* wildfires) dominate the total fire emissions.

[3] Because emissions from fires dominate emissions from within the Planning Area, it is useful to scale emissions from the oil and gas well operations to them. This scaling provides a perspective as to the relative importance of the oil and gas emissions.

SECTION 4: AIR EMISSIONS ESTIMATES FOR NON-OIL AND GAS SOURCES FOR CRITERIA AIR POLLUTANTS, AIR TOXICS, ORGANICS, AND GREENHOUSE GASES

A summary of air emission estimates of criteria air pollutants, hazardous air pollutants (HAPs or air toxics), volatile organic compounds (VOCs or organics), and GHGs from prescribed and wildland fire management, sand and gravel operations, vegetation and forestry activities, trails and travel management (recreation), travel equipment usage (e.g., generators and vehicles), and livestock grazing for each alternative are presented in Tables 5 and 6 (BLM, 2014). **These tables apply only to air emissions estimates and thus cannot be compared to air quality standards.**

Table 5. Estimated Air Emissions for Criteria Pollutants, Toxics, and Organics by Alternative (tons/year).

Alterna-tive	Criteria Pollutants					Toxics & Organics	
	Carbon Monoxide (CO)	Oxides of Nitrogen (NO_X)	Particulates		Sulfur Dioxide (SO_2)	Hazardous Air Pollutants (HAPs)	Volatile Organic Compounds (VOCs)
			(PM_{10})	($PM_{2.5}$)			
A	87,162	3121	10,722	7942	666	454	4542
B	87,162	3119	10,637	7748	666	454	4542
C	87,162	3122	10,722	7942	666	454	4542
D	87,162	3122	10,722	7942	666	454	4542

Criteria air pollutants are CO, NO_x, PM_{10}, $PM_{2.5}$, and SO_2.
Toxic air pollutants consist of HAPs.
Organic pollutants consist of VOCs.

Table 6. Estimated Greenhouse Gas Emissions by Alternative (tons/year).

Alternative	Carbon Dioxide (CO_2)	Methane (CH_4) as $CO_{2\,eq}$	Nitrous Oxide (N_2O) as $CO_{2\,eq}$	Carbon Dioxide equivalent ($CO_{2\,eq}$)
A	1,844,275	118,251	207,082	2,169,608
B	1,631,384	112,707	206,549	1,950,640
C	1,844,275	118,251	207,082	2,169,608
D	1,844,275	118,251	207,082	2,169,608

$CO_{2\,eq}$ is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount of CO_2 that would have the same global warming potential (GWP), when measured over a specified timescale (generally 100 years). CO_2 has a GWP of 1, CH_4 a GWP of 21, and N_2O a GWP of 310 over a 100-year time horizon (IPCC 1996).

As demonstrated in Tables 5 and 6, emissions per specific air pollutant are **nearly the same across all alternatives.** The differences are mainly attributed to livestock grazing activities which varies in Alternative B. For criteria pollutants, all alternatives have the same carbon monoxide (CO) and sulfur dioxide (SO_2) emissions. Alternative B has the lowest emissions for oxides of nitrogen (NO_X), PM_{10}, and $PM_{2.5}$ (Table 5). Alternative B would contribute the least to air quality impacts associated with criteria pollutants, although only incrementally more than the other alternatives. All alternatives contribute equally to HAPs and VOCs impacts.

For GHG emissions, Alternatives A, C and D have the same emissions for carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and carbon dioxide equivalent ($CO_{2\ eq}$). These emissions are about 11% higher than Alternative B, due primarily to livestock grazing emissions. Alternative B had the lowest emissions for all GHGs as this alternative had the lowest amount of livestock grazing emissions (29% of the amount compared to other Alternatives). Table 6 shows that Alternatives A and C would contribute the most and Alternative B the least to GHG impacts.

References – Section 4

BLM. 2014. Draft Air Resources Section for Chapter 4, Environmental Consequences, Four Rivers, ID Resource Management Plan (RMP)/Environmental Impact Statement (EIS). Bureau of Land Management.

IPCC. 1996. Climate Change 1995: The Science of Climate Change, Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change, Houghton, J.T., Meira Filho, L.G., Callander, B.A., Harris, N., Kattenberg, A., and K. Maskell (eds.), Cambridge University Press, Cambridge, UK and New York, NY, USA.

SECTION 5: CURRENT AIR QUALITY CONDITIONS

Criteria air pollutants are those for which national health-based concentration standards have been established. Measured pollutant concentrations greater than these standards represent a risk to human health or welfare. Criteria air pollutant concentrations are compared to National Ambient Air Quality Standards (NAAQS, EPA 2014) which are the same as the Idaho Ambient Air Quality Standards (ID-AAQS; IDEQ 2014a).

Emissions Sources

The most significant emissions sources from BLM-related activities throughout the Four Rivers Planning Area (PA) are expected from wildland fires (wildfires) and prescribed fires. Other emissions sources include sand and gravel mining, vegetation and forestry activities, recreation, travel equipment usage (e.g., generators and vehicles), and livestock grazing.

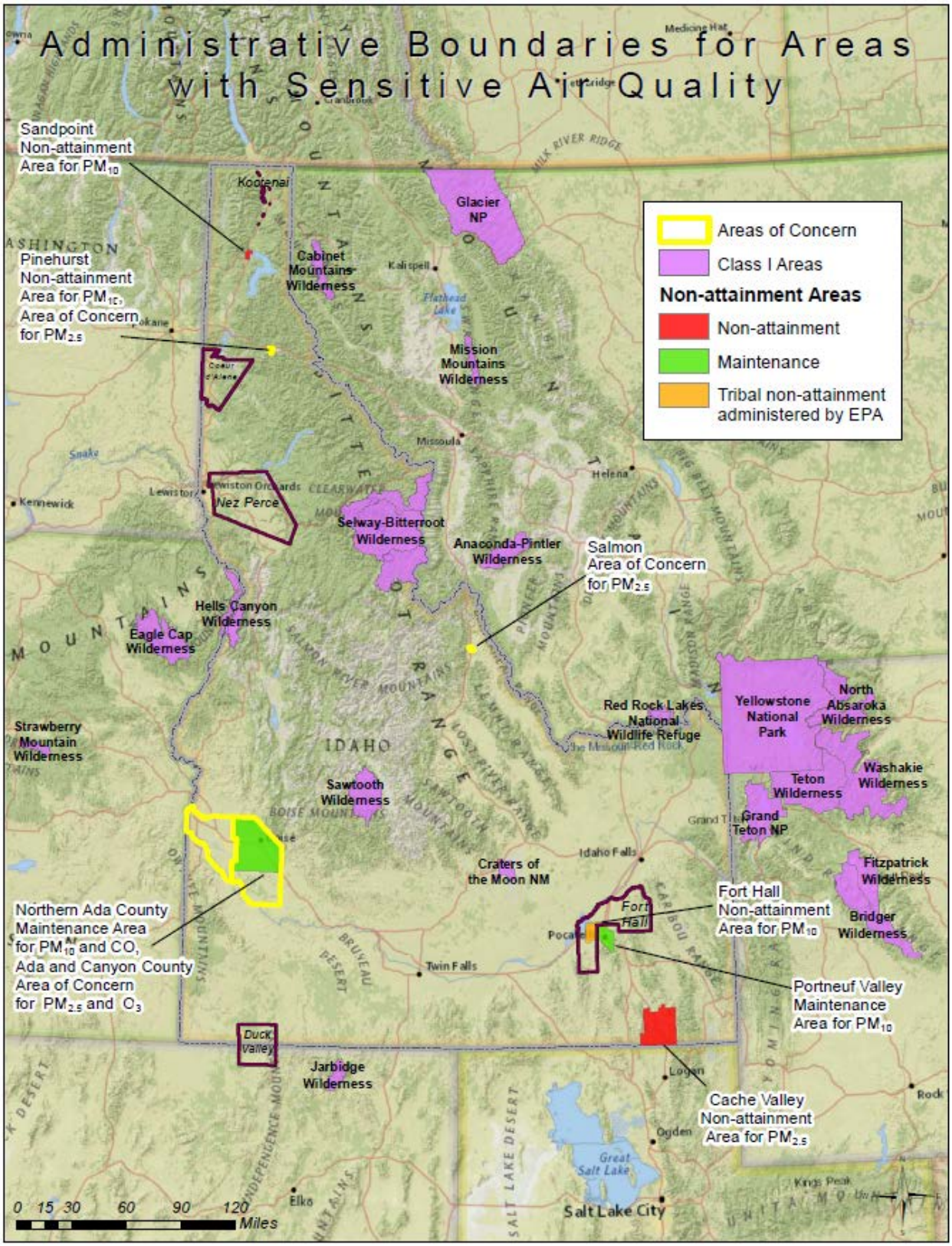
Attainment/Non-Attainment/Maintenance Areas

All areas in the United States are designated to reflect compliance with the NAAQS. Attainment areas are areas for which compliance with the NAAQS has been demonstrated; non-attainment areas are areas which persistently exceed the NAAQS and have been designated by the State or EPA; maintenance areas are former non-attainment areas that now comply with the NAAQS; unclassifiable areas are areas for which data are not available to determine attainment status.

Figure 7 displays the State of Idaho and the nearby sensitive air quality areas, areas of concern, and Prevention of Significant Deterioration (PSD) Class I areas which are described below (IDEQ, 2014b). At present, the northern portion of Ada County is Idaho's only designated CO Maintenance Area. Mobile and area source emissions are the two primary sources of CO. The chief sources of PM_{10} are fugitive dust and agriculture.

There are no non-attainment areas within or in the vicinity of the Four Rivers planning area. PM_{10} and $PM_{2.5}$ are currently the most common pollutants identified in the PA. Common sources of PM_{10} and $PM_{2.5}$ include windblown dust, re-entrained road dust, smoke (residential, agricultural, and prescribed and wildland fires), industrial emissions, and motor vehicle emissions.

Figure 7. State of Idaho and Vicinity Sensitive Air Quality Areas (Source: IDEQ 2012b).



Clean Air Act

The Clean Air Act of 1970 (CAA, 42 U.S.C. 85 §§ 7401 *et seq.*), as amended, is the comprehensive Federal law that regulates air emissions from point (stationary), area, and mobile sources. It was passed by Congress to protect human health and the environment as well as visibility in sensitive areas. The Idaho Department of Environmental Quality (IDEQ) has the primary responsibility to carry out the requirements of the CAA in Idaho. The 1977 amendments to the Clean Air Act (CAAA, 1977) clarified that the Federal government is subject to CAA requirements.

Air Quality Related Values (AQRVs)

AQRVs include visibility and atmospheric deposition. Visibility can be defined as the ability to see color, texture, and contrast at a distance and can be reported as visual range, in units of distance such as miles. Visibility can be expressed in terms of deciview (dv), a measure for describing perceived changes in visibility. One dv is defined as a change in visibility that is just perceptible to an average person.

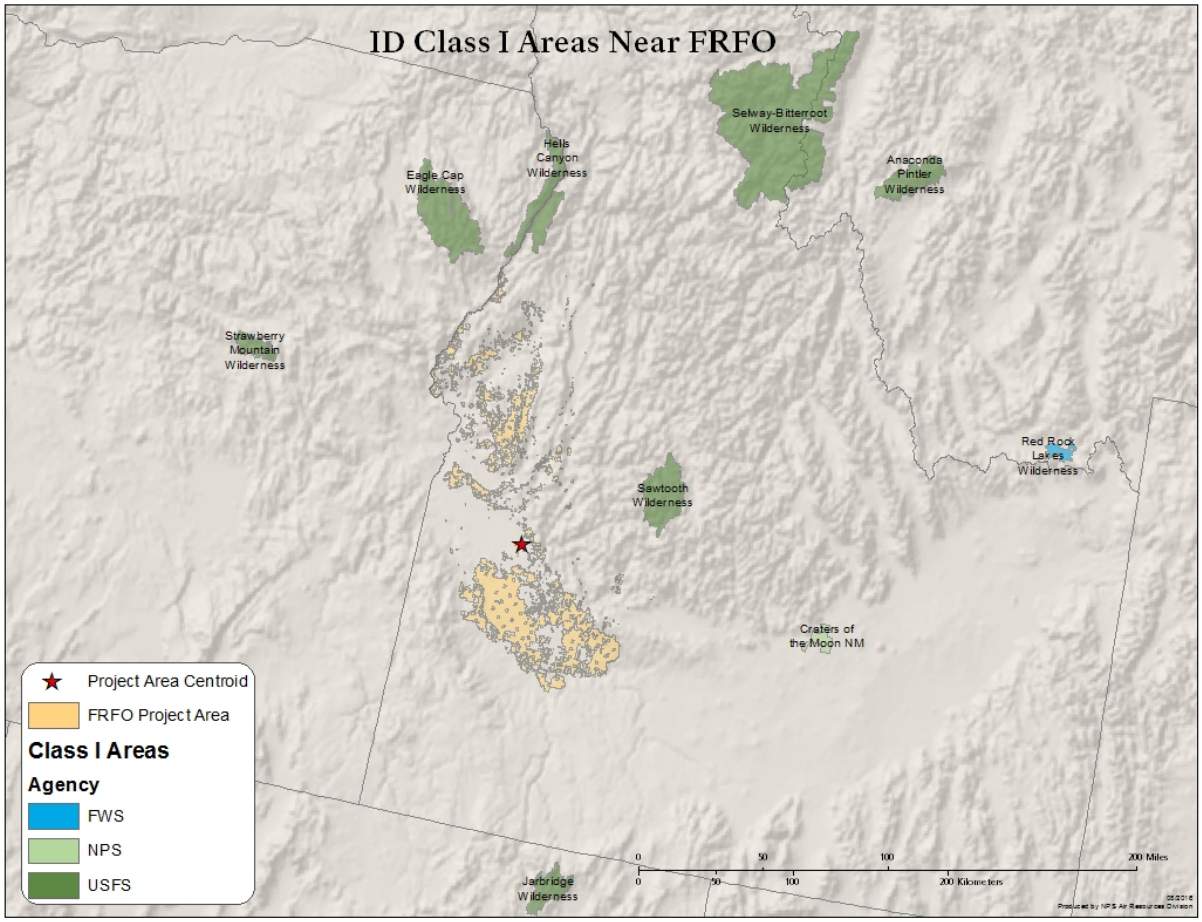
Visibility impairment is one of the most obvious indicators of poor air quality. Air pollution can cause light to be absorbed or scattered, thereby affecting the image. The pollution and resulting changes in light are referred to as "haze." In general, haze in Idaho is the result of smoke from fires and dust. Depending on the source(s) of the haze, it may be localized or transported into the area by wind.

There are seven (7) Class I areas with visibility monitoring stations in the vicinity of the Four Rivers planning area encompassing the four major directions: Sawtooth National Recreation Area – Forest Service (Idaho), Eagle Cap Wilderness - Forest Service (Oregon), Hells Canyon National Recreation Area – Forest Service (Oregon/Idaho), Strawberry Mountain Wilderness - Forest Service (Oregon), Selway-Bitterroot Wilderness Area – Forest Service (Idaho/Montana), Craters of the Moon National Monument and Preserve - National Park Service and Bureau of Land Management (Idaho), and Jarbidge Wilderness Area - Forest Service (Nevada).

For Class I areas located within the *nearfield* of a source (typically ≤50km), the updated EPA VISCREEN (v.13190) screening model (EPA, 2013) may be run to assess visibility impacts associated with the oil & gas wells in an idealized modeling scenario. VISCREEN determines whether screening criteria for sky and terrain background from plumes originating from the source would be exceeded or not exceeded within the boundary of the respective Class I areas. Figure 8 shows the approximate location of the centroid of the 22-well cluster (oriented over New Plymouth, ID) and its relation to the surrounding 7 Class I areas in the region. Since the closest Class I area (Sawtooth Wilderness) is 118km from this centroid, VISCREEN is an inappropriate screening model to use for assessing visibility impacts.

When VISCREEN was run in its ultra-conservative mode for all 7 areas, there were no exceedances of the screening criterion for either sky or terrain background from the oil and gas well emissions, either inside or outside of the Class I areas. A hypothetical Class I area was modeled whose closest and farthest boundaries were 40km and 60km, respectively, from the well cluster. Using an average background visual range of 200km, and running VISCREEN in its (less conservative) Level 2 mode (e.g., 2m/s winds and neutral atmospheric stability), there were no exceedances of the screening criterion for either sky or terrain background from the well emissions *inside* the Class I area. Exceedances were flagged *outside* the Class I area, though the exact location of these exceedances is not clear. It was decided not to perform refined regional-scale dispersion modeling because such an exercise would be rigorous, and actual operating parameters (hence emissions) are unknown. It is BLM's considered judgment that the well cluster will not adversely impact AQRVs within the planning area.

Figure 8. Idaho Class I Areas Near Four Rivers Planning Area. Centroid is oriented to New Plymouth, ID, where most of the foreseeable oil & gas wells are expected.



Wildland and Prescribed Fire Smoke Management
Smoke management indicators include concentrations of carbon monoxide and particulate matter. Wildland fires and prescribed burning produce ozone (O_3), CO, and PM from burning vegetation. These emissions under certain meteorological conditions may affect large areas for extended periods of time; however, impacts are generally short-term, localized, and seasonal. Prescribed burns and controlled wildfires may be instrumental in minimizing, or limiting, overall hazardous particulate matter concentrations as they reduce fuel load accumulation that can subsequently result in intense, long-duration, uncontrolled wildland fires.

EPA, in cooperation with Federal land managers, states and tribes, issued the Interim Air Quality Policy on Wildland and Prescribed Fires (EPA 1998). One of the goals of the policy is to allow fire to function as a disturbance process on federally managed wildlands, while protecting public health and welfare.

Trends

Air Pollutant Concentration Monitoring
Concentrations of criteria pollutants within the planning area may remain about the same or increase, depending upon alternatives. Exceedances of the NAAQS for carbon monoxide, nitrogen dioxide, lead, and sulfur dioxide are unlikely, due to the existing low concentrations and relatively low local emissions.

Air Quality and Air Quality Related Values
The trend for each of the seven sites over the past 13 years is showing an improvement in visibility. Overall, the average visibility (standard visual range) is fairly close for all sites with the Selway-Bitterroot Wilderness Area showing the highest value at 218 km (135 miles) followed closely by Sawtooth National Recreation Area and Jarbidge Wilderness Area at 210 km (130 miles) each.

The National Atmospheric Deposition Program (NADP), initiated in 1978, provides long-term records of precipitation chemistry across the United States. Samples are collected on a weekly basis nationwide. The NADP station nearest to the PA is located at Reynolds Creek, ID. The automated collector ensures the sample is exposed only during precipitation (wet-sampling only). Craters of the Moon National Monument and Preserve also samples for wet deposition. Average precipitation pH is about 5.6 at Reynolds Creek and 5.5 at Craters of the Moon National Monument and Preserve (NADP 2012).

The trend has been for increasing precipitation pH (less-acidic precipitation). While pure water has a pH of 7.0, natural rainwater has a pH of around 5.6 due to the natural presence of CO_2, NO_2, and SO_2 in the atmosphere (Brown et al. 2011). The closest Mercury Deposition Network (MDN) to the PA is at Yellowstone National Park, WY on the east side of the Grand Teton Mountains and Continental Divide. As a result, data from this site would not likely be representative of deposition in the Four Rivers PA.

The Clean Air Status and Trends Network (CASTNet) is a national air quality monitoring program designed to provide data to assess trends in air quality, atmospheric dry deposition, and ecological effects due to changes in air pollutant emissions. The CASTNet program has measured concentrations of nitric acid, nitrate, and ammonium, as well as ozone, sulfur dioxide, and sulfate, since 1991.

The CASTNet stations nearest the PA are at Yellowstone National Park, WY and Pinedale, WY, where concentrations are typical for remote areas. The trends at both stations for sulfur dioxide and sulfates have generally decreased from 2001 to 2012. The trends for nitrates and nitrogen compounds (including ammonium) have also generally decreased in mean annual concentrations from 2007 to 2012 (CASTNet 2014).

References –Section 5

Brown, T.E., LeMay, H.E., Bursten, B.E., Murphy C. and P. Woodward, 2011. Chemistry: The Central Science, 12th Ed., Prentice Hall, New Jersey.

Clean Air Act Amendments (CAAA), 1977. Clean Air Act Amendments of 1977 (91 Stat. 685, Public Law 95-95), August 7.

Clean Air Act Extension, 1970. Clean Air Act of 1970 (Public Law 91-604), Air Pollution Prevention and Control Act. United States Code (42 U.S.C. 85, 7401 et. seq.). Available on-line at: www.gpoaccess.gov/uscode/browse.html

Clean Air Status and Trends Network (CASTNet), 2014. Mean Annual Concentrations of Nitrogen Compounds and Sulfur Compounds and Yellowstone National Park, Wyoming. Available on-line at: http://epa.gov/castnet/javaweb/index.html

Environmental Protection Agency (EPA), 2014. National Ambient Air Quality Standards (NAAQS). Available on-line at: http://epa.gov/castnet/javaweb/index.html

____, 2013. Workbook for Plume Visual Impact Screening and Analysis (VISCREEN), EPA-40/4-88-015, Office of Air Quality Planning and Standards (OAQPS), Research Triangle Park, North Carolina. Available on-line at: http://www.epa.gov/ttn/scram/dispersion_screening.htm#viscreen

____, 1998. Interim Air Quality Policy on Wildland and Prescribed Fires. U.S. Environmental Protection Agency, April 23, 43 pages.

Idaho Department of Environmental Quality (IDEQ), 2014a. State of Idaho Ambient Air Quality Standards. Idaho Air Quality Division, Boise, Idaho.

____, 2014b. Idaho Air Quality Division, Boise, Idaho. Map of State of Idaho and Vicinity Sensitive Air Quality Areas. 1 page. Available on-line at: http://www.deq.idaho.gov/media/662796-nonattainment_map.pdf

Interagency Monitoring of Protected Visual Environments (IMPROVE), 2012. Available on-line at: http://vista.cira.colosate.edu/views/web

National Atmospheric Deposition Program (NADP), 2012. Mean Annual Precipitation pH at Craters of the Moon National Monument and Preserve, Idaho (from 1980 to 2010). Available on-line at: http://nadp.sws.uiuc.edu/

U.S. Forest Service, 2014. Visibility Data Summary for Hells Canyon National Recreation Area, Oregon/Idaho and Selway – Bitterroot Wilderness Area, Idaho/Montana. Thomas Dzomba (U.S. Forest Service, Missoula, MT) and Rick Graw (U.S. Forest Service, Portland, OR). Personal conversations with David Maxwell, BLM, National Operations Center; Denver, CO. February 21 and 24, respectively. Available on-line at: http://vista.cira.colostate.edu/views/web

SECTION 6: RECOMMENDATION

Section V.E.4 of the Federal Air Quality Memorandum of Understanding (Air Quality MOU 2011) Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions through the NEPA Process, signed June 23, 2011, states that if the lead agency can show that impacts from projected oil and gas wells would not cause a substantial increase in emissions and the agencies whose lands are affected concur (in writing or by electronic transmissions), refined air quality modeling (e.g., AERMOD, CALPUFF, or photochemical models) would not be required.

Based upon the information provided in the previous sections, the BLM, as the lead NEPA Federal agency, recommends that air quality modeling need not be performed for determining air quality impacts from twenty two (22) oil and gas wells located on separate well pads in a medium development zone within the planning area since the projected development would not likely cause a substantial increase in air quality emissions. The reasons for not performing an air quality modeling analysis follow.

1. The planning area is not located near an air quality non-attainment area. Applying EPA's VISCREEN screening model for determining potential visibility impacts to the seven (7) closest Class I air quality areas (EPA 2013), using very conservative assumptions, no exceedances were indicated either within the Class I areas or outside the Class I areas. The closest Class I area to the moderate potential development area is Hells Canyon to the northwest. The distance from the projected gas wells to the closest boundary of Sawtoth Wilderness is 118 km (73 miles).
2. Table 6 shows that projected emissions from 22 gas wells are 5% of the projected fire management emissions (the maximum emissions expected from any air quality soucrce) for all pollutants except for NO_x (12.5%) and CH_4 (6.5%).
3. The location of the gas wells would likely be in areas that would meet both Federal and state ambient air quality standards.
4. The projected development of a total of 22 gas wells will not materially contribute to potential adverse cumulative air quality impacts as determined under NEPA.
5. Mitigation measures (best management practices) will be employed to reduce the amount of air pollutants at oil and gas well facilities. Suggested minimum air pollution controls for gas well operations include:
    A. Tier II or better drilling rig engines.
    B. Stationary internal combustion engine standard of 2 grams NO_x/breakhorse power per hour (bhp-hr) for engines under 300 horsepower (HP) and 1 gram NO_x/bhp-hr for engines above 300 HP.
    C. Low bleed or no bleed pneumatic pump valves.
    D. Dehydrator VOC emission controls to +95% efficiency.
    E. Tank VOC emission controls to +95% efficiency.

References – Section 6

Air Quality MOU, 2011. Air Quality Memorandum of Understanding (MOU) Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions through the National Environmental Policy Act (NEPA) Process, signed June 23, 2011, Washington, DC. 17 pp. plus appendices. Avialable on-line at:

http://www.epa.gov/compliance/resources/policies/nepa/air-quality-analysis-mou-2011.pdf

Environmental Protection Agency (EPA), 2013. Workbook for Plume Visual Impact Screening and Analysis (VISCREEN), EPA-40/4-88-015, Office of Air Quality Planning and Standards (OAQPS), Research Triangle Park, North Carolina. Available on-line at:

http://www.epa.gov/ttn/scram/dispersion_screening.htm#viscreen

Appendix Q- Climate and Meteorology

Climate and Greenhouse Gases

Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a long series of years. Climate indicators include temperature, precipitation, wind, barometric pressure, humidity, sunshine, and cloudiness.

Climate change is a statistically-significant and long-term change in climate patterns. The terms climate change and "global warming" are often used interchangeably, although they are not the same thing. Climate change is any deviation from the average climate, whether warming or cooling, and can result from both natural and human (anthropogenic) causes. Natural contributors to climate change include fluctuations in solar radiation, volcanic eruptions, and plate tectonics. *Global warming* refers to the apparent warming of climate observed since the early-twentieth century and is primarily attributed to human activities such as fossil fuel combustion, industrial processes, and land use changes.

Climate change indicators focus more on temperature and precipitation. Issues of concern with respect to climate change include climate variability (how climate change may affect resources), trends, and trend rates (how human activities and other factors may affect climate). Several factors contribute to climate change, including emissions of greenhouse gases (GHGs), especially carbon dioxide (CO_2) and methane (CH_4) from fossil fuel development, large wildland fires, and activities using combustion engines; changes to radiative forces and reflectivity (albedo). It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of CO_2 could influence climate for decades.

The Greenhouse Effect and Climate Change

The natural greenhouse effect is critical to the discussion of climate change. The *greenhouse effect* refers to the process by which greenhouse gases (GHGs) in the atmosphere absorb heat energy radiated by earth's surface. Water vapor is the most abundant GHG, followed by CO_2, CH_4, nitrous oxide (N_2O), and several trace gases. These GHGs trap heat that would otherwise be radiated into space, causing earth's atmosphere to warm and making temperatures ideal for life on earth. Without the natural greenhouse effect, the average surface temperature of the earth would be about zero degrees Fahrenheit. Water vapor is often excluded from the discussion of GHGs and climate change since its atmospheric concentration is largely dependent upon temperature rather than being emitted by specific sources.

Atmospheric concentrations of naturally-emitted GHGs have varied for millennia and earth's climate fluctuated accordingly. However, since the beginning of the industrial revolution around 1750, human activities have significantly increased GHG concentrations and introduced man-made compounds that act as GHGs in the atmosphere. The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years (IPCC 2013). From pre-industrial times until today, the global average concentrations of CO_2, CH_4, and N_2O in the atmosphere have increased by around 40%, 150%, and 20%, respectively (IPCC 2013). Table Q-1 below shows the average global concentrations of CO_2, CH_4, and N_2O in 1750 and in 2011. Atmospheric concentrations of GHGs are reported in parts per million (ppm) and parts per billion (ppb).

Table Q-1 Average global concentrations of greenhouse gases in 1750 and 2011.

Greenhouse Gas	In 1750[1]	In 2011[1]	Change: 1750 – 2011
Carbon dioxide, CO_2	278 ppm	390.5 ppm	40%
Methane, CH_4	720 ppb	1803 ppb	150%
Nitrous oxide, N_2O	270 ppb	324 ppb	20%

[1] Source: IPCC (2013)

Human activities worldwide emit billions of tons of carbon dioxide every year. Carbon dioxide is primarily emitted from fossil fuel combustion, but has a variety of other industrial sources. Methane is emitted from oil and natural gas systems, landfills, mining, agricultural activities, and waste and other industrial processes. Nitrous oxide is emitted from anthropogenic activities in the agricultural, energy-related, waste and industrial sectors. The manufacture of refrigerants and semiconductors, electrical transmission, and metal production emit a variety of trace GHGs (including hydrofluorocarbons [HFCs], perfluorocarbons [PFCs], and sulfur hexafluoride [SF_6]). These trace gases have no natural sources and come entirely from human activities. Carbon dioxide, methane, nitrous oxide, and the trace gases are considered well-mixed and long-lived GHGs.

Several gases do not have a direct effect on global warming, but indirectly affect the absorption of radiation by impacting the formation or destruction of GHGs. These gases include carbon monoxide (CO), oxides of nitrogen (NO_x), and non-methane volatile organic compounds (NMVOCs). Fuel combustion and industrial processes account for the majority of emissions of these indirect GHGs. Unlike other GHGs, these gases are short-lived in the atmosphere.

Atmospheric aerosols, or particulate matter (PM), also contribute to climate change. Aerosols directly affect climate by scattering and absorbing radiation (aerosol-radiation interactions) and indirectly affect climate by altering cloud properties (aerosol-cloud interactions). Particles less than 10 micrometers in diameter (PM_{10}) typically originate from natural sources and settle out of the atmosphere in hours or days. Particles smaller than 2.5 micrometers in diameter ($PM_{2.5}$) often originate from human activities such as fossil fuel combustion. There are also natural sources of fine particles. These so-called “fine” particles can exist in the atmosphere for several weeks and have local short-term impacts on climate. Aerosols can also act as cloud condensation nuclei (CCN), the particles upon which cloud droplets form.

Light-colored particles, such as sulfate aerosols, reflect and scatter incoming solar radiation, having a mild cooling effect, while dark-colored particles (often referred to as “soot” or “black carbon”) absorb radiation and have a warming effect. There is also the potential for black carbon to deposit on snow and ice, altering the surface albedo (or reflectivity), and enhancing melting. There is high confidence that aerosol effects are partially offsetting the warming effects of GHGs, but the magnitude of their effects contribute the largest uncertainly to our understanding of climate change (IPCC 2013).

Scientific consensus confirms that human activities have altered Earth’s energy balance, with more energy from the sun entering than exiting the top of the atmosphere (IPCC 2013). Radiative forcing (RF) is a measure of the net change in Earth’s energy balance resulting from some external perturbation. Positive RF contributes to global warming and negative RF contributes to cooling. Figure Q-1 illustrates the RF of climate between 1750 – 2011 and confidence level associated with each RF component. Over this period of time, total anthropogenic RF is around 2.4 Watts per square meter (W m^{-2}). The RF of well-mixed greenhouse gases (WMGHGs) in 2011 is 2.83 W m^{-2}.

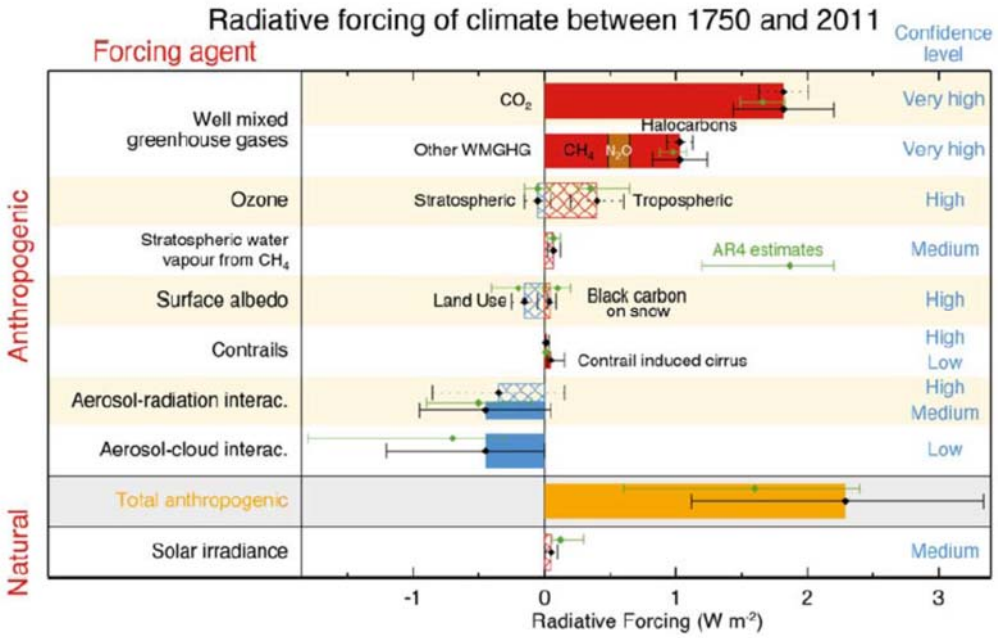


Figure Q-1 Radiative forcing (RF) of climate between 1750 – 2011 (IPCC 2013).

Climate

The Four Rivers PA displays less of a continental climate than that of the eastern and southern portions of the state. The semi-arid climate of the area yields annual precipitation ranging from about 12 inches at lower elevations to 22 inches in the highlands and mountains, with a majority of the precipitation occurring in the winter and spring months. Summer precipitation is light and infrequent in the lower elevations (NOAA 2014).

The Cascade and Blue Mountain range modify Pacific Maritime air masses as they move east across to the Treasure Valley and the city of Boise. The Treasure Valley is part of the large Snake River Valley of southern Idaho. The modified air masses are considerably drier once they reach southwestern Idaho. In addition, the Rocky Mountains to the east act as a barrier to cold shallow air masses moving southward from Canada in the winter. The effect from these mountain ranges is to make Boise and the Treasure Valley semi-arid with relatively mild winters for its northern location.

Average maximum monthly high temperatures vary from 94°F to average minimum monthly low temperatures of 18°F in the Treasure Valley and from 82°F to 11°F in the highlands (NOAA 2014). Winds within the Treasure Valley (the valley is has a northwest to southeast orientation) are from the southeast during the night and early morning hours. During afternoon hours the east end of the valley heats up faster than the west end thus creating surface low pressure, which in turn causes a northwest wind. This effect is more prevalent during the warm months when heating is intense and more rapid. The mountain ranges both to the north and southwest of the valley act to channel winds through the valley in both the northwest and southeast directions. Overall wind direction in the Treasure Valley indicates that 85% of all wind come from either the northwest or southeast direction and is evenly split between the two directions.

The Treasure Valley is not a windy location, but strong or gusty winds may occur at both ends of the valley. Boise is located about midway through the valley and closer to the Boise Front Range, thus channeling effects are not as pronounced as they are at the endpoints of the valley. Hence, lighter, more variable winds occur at Boise.

During summer, air quality can be adversely affected by an occasional dust storm and wildfires. In winter, severe temperature inversions can trap air pollutants in the Treasure Valley for days

Meteorology Data

Table Q-2 displays long-term climate monthly summaries for four Idaho locations within the planning area: Boise, Cascade, Emmett, and Weiser. Boise and the Treasure Valley have a typical high desert temperature regime. Nights cool down quickly and days heat up rapidly. This is due to the overall dryness of the air and higher elevation. Since Boise lies within the main belt of the prevailing westerly wind patterns, maritime polar air masses dominate the region much of the year, but are considerably moderated by the time they reach the local area.

Normally, milder temperatures are common in the Treasure Valley in winter often resulting in rain instead of snow. In the west end of the Valley, a persistent temperature inversion with snow cover keeps winter temperatures several degrees colder than Boise. The all-time record high temperature in Boise was 111°F in July 1960 while the record low temperature was -25°F in December 1990 (NOAA 2014).

Boise, Idaho - Station 101022 (National Weather Service Forecast Office)
Elevation: 2,871 feet; Latitude 43° 34', Longitude 116° 13 W
Period of Record: 01 January 1940 to 31 March 2013

Record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (°F)	37.1	44.4	53.1	61.7	71.1	79.9	90.9	88.6	78.1	64.8	48.5	38.6	63.1
Average Min. Temperature (°F)	22.6	27.5	32.1	37.4	44.7	51.9	58.9	57.6	49.3	39.7	30.7	24.0	39.7
Average Total Precipitation (in.)	1.40	1.07	1.25	1.20	1.29	0.84	0.25	0.28	0.55	0.81	1.32	1.42	11.70
Average Total Snowfall (in.)	6.2	3.3	1.6	0.5	0.1	0.0	0.0	0.0	0.0	0.1	2.0	5.8	19.6

Cascade, Idaho[1] - Station 101514 (1 NW)
Elevation: 4,760 feet; Latitude 44° 32' N, Longitude 116° 03' W
Period of Record: 01 January 1942 to 31 March 2013

Record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (°F)	29.8	35.5	42.6	53.3	62.2	70.4	82.0	81.0	71.4	57.9	40.3	30.8	54.7
Average Min. Temperature (°F)	10.5	13.0	18.7	26.3	33.4	39.4	44.3	42.1	34.7	27.9	21.4	13.3	27.1
Average Total Precipitation (in.)	2.84	2.17	2.16	1.74	1.94	1.75	0.49	0.61	0.95	1.73	2.75	3.16	22.28
Average Total Snowfall (in.)	25.3	16.5	11.7	3.7	0.5	0.0	0.0	0.0	0.0	1.2	12.0	24.4	95.4

Emmett, Idaho[2] - Station 102942 (2 E) **Elevation: 2,362 feet; Latitude 43° 52' N, Longitude 116° 28' W** **Period of Record: 01 October 1906 to 31 March 2013**													
Record	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average Max. Temperature (°F)	37,7	45.4	55.8	64.9	73.9	82.4	92.5	90.6	80.3	66.9	50.4	39.7	65.0
Average Min. Temperature (°F)	21.5	26.1	31.4	36.7	43.2	49.7	55.7	53.5	45.7	37.0	29.0	23.2	37.7
Average Total Precipitation (in.)	1.61	1.29	1.29	1.12	1.23	0.92	0.24	0.28	0.61	0.90	1.47	1.66	12.61
Average Total Snowfall (in.)	5.1	2.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	3.2	12.5

Weiser, Idaho[3] - Station 109638 (2 E) **Elevation: 2,129 feet; Latitude 44° 15' N, Longitude 116° 58' W** **Period of Record: 01 November 1911 to 06 March 2012**													
Record	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average Max. Temperature (°F)	35.3	43.9	55.9	65.7	75.6	83.8	94.1	92.0	81.1	67.0	49.6	37.8	65.2
Average Min. Temperature (°F)	18.4	24.1	30.4	36.3	43.7	50.6	56.3	53.7	44.2	35.0	27.6	21.0	36.8
Average Total Precipitation (in.)	1.68	1.33	1.03	0.95	0.90	0.91	0.22	0.30	0.44	0.78	1.40	1.66	11.61
Average Total Snowfall (in.)	9.1	4.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.4	7.2	22.5

Table Q-2 Long-term Climate records for Boise, Cascade, Emmett, and Weiser, Idaho, within the Four Rivers Planning Area.

Source: WRCC (2013) – wrcc@dri.edu

[1] Cascade, ID is located about 55 miles north of Boise, ID along State Road 55.

[2] Emmett, ID is situated about 25 miles northwest of Boise, ID on Highway 52.

[3] Weiser, ID is about 70 miles northwest of Boise, ID on the Oregon-Idaho border on State Road 95.

Indicators

Our current understanding of the climate system comes from the cumulative results of observations, experimental research, theoretical studies, and model simulations. The IPCC Fifth Assessment Report (AR5) (IPCC 2013) uses terms to indicate the assessed likelihood of an outcome ranging from *exceptionally unlikely* (0 – 1% probability) to *virtually certain* (99 – 100% probability) and level of confidence ranging from *very low* to *very high.*

The findings presented in AR5 indicate that warming of the climate system is unequivocal and many of the observed changes are unprecedented over decades to millennia. It is *certain* that Global Mean Surface Temperature (GMST) has increased since the late 19th century and *virtually certain* (99 – 100% probability) that maximum and minimum temperatures over land have increased on a global scale since 1950. The globally averaged combined land and ocean surface temperature data show a warming of 0.85°C (1.5°F). Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. It is *extremely likely* (95 – 100% probability) that human influence has been the dominant cause of the observed warming since the mid-20th century (IPCC 2013).

Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850 (NOAA 2013). Figure Q-2 shows the Global Mean Surface Temperature (GMST) anomaly from 1901 – 2012. Worldwide, 2001 – 2010 was the warmest decade ever recorded (NOAA 2013). In the Northern Hemisphere, the period 1983 – 2012 was *very likely* (90 – 100% probability) the warmest 30-year period of the last 800 years (*high confidence*) (IPCC 2013). Figure Q-3 shows the temperature anomaly in the 48 contiguous states from 1901 – 2012. Seven of the top 10 warmest years on record occurred for the 48 contiguous states occurred since 1998 and 2012 was the warmest year ever recorded (NOAA 2013).

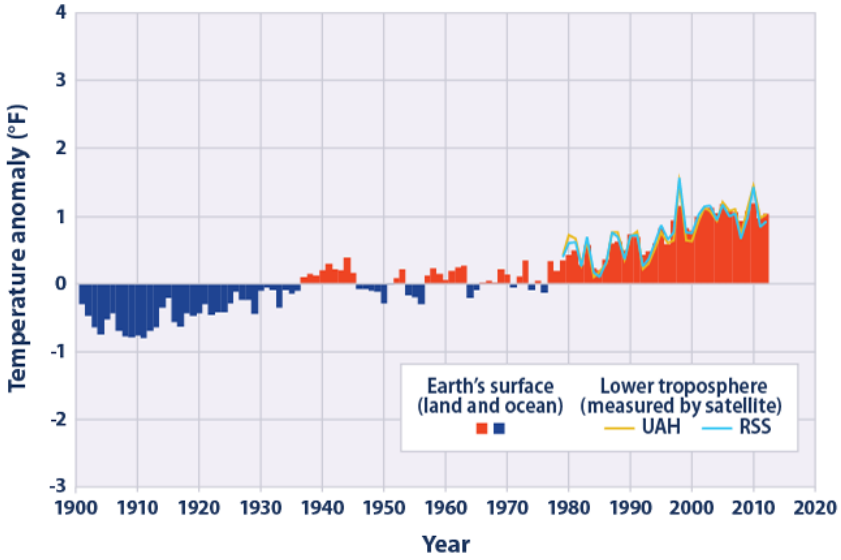


Figure Q-2 Global Mean Surface Temperatures (GMST) anomaly from 1901 – 2012 (NOAA 2013).

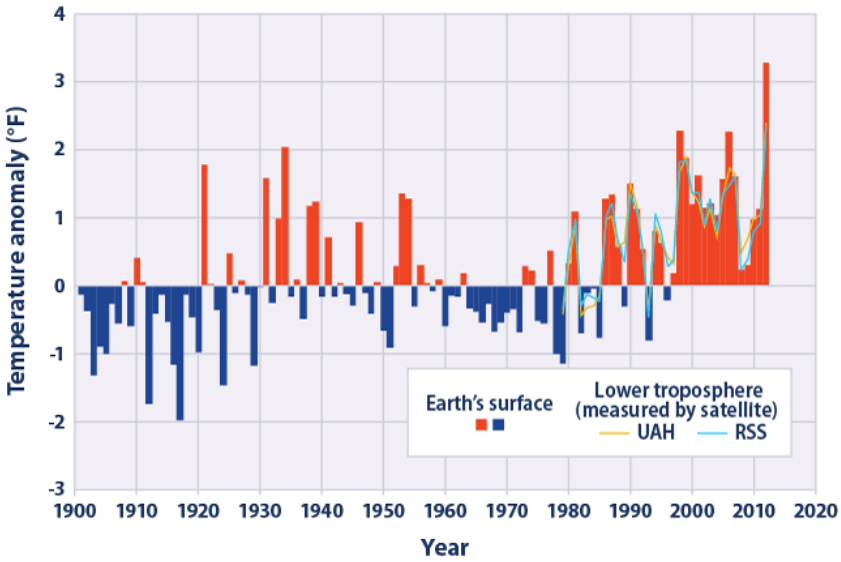


Figure Q-3 Temperature anomaly in the contiguous 48 states from 1901 – 2012 (NOAA 2013).

Findings from AR5 also indicate that changes in the climate system are not uniform and many regional differences are apparent. There is *very high confidence* that snow cover extent has decreased in the Northern Hemisphere, especially in spring. Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink

worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent (*high confidence*). There is *high confidence* that permafrost temperatures have increased in most regions since the early 1980s. Observed warming in parts of Alaska has been up to 3°C (5.4°F) from the early 1980s to mid-2000s.

The climate is both a driving force and a limiting factor for biological, ecological, and hydrological processes. For example, the intensity and duration of sunlight and moisture affects flora and fauna composition, species, size, distribution, and structure. Therefore, the climate may impact resource management activities, such as disturbed-site reclamation, wildland fire management, drought management, mineral resource development, management of rangeland and watershed productivity, and management of wildlife habitat. These activities may, in turn, impact the climate. Because the climate has great potential to influence renewable and non-renewable resource management (affecting the productivity and success of many BLM activities), incorporating climatic information into the BLM's programs, projects, activities, and decisions, all of which authorize use of the public lands, is critical for effective management and relevant for environmental review (BLM 2009).

Certain BLM-authorized activities within the PA would produce pollutants considered to be GHGs, particularly CO_2. For example, oil and gas development, construction activities, vehicle travel, and the use of motorized tools and prescribed burning for vegetation and wildlife habitat manipulation generate CO_2 and CH_4. These activities contribute to GHG primarily through carbon emissions (Zahniser *et al.* 2009). Other activities occurring on public lands that may generate criteria pollutants or particulate matter and affect air quality include mining and mineral processing (e.g., crushing or hot mix operations), forestry, construction, motorized travel, off-highway vehicle (OHV) use, and recreation activities (e.g., camp fires). Activities, programs, and projects initiated by BLM, as well as operator-initiated activities and projects the BLM authorizes, have the potential to affect and/or be affected by the climate and climate change. However, some authorized activities may help sequester carbon, such as maintaining vegetative and forested cover, which may help build organic carbon in soils and function as carbon sinks.

Climate and Climate Change

Temperatures have warmed in the PA from 0.4–0.8°F each decade since 1976, while precipitation has increased from 0.1–0.3 inch per decade. Global mean surface temperatures have increased nearly 1.3°F from 1906–2008 (Goddard Institute for Space Studies 2009). Northern latitudes (above 24° N) have exhibited temperature increases of nearly 2.1°F since 1900, with nearly a 1.8°F increase since 1970 alone. Figure Q-4 shows annual mean temperature change for the northern latitudes from 1900 to 2000.

In 2001, the IPCC indicated that by the year 2100, global average surface temperatures would increase 2.5 to 10.4°F above 1990 levels. The National Academy of Sciences (NAS) has confirmed these findings, but also has indicated that there are uncertainties regarding how climate change may affect different regions (NAS 2008). Computer model predictions indicate that increases in temperature will not be equally distributed, but are likely to be accentuated at higher latitudes.

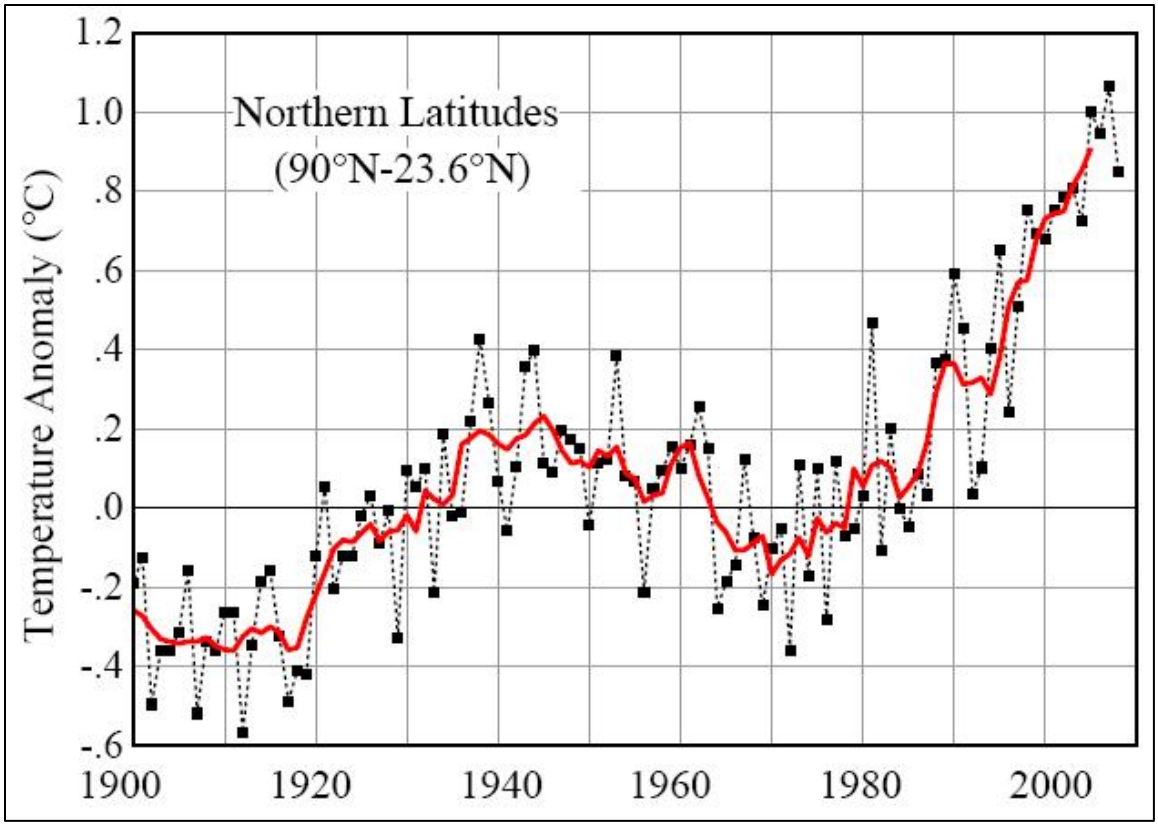


Figure Q-4 Annual mean temperature change for the northern latitudes from 1900 to 2000.

Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures. Increases in temperatures would tend to increase water vapor in the atmosphere, and reduce soil moisture, increasing generalized drought conditions, while at the same time enhancing heavy storm events. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

BLM Activities

How climate change will impact BLM resources specifically is mostly dependent upon the location of the affected resource, and how the affected resource further affects associated resource uses and the human environment. There will be positive and negative impacts of climate change, even within a single region. For example, warmer temperatures may bring longer growing seasons in some regions, benefiting farmers who can adapt to the new conditions but potentially harming native plant and animal species. In general, the larger and faster the changes in climate, the more difficult it will be for human and natural systems to adapt.

Climate and Global Warming Forecast

Assuming there are no major volcanic eruptions or long-term changes in solar irradiance, global mean surface temperature increase for the period 2016 – 2035 relative to 1986-2005 will likely be in the range of 0.3 – 0.7°C (0.5 – 1.3°F). Global mean temperatures are expected to continue rising over the 21st century under all of the projected future concentration scenarios. Global mean temperatures in 2081 – 2100 are projected to be between 0.3 – 4.8°C (0.5 – 8.6°F) higher relative to 1986 – 2005 (IPCC 2013).

Global warming will impact regions differently and warming will not be equally distributed. Both observations and computer model predictions indicate that increases in temperature are likely to be greater at higher latitudes, where the temperature increase may be more than double the global average. Warming of surface air temperature over land will very likely be greater than over oceans (IPCC 2013). There is also high confidence that warming relative to the reference period will be larger in the tropics and subtropics than in mid-latitudes. Frequency of warm days and nights will increase and frequency of cold days and cold nights will decrease in most regions. Models also predict increases in duration, intensity, and extent of extreme weather events. The frequency of both high and low temperature events is expected to increase. Near- and long-term changes are also projected in precipitation, atmospheric circulation, air quality, ocean temperatures and salinity, and sea ice cover.

It is *virtually certain* (66 – 100% probability) that changes in the global water cycle in response to the warming over the 21st century will not be uniform (IPCC 2013). Some regions will experience precipitation increases, and other regions will have decreases or not much change. The contrast in precipitation between wet and dry regions and between wet and dry seasons is expected to increase. The high latitudes are *likely* (66 – 100% probability) to experience greater amounts of precipitation due to the additional water carrying capacity of the warmer troposphere. Many mid-latitude arid and semi-arid regions will *likely* (66 – 100% probability) experience less precipitation (IPCC 2013).

The IPCC concludes that "cumulative emissions of CO_2 largely determine global mean surface warming by the late 21st century and beyond. Most aspect of climate change will persist for many centuries even if emissions of CO_2 are stopped. This represents a substantial multi-century climate change commitment created by past, present and future emissions of CO_2" (IPCC 2013).

The current condition of the PA could be very different in the future, not as a result of the land use planning process, or implementation actions that follow an approved RMP, but as a result of climate change itself to the "current condition" of the PA.

Potential management options that could be considered (Zahniser et al. 2009) to respond to climate change and GHG emission activities during the land use planning process include:

- Managing from a watershed and ecosystem scale
- Planting new biomass afforestation/reforestation/restoration
- Preserving existing biomass
- Conserving soil organic matter
- Avoiding overgrazing
- Restoring soils and degraded land
- Improving management of forest resources.

References

Bureau of Land Management (BLM), 2009. 7300 – Air Resource Management Manual, Rel. 7-109. January 16. 21pp.

Goddard Institute for Space Studies (GISS), 2009. Datasets and Images – Annual Mean Temperature Change for Three Latitude Bands (Last Modified: January 9, 2009). Available at: http://data.giss.nasa.gov/gistemp/graphs

Intergovernmental Panel on Climate Change (IPCC), 2013. Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: The Physical Science Basis, Stocker, T., Dahe, Q. and G.K. Plattner (eds.), Cambridge University Press, Cambridge, UK and New York, NY, USA.

National Academy of Sciences (NAS), 2008. Understanding and Responding to Climate Change – Highlights of National Academies Reports – 2008 Edition. Available online at: http://dels.nas.edu/dels/rpt_briefs/climate_change_2008_final.pdf

National Oceanic and Atmospheric Administration (NOAA), 2013. National Climatic Data Center. Accessed April 2013. www.ncdc.noaa.gov/oa/ncdc.html

_____ , 2014. National Climatic Data Center. Accessed February 2014. www.ncdc.noaa.gov/oa/ncdc.html.

Western Regional Climatic Center (WRCC), 2013. Historical Climate Information – Cooperative Climatological Data Summaries for Temperature and Precipitation at Idaho Falls, ID; Arco, ID; Spencer, ID; and Ashton, ID. Available online at: http://www.wrcc.dri.edu/summary/climsmid.html

Zahniser, A., J. Cossa, and S. Stewart, 2009. Incorporating Climate Change into BLM Planning and NEPA Processes. BLM National Land Use Planning Conference "Keeping Pace with Change." Portland, OR. March. 48 pp.

Appendix R – Livestock Grazing Allotments

Allot #	Allotment Name	Public Land Acres	Private Acres	State Acres	USFS Acres	Total Acres	AUMs
3	Jerusalem	11,453	7,970	5,500	56	24,979	1,428
5	Willow Ridge	35,175	5,620	4,456	0	45,252	4,412
6	Sheep Creek Common	12,664	1,531	987	2	15,184	2,103
7	Tommy Carr	5,052	3,710	640	2	9,404	781
9	Butte Ranch	696	1,045	173	0	1,914	20
10	Chacartegui	1,905	2,978	519	0	5,403	175
11	Round Valley	13	4	0	0	17	57
12	Armacost Individual	514	931	0	1	1,445	50
14	Lower	352	638	0	0	990	59
16	Goodrich	5,230	1,486	0	119	6,835	1,011
20	Barker Individual	264	3,736	0	0	4,001	96
22	Beal Individual	79	165	0	0	243	12
23	Bean Individual	110	868	0	0	978	25
25	French Corner	1,047	13,053	829	0	14,929	370
27	Bezates Individual	1,175	6,160	0	0	7,334	148
28	Stillwell Individual	205	2,300	0	0	2,505	36
29	Fir Tree	986	1,607	849	0	3,442	153
30	Westside North	1,198	1,908	195	0	3,302	301
31	Biggers	74	151	833	0	1,057	12
32	Randall Mountain	2,223	4,415	797	0	7,435	421
33	Camp Creek	291	2,522	599	2	3,414	36
35	C-Line	903	224	17	0	1,144	152
37	Brownlee	1,556	1,125	1,432	0	4,114	330
39	Ross Gulch	592	971	0	1	1,565	50
40	Boyd Individual	331	1,710	0	0	2,040	62
41	Granger Butte	3,320	6,453	102	2	9,876	432
42	West Crane Individual	449	2,217	6	0	2,671	83
43	Indian Valley	2,154	2,027	421	1	4,603	1,293
44	Riley Butte	716	7	272	0	995	91
45	Branch Individual	539	12,017	353	1	12,909	174
46	Cow Creek	470	1,351	380	0	2,201	207
47	Glasscock Draw	826	614	0	0	1,440	171
49	South Grays Creek	3,919	1,973	559	3	6,455	800
51	Brent Mountain	121	1,808	597	0	2,526	22
52	M. Brent Individual	241	860	0	0	1,101	43
53	Three Springs	80	163	0	0	243	30
57	Butler	350	163	0	0	513	43
59	Minnie	5,166	1,972	0	0	7,138	606
60	West Crane Common	8,113	1,195	0	0	9,308	2,045
61	Tennison Creek	196	910	63	0	1,168	35
63	T. Cada Individual	1,083	1,564	0	0	2,647	83
64	Canaday Individual	257	393	0	0	650	36
66	Carr Individual	169	4,114	123	0	4,407	34
67	Mitchell Individual	38	341	0	0	379	8
68	Chandler Individual	1,323	2,029	0	2	3,354	60
69	Chrestesen	827	1,374	0	0	2,200	285
71	McFadden	624	175	9	0	807	89
74	Cove Creek	2,903	177	824	0	3,904	246
76	Fruitvale	992	4	0	0	996	85
79	Fruitvale Glen	80	827	0	0	906	85

Allot #	Allotment Name	Public Land Acres	Private Acres	State Acres	USFS Acres	Total Acres	AUMs
80	East Riley Butte	695	14	9	0	718	144
81	Milk Creek	945	2,823	0	0	3,768	126
82	Cambridge	358	625	0	0	983	81
84	Dahnke	496	992	0	0	1,488	59
85	Cove Springs	45	676	0	0	721	6
87	Webb Creek FFR	291	1,287	1	0	1,579	48
88	Round Valley FFR	80	243	0	0	322	17
89	Squaw Butte	2,137	35	0	0	2,172	414
90	Gambril Individual	121	327	590	0	1,037	14
92	East Garden Valley	2,292	25	0	0	2,317	1,216
95	Horse Flat	4,185	1,426	636	0	6,246	356
99	Emery Individual	1,727	315	0	0	2,042	60
100	WMA	963	1,106	22,504	30	24,603	0
101	Sage Creek	1,576	1,417	0	0	2,993	250
102	North Rush Creek	195	557	0	0	752	27
103	Dry Ridge	58	125	0	0	182	8
105	Ridge Creek	122	712	187	0	1,022	20
106	Indian Creek	551	69	0	0	620	132
107	Indian Creek Custodial	113	1,077	0	0	1,189	26
108	Beaver Creek	80	1,379	0	0	1,459	15
109	Long Gulch	1,844	0	37	0	1,881	215
111	Butte	153	272	0	0	425	33
112	Thorn Springs	319	399	0	0	718	64
113	Justus FFR	357	1,335	50	0	1,741	46
114	Gatfield Individual	163	490	318	0	971	20
115	Packer John	1,282	1,329	19,988	133	22,733	83
116	Patterson & Goodwin	3,497	655	28	0	4,180	252
122	Bear Creek	792	612	0	0	1,404	107
123	Greenwood	277	0	0	0	277	33
124	Sand Hollow	1,516	4,261	0	0	5,778	122
125	Dechambeau Individual	437	3,548	0	513	4,498	150
126	Hadley Individual	1,060	377	0	0	1,438	26
127	Sunnyside	37	766	0	0	803	15
128	Hillard	148	891	0	0	1,038	24
129	Hale Individual	115	173	0	0	288	24
130	Gross	306	1,322	3	0	1,632	12
135	Big Hill	170	1,739	240	0	2,148	23
138	Upper Robinson Gulch	240	400	0	0	640	42
141	Helmick Individual	266	361	0	0	627	38
142	Wolf Creek	1,491	264	0	0	1,755	203
143	Herrick FFR	39	1	0	0	40	8
144	Lacey	280	154	0	0	434	40
145	Scott Creek	3,339	4,229	0	0	7,567	475
146	Hoffman Individual	155	877	7	0	1,038	34
147	Holbrook Individual	250	1,072	113	135	1,571	55
148	Indian Mountain Common	724	181	0	0	905	215
149	Grays Creek Road	46	386	0	0	432	6
150	Hopper Creek	448	151	0	0	599	62
151	Deer Creek	80	495	0	0	575	8
152	Council-Cuprum Road	79	391	0	0	469	8
153	Horning Individual	47	283	0	0	329	10
154	Cambridge	1,535	488	1	0	2,024	122
156	Little Pine Creek East	80	1,948	0	0	2,028	7

Allot #	Allotment Name	Public Land Acres	Private Acres	State Acres	USFS Acres	Total Acres	AUMs
158	Jackson Creek	2,081	1,316	1,433	0	4,829	386
159	Little Jackson	489	1,563	2,258	0	4,311	24
161	Little Johnson	178	61	0	0	239	48
162	Lower Bissel Creek	353	198	2	0	553	56
163	Kaufman	67	1,770	0	0	1,837	25
164	Keithley Creek	1,537	192	34	0	1,763	173
166	Kennedy Individual	134	147	0	0	282	11
167	Lupine Hills	158	59	0	0	217	33
168	South Squaw Butte	443	28	0	0	470	108
169	Rush Creek	159	447	0	0	606	34
170	Little Jackson FFR	460	2,279	8,061	7	10,808	44
171	A. Legg Individual	41	1,210	0	0	1,250	6
172	East Pine Creek	79	165	0	0	243	8
174	Sage Hen Flat	330	1,109	0	0	1,440	17
175	Black Canyon Fenced	81	15	0	0	96	14
176	Black Canyon	4,625	126	2	0	4,753	1,202
177	Big Flat	826	1,733	212	0	2,770	63
178	Paddy Flat	40	28,427	3,911	15	32,393	81
179	Sandy Ridge	710	194	0	0	905	115
180	M. C. & M. Individual	122	114	0	0	235	20
181	Anderson Creek	1,198	1,388	676	0	3,261	158
183	Cabarton Ranch	145	2,056	10	0	2,212	8
185	Maddox Individual	102	442	0	0	544	8
187	Marvin Individual	1,187	1,164	0	0	2,351	24
188	Westside South	1,163	1,458	117	0	2,738	146
189	McCool Individual	1,143	963	69	0	2,174	104
190	River	2,092	290	8	0	2,391	210
191	Linson Creek	5,211	2,005	14	0	7,230	892
192	Fenced Federal Range	120	2,700	272	0	3,092	124
193	McGinnis Individual	23	160	0	0	183	3
194	Grouse Creek	5,732	6,377	1,420	0	13,529	1,091
196	McPherson Individual	235	41	0	0	276	34
197	Buck Creek	228	864	20	29	1,141	35
198	Grouse	122	3,500	1	0	3,623	16
200	Advent Gulch	40	1,106	0	0	1,146	18
203	Sage Creek	2,557	2,162	0	6	4,725	300
206	Rocky	397	1,529	634	0	2,560	72
210	Montour Individual	105	36	0	0	142	8
211	Nissula Individual	167	179	0	0	345	20
217	River Bend	40	169	1	0	210	9
219	Mesa Siding	545	86	307	0	938	113
222	Pratt Individual	358	373	0	0	731	24
223	Rush Peak	795	173	0	0	968	130
224	Pleasant View	520	4,914	637	0	6,071	96
225	Indian Head Mountain	1,140	317	0	0	1,458	152
227	West Fork	42	0	0	0	42	8
228	Sagebrush Hill	846	1,363	60	0	2,268	101
230	Mann Creek	1,065	3,070	0	0	4,135	85
231	Rocky Slope	403	2,611	0	0	3,014	70
232	Jacknife	1,325	2,605	753	0	4,683	140
236	Middle Fork	747	428	461	0	1,635	90
238	Simplot Cattle Co.	237	2,797	449	0	3,483	67
240	Clipper Flat	448	9,905	19	0	10,371	219

Allot #	Allotment Name	Public Land Acres	Private Acres	State Acres	USFS Acres	Total Acres	AUMs
241	Sisler Individual	40	363	0	0	403	10
242	Roy Slyter	158	740	0	0	897	32
243	Rocky Ridge	477	1,628	7	0	2,112	110
246	Smith-Black Canyon	680	865	39	0	1,584	86
247	School Creek	160	1,181	0	0	1,341	20
248	Hashagen	511	1,901	0	0	2,412	114
249	Sturgill Creek	6,915	6,021	984	0	13,920	1,516
250	Squaw Creek	117	2,110	1	0	2,229	25
251	Hog Creek	99	1,194	0	0	1,293	28
252	Willow Creek	283	213	0	0	496	44
254	Sand Hollow	4,935	10,105	613	0	15,652	1,500
256	Sutton Ranches Individual	78	3,743	14	4	3,839	16
258	Little Weiser River	259	391	4	0	655	56
259	Towell	116	379	0	0	495	19
260	Crane Creek Individual	661	48	0	0	710	143
261	Twin Sisters	2,681	4,971	725	0	8,377	314
262	Grizzly Creek	158	751	0	0	909	32
263	Split County	120	399	0	0	518	6
264	Walker Individual	165	1,649	0	0	1,814	10
265	West Payette	34		0	0	34	4
266	Montour Individual	293	5,499	391	0	6,183	16
267	Alder Creek Individual	946	929	4	18	1,896	163
268	West Pine Creek	1,012	8,556	315	1	9,883	211
270	Thorn Creek South	40	17	0	0	57	7
271	Williams-Fairchild	1,604	9	0	0	1,613	251
272	Thousand Springs	288	4,113	0	0	4,401	26
273	Perkins Creek	411	1,030	0	0	1,441	70
275	Woodland Individual	488	789	0	0	1,277	128
276	Starkey	203	156	0	0	359	40
278	Spring Valley	8,174	35,027	2,089	0	45,290	739
280	Lick Creek	14,160	6,225	2,770	0	23,155	1,678
284	Spring Creek	7,747	606	624	2	8,979	1,051
285	Whitney	1,279	159	0	0	1,438	247
286	North Crane Creek	173	249	0	0	422	28
287	Middle Creek	320	1,618	1	0	1,938	40
289	Porter Creek	127	123	0	0	250	15
290	North Hornet	221	53	0	0	274	40
291	Hornet Creek	120	23	0	0	142	6
292	Thorn Creek	563	697	0	0	1,261	85
295	Little Willow	1,832	3,960	151	0	5,943	332
298	Holland Gulch	1,078	377	0	0	1,456	143
301	Holland Gulch	3,940	1,541	0	0	5,481	553
302	Weiser Cove	382	648	0	0	1,031	56
307	Dry Lake	159	2	0	0	161	136
308	Sky Ranch Individual	198	1,771	0	0	1,969	20
309	Boise Front	5,593	630	7,112	44	13,380	707
310	Black Canyon	15,939	7,777	720	0	24,436	2,853
311	No Unit	5,225	1,122	0	44	6,391	1,478
312	Bannister Basin	3,963	2,906	331	0	7,200	266
313	Fenwick Place	75	477	0	0	552	13
314	Bingham Place	39	2	1	0	43	14
315	Terteling	38	4	0	0	42	5
344	Jenkins Creek	2,748	8,651	60	0	11,459	375

Allot #	Allotment Name	Public Land Acres	Private Acres	State Acres	USFS Acres	Total Acres	AUMs
345	Tar Gulch	104	247	0	0	351	12
346	Oxbow	13,733	8,256	2,223	3	24,216	1,934
347	Little Rock Creek	452	3,672	0	0	4,123	53
348	Minnie Snyder	863	3,355	1	0	4,219	85
349	McChord Butte	16,030	17,571	637	2	34,240	968
350	Lucky Peak	181	313	0	0	494	39
352	Shirts Creek	319	403	0	0	722	44
356	Roberts Individual	38	1,091	0	0	1,129	8
361	Crane Creek	11,795	17,053	1,299	0	30,147	1,613
362	Foothills	7,715	629	326	0	8,670	1,035
363	Drake	449	92	585	0	1,127	63
365	Old Craig	340	623	0	0	963	49
366	Staley	207	1,147	0	0	1,353	36
370	Paddock Valley	24,996	28,512	3,559	0	57,067	2,272
371	Callender Individual FFR	326	1,218	0	0	1,543	48
373	Goodrich Creek	432	416	0	0	848	45
375	Gibson	119	132	0	0	251	12
376	Fry Individual FFR	206	155	0	0	361	22
381	Cow Camp	197	130	0	0	328	28
382	Beef Trap	1,109	735	0	0	1,844	231
385	Turkey Tracts	40	69	0	0	109	5
387	Ridge	42	491	0	0	533	6
389	Long Hollow Field	944	1,518	907	0	3,368	190
391	Little Emmett	28,514	21,837	2,923	0	53,274	4,951
392	Fenced Federal Range	339	328	118	0	786	58
393	Indian Jake	16,280	7,132	2,660	0	26,072	3,303
394	Deer Creek	157	111	0	0	268	30
395	Homestead	307	18	0	0	325	60
399	Spring	23	262	0	0	285	2
400	Silver Sage FFR	270	232	0	0	502	25
813	Mountain Home Subunit*	52,049	1,402	6,277	0	59,728	6,352
814	Long Tom	6,696	927	445	0	8,068	956
815	Mud Springs	11,013	337	846	0	12,196	2,467
816	Lockman Butte*	4,407	760	530	0	5,697	583
817	Martha Avenue*	13,377	2,648	117	0	16,142	1,833
818	Ditto Creek	17,508	20,122	2,816	0	40,446	2,128
819	Dive Creek/Big Bluff	9,565	374	349	0	10,288	792
820	Cornell	6,670	8,908	203	0	15,781	1,044
821	Chalk Flat*	1,133	1,054	0	0	2,187	238
822	West Slater Flat	4,851	60	244	0	5,155	1,174
823	McConnell	3,398	233	5,243	0	8,874	100
824	Bonneville Point	3,019	5,792	74	0	8,885	521
825	Sunnyside Spring/Fall*	33,505	95,920	15,654	0	145,079	2,896
827	Rattlesnake Seeding*	3,592	461	424	0	4,477	612
828	Crater Rings*	954	1	0	0	955	226
829	2+ Custodial	1,878	9,639	1,581	633	13,731	201
830	Bowns Creek	563	114	0	0	677	270
831	Sheep Creek	1,502	2,050	657	0	4,209	280
836	West Tacket Creek	1,867	1,533	161	243	3,803	264
838	Section 1	40	124	0	0	164	10
870	Pony Spring	215	664	0	0	879	21
871	Cottonwood	4,510	3,311	1,175	46	9,041	735
873	Reverse*	233	42	0	0	275	44

Allot #	Allotment Name	Public Land Acres	Private Acres	State Acres	USFS Acres	Total Acres	AUMs
876	East Slater Flat	3,998	2,844	0	0	6,842	1,165
877	Stewart FFR	162	959	93	0	1,214	32
878	Indian Creek FFR	1,039	1,662	3,093	0	5,794	120
879	Blacks Creek FFR	183	249	1,135	0	1,568	62
880	Greek Field FFR	87	1,080	104	0	1,271	16
881	Bryons Run FFR	237	1,198	0	0	1,435	20
886	Squaw Creek*	3,315	573	1,169	0	5,057	648
887	Simco*	749	1	0	0	750	76
888	Clover Hollow*	74	1	0	0	75	7
895	Plateau	1,714	173	640	0	2,527	473
1028	Emigrant Crossing	3,337	52	1,042	0	4,431	434
1030	Southwest Alkali Seeding	1,066	65	0	0	1,131	169
1033	Hammett #1	27,243	316	1,520	0	29,079	4,135
1034	Hammett #2	1,590	147	0	0	1,737	251
1036	Hammett #4	15,731	285	1	0	16,017	2,146
1037	East Hammett #5	10,470	694	638	0	11,802	1,493
1038	Hammett #6	6,461	172	1,740	0	8,373	912
1039	Hammett #7	2,306	16,215	3,306	13	21,840	345
1040	Hammett #4 - State	243	1	317	0	562	30
1041	King Hill Canyon	3,285	549	0	0	3,834	300
1043	South Camas	962	236	39	548	1,785	75
1044	North Slope	896	4,464	408	0	5,768	233
1045	Lower Bennett Creek	3,655	384	222	0	4,261	431
1054	Hammett Individual	1,540	267	0	0	1,807	216
1068	Little Canyon	2,280	59	0	0	2,339	473
1091	Camas Creek Field	190	280	118	1	589	42
1097	Double Anchor FFR	406	2,177	0	0	2,583	20
1098	North Camas	558	181	218	708	1,665	115
1101	East Bennett Mountain	1,512	5,482	0	0	6,994	146
1103	Hot Springs	4,091	187	646	0	4,924	504
1104	Morrow Field	225	362	0	0	587	20
1124	Sugarbowl	1,784	209	1	0	1,994	242
1127	Lower Alkali	2,197	5	0	0	2,202	301
1128	North Cold Springs	6,481	235	0	0	6,716	588
1129	Southeast Alkali Seeding	898		0	0	898	235
1130	South Cold Springs	8,784	72	227	0	9,083	1,314
1195	Hammett Livestock	4,658	4	1	7	4,670	361
1197	McPherson Section 15	557	57	0	0	614	99
1198	Ballantyne Section 15	723	0	0	0	723	144
1199	Joost Section 15	397	1	0	1	399	40
1278	Quartzberg	2,154	303	0	23	2,480	404
1356	Big Ridge	120	0	0	0	120	20
1357	Snips	43	195	0	0	239	4
1358	Pole Creek	115	127	0	0	242	11
1359	North Hill	80	0	0	0	80	15
1360	Timber Gulch	160	179	0	0	339	16
1361	Little Pine Creek West	121	54	0	0	174	12
1362	Little Pine Creek East	79	1,978	0	1	2,058	7
1363	Limestone	519	47	0	0	566	54
1364	Pleasant Ridge	2,668	5,203	640	0	8,511	491
1365	Reeds Grove	8,574	5,649	604	3	14,830	860
1502	Wittie	84	988	1	0	1,073	15
20122	Grouse Ridge	159	2,570	84	0	2,813	9

Allot #	Allotment Name	Public Land Acres	Private Acres	State Acres	USFS Acres	Total Acres	AUMs
20123	Park Individual	194	228	0	0	422	25
20124	Lund FFR	201	3,166	45	0	3,412	12
20125	Crane Creek	1,188	1,086	0	0	2,274	241
20126	Sage Creek	5,453	3,553	0	128	9,133	676
20127	Homestead Gulch	398	1,570	0	0	1,968	103
20128	Cherry Gulch	198	611	0	0	808	39
20129	Rock Creek	359	624	0	0	984	82
20130	Parks Individual	437	82	0	0	519	33
20131	Rock Quarry Gulch	563	1,940	0	0	2,502	115
20133	Pound	2,016	1,354	0	0	3,369	219
20135	Black Canyon (Shaw)	10,465	2,824	240	0	13,528	1,972
20136	Simplot Industries	31	6,383	487	0	6,901	12
20137	Thorn Creek West	81	303	0	0	383	7
Grand Total		**770,669**	**746,553**	**175,855**	**3,536**	**1,696,609**	**112,768**

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Appendix S - Recreation

Special Recreation Management Areas

An SRMA is an administrative unit where existing or proposed recreation opportunities and Recreation Setting Characteristics (RSC) are recognized for their unique value, importance, and/or distinctiveness, especially as compared to other areas used for recreation. An SRMA is managed to protect and enhance a targeted set of activities, experiences, benefits, and desired RSCs. Within an SRMA, R&VS management is recognized as the predominant LUP focus, where specific recreation opportunities and RSCs are managed and protected on a long-term basis.

Previous land use plans established five SRMAs in the PA. These SRMAs include:

- **Boise Front** — 15,000 acres. The Boise Front encompasses the foothills adjacent to the city of Boise, and is cooperatively managed with the city of Boise, Ada County, IDFG, USFS, and BLM. The area is managed to provide, primarily, nonmotorized trail opportunities close to Boise, and motorized trail opportunities higher in the foothills. Formal cooperative management started in the late 1980s. The Boise Front is managed to provide diverse recreational opportunities and experiences on more than 200 miles of roads, trails, associated trailheads, and interpretive and educational facilities scattered across and 80,000-acre foothills area that rises steeply behind Boise. The supply of trails available has increased from about 90 miles of trails in 2000 to more than 190 miles of trails available in 2016. The BLM sites include Miller Gulch, Cartwright trailhead, and Upper Hulls Gulch trailheads, and Hulls Gulch Interpretive Trail. The Boise Front (referred to as Ridge to Rivers Trail System) trails are enormously popular within the region and have broad local and regional support. An estimated one million recreationists used areas of the Boise Front in 2016 (BLM 2016d).
- **Payette River** — 22,100 acres. This SRMA includes the North Fork, South Fork, and Main Payette Rivers, and is jointly managed with the USFS. The focus is to provide a range of whitewater, river-related recreational opportunities. The Payette River system is Idaho's most heavily boated whitewater river, with stretches available for beginners through expert (Class II-V) users. The character of the landscape (physical setting) is rural with paved road access, boat launches, and rustic facilities including toilets and changing rooms at launches and take outs. The use and users setting (social) is front country with 7-15 other groups typically encountered while on the river. The management (administrative) setting is Front Country where agency staff periodically present and rules are posted at launch and take out sites.
- **Oregon National Historic Trail** — 16,000 acres. The purpose of this SRMA is to protect the visual and historic values of the Oregon Trail. The Oregon Trail SRMA is primarily a Backcountry Byway with Bonneville Point interpretive site as the only developed site. Reported visitation has declined from 22,708 visits in 1999 to 7,200 in 2017.
- **Oxbow-Brownlee** — 56,400 acres. The SRMA includes public lands along three reservoirs, Oxbow, Brownlee, and the extreme southern tip of Hells Canyon, and inland for several miles, to include the higher elevation Snake River "Breaks" country. These Snake River reservoirs form a segment of the Idaho-Oregon boundary in the PA's western section. Its objectives are to provide diverse recreational opportunities, primarily associated with the reservoirs; maintain and/or enhance the scenic, cultural, and natural qualities of the area; and provide for safe, healthy reservoir use. Popular recreational activities include reservoir and bank fishing, camping, OHV riding, and hunting (upland bird and big game). The BLM operates one developed fee campground, Steck Park, on Brownlee Reservoir in the SRMA near Weiser, Idaho. Use at this site has declined over the past twenty years from 25,600 visits in 1997 to about 7,250 visits in 2017.
- **Bennett Hills Winter Recreation Area** — 50,300 acres. The rugged, mountainous area northeast of Mountain Home provides opportunities for various snow-related recreational activities (primarily

snowmobiles). Other recreational uses during warmer months include hunting (big game and upland bird), camping, horseback riding, hiking, backpacking, and birdwatching. Annual visitation has declined over the past 20 years with 4,600 reported annual visits in 1999 and 3,000 reported visits for 2017. The primary activities have likely changed during this period also. Hunting of upland birds and big game are thought to have replaced winter activities (cross country skiing and snowmobiling) as snow conditions at mid-elevations 4,000-6,000 feet of the SRMA do not provide reliable snow conditions in many winters for these activities.

Extensive Recreation Management Areas – existing condition and pre-2014 direction (see table below)
ERMAs are administrative units that require specific management consideration in order to address recreation use, demand or R&VS program investments. The ERMAs are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management of ERMAs is commensurate with the management of other resources and resource uses. The Field Office is currently managed under several plans containing two ERMAs (Cascade and Treasure Valley) covering approximately 639,000 acres. They consist of general, dispersed recreation over a diverse range of landscapes and vegetation.

Recreation Management Area Comparison Table (BLM Handbook H-8320-1 – Planning for Recreation and Visitor Services)

	SRMA	**ERMA**	**Lands Not Designated as an RMA**
Definition	Administrative units where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, and/or distinctiveness, especially compared to other areas used for recreation	Administrative units that require specific management consideration in order to address recreation use, demand, or recreation and visitor services program investments.	All lands not established as an SRMA or ERMA.
Management Focus	SRMAs are managed to protect and enhance a targeted set of activities, experiences and benefits, and desired recreation setting characteristics. Within SRMAs, recreation and visitor services management is recognized as the predominant land use plan focus, where specific recreation opportunities and recreation setting characteristics are	ERMAs are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. ERMA management is commensurate and considered in context with the management of other resources and resource uses.	Recreation is not emphasized. However, recreation activities may occur. Recreation and visitor services are managed to allow recreation uses that are not in conflict with the primary uses for these lands.

	SRMA	ERMA	Lands Not Designated as an RMA
	managed and protected on a long-term basis.		
Specific Requirements	SRMAs/recreation management zones must have measurable outcome-focused objectives. Supporting management actions and allowable use decisions are required to: (1) sustain or enhance recreation objectives; (2) protect the desired recreation setting characteristics; and (3) constrain uses, including incompatible recreation activities that are detrimental to meeting recreation or other critical resource objectives.	ERMAs must have measurable objectives. Supporting management actions and allowable use decisions must facilitate the visitor's ability to participate in outdoor recreation activities and protect the associated qualities and conditions. Incompatible uses, including some recreation activities, may be restricted or constrained to achieve interdisciplinary objectives.	Management actions and allowable use decisions may still be necessary to address basic recreation and visitor services and resource stewardship needs.
Common Requirements	All areas are managed to meet statutory requirements to ensure resource protection, ensure human health and safety, and reduce conflict, as well as achieve other program planning objectives.		

Diagram Showing Potential Range of Alternatives for Recreation & Visitor Services (from BLM H8320-1 pg. III-2)

Recreation and Visitor Services ***How will recreation be managed and what recreation opportunities will be offered?***			
Alternative A Existing Decisions	**Alternative B Conservation Emphasis**	**Alternative C Resource Use and Development Emphasis**	**Alternative D Preferred Alternative**
Recreation management and administration will be directed by decisions in the existing LUP, LUP amendments, and RAMPs. Recreation management will generally emphasize the continued availability of dispersed and unstructured outdoor recreation opportunities, interpretation, and	Recreation opportunities will be emphasized that are in concert with sustaining the biological integrity of habitats for plant, wildlife, and fish species. In ecologically sensitive areas, recreation use will be limited. R&VS management will be recognized as the predominant land use focus in few areas.	Emphasis managing BLM lands for a variety of structured and dispersed recreational opportunities in a manner favorable to accommodate the maximum amount of recreation use in combination with other BLM land uses in order to produce social and economic benefits. R&VS management	Strategically emphasize a variety of recreation opportunities along with the protection of natural and cultural resources. R&VS management will be recognized as the predominant land use focus where the existing or proposed recreation opportunities and RSCs are recognized for their unique value and

visitor health and safety.		will be recognized as the predominant land use focus in many areas.	distinctiveness or where R&VS require specific management consideration in order to address recreation use/investments.

Special Recreation Permits

During an average year, the Field Office issues several SRPs for competitive OHV events (primarily at Little Gem Cycle Park), competitive whitewater events on the Payette River, and competitive trail races in the Boise Foothills. Commercial outfitter permits on the Payette River are jointly administered with USFS. Other SRPs (vending and organized group) are issued on a more irregular basis, as the need arises.

Alternative D Objectives, Recreation Settings, and Management Actions for Special and Extensive Recreation Management Areas and Backcountry Conservation Areas.

BOISE FRONT SRMA
OBJECTIVE(S) DECISIONS
Objective Statement: Within the Boise Front SRMA, by the year 2025 and beyond, 80% of recreation assessment participants will indicate identified experiences and benefits mostly are realized (4 on scale of 1-5).
Activities: Non-motorized and motorized trail uses and wildlife viewing. **Experiences**: • Enjoying physical exercise close-to-home in a natural setting; • Feeling that this community is a special place to live; • Appreciation of publicly owned open spaces; • Opportunity to escape urban pressures; • Enjoying easy access to natural landscapes; and • Enjoying risk-taking experiences. **Benefits**: • Improved mental and physical health; • Enhanced understanding and awareness of nature; • Greater community involvement in recreation and land management; • Increased desirability to live or retire in area; • Greater value-added local services/industry; and • Greater community ownership and stewardship of recreation and natural resources.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
Physical Components: Front Country – many areas >0.5 miles from roads, limited facilities development (primarily trails, parking, restrooms, interpretation), primarily non-motorized uses. **Social Components**: Front Country/Rural – 15-30+ encounters (especially on weekends), 1-5 people/group on average with periodic large groups (e.g., mountain bike groups), small areas of alteration prevalent – vegetation gone in well-used areas, people regularly heard **Operational Components**: Middle Country – non-motorized use predominates with limited motorized use, staff periodically present, area maps/brochures and rules/interpretation posted primarily at trailheads
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS
Recreation and Visitor Services Program: • Manage area in coordination with cities, counties, State, and USFS through MOU and other mechanisms; • Permit competitive events and guiding on a case-by-case basis; • Do not permit commercial vending; and • Limit to day use. **Other Programs**: • Non-motorized and motorized use is Limited. Route designation would occur through travel management planning. Implement seasonal closures to address resource concerns (saturated soils, big game winter use); • Retain scenic qualities while allowing for recreation developments (e.g., trails, trailheads, restrooms); • Avoidance area for LUAs and mineral material disposal to maintain Front Country setting characteristics;

• Closed to renewable energy development; and • Consider fuel breaks on a case-by-case basis while retaining scenic qualities.
IMPLEMENTATION DECISIONS Implementation decisions are actions to achieve or implement land use plan decisions. Implementation decisions include management, administration, information and education, and monitoring.
Implementation Decisions (e.g., The land use plan decision may be to designate overnight camping areas, while the supporting implementation decision may be to address specific site locations, size, and amenities to be provided.):

PAYETTE RIVER SRMA
OBJECTIVE(S) DECISIONS
Objective Statement: Within the Payette River SRMA, by the year 2025 and beyond, 80% recreation assessment participants will indicate identified experiences and benefits mostly are realized (4 on scale of 1-5).
Activities: Non-motorized boating and water play. **Experiences**: • Developing skills and abilities to gain greater self-confidence; and • Enjoying time with family and friends and telling others about trips. **Benefits**: • Greater self-reliance; • Improved skills for outdoor enjoyment with others; • Greater community involvement in recreation and other land use decisions; and • Improves local economic stability,
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
Physical Components: Rural - paved roads, boat launches, and facilities. **Social Components**: Primarily Front Country - 7-15 encounters (on river), 7-25 people/group, small areas of alteration prevalent – vegetation gone in used areas, people regularly heard. **Operational Components**: Front Country – 2- and 4-wheel drive vehicles, staff periodically present, rules posted.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS
Recreation and Visitor Services Program: • Manage area in coordination with USFS through MOU and other mechanisms; • Charge fees at developed sites; • Limit to day use unless campground is developed; and • Permit special events and outfitters and guides on a case-by-case basis. **Other Programs**: • Retain scenic qualities while allowing for recreation developments (e.g., boat launches, restrooms); • Closed to timber harvest, but thinning/fuels treatments could be allowed; • NSO for leasable minerals; and • See WSR management actions for additional restrictions/guidance.
IMPLEMENTATION DECISIONS: Implementation decisions are actions to achieve or implement land use plan decisions. Implementation decisions include management, administration, information and education, and monitoring.
Implementation Decisions (e.g., The land use plan decision may be to designate overnight camping areas, while the supporting implementation decision may be to address specific site locations, size, and amenities to be provided.):

BROWNLEE/OXBOW ERMA
OBJECTIVE(S) DECISIONS
Objective Statement: By 2025, the Brownlee/Oxbow ERMA will offer a variety of water and upland recreation opportunities in a relatively unchanged scenic setting.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS
Recreation and Visitor Services Program: • Issue special recreation permits and vendors on a case-by-case basis; and • Consider additional visitor use facilities to address user demand and/or to protect natural resources. **Other Programs**: • Except for Weiser Dunes Play Area, motorized use is Limited. Route designation would occur through travel management planning. • Retain scenic qualities while allowing for recreation developments (e.g., campgrounds, boat docks, and restrooms); • NSO for leasable minerals within 0.5 miles of developed sites; and • Avoidance for mineral material disposal, LUAs, and renewable energy development to maintain scenic qualities.

BENNETT HILLS BACKCOUNTRY CONSERVATION AREA

OBJECTIVE(S) DECISIONS

Objective Statement: Within the Bennett Hills BCA, protect and enhance high quality wildlife-dependent recreation activities and wildlife habitats.

Activities: Hunting, camping, and wildlife viewing.

Experiences:

- Developing skills and abilities;
- Talking to others about gear;
- Getting away from family for a while;
- Enjoying strenuous exercise; and
- Enjoy teaching others about the outdoors.

Benefits:

- Improved primitive outdoor skills;
- Greater self-reliance;
- Greater sense of adventure;
- Stronger ties with friends;
- Preserving cultural heritage
- Positive contributions to local/regional economies; and
- Protection of intact natural landscapes.

RECREATION SETTING CHARACTERISTIC DESCRIPTIONS

Physical Components: Back Country - within 0.5 miles of mechanized routes, minimally modified natural landscapes, no structures.

Social Components: Back Country - 7-15 encounters (on main access roads), 4-6 people/group, areas of alteration uncommon, people infrequently heard.

Operational Components: Primitive – Motorized on main access routes, foot/horseback on remaining area, maps online, staff rarely present, few restrictions.

MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program:

- No competitive use permits;
- Permits for outfitters and guides considered on a case-by-case basis; and
- Recreation facilities only where necessary for the protection of resources.

Wildlife:

- Emphasize habitat restoration, with focus on big game and greater sage-grouse habitat needs; and
- Reduce or minimize habitat fragmentation when considering activities.

Other Programs:

- Pursue access and conservation easements;
- Motorized use is Limited. Route designation, including over-snow vehicles, would occur through travel management planning. Implement seasonal closures to address resource concerns (saturated soils, big game winter use);
- Retain VRM Class II scenic qualities;
- TLS and NSO (Important Habitat Management Areas for greater sage-grouse) for leasable minerals;
- Exclusion area for renewable energy development to maintain Primitive or Back Country setting characteristics;

- Avoidance area for LUAs and mineral material disposal to maintain Primitive or Back Country setting characteristics; and
- Consider fuel breaks on a case-by-case basis while minimizing habitat fragmentation.

BENNETT HILLS ERMA
OBJECTIVE(S) DECISIONS
Objective Statement: By 2025, the Bennett Hills ERMA will offer wildlife dependent recreation opportunities, in a relatively unchanged physical recreation setting, that facilitate the visitor's freedom to participate in a variety of dispersed recreation activities.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS
Recreation and Visitor Services Program: • Issue special recreation permits on a case by case basis; and • Consider visitor use facilities to address public safety and/or to protect natural resources. **Other Programs**: • Emphasize habitat restoration, with focus on big game and greater sage grouse needs. • Pursue access and conservation easements; • Motorized use is limited. Route designation, including over-snow vehicles, would occur through travel management planning; • TLS and NSO (Important Habitat Management Areas for greater sage-grouse) for leasable minerals; • Retain VRM Class II scenic qualities; • Exclusion area for renewable energy development to maintain VRM Class II setting; • Consider fuel breaks on a case by case basis to protect habitat while minimizing habitat fragmentation.

Appendix T – Fluid Minerals Reasonably Foreseeable Development Scenario

Background:

The planning area lies within three geologic provinces- the Idaho Batholith, the Weiser embayment of the Columbia Plateau, and the western Snake River Plain. The Idaho Batholith lies north of the Treasure Valley and east of the Payette River, and is comprised of granitic rock with no oil and gas potential due to the lack of a source rock. The Weiser Embayment, which lies north of Weiser and Payette, and west of the Payette River, is comprised of thick sequences of Columbia River basalts with no to low oil or gas potential, due to depth of any source rock that may underlie the basalts (BLM 2009d).

The remaining parts of the planning area lie within the western Snake River Plain, an approximately 40-mile wide, northwest-trending graben structure, filled with sediments of Plio-Pleistocene Lakes Idaho and Bruneau and intercalated basalts. These sediments are referred to as the Idaho Group (Pliocene) and Payette Formation (Miocene), and are very similar in that they consist of semi-consolidated clay, silt, sand, volcanic ash, diatomite, freshwater limestone, conglomerate, and intercalated basalt flows. This is the only region in the planning area with any oil and gas potential (BLM 2009d).

The first exploratory oil and gas well in the planning area is reported to have been drilled in 1907 in the Payette area. When natural gas was reported from this well, it created a flurry of exploration activity and excitement in the Payette area, but as more wells were drilled and no oil was found, interest quickly waned. Exploration drilling continued sporadically (depending on economic conditions) throughout the 20th century- a total of 57 wells have been reportedly drilled in the planning area. Of these, 13 wells encountered gas (methane), albeit not in commercial quantities. These gas wells were located primarily in the Payette-New Plymouth area, although a few wells with gas shows are scattered throughout Canyon County. The deepest well (a dry hole) in the planning area was drilled in 1976, to a depth of 14,006 feet (located north of the town of Meridian in T. 4 N., R. 1 W., section 27). The deepest well with a gas show was drilled in 1981 to a depth of 9022 feet (located south of Lake Lowell in T. 2 N., R. 2 W., section 19) (BLM 2009d).

Since 2009, 17 wells have been drilled on private lands north of Interstate 84 east of Payette, in two areas that have been designated the Willow and Hamilton Fields. Seven wells in the Willow Field are now producing commercial quantities of natural gas and natural gas condensate. A pipeline system and other support facilities have been constructed, and have been supplying an average of 7.5 million cubic feet of gas per day since August 1, 2015, to the Williams Northwest pipeline. Since January, 2014, another well, State #1-17, has been producing an average of 30,000 cubic feet of natural gas per day from the Hamilton Field, supplying the town of New Plymouth with some of its natural gas needs. Completion of several three dimensional (3D) seismic surveys have aided the oil and gas developer in exploration, resulting in plans to drill a wildcat well, State #1-16, located approximately 5 miles east of the Willow Field. A wildcat well is an exploratory well drilled in an area with no existing production.

Oil and Gas

The Secretary of the Interior delegates to the BLM authority to lease the public's oil and gas resources – in accordance with the Mineral Leasing Act of 1920 as amended. Federal regulations concerning oil and gas leasing and development is found in 43 CFR Subpart 3100.

Permitting and operation of oil and gas wells are governed by BLM lease terms, regulations, Onshore Orders and other applicable federal and state laws and regulations, including Idaho Administrative Procedures Act (IDAPA) 20.07.02.- *Rules Governing Conservation of Oil and Natural Gas in the State of Idaho*.

According to a recent publication by the Idaho Department of Lands, unconventional reservoirs of shale gas/oil or coal bed methane resources that require multi-stage hydraulic fracturing are not known in Idaho. The gas resource discovered in Payette County is a conventional natural gas reservoir, in which the sandstone that contains hydrocarbons is highly permeable and porous. The State of Idaho has implemented rules to address concerns regarding hydraulic fracturing and potential impacts to groundwater and air quality. While no unconventional geologic formations have been identified in the planning area, the following description of impacts from hydraulic fracturing is included in the event hydraulic fracturing is proposed in the future.

Hydraulic Fracturing

Hydraulic fracturing has been used by oil and natural gas producers since the late 1940s and for the first 50 years was mostly used in vertical wells in conventional formations to stimulate production from existing wells. Hydraulic fracturing is still used in these settings, but the process has evolved. Technological developments (including horizontal drilling) have led to the use of multi-staged hydraulic fracturing in unconventional hydrocarbon formations such as low permeable tight sand and shale formations that could not otherwise be profitably produced (BLM 2013b).

The hydraulic fracturing process involves the injection of a fracturing fluid into the hydrocarbon bearing formation under sufficient pressure to further open existing fractures and/or create new fractures which would allow the hydrocarbons to more readily flow into the wellbore. Fracturing fluids consist of 95 to 99 percent water and a small percentage of special-purpose chemical additives and proppant. Chemical additives utilized in the hydraulic fracturing process may include, but not limited to, hydrochloric acid, anti-bacterial agents, corrosion inhibitors, gelling agents (polymers), surfactants, and scale inhibitors. Proppant consists of synthetic or natural silica sand. Water, fracturing fluid, and proppant would likely be stored in onsite tanks or lined pits during the drilling and completion process. Equipment transport and setup for hydraulic fracturing operations can take several days, and the actual hydraulic fracturing and flowback process can occur in a few days up to a few weeks. Emissions associated with hydraulic fracturing, if proposed, would be analyzed through a site specific NEPA document to ensure that the operation would not cause a violation of the Clean Air Act.

In 2015, the USGS estimated that water consumption for horizontal well was estimate at more than 4 million gallons per oil well and 5.1 million gallons per gas well. The median water use in vertical and directional wells remained below 671,000 gallons per well. For comparison, an Olympic-sized swimming pool holds about 660,000 gallons (USGS 2015). Freshwater-quality water is required to drill the surface-casing section of the wellbore per Federal regulations; other sections of the wellbore (intermediate and/or production strings) would be drilled with appropriate quality makeup water as necessary. This is done to protect usable water zones from contamination, to prevent mixing of zones containing different water quality/use classifications, and to minimize total freshwater volumes. With detailed geologic well logging during drilling operations, geologists/mud loggers on location identify the bottoms of these usable water zones, which aids in the proper setting of casing depths.

Several sources of water are available for drilling and/or hydraulic fracturing in Idaho. Like any other water user, companies that drill or hydraulically fracture oil and gas wells must adhere to Idaho water laws when obtaining and using specific sources of water. From an operators' standpoint, the decision regarding which water source will be used is primarily driven by the economics associated with procuring a specific water source. Potential sources utilized for hydraulic fracturing of water include water transported from offsite, irrigation water leased or purchased from a land owner, treated water or raw water leased or purchased from a water provider, new diversion from surface water from a stream or reservoir, produced water, reused or recycled drilling water, or onsite water supply well.

The use of horizontal drilling combined with multi-stage hydraulic fracturing activities has led to an increase in oil and gas activity in several areas of the country with unconventional reservoirs (i.e., tight

sands, shale oil), which has, in turn, resulted in a dramatic increase in domestic oil and gas production nationally. However, along with the production increase, fracking activities are suspected of causing contamination of groundwater by creating fluid communication between oil and gas reservoirs and aquifers. The Environmental Protection Agency (EPA) recently conducted an assessment of fracking on drinking water resources (https://www.epa.gov/hfstudy) (EPA 2016). The EPA concluded that fracking activities can impact drinking water resources under some circumstances. Impacts can range in frequency and severity, depending on the combination of hydraulic fracturing water cycle activities and local- or regional-scale factors. The EPA found that the following combinations of activities and factors are more likely than others to result in more frequent or more severe impacts:

- Water withdrawals for hydraulic fracturing in times or areas of low water availability, particularly in areas with limited or declining groundwater resources;
- Spills during the management of hydraulic fracturing fluids and chemicals or produced water that result in large volumes or high concentrations of chemicals reaching groundwater resources;
- Injection of hydraulic fracturing fluids into wells with inadequate mechanical integrity, allowing gases or liquids to move to groundwater resources;
- Injection of hydraulic fracturing fluids directly into groundwater resources;
- Discharge of inadequately treated hydraulic fracturing wastewater to surface water resources;
- Disposal or storage of hydraulic fracturing wastewater in unlined pits, resulting in contamination of groundwater resources.

These impacts can be mitigated through application of stipulations to the lease or when applying for a permit to drill. Additional information pertaining to the oil and gas potential and reasonably foreseeable development for oil and gas in the PA are included as attachments at the end of this Appendix (Attachments 1).

Geothermal

Based on the geothermal potential (RFDS) for the PA, it is reasonable to assume that a 50-MW plant might be developed in those areas determined to have high potential for indirect use. It is reasonable to assume that a 20-MW geothermal power plant might be developed anywhere along the northwest-trending fault zone, particularly on the southwest (valley) side of the fault zone, over the life of the plan. The projected production is relatively low when compared to other Idaho and western United States areas. Increasing interest in renewable energy, technology advances, and higher, overall energy prices would likely spur new exploration for, and development of, geothermal resources. Additional information pertaining to the reasonably foreseeable development of geothermal resources in the PA is found in Attachment 3 of this appendix – Reasonably Foreseeable Development Scenario for Geothermal Development in the Four Rivers Planning Area.

Split Estate Lands

In the case of split estate lands, the land may have left federal ownership, however the U.S. retained some or all of the mineral estate. In most cases where there are federal minerals, the surface is also managed by a government agency, such as the BLM or the USFS. However, in the case of split estate lands, the surface may be private while the minerals are reserved to the U.S. This situation is common, for example, on Stock-raising Homestead Act lands.

In these situations, mineral rights are considered dominant; the federal courts have consistently held that they take precedence over other rights associated with the property, including those owning the surface. However, the mineral owner must show due regard for the surface estate owner's interests, and occupy only those surface portions that are reasonably necessary to develop the mineral estate. The mineral owner may be required to compensate the surface owner for the loss of his use of the surface estate.

Mineral exploration and development on split estate is considered a “federal action” and as such, is subject to NEPA and all other federal laws and applicable regulations in the same manner and degree as lands with federal surface.

ATTACHMENT 1-

AMENDED

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

FOR

OIL AND GAS

IN THE

FOUR RIVERS FIELD OFFICE

IDAHO

Prepared by: Karen Porter, BLM Idaho State Office Geologist

Prepared by: Karen Porter Date: 8-10-16

Reviewed by: David Murphy, BLM Idaho State Office Geologist

Reviewed by: David M. Murphy Date: 10 AUGUST 2016

I. Summary

This amended Reasonably Foreseeable Development Scenario (RFDS) is a long-term projection of oil and gas exploration, development, production, and reclamation activity anticipated to occur over the next 20 years in the Four Rivers Field Office Planning Area. It is written in support of the Bureau of Land Management's (BLM) preparation of the Four Rivers Resource Management Plan (RMP) and Environmental Impact Statement (EIS). An RFDS is a planning tool developed to aid BLM specialists in their analysis of the effects to other natural resources by future oil and gas leasing, by identifying possible post-lease impacts related to exploration, development, and cumulative effects. The scenario is hypothetical, and assumes all potentially productive areas can be leased under standard terms and conditions, except those areas designated as closed to leasing by law, regulation or executive order. Actual drilling proposals that result from leasing, if any, may differ in location from those anticipated by this scenario. It is also possible that leasing could result in either more or fewer drilling proposals than presented in the scenario.

Based on the recent discovery and successful development of a natural gas field east of Payette, Idaho, BLM is amending its 2009 Reasonably Foreseeable Development Scenario (RFDS) that was written for the Four Rivers RMP revision. Since 2009, 17 wells have been drilled on private lands north of Interstate 84 east of Payette, in two areas that have been designated the Willow and Hamilton Fields. Seven wells in the Willow Field are now producing commercial quantities of natural gas and natural gas condensate. A pipeline system and other support facilities have been constructed, and have been supplying an average of 7.5 million cubic feet of gas per day since August 1, 2015, to the Williams Northwest pipeline (See Figure 1, "Southwest Idaho Natural Gas Play," 2014, from the Idaho Geological Survey). Since January, 2014, another well, State #1-17, has been producing an average of 30,000 cubic feet of natural gas per day from the Hamilton Field, supplying the town of New Plymouth with some of its natural gas needs. Completion of several three dimensional (3D) seismic surveys have aided the oil and gas developer in exploration, resulting in plans to drill a wildcat well, State #1-16, located approximately 5 miles east of the Willow Field. A wildcat well is an exploratory well drilled in an area with no existing production.

BLM has revised its oil and gas occurrence and development potential in the western part of the planning area, based on the discovery of a commercially viable natural gas field. While very little new geologic information has been released, based on the activity described above, BLM now estimates that a total of 130 wells would be drilled and eleven natural gas fields would be developed in the planning area, regardless of land ownership, over the life of the Four Rivers RMP, disturbing approximately 975 acres. This assumes each drill pad would be 2.5 acres in size and each well would require the construction of, on average, one mile of 40-foot wide access road (5 acres per mile). Of the 130 wells drilled in the planning area, it is assumed that 42 wells would be dry. These wells would be plugged and abandoned, and 315 acres of surface disturbance would be reclaimed. Based on the location and amount of lands in the prospective area that have minerals reserved to the United States, BLM anticipates that 22 of the wells would be drilled on federal lands, including those lands with private surface/federal minerals (split estate). BLM anticipates that up to 165 acres of long-term surface disturbance would occur on federal lands in the planning area over the life of the plan. Roughly half that acreage would be reclaimed on an interim basis, as once the well is drilled and put into production, a large drill pad and wide access road are no longer needed.

II. Introduction

The purpose of this report is to amend the original Reasonably Foreseeable Development Scenario (RFDS) for the Four Rivers RMP revision, which was written in 2009. The RMP revision has still not been completed, and in the meantime, an oil and gas exploration company has drilled wildcat wells in an area located approximately 6 miles east of Payette and discovered two natural gas fields that have since

been developed. In the original RFDS, it was anticipated that six to ten exploratory wells would be drilled on BLM-administered lands, likely in the Payette area, over the life of the land use plan, assumed to be approximately 20 years. That prediction was based on an analysis of the mineral potential of the planning area, and on the results of exploration drilling activity that had occurred to-date. At the time the RFDS was written, exploratory drilling had been unsuccessful in discovering oil or gas in commercial quantities.

In 2009 Bridge Resources Corporation (Bridge) and Paramax Resources, Ltd. entered into a joint venture agreement and began exploration in the western Snake River Plain, near the town of New Plymouth. In March 2010 five wells were drilled, resulting in the discovery of the Willow and Hamilton fields. Based on this success, Bridge drilled six more wells to appraise its discoveries in the two fields, completing its drilling program by November 20, 2010. Of the eleven wells drilled, seven were reported to have significant shows of natural gas (University of Idaho Policy Analysis Group, 2013). Bridge's and Paramax's assets were acquired in early 2012 by a group headed by Alta Mesa Holdings, L.P. (Alta Mesa) of Houston, Texas. Alta Mesa drilled two wells in the Willow Field in 2014, and drilled 2 more wells beginning in late 2015.

This report updates the oil and gas occurrence and development potential in the Four Rivers Field Office, and updates BLM's description of the reasonably foreseeable exploration and development operations that could occur over the life of the land use plan, in compliance with the Supplemental Program Guidance for Fluid Minerals (BLM Manual Section 1624-2) and BLM's policy for RFDS for oil and gas (Washington Office Instruction Memorandum No. 2004-089). An RFDS is a long-term projection of oil and gas exploration, development, production, and reclamation activity, providing a tool for BLM to use to analyze the effects that discretionary management decisions have on oil and gas activity. The RFDS also provides basic information about the types of operations that can be expected as a result of issuing leases, so that environmental impacts can be analyzed objectively in the National Environmental Policy Act (NEPA) document under various alternatives, and appropriate stipulations can be developed to mitigate those impacts.

III. Updated Geologic Information

As described in the 2009 Oil and Gas Potential Report for the Four Rivers RMP, the only region in the planning area with commercial oil and gas potential lies within the western Snake River Plain, an approximately 40-mile wide, northwest-trending graben structure, filled with sediments of Pliocene and Miocene Lakes Idaho and Bruneau, and intercalated basalts. It is filled largely with lacustrine sediments related to Pliocene Lake Idaho, a large, long-lived lake system that formed first at the northwestern end of the graben (near Oregon) and extended to the southeast along with the structural graben. These sediments are referred to as the Idaho Group (Pliocene) and Payette Formation (Miocene), and are very similar in that they consist of semi-consolidated clay, silt, sand, volcanic ash, diatomite, freshwater limestone, conglomerate, and intercalated basalt flows. Sediments of the Idaho Group lie along the southern edge of the western Snake River Plain graben near Grandview. That area lies south of the Snake River, beyond the boundaries of the Four Rivers RMP, and therefore will not be discussed further in this report.

The 2009 Oil and Gas Potential Report did not discuss the U.S. Geological Survey oil and gas resource assessment for the planning area, so it will be described here. As part of a national assessment of U.S. oil and gas resources conducted by the U.S. Geological Survey in 1995, USGS geologists systematically identified and described the oil and gas plays of their assessment provinces, assigning a number to each play and quantifying the play's geologic risk, expressed as the probability of recovering an oil or gas resource. The term "play" is used to describe a group of oil or gas fields or prospects in the same region that are controlled by the same set of geological circumstances. USGS' analysis of each play is based upon established concepts of petroleum geology together with the known geology of the area. The lands in the planning area are described in three hypothetical oil and gas plays in the Idaho-Snake River

Downwarp Province (Peterson, 1995). USGS defines a hypothetical play as a play that lacks any discovered accumulations of 6 billion cubic feet (bcf) of gas or larger. USGS describes the Miocene Lacustrine (Lake Bruneau) Play (1701) based on the presence of 7000 feet or more of primarily lacustrine shale, clay, sandstone, etc. Potential reservoirs are fluvial and lacustrine sandstones, while source rocks are organic-rich lacustrine shales. Traps are fault blocks, folds, and stratigraphically isolated sandstone or siltstone, sealed by fluvial and lacustrine shaly beds or volcanics. Temperature gradients are high in much of the area, potentially heating source rocks into the thermal stages of oil or gas generation. Reservoir size and quality may be affected by intermixing tuff and ash deposits. Biogenic gas generated soon after burial and accumulated in adjacent reservoirs. Extensive faulting and fracturing, along with increased heat flow in the Pliocene, probably resulted in renewed migration of some earlier deposits into a reconstituted reservoir system. USGS estimates the mean risked technically recoverable resource for this play is 11 bcf of gas. USGS describes the Pliocene Lacustrine (Lake Idaho) Play (1702) as being very similar to the Miocene Lacustrine Play, except that the beds in the Pliocene Lacustrine Play are shallower and more likely to contain biogenic gas and less thermal gas. Traps are similar to the Miocene Lacustrine play, except that there may be greater incidences of small isolated stratigraphic traps in the Pliocene beds. Because of its low play probability (0.10), this play was not quantitatively assessed by the USGS. USGS describes the Older Tertiary Play (1704) based on the possible presence of a thick section of early Tertiary rocks (potentially partly marine) in the southwestern corner of the Snake River downwarp. These rocks have never been encountered in drilling in Idaho, however USGS projects their existence on a regional scale. Potential reservoir rocks are fluvial, lacustrine, and marine sandstones and carbonates. Play 1704 is deep and gas prone with very high risk. Quantitative data are sparse to absent. Because of its low play probability (0.06), this play was not quantitatively assessed by the USGS.

No new technical papers or articles have been published about the geology of the western Snake River Plain since the 2009 RFDS was written, however limited information about the Willow and Hamilton Fields can be gleaned from some of the drilling permit applications that are posted on the Idaho Geological Survey website (http://www.idahogeology.org), well spacing orders available from the Idaho Oil and Gas Conservation Commission, and news releases. In addition, the author had personal communications with Alta Mesa's geophysicist, who provided a general interpretation of the results of the company's 3D seismic programs.

The Willow-Hamilton area is structurally located along the northern margin of the western Snake River plain graben in a broad low area between the northeast edge of the basin and the central basin high, located to the southwest. The geological targets are Tertiary-aged porous and permeable sandstone bodies interbedded with organic-rich lacustrine shales. Two fluvial sands have been described as reservoirs, referred to as the 4100 Foot Sand and the 3750 Foot Sand. The upper fluvial sand package is reported to be widespread across the Willow-Hamilton area and ranges from 500 to 800 ft. thick, except where replaced or interrupted by volcanics. Available subsurface data indicates the fluvial sand appears to be a consistent reservoir quality. The fluvial sand is overlain by 1700 ft. to 3500 ft. of lacustrine shale, providing a regional topseal. These characteristics are applicable to both the Willow and Hamilton fields (Final Order Idaho Oil and Gas Conservation Commission, 4-16-2013, Kim Parsons' testimony).

In testimony presented in a March 31, 2011 public hearing for the Idaho Department of Lands concerning a change in well spacing from one well per 640 acres to one well per 160 acres, the geology of the area was described by representatives of Bridge Energy, the company that initially drilled and discovered the Willow and Hamilton Fields. In the Willow Field area, Bridge drilled the ML 1-10 as the discovery well on 640 acre spacing. They then drilled the DJS 1-15 and DJS 1-14 wells, located approximately one mile south and one mile southeast of the ML 1-10 well, respectively. The pay interval in the DJS 1-15 well was not present in the DJS 1-14 well. Bridge also drilled the May 1-13

well approximately 4 miles west of the DJS 1-15 well. The result was a dry hole. Pay zones between wells in the Hamilton Field could not be correlated, and bottom hole pressure data showed that at least three different pressure compartments are present in that field, likely due to the highly faulted volcanic basement.

More recent information about reservoir characteristics is available from an April 16, 2013, Final Spacing Order, requested by Alta Mesa for the purpose of returning the well spacing back to 640 acres, while also requesting an administrative mechanism to deviate from the standard spacing on a case-by-case basis, to accommodate high variability between the identified sands showing extreme differences in reservoir deliverability. In that testimony, Alta Mesa experts described the characteristics of two reservoirs, referred to as the 3750 Foot Sand and the 4100 Foot Sand, that contain commercial quantities of hydrocarbons. The 4100 Foot Sand is reported to have a net-to-gross ratio of 80% and a net pay of 9 feet in the ML Investments #1-10 well. The porosity of this formation is 22% and is filled with a wet gas yielding 18 barrels of condensate per million cubic feet of gas. An extended pressure buildup test conducted in January 2013 on this well yielded an effective permeability to gas of 304 millidarcy ("md"). A single well simulation model indicated that the well will load up at 325,000 cubic feet per day (mcfd), at a reservoir pressure of 125 lbs per square inch gauge (psig). Gas recovery at this abandonment pressure is over 90% of the original gas in place.

Porosity of the 3750 Foot Sand is 33%, and the effective permeability to gas is 0.5 md, based on an extended pressure buildup test on the DJS-15 well conducted in January 2013. A 640 acre simulation model of this low permeability reservoir indicates liquid load up will occur at 120 mcfd, at a reservoir pressure over 1200 psig, yielding 35% recovery.

As stated above, block faulting is prevalent in parts of the Willow Field, resulting in compartmentalization of the oil and gas reservoir in some instances. Several exceptions to the 640-acre well spacing have been granted by the Idaho Department of Lands, thereby allowing a second well to be drilled in a section, due to faulting. These have occurred in sections 3 and 10 of T. 8 N., R., 4 W. In both instances, developer Alta Mesa provided information showing that north- and northwest-trending faults bisect each of these sections. In section 10, a fault with as much as 200 feet of vertical displacement prevents the effective drainage of the reservoir from a single well in the section. The fault serves as a structural trap, separating the reservoir on the east side from the reservoir on the west side of the fault. The faults are believed to have been created by deformation after the deposition of the reservoir sands, probably due to continued basinal subsidence in the region. Both wells in section 10 are currently reported to be in production. The Idaho Department of Lands also approved a second well in section 3, based on Alta Mesa's submission of 3D seismic information that showed a fault similarly bisects the reservoir. Drilling on the two wells in section 3 began in late 2015, and it is anticipated they will go into production in early 2016.

IV. Updated Oil and Gas Exploration Activity

The original Mineral Potential Report describes exploration activity that had occurred in the planning area up to 2009, which is around the time that Canadian exploration companies Bridge Resources Corporation and Paramax Resources Ltd. jointly announced their intent to drill wildcat (unproven exploratory) wells in the planning area. In 2010 the companies announced that their initial five-well exploratory drilling program had resulted in two confirmed discoveries, the ML Investments 1-10 well, establishing the Willow Field, and the Espino 1-2 well, establishing the Hamilton Field. Bridge and Paramax drilled a total of eleven wells before they sold their Idaho assets to Snake River Oil and Gas and its partner AM Idaho, LLC, a subsidiary of Alta Mesa Holdings, in early 2012. The new operator will be referred to in this report as "Alta Mesa."

As of the time of the writing of this report, exploration and development drilling has resulted in a total of 17 wells drilled in the Willow and Hamilton Fields, six of which are now in production. Alta Mesa

has conducted three large 3-D seismic surveys across the region, and recently applied for a drilling permit from the Idaho Department of Lands, to drill a new wildcat well to be located in T. 8 N., R. 3 W., section 16, in the Big Willow Creek drainage on private lands approximately 5 miles east of the producing wells in the Little Willow Creek area.

In addition to the exploration and development activities conducted in the Willow and Hamilton Fields, a wildcat well was drilled on private lands in 2014, in T. 5 N., R. 3 W, section 10 (north of Notus, east of Parma), by Trendwell Energy Corporation. The well, named Smith 1-10, was drilled in 2014 to a depth of 5200 feet and was reported to be a dry well. This is the only other oil and gas drilling activity that has occurred since the 2009 RFDS was written.

V. Updated Oil and Gas Leasing Activity

The 2009 RFDS written for the Four Rivers RMP indicated that 181,000 acres of federal mineral estate had been nominated for leasing in the planning area, but that BLM was deferring leasing in the planning area until the RMP revision was completed. However, due to the threat of uncompensated drainage of federal oil and gas resources from adjacent private development, the BLM was compelled to lease approximately 6,474 acres in the Little Willow Creek area of Payette County, prior to completion of the Four Rivers RMP. Five protective leases, subject to stipulations that prohibit surface and sub-surface occupancy of the leases (known as NSO/NSSO stipulations) until the Four Rivers RMP can be implemented, were sold for approximately $3.8 million in a competitive lease sale in May, 2015. Even though the lessee cannot drill into the federal minerals at this time, now that the lands are leased BLM can establish Communitization Agreements with the federal lessees. A Communitization Agreement (CA) allows the federal government to collect royalties on its proportionate share of production from those wells that drain the federal mineral estate. To date, two CAs have been approved, one for the Kauffman 1-34 well, and one for the ML Investments #1-3 and ML Investments #2-3 wells (because the wells are located in the same section, they are covered by one CA). In July, 2016, BLM again offered similar protective leases on an additional 9,300 acres in the Big Willow Creek area at a competitive lease sale. Those leases are also subject to NSO/NSSO stipulations, until the Four Rivers RMP is completed and can be implemented. At that time, the stipulations will be modified consistent with direction from the RMP. It is anticipated that once the Four Rivers RMP can be implemented, BLM will conduct competitive lease sales of nominated lands on a regular basis, as required by law.[1] Those parcels would be offered subject to site-specific stipulations derived from the RMP.

The Idaho Department of Lands has leased oil and gas on lands under its jurisdiction in the following areas: southern Washington County, all of Payette County, the southwestern part of Gem county, and northern Canyon County (from IDL website, located at http://www.idl.idaho.gov/ oil-gas/leasing/ 2015-0514- map-active-oil-gas-leases.pdf). Numerous private oil and gas leases have also been signed with landowners through-out the medium and high potential areas.

VI. Updated Oil and Gas Development Activity

Most of the medium and high potential areas have adequate basic infrastructure such as power lines and roads. A rail line operated by Union Pacific runs generally east-west through the area. The presence of the Williams Northwest pipeline is a significant attribute for natural gas development in the planning area. The natural gas pipeline was constructed in the 1950's and runs parallel to I-84 in the planning area. It consists of a 24-inch diameter buried pipeline, and has a capacity of 1.3 billion-cubic-feet of gas per day. It gathers gas from several locations in the Rockies and Canada, and delivers it to multiple locations in the northwestern states, with the biggest market being the greater Seattle area. Another attractive feature about the planning area for natural gas developers is proximity to the Langley Gulch

[1] The Federal Oil and Gas Leasing Reform Act of 1987 requires the BLM to offer land that is nominated by industry or the public for oil and gas leasing – provided the lands are eligible and available for leasing, as identified in an resource management plan (RMP).

natural gas-fired power plant, completed in 2012. It is located just south of I-84 at Exit 9 (Highway 30 south of New Plymouth), and requires 50 million cubic feet of natural gas per day. The plant uses natural gas to fire a massive turbine that generates electricity. Heat from that turbine creates steam that powers a second turbine. Combined, these turbines can generate up to 300 megawatts (MW) of electricity, which is enough to power 208,500 homes (Idaho Power website). The presence of a major interstate pipeline and a new natural gas-fired power plant improve the economic viability of the area's natural gas fields.

Construction of infrastructure to treat the hydrocarbons produced from the Willow Field and transport them to a point of sale was completed in 2015. At each well site, produced fluids are sent through a series of heaters and a separator, to remove free water and Natural Gas Liquids from the natural gas. The liquids are sent to onsite tanks for storage and eventual transport via trucks for disposal. The gas from each well site is piped to a central gathering facility located along the Little Willow Creek road, approximately 2 ½ miles northeast of Highway 52. The gathering facility began operating on August 1, 2015, with a daily capacity of 10 million cubic feet of natural gas (http://livinginthenews.com/article/11341 "District 9 Legislators Tour Payette County Natural Gas Facilities", published on Tuesday, September 1st, 2015 by Rep. Judy Boyle). At this site, production from the individual well sites flows into individual Line Heater/Separators (Gas Production Units), where produced gas, oil (condensate or crude) and water are separated. The separated water is piped to tanks and trucked off site. Crude oil is similarly piped to tanks and trucked off site. Flashed vapors from the tanks are collected in a venting system and piped to a vapor combustor to be burned. Condensate from all of the individual Gas Production Units is commingled and flows into a single 3-phase separator, to allow flashed gas from pressure reduction to separate out before metering. The condensate is then transported through a 4" pipeline to the refrigeration plant, located approximately 11 miles to the south. The separated gas from the individual Gas Production Units is compressed in an engine compressor to pipeline pressure. The gas is then sent to an electric cooler to be cooled and then into a 99.97% emission free dehydrator. The gas is measured again before being sent through a 12" pipeline to the refrigeration plant.

The Highway 30 refrigeration plant is 6 acres in size, and is made up of eight 30,000-gallon bullet tanks, according to a March 18, 2015 article published in the Argus Observer. At this facility, the natural gas is further refined to meet the specifications for delivery to the Williams Northwest Pipeline.

According to the Idaho Department of Lands website, at least five wells in the Willow Field and one well in the Hamilton Field are now in production. The State of Idaho now requires that an operator submit production records to the Idaho Department of Lands six months after a well starts producing. Six months after that, the state is required to make those records public. Since production from the Willow Field did not begin until August, 2015, production reports for individual wells in that field are not yet available to the public. However, the Williams Northwest pipeline website reports daily receipts and deliveries of natural gas on its Operationally Available Capacity Report portal. On August 1, 2015, the website reported a new receipt station had been established at East Hamilton, Idaho, which is assumed in this report to be reflective of the production from the five producing wells in the Willow Field. Between August 1 and December 16, 2015, quantities of gas supplying the Williams Northwest pipeline at the East Hamilton station ranged between 500,000 and 12 million cubic feet (reported as 500 to 12,000 MMBtu) per day, averaging approximately 7.5 million cubic feet per day (7500 MMBtu per day). Between December 17, 2015 and January 6, 2016, the average increased to 10,000 MMBtu per day, presumably as newly drilled wells came on line. According to the American Gas Association, the average U.S. home uses 168 cubic feet of natural gas on a daily basis (AGA Natural Gas: The Facts, 2015). Therefore, the daily average production of natural gas assumed to be from the wells in the Willow Field is now sufficient to supply the daily needs of almost 60,000 homes. Liquid natural gas condensate is also produced from the Willow Field, however the amount is unknown.

According to the Idaho Department of Lands website, one well in the Hamilton Field, named the State 1-17 well, has been supplying natural gas to the town of New Plymouth since January of 2014. These reports are now available to the public. Total production for 2014 from the well was reported to be 13.33 million cubic feet of gas, while 2015 production through November totaled 9.102 million cubic feet of gas. No oil or condensate has been produced from this well.

Most of the wells drilled in the Willow and Hamilton Fields have been drilled vertically, with a few having slight deviation at depth. The wells that are not in production are listed on the IDL website as "shut in pending pipeline." The fate of these wells is unknown at this time, but if they are not put to use, they will be plugged and abandoned in accordance with State of Idaho rules and regulations. No horizontal wells have been proposed, and none are anticipated in the planning area, due to favorable reservoir characteristics that do not require such a practice.

While Alta Mesa's predecessors reportedly planned to "stimulate" several of their wells in 2011 (referring to the practice as "mini-fracking"), the IDL reports that no permits for such well treatment activity were ever requested or granted (personal communication with James Thum, IDL Oil and Gas Program Manager, 8-10-16). The purpose of the well stimulation was reported to be to clean up highly porous conventional sand reservoirs in order to determine well production rates and optimal pipeline size (Oil and Gas Journal article dated 3-21-2011, entitled "Two Idaho gas-condensate fields to be developed"). Well stimulation is a common practice that has been employed by the oil and gas industry for vertical wells with little consequence for over 60 years. Hydraulic fracturing uses water, sand and small amounts of chemicals to release trapped fuels. According to the U.S. Department of Energy (DOE), more than 2 million wells have been hydraulically fractured to date and about 95 percent of new wells drilled today are fractured.

Technical information about the hydrocarbon resource discovered in the Willow and Hamilton Fields, such as Oil API gravity[2], gas/oil ratios, and gas characteristics, including Carbon Dioxide, Hydrogen Sulfide, Helium, and Natural Gas Liquid content, has not been released. Since the wells have only been producing for a few months and are located on private land, BLM is not privy to any production profiles the company has created.

According to a news release dated January 25, 2011, Bridge Resources Corp. disclosed that the total cost for drilling the initial 11 wells, including completion and testing, was $12 million. According to an op-ed article from the Idaho Department of Lands, released on January 6, 2016 and posted on the Idaho Petroleum Council website, the cost of constructing the pipelines was $35 million (Idaho Petroleum Council blog, "Unique Opportunity Ahead"). The total cost of development of the Willow Field has not yet been disclosed, however.

VII. Updated Oil and Gas Economic Outlook

Oil is currently trading at an eleven-year low, according to an article published on MSN MoneyWatch website on January 6, 2016 ("Brent[3] slides to 11-year low as Iran official warns of oil's 'biggest threat'"). The article reports that Brent Crude for February delivery dropped $1.57, or 4.3%, to $34.85 barrel, setting it on track for its lowest settlement price since the summer of 2004, according to FactSet data. A slowdown in the economic growth of China and tensions between Iran and Saudi Arabia, two prominent members of the Organization for the Petroleum Exporting Countries, are given as reasons for

[2] The American Petroleum Institute gravity, or API gravity, is a measure of how heavy or light a petroleum liquid is compared to water: if its API gravity is greater than 10, it is lighter and floats on water; if less than 10, it is heavier and sinks.

[3] A benchmark crude or marker crude is a crude oil that serves as a reference price for buyers and sellers of crude oil. There are three primary benchmarks, West Texas Intermediate (WTI), Brent Blend, and Dubai Crude (Wikipedia).

the low price. The article also reported that natural gas for February rose 0.1% to $2.33 per million British thermal unit, while gasoline for the same month sank 4.2% to $1.20 a gallon.

Future prices for natural gas are expected to remain flat, according to the U.S. Energy Information Administration (EIA), primarily due to the ample supply of natural gas and other hydrocarbons found in shale rock ("tight gas") formations across the North American continent that has transformed the U.S. energy market since 2005. Natural gas remains a good economic value as an energy source, especially when compared to its price levels of just a few years ago and to the price of substitute fuels like oil. This remains true even in the current environment of lower priced oil. In its 2008 Annual Energy Outlook, the EIA projected that the spot price of natural gas at the Henry Hub[4] would average $7.25 per thousand cubic feet (Mcf), or dekatherm (Dth)[5], in 2012. The actual average Henry Hub spot price for natural gas in 2012 was $2.75/Dth. The EIA currently forecasts the average annual spot price of natural gas to remain below $7/Dth through 2035.

Future demand for natural gas may grow, however, as the recently enacted Clean Power Plan is implemented. Adopted on August 3, 2015 pursuant to EPA's authority under the Clean Air Act, the Clean Power Plan is projected to reduce carbon emissions from existing power plants by 32 percent between 2005 and 2030, by establishing unique emission rate goals and mass equivalents for each state. One of the three potential pathways applied regionally to reduce Carbon Dioxide (CO_2) emissions is to increase power generation from lower-emitting natural gas[6] combined cycle plants, such as the Langley Gulch Power Plant. The Clean Power Plan envisions about a third of U.S. electricity coming from natural gas in 2030 (Center for Climate and Energy Solutions website, accessed 1-5-2016).

VIII. Updated Oil and Gas Occurrence and Development Potential

BLM uses the following ranking system for determining oil and gas potential (from BLM Manual H-1624-1, Planning for Fluid Mineral Resources):

> High Potential: Inclusion in an oil and gas play as defined by the USGS national assessment, or, in the absence of a play designation by USGS, the demonstrated existence of: source rock, thermal maturation, and reservoir strata possessing permeability and/or porosity, and traps. Demonstrated existence is defined by physical evidence or documentation in the literature.
>
> Medium Potential: Geophysical or geological indications that the following may be present: source rock, thermal maturation, and reservoir strata possessing permeability and/or porosity and traps. Geologic indication is defined by geological inference based on indirect evidence.
>
> Low Potential: Specific indications that one or more of the following may not be present: source rock, thermal maturation, or reservoir strata possessing permeability and/or porosity, and traps.
>
> No Potential: Demonstrated absence of (1) source rock, (2) thermal maturation, or (3) reservoir rock that precludes the occurrence of oil and/or gas. Demonstrated absence is defined by physical evidence or documentation in the literature.

[4] The Henry Hub is a distribution hub on the natural gas pipeline system in Erath, Louisiana, owned by Sabine Pipe Line LLC, a subsidiary of Chevron Corporation. Due to its importance, it lends its name to the pricing point for natural gas futures contracts traded on the New York Mercantile Exchange (NYMEX) and the OTC swaps traded on Intercontinental Exchange (ICE) (Wikipedia, 1-6-2016).

[5] An Mcf is a volumetric measure, while a Dth is a measure of energy content representing one million British Thermal Units (Btu). While the energy content of a Mcf varies according to a variety of factors, it is roughly equivalent to a Dth (typically 0.95 to 1.05 Dth per Mcf). Therefore the terms are often used interchangeably.

[6] Natural gas emits about 50% less carbon dioxide as coal when burned in power plants and 25% less than gasoline or diesel when used for vehicle fuel.

Based on the discovery of the Willow and Hamilton Fields, BLM is revising its assessment of the oil and gas occurrence and development potential in the planning area. The 2009 Four Rivers Planning Area Mineral Potential Report and RFDS did not identify any areas with high oil and gas potential in the planning area, since a resource with the necessary characteristics could not be demonstrated at that time. Since that time, however, it has been demonstrated through drilling and development that a commercially viable hydrocarbon resource exists in the area that includes the Willow and Hamilton Fields. Therefore BLM is upgrading that area from medium to high potential. BLM is expanding the high potential area beyond the field boundaries in areas where historic drilling records indicated natural gas "shows" or where the developer has generally indicated possible resources from its 3D seismic interpretation. BLM has also slightly expanded the medium potential area boundary, based on historic drilling records and a review of the available geologic literature. A revised Oil and Gas Potential map is included in this report (Figure 2).

IX. Updated RFD Scenario and Estimated Surface Disturbance

The 2009 RFDS described four phases of oil and gas exploration and development that are typical in developing an oil or gas field, and estimated the amount of surface disturbance that was anticipated over the life of the plan. These phases will again be described in this document, with updated information about the number of wells and acres of disturbance now anticipated, given the activities that have occurred since 2009.

Phase One: Geophysical Exploration

The 2009 RFDS anticipated that four to six geophysical exploration programs would be conducted over the next 20 years. Since then, at least 2 two-dimensional (2-D) seismic surveys and three three-dimensional (3-D) seismic campaigns have been conducted in the medium and high potential areas (https://www.idl.idaho.gov/oil-gas/regulatory/20160302_seismic_southwest_webmap.pdf, accessed 8-10-2016). BLM now anticipates that an additional ten (10) 3-D seismic surveys may be conducted over the life of the land use plan. These surveys may be conducted in areas identified as having low potential, but are unlikely to be conducted in areas of no potential. Geophysical techniques are often implemented to identify subsurface geologic structures and determine drilling targets. The BLM reviews and approves geophysical operations on federal lands on a case-by-case basis, and a lease is not necessary for such work.

Seismic reflection surveys are the most commonly used geophysical tool. A seismic survey is conducted by creating a shock wave – a seismic wave – on the surface of the ground along a predetermined line, using an energy source. The seismic wave travels into the earth, is reflected by subsurface formations, and returns to the surface where it is recorded by receivers called geophones – similar to microphones. The seismic waves are created either by small explosive charges set off in shallow holes ("shot holes"), or by large vehicles equipped with heavy plates ("Vibroseis" trucks) that vibrate on the ground. By analyzing the time it takes for the seismic waves to reflect off of subsurface formations and return to the surface, a geophysicist can map subsurface formations and anomalies and predict where oil or gas may be trapped in sufficient quantities for exploration activities. Both operations generally utilize a crew of 10 to 15 people with five to seven vehicles. Seismic surveys may be supported by aircraft.

The advent of 3-D seismic surveys has revolutionized the industry, by lowering finding costs and allowing exploration for reserves not locatable by other means. Currently, almost all oil and gas exploratory wells are preceded by 3-D seismic surveys. The basic method of testing is the same as for 2D, but instead of a single line of energy source points and receiver points, the source points and receiver points are laid out in a grid pattern across the property. The resulting recorded reflections received at each receiver point come from all directions, and sophisticated computer programs can analyze this data to create a three-dimensional image of the subsurface. Although dry holes have been

greatly reduced by 3D seismic technology, they have not been eliminated. The proper interpretation of 3-D data is a critical step in the process.

Based on the revised potential of the planning area, it is anticipated that ten additional geophysical exploration programs would be conducted over the next 20 years, to aid in identifying potential exploration drilling targets. It is likely that ATVs or other rubber-tired vehicles would be utilized, however no construction of roads would be required. While physical surface disturbance would be negligible, the multiple vehicles and presence of personnel in the area may temporarily disturb wildlife resources. Seasonal restrictions may be necessary to avoid conflicts with some sensitive wildlife.

Phase Two: Exploratory Drilling

The 2009 RFDS anticipated that six to ten exploratory wells would be drilled on federal minerals in the planning area, in order to test geologic targets. Based on the exploration and development activity that has occurred in the Willow and Hamilton Fields since 2009, BLM now anticipates that 20 exploratory wells would be drilled, roughly one per township regardless of land ownership, in the areas described as having medium or high development potential. There are roughly 20 townships in that area.

In order to drill an exploration well on federal lands, including split estate lands, a federal oil and gas lease must first be obtained. Leases are offered through competitive bidding, and may be subject to special stipulations to protect other resources that are not protected by the standard lease stipulations. A federal oil and gas lease can be for up to 2,560 acres in size, and has an initial term of ten years. Once a lease is in place, in order to drill a well, the lessee must submit an application for permit to drill (APD) on BLM Form 3160-3, submit a performance bond, and obtain BLM's approval. Each proposed APD must conform with Onshore Oil and Gas Order Number 1 and must be analyzed through the NEPA process, separate from the leasing analysis, to determine whether drilling at the proposed location would violate any federal laws. The BLM cannot approve an APD until the requirements of certain other laws and regulations including NEPA, the National Historic Preservation Act, and the Endangered Species Act, have been met. If those requirements cannot be met at the proposed location, the location may need to be changed to another site on the lease. In accordance with 43 CFR 3101.1–2, the BLM may require reasonable mitigation measures to ensure that the proposed operations minimize adverse impacts to other resources, uses, and users, consistent with granted lease rights. The BLM will incorporate any mitigation requirements, including Best Management Practices, identified through the APD review and appropriate NEPA and related analyses, as Conditions of Approval to the APD. A performance bond is required, to ensure there is adequate funding to properly plug the well and reclaim the site, in the event the operator or lessee is unable to do so. The BLM must approve the APD before the operator may begin any surface-disturbing activity. Operations on the lease must be consistent with federal regulations at 43 CFR 3160.

Oil and gas drilling requires construction of a drill pad to accommodate the drill rig and equipment. While Alta Mesa's drill pads have been smaller, BLM assumes a drill pad size of 2.5 acres (300' x 350') for the purposes of this report. In order to obtain a level pad, cut and fill of the site may be required. BLM requires the operator to first remove topsoil from the well pad site and store it on site for future reclamation. It may be necessary to haul in gravel from an off-site source to construct the pad. In addition to accommodating the drill rig, the well pad may house a reserve pit for storage or disposal of water, drill mud, and cuttings; several mud pits and pumps, a tool shed, drill pipe rack, a fuel tank, a water tank, a generator and several compressors, equipment storage, and several trailers for temporary lab and office quarters. Depending on the contents of the reserve pit and environmental sensitivity of the site, the pit may be lined or unlined. Site preparation and construction typically takes 7 to 14 days to complete.

Temporary roads would likely be needed to transport and maintain the drill rig and other heavy equipment. Either existing roads would be improved, or new roads would 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 disturbance width of about 40 feet. It may be necessary to haul in gravel to obtain a good road base, as well as a base for the well pad. Roads used to access well sites are rarely permanent, and exist only as long as necessary to complete exploration and production operations. Based on the road density in the planning area, it is assumed that access to the drill pads may require up to one mile of road construction or improvement. Surface disturbance from construction of one mile of 40-foot wide road equals about 5 acres. After the well is drilled, it is assumed that most of the roads would be reduced in width to 20 feet, thereby reducing the long-term surface disturbance by half.

Getting the rig and ancillary equipment to the site typically requires 2 to 3 days of 15 to 20 trips by full-sized tractor-trailers, with a similar amount for de-mobilizing the rig. There would be 10 to 40 daily trips for commuting and hauling in equipment. A drilling operation generally has from 10 to 15 people on-site at all times, with more people coming and going periodically with equipment and supplies. Drilling operations would likely occur 24 hours a day. Each of Alta Mesa's wells took approximately 5 to 7 days per well to drill, and an additional 3 to 5 days to complete (Alta Mesa presentation to IDL, November, 2015).

Well drilling also 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. Initially, water would need to be provided, either by wells or trucked in, to meet demands. Many oil or gas wells encounter water at depth when drilling for oil and/or gas, as it may be part of the oil and gas reservoir. This produced water is considered a waste product and must be properly disposed of. Any water rights required on federal lands would need to be filed in the name of the BLM.

Exploration holes can range in depth from a few thousand feet to tens of thousands of feet, but in southwest Idaho would probably be 4,000 to 7,000 feet deep. Oil and gas wells are generally about 18 inches in diameter at the surface, then narrow (telescope) to 5½ inches at the bottom of the well. In order to drill these deep, large-diameter holes, a large drilling rig is required. While deeper wells may require a rig with a derrick that stands as high as 155 feet above the ground surface, the rigs used to drill the wells in southwest Idaho have been smaller, with a derrick height of around 105 feet (personal communications with James Thum, IDL Oil and Gas program Manager, 8-10-2016). These rigs are typically equipped with diesel engines, fuel and drilling mud storage tanks, mud pumps, and other ancillary equipment. Blow-out prevention equipment would be utilized while drilling, to prevent uncontrolled flow at the surface if a pressurized thermal pocket is encountered.

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 with drilling mud placed in the space between plugs. When abandonment is complete, the site is reclaimed, which includes pad and road recontouring, topsoil replacement, and seeding with approved mixtures. Erosion control measures would be incorporated into the reclamation design as needed.

The drilling site could be active for approximately one year, from the start of drill pad and access road construction; through drilling and well testing; to completion of plugging the hole and reclamation. Total surface disturbance expected from the drilling of twenty exploratory wells would be up to 150 acres.

Phase 3: Field Development and Production

In the 2009 RFDS, BLM assumed that only one of the exploration wells would potentially encounter hydrocarbons in sufficient quantities to warrant field development, resulting in the development of a five-well field. BLM now anticipates eleven (11) of the 20 wildcat (exploratory) wells drilled would result in "discoveries" of commercial quantities of oil or gas. Given the discoveries already made in the

high potential area, BLM now assumes that 5 wildcat wells of the seven drilled in the high potential area would encounter commercial quantities of natural gas, while two wells would be "dry" (no economically producible oil or gas discovered). Given the general success rate for exploratory drilling based on 3D seismic surveying of 50% (Bohi 1998), BLM assumes that 6 wildcat wells in the medium potential area would encounter commercial quantities of natural gas, while seven wells would be dry. The nine (9) dry wells would be plugged and abandoned soon after testing, and the associated well pads and access roads would be recontoured and re-seeded within one year.

If a producible quantity of oil or gas is discovered, additional development wells would be drilled to confirm the discovery, establish the limits of the field, and drain the field. Most states have well spacing requirements, in order to prevent waste of the resource and to protect the correlative rights of adjacent mineral owners. Well spacing is based on the aerial extent that a single well could drain (the volume) from a reservoir. Depending on the geologic structure, the size of the reservoir, and whether it is oil or gas, well spacing could be as small as 10 acres or as large as 640 acres. In Idaho, well spacing for natural gas is generally 640 acres, while default well spacing for oil is 40 acres. Exceptions may be granted by the Idaho Oil and Gas Conservation Commission on a case-by-case basis, based on geologic evidence.

For each of the eleven (11) discovery wells, BLM estimates that an average of 10 development wells would be drilled to drain each field. Development wells are drilled to establish the boundaries of an oil and gas field and to efficiently drain it. It is estimated that, on average, 7 of the development wells would be capable of production for each discovery well, while the other 3 development wells would likely be plugged and abandoned. Therefore, in addition to the twenty wildcat wells drilled, BLM now estimates that up to 110 development wells would be drilled in the planning area over the life of the Four Rivers RMP, disturbing an additional 825 acres. Thirty-three (33) development wells would be plugged and abandoned. Based on the size of the producing area of the Willow Field, it is assumed that each field would be roughly 9 square miles in size. In total, exploration and development of 11 natural gas fields- 5 in the high potential area and 6 in the medium potential area- would result in 88 producing wells, resulting in surface disturbance of 660 acres.

This estimated well count and surface disturbance estimate is made regardless of land ownership. The land ownership pattern in the medium to high potential area is a mixture of federal lands (including both private and BLM surface), State of Idaho lands, and privately owned lands. Lands with federal mineral estate (including private surface and BLM surface) make up roughly 25% of the medium to high potential area, while fee lands (lands where the surface owner also owns the mineral estate) make up approximately 70%, and lands with State-owned oil and gas make up around 5% of the medium to high potential area. Applying these percentages to the number of wells and surface disturbance that could occur on federal minerals, BLM anticipates 22 wells would be drilled on federal minerals, resulting in surface disturbance of approximately 165 acres. Over half that surface disturbance is anticipated to occur on split estate lands (private surface, federal minerals). Once a field is developed, it is typical that unneeded portions of drill pads are recontoured and reclaimed, and roads are pulled back to the minimum width needed for access of smaller vehicles and for well maintenance.

Phase Four: Abandonment

If paying quantities of oil and gas are not discovered, or at the end of the producing life span of a producing well or field, the operator is required to plug the well according to Federal and State standards and reclaim the disturbed areas. To plug a well, cement plugs are placed above and below water-bearing units with drilling mud placed in the space between plugs. When well abandonment is complete, equipment and surface facilities are removed, and the site is reclaimed. In a producing field, underground pipelines are often plugged and left in place in order to avoid re-disturbing these areas. Site reclamation includes pad and road obliteration and recontouring, topsoil replacement, and seeding

with approved mixtures. Erosion control measures would be incorporated into the reclamation design as needed.

Plans for surface reclamation must be designed to return the disturbed area to productive use and to meet the objectives of the land and resource management plan. While the State of Idaho requires reclamation to be completed within 12 months of well completion (IDAPA 20.07.02.510.01), Federal Oil and Gas Onshore Order Number 1 requires that earthwork for interim and final reclamation be completed within 6 months of well completion or well plugging (weather permitting). All pads, pits, and roads must be reclaimed to a satisfactorily revegetated, safe, and stable condition, unless an agreement is made with the landowner, in a split estate situation, to keep the road or pad in place. Pits containing fluid must not be breached (cut) and pit fluids must be removed or solidified before backfilling. Pits may be allowed to air dry subject to BLM approval, but the use of chemicals to aid in fluid evaporation, stabilization, or solidification must have prior approval. Seeding or other activities to reestablish vegetation must be completed within an approved upon time period. Upon completion of reclamation operations, the lessee or operator is required to notify the BLM using Form 3160–5, Final Abandonment Notice, when the location is ready for inspection. Final abandonment will not be approved until the surface reclamation work required in the Surface Use Plan of Operations or Subsequent Report of Plug and Abandon has been completed to the satisfaction of the BLM.

BLM anticipates 42 wells (9 dry exploratory wells and 33 development wells) would be plugged and abandoned and the site reclaimed within one year of drilling, temporarily disturbing 315 acres.

X. Conclusion

BLM estimates that a total of 130 wells would be drilled in the planning area, regardless of land ownership, disturbing up to 975 acres of land, over the 20 year life of the land use plan. This activity would occur primarily in 11 natural gas fields in 11 townships. Each field is anticipated to be roughly 9 square miles in size. A total of 42 wells- 9 exploration and 33 development wells- are expected to be dry, and would be plugged and abandoned, and 315 acres of drill pads and access roads would be reclaimed within a year of drilling.

Of the 660 acres of disturbance resulting from the drilling of 88 producing wells, close to half would be reclaimed by reducing the footprint of drill pads and access roads after drilling. BLM anticipates 22 of the producing wells would be drilled on lands with federal minerals, resulting in short-term surface disturbance of approximately 165 acres, and long-term surface disturbance of approximately 90 acres.

REFERENCES

Bohi, 1998, Changing Productivity in U.S. Petroleum Exploration and Development. Accessed 12/17/2015 http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-98-38.pdf

Bond, J.G., Kauffman, J, Rember, and Shiveler, 2011, "Weiser Basin Evaluation", prepared by Geoscience Research Consultants for CENEX Exploration and Production, Idaho Geological Survey Technical Report 11-1.

Center for Climate and Energy Solutions website, accessed 1-5-2016 http://www.c2es.org/federal/executive/epa/q-a-regulation-greenhouse-gases-existing-power

Idaho Department of Lands website, accessed 01-04-2016 and 8-10-2016 http://www.idl.idaho.gov/oil-gas/regulatory/well-permits/index.html

Idaho Geological Survey website, accessed 12/24/2015, http://www.idahogeology.org/services/Oilandgas/

Idaho Petroleum Council website, accessed 01/07/2016, "Unique Opportunity Ahead," http://idahopetroleumcouncil.com/oil-and-gas-conservation-commission-ogcc-op-ed-submission

Idaho Power website, accessed 1-6-2016, https://www.idahopower.com/pdfs/NewsCommunity/news/customerConnection/201208.pdf

Newton, V.C. and Corcoran, R.E., 1963, Petroleum Geology of the Western Snake River Basin, Oregon-Idaho, State of Oregon Department of Geology and Mineral Industries Oil and Gas Investigations No. 1.

Northwest Gas Association website, www.nwga.org, accessed 1-5-2016.

Peterson, J. A., 1995, Idaho-Snake River Downwarp Province (017), *in* Gautier, D. L., Dolton, G.L., Takahashi, K.I., and Varnes, K.L., ed., 1995 National assessment of United States oil and gas resources--Results, methodology, and supporting data: U.S. Geological Survey Digital Data Series DDS-30, Release 2. *http://certmapper.cr.usgs.gov/data/noga95/prov17/text/prov17.pdf*

Ratchford, Michael Ed, and Stanford, 2014, "Southwestern Idaho Natural Gas Play," Digital Web Map-172, Idaho Geological Survey.

U.S. Department of Energy, Natural Gas From Shale: Questions and Answers, April 2013

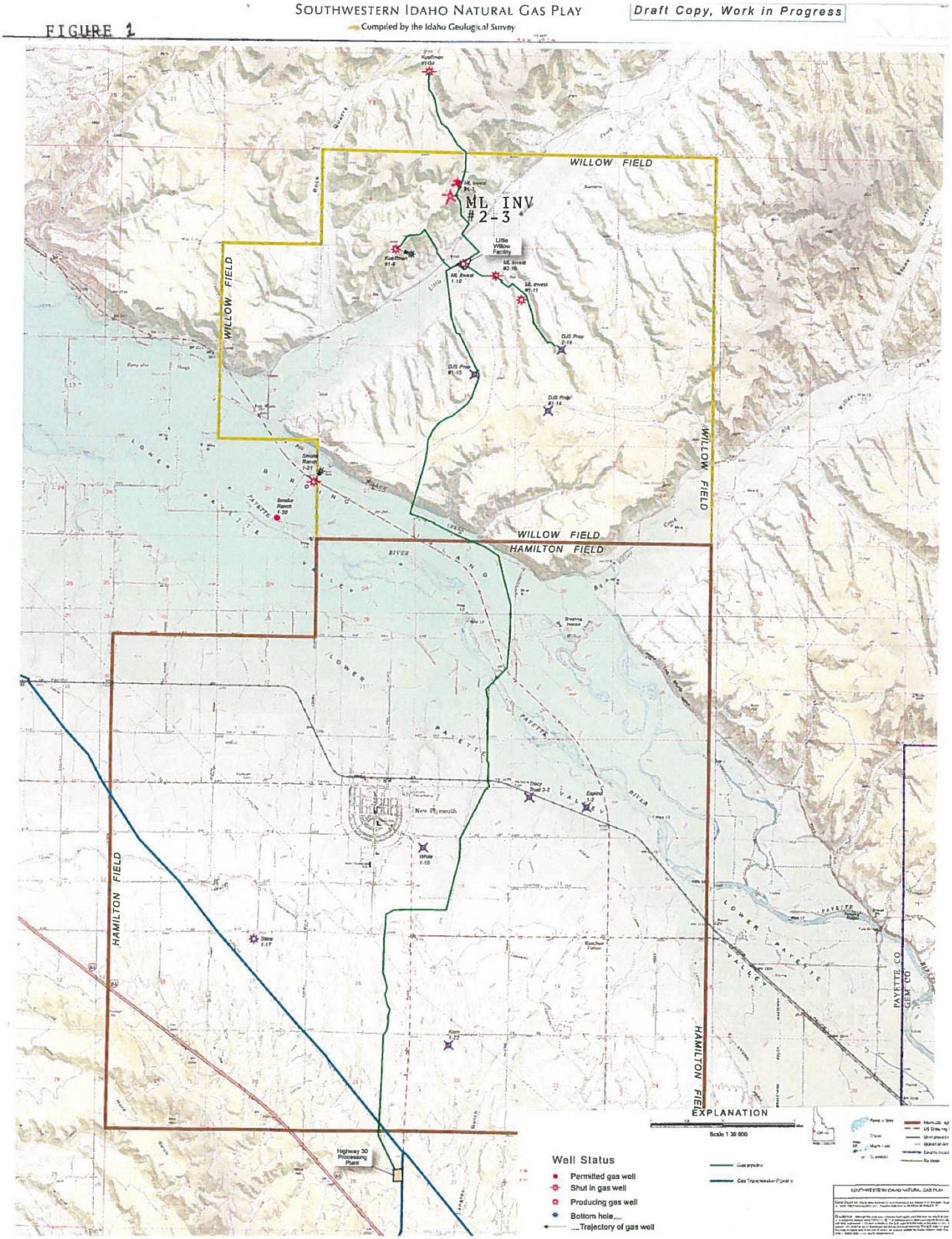
Williams Northwest Pipeline website, accessed 1-8-2016, http://co.williams.com/operations/west-operations/northwest-pipeline/

XI. Figures

Figure 1- Southwestern Idaho Natural Gas Play, Idaho Geological Survey, DWM-172, created by Ratchford and Stanford, 2014

Figure 2- Four Rivers Planning Area Oil and Gas Potential Map

FIGURE 1


SOUTHWESTERN IDAHO NATURAL GAS PLAY
Compiled by the Idaho Geological Survey
Draft Copy, Work in Progress
WILLOW FIELD
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WILLOW FIELD
WILLOW FIELD
HAMILTON FIELD
HAMILTON FIELD
HAMILTON FIELD
Little Willow Facility
Highway 30 Processing Plant
New Plymouth
PAYETTE CO
GEM CO
EXPLANATION
Scale 1 30 000
Well Status
Permitted gas well
Shut in gas well
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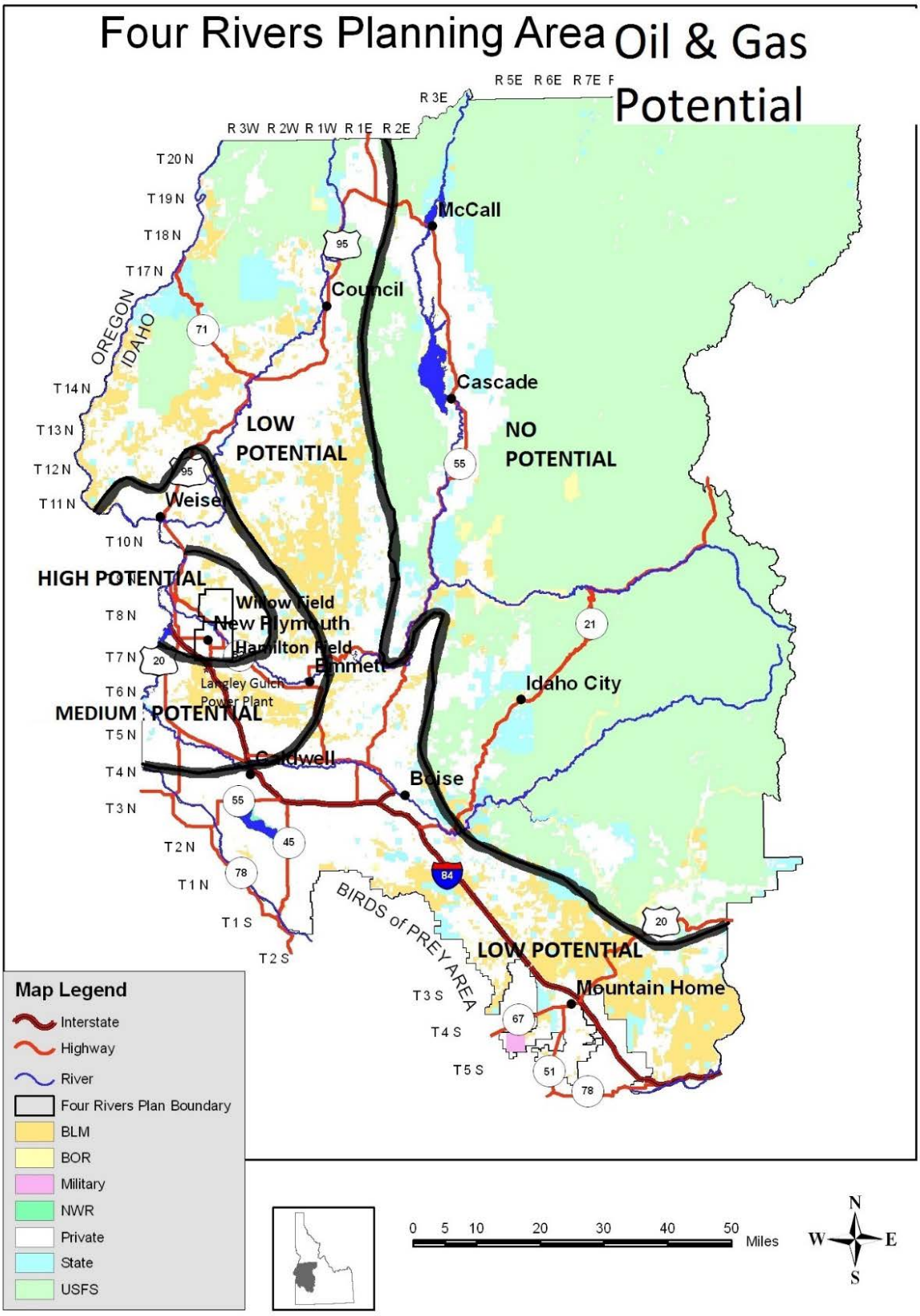
Bottom hole,...
...Trajectory of gas well

Figure 2-


Four Rivers Planning Area Oil & Gas Potential
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Council
Cascade
Weiser
Willow Field
New Plymouth
Hamilton Field
Emmett
Langley Gulch Power Plant
Idaho City
Caldwell
Boise
Mountain Home
LOW POTENTIAL
NO POTENTIAL
HIGH POTENTIAL
MEDIUM POTENTIAL
LOW POTENTIAL
BIRDS of PREY AREA
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Map Legend
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River
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ATTACHMENT 2

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO FOR GEOTHERMAL DEVELOPMENT IN THE FOUR RIVERS FIELD OFFICE

Prepared by: Karen Porter, BLM Idaho State Office Geologist

SUMMARY

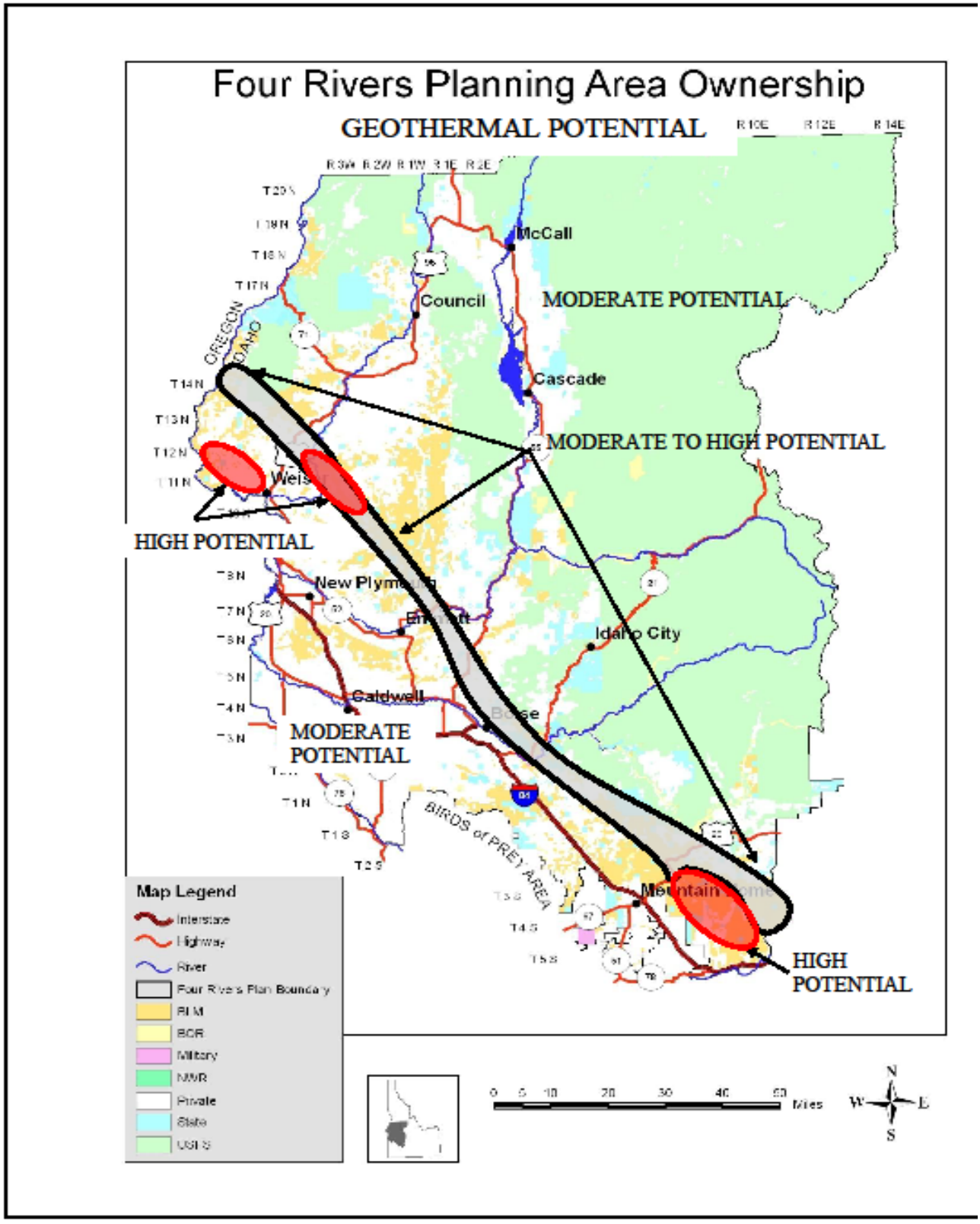
Based on the geology of the Four Rivers Field Office (i.e., the planning area), the presence of numerous hot springs and wells, the presence of several former Known Geothermal Resource Areas (KGRAs), and a review of the available data collected and technical reports written on the area, it has been determined that all the lands within the planning area have at least moderate potential for the discovery and/or development of a geothermal resource for both indirect use (i.e., commercial generation of electricity) and direct use (i.e., use of the resource for other purposes). The lands which lie along a northwest-trending fault system that runs from east of Mountain Home to the Oregon border, are determined to have moderate to high potential for indirect use (i.e. power generation), while three specific areas along the fault system are determined to have high potential for indirect use (see map, Figure 1). These include the Crane/Cove Creek area, lands west of Weiser near Weiser Hot Springs, and lands east of Mountain Home at the base of the Mount Bennett Hills. The remaining lands in the planning area are determined to have moderate potential for indirect use. These conclusions are described in more detail in the Geothermal Potential Report prepared for the area (BLM 2010b).

Based on the geothermal potential for the planning area, it is reasonable to assume that a 50 MW plant might be developed in those areas determined to have high potential for indirect use. It is reasonable to assume that a 20-MW geothermal power plant might be developed anywhere along the northwest-trending fault zone, particularly on the southwest (valley) side of the fault zone, over the 20-year life of the plan. Cumulative disturbance associated with development of a 50 MW plant is anticipated to be between 147 and 181 acres, while disturbance associated with developing a 20 MW plant is anticipated to be between 60 and 75 acres. This development includes the construction of drill pads to support the drilling of 20 temperature-gradient wells and 25 production and injection wells, road construction, power plant development, and pipeline and transmission line construction. Much of this disturbance would be reclaimed after each phase of development, such that once the power plant is operational, the actual disturbance would be considerably less than the cumulative total. Development is likely to occur in stages, however this is not always the case. Surface disturbances associated with direct use activities are expected to be much less than those anticipated for indirect use.

INTRODUCTION

This report, describing a Reasonably Foreseeable Development Scenario (RFDS), accompanies the Geothermal Potential Report (BLM 2010c) prepared for the planning area. The RFDS describes the anticipated level of exploration and development activity associated with geothermal leasing. These projections are necessary for assessing the anticipated impacts of geothermal development-related activity in the Environmental Impact Statement (EIS) for the Four Rivers Resource Management Plan (RMP); for determining which lands within the planning area will be available for geothermal leasing; and for determining what stipulations may be necessary to attach to leases in order to protect surface resources. These anticipated impacts are for the BLM-administered public lands described above over the next 20 years.

Figure 1- Geothermal Potential Map



REASONABLY FORESEEABLE DEVELOPMENT SCENARIO: GENERAL ASSUMPTIONS

The general assumptions and descriptions of the phases of development that follow are based on the geothermal potential in the Four Rivers Field Office. This Reasonably Foreseeable Development Scenario (RFDS) was adapted from the Final Programmatic Environmental Impact Statement (PEIS) for Geothermal Leasing in the Western U.S., released in October 2008 (BLM and USFS 2008), and applied to the local conditions and mineral potential of the planning area. The RFDS primarily describes the development of the resource for the commercial generation of electricity, termed "indirect use"; however, geothermal resources also can be utilized directly. Direct uses are briefly described at the end of this RFDS.

Table 1 provides the estimated acreage of land disturbance that would be anticipated for exploration and development of a geothermal resource, over the life of the RMP. The actual area of disturbance varies depending upon site conditions and the size of power plant being constructed. Acreages are not provided for the Reclamation and Abandonment phase since this phase involves the return of previously disturbed lands to their existing conditions. Much of the land would be reclaimed after each phase of the initial exploration, drilling, and construction. For example, once wells are drilled, the well pad would be reduced to a minimum size and the pad reclaimed. Therefore, the actual amount of land occupied during the utilization phase would be less than the total cumulative acreage.

A typical development generally requires several leases and/or the use of private or other adjacent lands. The wells need to be spaced adequately so that they don't drain each other, and so that injection wells can be placed such that they don't interfere with production. The details of each phase of development are described in the section following the table. The information below is based on the Programmatic EIS for Geothermal Leasing (BLM 2008g) and is adjusted for local conditions, such as proximity to roads and power lines, in the planning area.

Table 1. Surface Disturbance Anticipated for a 50-MW Power Plant in the Four Rivers Field Office

Development Phase	Disturbance Estimate
Exploration	
Geologic mapping	negligible
Soil surveys	30 square feet[a]
Gravity and magnetic surveys	negligible
Seismic surveys	negligible
Resistivity surveys	negligible
Shallow temperature measurements	negligible
Road/access construction for temperature gradient wells	1 - 6 acres
Temperature gradient well pads	1 - 5 acre[b]
Total Exploration Disturbance	**2 - 11 acres**
Drilling and Utilization	
Drill pads	87.5 acres[c]
Road improvement/construction	6 acres[d]
Power plant construction	25 acres[e]
Installing wellfield equipment including pipelines	20 to 40 acres[f]
Installing transmission lines	5-10 acres[g]
Well workovers, repairs and maintenance	negligible[h]
Total Development and Utilization Disturbance	**145 to 170 acres**
TOTAL CUMULATIVE DISTURBANCE for 50 MW plant	**147-181 acres**
TOTAL CUMULATIVE DISTURBANCE for 20 MW plant	**60 to 75 acres**

[a] Calculated assuming 10 soil gas samples, at a disturbance of less than three square feet each.
[b] Calculated assuming an area of disturbance of up to 0.05 to 0.25 acre per well and 20 T-G wells.

[c] Calculated assuming a 50-MW power plant requires about 25 well pads, at 3.5 acres (approx. 400' x 400') each, to support 15 production wells and 10 injection wells. Does not assume multiple wells located on a single well pad.
[d] Assumes 0.25 miles of road per well (25 wells). Estimates 30-foot wide surface disturbance for an 18-20 foot road surface, including cut and fill slopes and ditches.
[e] Based on an average of 25 acres of disturbance per 50 MW power plant. Power plant likely to be located on private land.
[f] Pipelines from well to plant assumed to be one-quarter to one-half mile long on average, for a total of 6 to 12 miles of pipeline in length, with a 25-foot-wide disturbance corridor.
[g] Transmission line from power plant to power grid assumed to be 1 to 2 miles long, 40-foot-wide construction corridor (this would likely be located on private land).
[h] Disturbance would be limited to previously disturbed areas around the well(s).

TYPICAL PHASES IN GEOTHERMAL DEVELOPMENT

This RFDS for geothermal resource use describes four sequential phases: (1) exploration, (2) drilling, (3) field development and utilization, and (4) reclamation, plugging, and abandonment. The success or failure of each phase affects the implementation of subsequent phases and, therefore, subsequent environmental impacts. The general assumptions and descriptions of the geothermal development are intended to be used in support of the Four Rivers RMP revision, to analyze future environmental impacts that may result from the issuance of Federal geothermal leases, and to identify areas that may require additional stipulations to the standard lease form to protect other resources, if those lands are nominated for leasing in the future. These anticipated impacts are for the BLM-administered public lands described above over the next 20 years. The EIS written in association with the RMP revision analyzes the leasing decision; however, additional site-specific NEPA analysis will be conducted for each phase of geothermal resource development activity. Additional Conditions of Approval may be developed and attached to these permitted activities.

Phase One: Geothermal Resource Exploration

Before geothermal resources are developed, a geothermal resource developer explores for evidence of geothermal resources on leased or unleased land. Exploration activities may involve some ground disturbance but does not include the direct testing of geothermal resources or the production or utilization of geothermal resources. Exploration operations include, but are not limited to, conducting geophysical and/or geochemical surveys, and drilling temperature gradient wells. A geothermal lease is not required to conduct exploration activities; however, an exploration permit is required from BLM (see 43 CFR 3250 for regulations pertaining to geothermal exploration operations).

Usually, the first, on-the-ground step in exploration is to conduct geophysical prospecting or surveying. This exploration method consists of collecting and interpreting electrical, gravitational, magnetic, thermal, and/or seismic data to identify underground structures favorable for the occurrence of a geothermal resource. Geophysical surveying is a relatively inexpensive method of indirectly exploring the sub-surface of a relatively large area for a mineral resource, and results in relatively minor disturbance to surface resources. Once the data are compiled, geologists and geophysicists examine the data and make inferences about where the higher temperature anomalies may occur and whether other geologic conditions, such as porosity and faulting, are present. These conditions can indicate the location of potential underground geothermal reservoirs capable of supporting commercial uses.

Resistivity surveys involve laying out long cables (up to 1,000 feet or more) on the land surface, or setting up equipment repeatedly in small areas (a few tens of square feet at the most for each measuring site). Minor, temporary disturbances are associated with each site for the burial of sensors.

While not widely used for geothermal surveys, seismic surveys have the greatest impact on the local environment. These surveys typically involve setting up an array of geophones and creating a pulse or series of pulses of seismic energy. The pulse is created either by detonating a small charge below the ground surface (requires drilling a narrow "shot hole", usually by hand) or by a vibroseis truck that is

driven through the survey area. Data is transmitted from the geophones to a central location. The geophones may be installed on the ground's surface, in small excavations made specifically for burying the geophones, and/or in existing wells. These surveys are typically undertaken over the course of a few days. No road building is required for this type of activity.

Geochemical surveying, such as collecting and analyzing water samples from hot springs, can also be used to determine the subsurface characteristics of a particular area. In some cases, gas collectors may be installed to measure soil gases. These collectors have partially buried sensors and may disturb small areas of less than three square feet.

Access requirements for geophysical and geochemical surveying can generally be met by the use of existing roads or trails, cross-country travel using all-terrain vehicles, or by foot. While very little surface disturbance is associated with these surveys, the survey crew, usually consisting of two to four personnel, may be walking or moving through a fairly large area for several days.

The second step of the exploration phase is to drill temperature gradient wells. A gradient well can provide additional information to determine a more precise location of above-normal temperature gradients; however, the geothermal resource is not directly accessed or utilized. Temperature gradient wells can be drilled using a truck-mounted rig, and range from 200 feet to over 4,000 feet deep. The number of gradient wells drilled varies, depending on the geometry of the system being investigated and the anticipated size of the geothermal reservoir, but usually 5 to 15 holes might be expected for a given project, with a drill hole density of approximately one hole per quarter section (160 acres). Geologists examine either rock fragments or long cores of rock that are brought up from the bottom of the well as it is being drilled. Water samples are taken from any groundwater encountered during drilling. Temperatures are measured at various depths. Both well temperatures and the results of rock sample analyses are used to determine if additional drilling is worthwhile to identify the presence and characteristics of an underground geothermal reservoir. After collecting the desired samples and data, the wells are plugged and abandoned in accordance with State and Federal requirements.

Figures 1and 2 are photographs of temperature gradient drilling activities at Crane Creek that occurred in the fall of 2009. These photographs illustrate the type of equipment used and the typical level of disturbance that can be expected at each drill site.

Most temperature gradient wells are drilled with a small rotary rig (often truck-mounted, as seen above), similar to that used for drilling water wells, or a diamond-coring rig, similar to that used for geologic sampling in mineral exploration and civic works projects. The mast of the drill rig is approximately 60 feet tall. Support equipment is needed, including a water truck, small tanks for mixing and holding drilling fluids, personnel and supply transport vehicles, and sometimes a backhoe for earthmoving activities needed to prepare the drilling site. During exploration, a driller is not permitted to produce any geothermal fluids out of, or inject any fluids into, the well; therefore, the site may also host a sump (as seen in Figure 2) or tanker truck. Additionally, a diesel generator may also be used at the site to power equipment. A temperature gradient drilling operation can be run by about three on-site personnel and others traveling to the site periodically with materials and supplies.

Temperature-gradient well drilling requires road access. Whenever possible, a driller would access the temperature gradient well site using existing roads. When existing roads are not available, temporary access roads may need to be constructed for the truck-mounted rig to reach the site, possibly disturbing 1 acre (for 0.25 miles of 30-foot wide road) to 6 acres (1.5 miles). Given the road density in the planning area, it is assumed that an average of one-half mile (2 acres) of temporary access road would be required per temperature gradient well.

Figure 1. Temperature Gradient Drill Rig at Crane Creek, Fall 2009

Figure 2. Temperature Gradient Drill Rig at Crane Creek, Fall 2009

Drilling a temperature-gradient well generally does not require construction of a well pad or earth-moving equipment unless the site is steeply sloping. Preparing the site for drilling may include leveling

the surface and clearing away vegetation (this was not necessary at the site above, since the site was level). The well site itself involves excavation of a small cellar (typically less than three feet square and less than three feet deep) to allow the conductor casing to be set beneath the rig. It is assumed that up to 0.25 acres of disturbance would occur per drill site. Drilling takes from several days to several weeks per hole. Several temperature gradient wells are usually drilled to determine both the areal extent of the temperature anomaly and where the highest temperature gradient occurs. It is assumed that 20 TG wells would be drilled over the life of the plan.

Temperature gradient wells are not intended to directly contact the geothermal reservoir, and therefore produce no geothermal fluids. In areas of known artesian pressures, any drilling expected to penetrate the groundwater table would be required to include blow-out prevention equipment. In cases where a temperature gradient well does penetrate a geothermal zone, any release of geothermal fluids at the surface is likely to be minimal due to the small well diameters and the use of blow-out prevention equipment, or by limiting drilling to a temperature threshold (i.e. drilling must cease if temperatures over 120° F are encountered).

Drilling fluids may include drilling mud (bentonite clay, activated montmorillonite clay and crystalline silica-quartz), drilling mud additives (caustic soda, sodium bicarbonate, or anionic polyacrylamide liquid polymer), cement (Portland cement and calcium chloride), fuel (diesel), lubricants (usually petroleum-based) and coolants. The specific fluids and additives depend on a variety of factors, including the geologic formations being penetrated and the depth of the well. Releases of drilling muds are not permitted. A sump and tanker trucks are required to capture all fluids. The risk of spills of other fluids is similar to that of any other project involving the use of vehicles and motorized equipment.

All surface disturbances would be reclaimed to the satisfaction of BLM. Once drilling is completed, the temperature gradient well would be plugged and abandoned in accordance with BLM and State requirements. Site reclamation includes removing all surface equipment and structures; re-grading the site to blend into the surrounding landscape and prevent erosion; and replanting vegetation with a seed mix approved by BLM, to facilitate natural restoration of the site.

Phase Two: Drilling Operations

Once exploration has indicated a viable prospect and necessary leases have been secured, the drilling of large-diameter wells can proceed, in accordance with 43 CFR 3260 regulations. Unlike temperature gradient wells, these wells tap the geothermal resource and are capable of being fitted for production; however, they are initially used to test the reservoir for commercial development. Multiple wells may be drilled per lease. Each well requires an approved Geothermal Drilling Permit. A Drilling Plan and an Operations Plan are also required (one Plan can be submitted for multiple wells). NEPA analysis is conducted to determine whether the drilling locations are appropriate and whether Conditions of Approval, attached to the Drilling Permit, are required in addition to the lease stipulations. A bond is required. Drilling operations include drilling large-diameter production wells, flow testing of the wells, producing geothermal fluids for chemical evaluation, and injecting fluids back into the geothermal reservoir. This would also involve the construction of sumps or pits on the well pad, to hold excess geothermal fluids. It could involve development of minor infrastructure to conduct such operations.

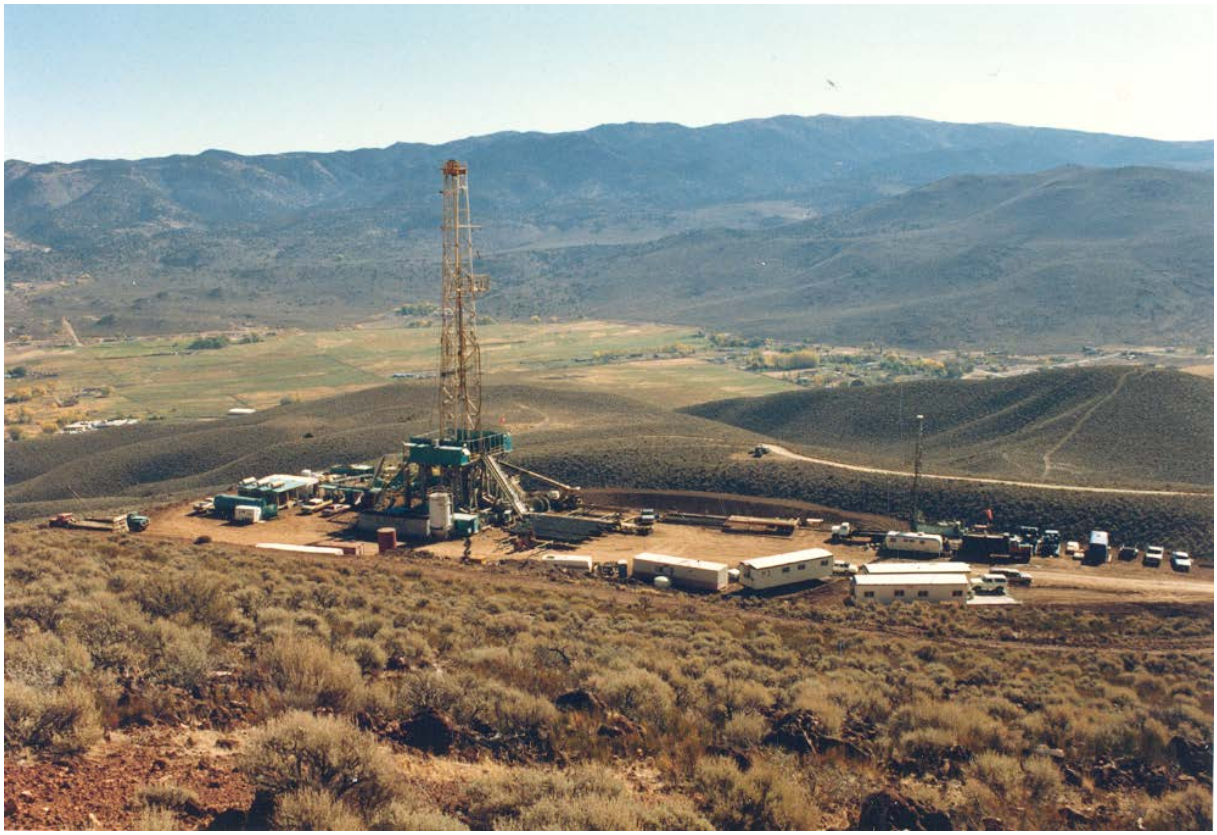
Access roads capable of supporting large drill rigs would be required. Given the road density in the planning area, it is assumed that 0.25 miles of new road would be constructed per well on average (total of 6.25 miles for a 50 MW prospect). Depending on the type and use-intensity of the road, the areas of surface disturbance is about 30-feet wide for an 18-20 foot wide road surface, including cut and fill slopes and ditches.

Construction of a well pad is required for drilling a production well. The size of the well pad is dependent upon site conditions and on the number of wells per pad, but they are typically about 3.5 acres (400 x 400 feet) for one well. The well pad needs to be of sufficient size to safely accommodate

drilling activities and various temporary support facilities such as generators, mud tanks, cement tanks, trailers for the drillers and mud loggers, housing trailers, and storage sheds. Each well pad would be fenced around the perimeter to prevent access by unauthorized persons, wildlife, or livestock during the duration of the drilling operation. If the drilling site is not located on level ground, minor cut and fill may be required. Gravel may be required to stabilize roads and pads and provide for drainage.

After a well pad has been constructed and support facilities have been assembled, production wells would be drilled using a geothermal (or oil and gas) drill rig (Figure 2). Production-size wells can be over 2 miles (10,560 feet) deep. The wells narrow (telescope) in diameter from 30 inches at the surface to 12 inches at the bottom of the well. In order to drill these deep holes, a large drilling rig would be erected. The top of the drill rig derrick could be as much as 155 feet above the ground surface, and the rig floor could be at least 25 feet above the ground surface. These rigs are typically equipped with diesel engines, fuel and drilling mud storage tanks, mud pumps, and other ancillary equipment. Blow-out prevention equipment would be utilized while drilling to prevent uncontrolled flow at the surface if a pressurized thermal pocket is encountered.

Figure 2. Typical Drill Rig for Drilling Production Wells



Getting the rig and ancillary equipment to the site may require 15 to 20 trips by full-sized tractor-trailers, with a similar amount for de-mobilizing the rig. There would be 10 to 40 daily trips for commuting and hauling in equipment. Drilling operations would likely occur 24 hours a day and seven days a week. It takes approximately one month to drill one well. A drilling operation generally has from 10 to 15 people on-site at all times, with more people coming and going periodically with equipment and supplies.

Geothermal fluid production and associated waste production (drill cuttings and waste drilling mud) is likely to occur for short periods, as wells are tested to determine reservoir characteristics. Excess geothermal fluids are either re-injected into a previously drilled well, if available, or are stored in

temporary pits or sumps, generally lined with a synthetic liner (permeability less than 10^{-7} cm/sec) or an impermeable clay liner. The water in the pit is left to evaporate and any sludge is removed and properly disposed of. The rate of fluid production from a geothermal reservoir is unknown until the development testing phase is completed.

During the initial stages of testing, one well is likely to be tested at a time. If testing is successful and the well and reservoir are sufficient for development, wellheads, valves, and control equipment would be installed on top of the well casing so that the wells can be utilized for production. The size of the well pad would be reduced to the minimum necessary for production, and the area reclaimed. If a production well is unsuccessful, it may be used for injection of fluids from other wells. If not necessary for either production or injection, the well would be plugged and abandoned in accordance with State and Federal requirements, and the site would be reclaimed by recontouring the well pad and seeding with an approved seed mix. Those roads that are no longer needed would be reclaimed.

Phase Three: Field Development and Utilization

Utilization of the geothermal resource is the final phase of development, if a viable reservoir is determined and a power purchase agreement can been secured. Utilization requires the applicant to secure a site license and construction permit from BLM, in accordance with regulations at 43 CFR 3270. An EIS may be required for the construction of a power plant on Federal lands.

It is likely that the existing production wells would be used, although additional drilling to expand and develop the well field may be required. The number of wells is dependent upon the geothermal reservoir characteristics and the planned power generation capacity. Based on the geothermal potential in the planning area, it is assumed that a 50-MW power plant would be developed, with 15 production wells and 10 injection wells. It is likely that a plant of this size would be developed in stages over a period of time. The utilization phase could last from 10 to 50 years and involves the operation and maintenance of the geothermal field(s) and generation and sale of electricity.

Additional infrastructure would be needed for commercial operations, including construction of a power plant, installation of production and injection pipelines, and installation of transmission lines. It is assumed that no new access roads would be required, beyond the roads constructed for the production well drilling.

Geothermal resources can be classified as low temperature (less than 90°C, or 194°F), moderate temperature (90 to 150°C, or 194 to 302°F), and high temperature (greater than 150°C, or 302°F). Until the early 1980's, only high temperature resources were used for generating electrical power, however the use of binary-cycle plants (explained below) has allowed development of moderate temperatures since that time. Ever-emerging technologies and demand for alternative energy sources are making ever lower temperature resources can be used for electrical generation.

Moderate to high temperature reservoirs, with adequate flow rates and fracture systems, are currently suitable for the commercial production of electricity. While there are several types of power plants that harness geothermal resources, the most likely type of plant used for moderate temperature resources expected to be encountered in the planning area, is a binary-cycle plant. These modular plants use the geothermal resource that has been pumped to the surface to heat a secondary "working fluid" such as isobutene or isopentane that has a lower boiling point than water. As the working fluid boils, it expands and turns a steam turbine, producing electricity. The geothermal fluid and the working fluid never come in contact with each other, nor are they exposed to the environment (closed loop system). The geothermal fluid is re-injected back into the geothermal zone via injection wells, while the working fluid is cooled, condensed, and recycled.

Binary plants are by far the most common type of power plant used today, as they can operate with lower water temperature (74 to 182° C, or 165 to 360°F) than flash or steam plants, produce few air

emissions, and are quiet and result in a low impact to the environment once constructed. They can be constructed off-site (e.g., Ormat's plants are manufactured in Israel), transported to a site, and erected fairly easily, and they can be expanded as a well field is developed. In this sense, they are modular units. Generally, the final permanent surface disturbance required for all related production wells, the power plant, and surface facilities is about 1 acre per Megawatt of power produced.

A 50-MW plant would utilize a site area of up to 20 to 25 acres to accommodate all the needed equipment, including the power plant itself, space for pipelines geothermal fluids and reinjection, space for moving and storing equipment, and buildings needed for various purposes (power plant control, fire control, maintenance shop, etc.). The power plant itself would occupy an estimated 25% of this area for a water-cooled plant, or about 50% for an air-cooled plant. Where topography permits, the power plant could be situated to be less visible from nearby roads, trails, scenic vistas, or scenic highways. The site of the plant requires reasonable air circulation to allow for efficient operation of the plant's condensers. A smaller, 20-MW plant would typically require approximately 5 to 10 acres for the entire complex. Figure 3 shows what a recently constructed, 10-MW power plant looks like.

Figure 3. 10-MW Power Plant at US Geothermal Inc. Raft River, Idaho Site (from US Geothermal Website)

A pipeline system would be needed to connect each of the production wells and injection wells to the power plant. Pipelines are usually 24 to 36 inches in diameter and are typically constructed on supports above the ground surface, resulting in little if any surface impact to the surrounding area once construction is complete and the corridor has been revegetated. The pipelines typically have a few feet of clearance underneath them, allowing small animals to easily cross their path. Every 100 to 200 feet or so, the pipeline may have an expansion loop, or U-shaped bends, to allow for expansion due to heating and cooling. Pipelines transporting hot fluids to the plant are wrapped in insulation, whereas injection pipelines are generally not. Where feasible, the pipeline may parallel the access roads and existing roads

to the power plant. The pipelines are typically painted to blend in with the surrounding environment. For the planning area, it is assumed that the pipeline to each well would be approximately one-quarter to one-half mile long on average, with a corridor width of about 25 feet. Once the pipeline is constructed, these corridors would be reclaimed, but the above-ground pipeline would remain.

Transmission lines would be required to carry power from the plant to the electric grid. It is assumed that in the planning area, these lines would be from 1 to 2 miles in length, with a corridor width of approximately 40 feet. Wooden poles would most likely support them, and about 5 acres could be disturbed per mile of transmission line.

The number of people required for routine operation of a power plant is typically three per shift; however, additional personnel may be on site during the day for maintenance and management of the facility and monitoring fluids and power production. Activities associated with operation and maintenance of the facility and energy production would not generally involve additional ground-disturbing activities.

Using data from other areas of geothermal development, it appears that production of geothermal fluids can be expected to vary widely from 1 to 6 million gallons per well, per day. Assuming 5 million gallons per day per well as an average production figure, a geothermal field with 5 producing wells would produce 25 million gallons of fluid per day. Geothermal fluids produced are re-injected back into the geothermal reservoir via injection wells. Binary power plants utilize a closed loop system; therefore, well production and injection wells operate with no fluid loss.

The routinely used chemicals for a binary geothermal plant include the hydrocarbon working fluid (such as iso-butane or n-pentane) and the lubricating oil used in the downhole pumps. While downhole scaling may be a problem for flash or steam plants, it does not occur in binary plants because they are liquid dominated systems. Therefore there is no need for scale inhibiting chemicals or any other chemicals with a binary plant.

Phase Four: Reclamation and Abandonment

This phase involves abandoning the well after production ceases and reclaiming all disturbed areas in conformance with BLM and State standards. Abandonment includes plugging and capping the wells and reclaiming the well site. Reclamation also includes removing the power plant and all surface equipment and structures, regrading the site and access roads to pre-disturbance contours, and replanting native or appropriate vegetation to facilitate natural restoration.

RFDS FOR DIRECT USE

Low temperature geothermal resources are increasingly being used for a wide variety of applications across the Western U.S., including within the planning area. These direct uses include:

- Agricultural uses, such as controlling environmental conditions for growing crops, flowers, or trees;
- Aquacultural uses, such as controlling environmental conditions for raising fish or other animals;
- District heating and cooling systems for buildings;
- Public safety uses, such as eliminating ice and snow on public sidewalks;
- Public health uses through food processing, such as dehydration, washing, and processing; and
- Recreational uses, such as hot tubs, steam baths, and mud baths.

Use of the geothermal resource for these activities on Federal lands requires a direct use geothermal lease, in accordance with regulations at 43 CFR 3205.

Surface disturbances for direct use are generally much less than for indirect use, since direct uses are more likely to be located near existing communities with less of a need for new access roads. Also, since direct use applications utilize the geothermal energy on-site, there is no need for the construction of electrical equipment and transmission lines, except for bringing in electricity from the existing grid to the facility being constructed. Surface disturbances can still be expected for well pad development, site access, and construction of the facility utilizing the resource, although in some cases the facility may already exist and may simply be shifting its heat source to geothermal.

TYPICAL PHASES IN DIRECT USE GEOTHERMAL DEVELOPMENT

Phase One: Exploration

Existing direct use applications are largely co-located with, and draw directly from, existing surface geothermal manifestations such as hot springs, eliminating the need for most exploration activities. Exploration activities in the past have often been limited to water temperature and chemistry analysis.

Looking to the future, it is likely that most direct use applications will not be able to draw from existing surface manifestations as they have in the past. Surface manifestations such as naturally occurring hot springs have become increasingly sought after with increases in population in the Western US, increased recreational use, and more stringent regulations preserving such resources for their recreational, cultural, or scenic value. In such cases where surface manifestations are not nearby or are not being utilized directly, exploration activities similar to those described above for indirect use would also apply for direct use.

Phase Two: Drilling

In applications where a surface manifestation is used directly, the resource development phase involves installing piping into that manifestation to withdraw the hot water. For applications requiring the drilling of a well, drilling activities would be similar to those described above under Phase Two for indirect use, although the well would not be as deep, likely only one well would be drilled, and the volume of fluid would not be as great as for indirect use.

Phase Three: Utilization

The utilization phase typically lasts for several decades or longer. Activities associated with the production phase are generally limited to maintenance and repair activities of all components of the collection, distribution and injection/use/disposal system.

As described above for indirect use, the drilling of production wells may be necessary. Drilling activities would be similar to that discussed above in the drilling phase, although it is likely that only one production well and one injection well would be required. Some applications may inject the post-use geothermal fluids back into the ground, in which case an injection well would be drilled and connected via piping to the application. In other applications where the spent geothermal fluids are discharged to a surface water body or used for some other purpose, then discharge piping, collection systems or distribution systems may need to be constructed. For such systems where the waters are not reinjected into the geothermal reservoir but are rather discharged or otherwise used, treatment systems may need to be installed to reduce levels of any naturally occurring but toxic chemicals present within the geothermal waters, such as mercury, arsenic, and boron, to meet applicable health or environmental standards. Operation and maintenance of existing facilities and production of geothermal energy also takes place during the production phase. Activities associated with operation and maintenance and energy production would involve managing waste generated by daily activities, managing geothermal water, landscaping, and maneuvering construction and maintenance equipment and vehicles associated with these activities.

Phase Four: Reclamation and Abandonment

As described above for indirect use, this phase involves abandoning the well after production ceases and reclaiming all disturbed areas in conformance with BLM and State standards. Abandonment includes plugging, capping, and reclaiming the wells. Reclamation includes removing all surface equipment and structures, regrading the site to blend into the surrounding landscape, and replanting native or appropriate vegetation.

LITERATURE CITED

BLM. 2010. *Geothermal potential of the Four Rivers Field Office*. Boise, ID: USDOI Bureau of Land Management, Idaho State Office.

BLM and USFS. 2008. *Final Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States*. Washington, DC: USDOI Bureau of Land Management and USDA United States Forest Service.

Appendix U - Areas of Critical Environmental Concern (ACEC) Report

An Area of Critical Environmental Concern (ACEC) is defined in the Federal Land Policy and Management Act of 1976 as amended (FLPMA) as an area 'within the public lands where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards.' This report includes a brief description of the ACEC evaluation process and summary of the preliminary results, as well as the completed ACEC Evaluation Forms used by the BLM. A detailed map of each of the existing or proposed ACECs is available on the project website.

ACEC Nomination Process

Part of the planning process for the Four Rivers RMP included a review of BLM-administered lands to determine whether they met the criteria for designation as an ACEC. ACECs are composed of onlyl BLM-administered lands; private lands and lands administered by other agencies are not included in the boundaries of ACECs. Unlike other special designations, such as Wilderness Study Areas, the designation of an ACEC does not by itself automatically prohibit or restrict other uses in the area (with the exception that a mining plan of operation is required for all proposed mining activities within a designated ACEC). However, to be considered for designation, special management beyond the standard provisions established by the RMP must be required to protect relevant and important qualities.

Several steps are required to identify and evaluate ACECs. These steps include (1) the nomination of areas by the public during scoping or by BLM resource specialists; (2) evaluation of the nominated areas to determine if they meet the importance and relevance criteria; (3) consideration of the potential ACECs as management scenarios analyzed in the Draft RMP and EIS. As part of this evaluation, the BLM also considers whether existing ACEC designations should be modified or terminated. The Draft RMP and EIS contains recommendations proposing potential ACECs for designation; public comment is requested. Public comments are reviewed and considered, and adjustments are made as necessary before the proposed RMP and Final EIS is released. Designation of ACECs is then incorporated in the Record of Decision (ROD) approving the RMP.

Regulations at 43 CFR 1610.7-2 state that during the resource management planning process, inventory data should be analyzed to determine whether there are areas within the PA containing resources, values, systems or processes or hazards eligible for further consideration for designation as ACECs. In order to be eligible for designation as an ACEC an area must meet at least one of both the relevance and importance criteria described below.

Relevance:

An area meets the relevance criteria if it contains one or more of the following:

- Historic, cultural, or scenic value, including but not limited to rare or sensitive archaeological resources and religious or cultural resources important to Native American Tribes;
- Fish or wildlife resources, including but not limited to habitat for Endangered, Threatened, or BLM Sensitive fish or wildlife species, or habitat essential for maintaining species diversity;
- Natural processes or systems, including but not limited to Endangered, Threatened, or BLM Sensitive plant species; rare, endemic, or relic plants or terrestrial aquatic, or riparian plant communities; or rare geologic features; or

- Natural hazards, including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils or seismic activity.

In the evaluation for relevance, a 'yes' answer indicates the area contains a value, resource, process, system, or hazard, while a 'no' answer indicates the area does not.

Importance:
Upon meeting the relevance criteria, a nominated site must then have qualities that are in need of protection or special attention in order for the area to meet the importance criteria. The area meets the importance criteria if its relevance qualities can be characterized by one or more of the following:

- Has more than locally significant qualities that 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;
- Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA;
- Has qualities that warrant highlighting in order to satisfy public or management concerns about safety and public welfare; or
- Poses a significant threat to human life and safety or to property.

In the evaluation for importance, a 'yes' answer indicates that the value, resource, system, process or hazard has substantial significance and values that meets one or more of the importance factors listed above. A 'no' answer indicates the area contains the value, resource, system, process, or hazard, but it is not substantially significant and does not meet the importance factors listed above. 'N/A' indicates that the value, resource, system, process, or hazard is not found within the area.

Based on comments received during scoping and internal recommendations from BLM specialists, eight of the 10 existing ACECs were nominated for continued designation with 7 existing ACECs receiving nominations for expansion. Two of the existing ACECs were recommended to be incorporated into a third existing ACEC; an additional 20 nominations were received, including the 5 RNAs from the Cascade RMP.

Table U-1 lists the nominations that were considered. This table lists the acreage of the proposed areas, the values of concern that warranted the nominations, the relevance and importance criteria of each area, and whether the area was recommended for analysis in the RMP. Additional information relevant to reach of the nominations is provided in the 'comments' column; further information relevant to each nominated area can be found in the individual ACEC evaluation forms in the following section of this report.

Area	Acres	Value(s) of concern	Relevance Criteria	Importance Criteria	Recommended	Comments
Existing ACECs- No Expansion						
Cartwright Canyon	400	Special status plant	Fish and wildlife resource; natural system or process	Fragile, sensitive or rare	Yes	The Cartwright Canyon ACEC was designated in the 1993 Amendment to the Cascade RMP.
Hulls Gulch	120	Special status plant	Significant scenic value; natural process or system	Fragile, sensitive or rare	Yes	The Hulls Gulch ACEC was designated in the 1993 Amendment to the Cascade RMP.
Woods Gulch	40	Special Status Plant	Natural process or system	Fragile, sensitive or rare	Yes	The Wood's Gulch ACEC was designated in the 1993 Amendment to the Cascade RMP.
Existing ACECs with Proposed Expansion						
Boise Front	11,360 (E) 24,630 (P)	Watershed; special status plant; visual	Scenic value; fish and wildlife resource; natural process or system; natural hazards	Fragile, sensitive or rare; qualities which warrant highlighting; substantial threat to human life and safety.	Yes	The Boise Front ACEC was designated in the 1988 Cascade RMP. The Boise Front is also an SRMA, serving multiple recreational activities. The expansion area contains two existing ACECs (Hulls Gulch and Cartwright Canyon); values of the expansion area are similar to the existing ACEC.
Hixon Columbia Sharp Tailed Grouse Habitat	4,170 (E) 21,100 (P)	Special status plant and wildlife	Fish and wildlife resource; natural system or process	More than locally significant; fragile, sensitive or rare	Yes	This is one of the last known populations of Columbian sharp-tailed grouse in Southwestern Idaho. The expansion area primarily consists of habitat acquired since the last RMP revision.
King Hill Creek	840 (E) 2,840 (P)	Special status plant and wildlife	Fish and wildlife resource; natural process or system	More than locally significant; fragile, sensitive or rare	Yes	The King Hill Creek ACEC was designated in the 2003 Shoshone RMP Amendment to the Shoshone MFP. The expansion area includes many of the same values as the existing ACEC.
Long-Billed Curlew Habitat	45,020 (E) 46,310 (P)	Wildlife	Fish and wildlife resource; natural process or system	More than locally significant; fragile sensitive or rare; warrants protection	Yes	The Long-billed Curlew Habitat ACEC was designated in the 1988 Cascade RMP. The expansion area includes lands acquired by the BLM since that time.
Sand Hollow	1,300 (E) 1,330 (P)	Special status plant	Natural process or system	More than locally significant; fragile, sensitive or rare	Yes	The ACEC was designated in the 1993 Amendment to the Cascade RMP. The expansion area includes the same values as the existing ACEC.

Area	Acres	Value(s) of concern	Relevance Criteria	Importance Criteria	Recommended	Comments
Sand-Capped Knob	40 (E) 180 (P)	Special status plant	Natural process or system; natural hazards	More than locally significant; fragile sensitive or rare	Yes	The ACEC was designated in the 1993 Amendment to the Cascade RMP. The expansion area includes the same values as the existing ACEC.
Willow Creek	1,010 (E) 1,120 (P)	Special status plant	Natural process or system	More than locally significant; fragile, sensitive or rare	Yes	The ACEC was designated in the 1993 Amendment to the Cascade RMP. The expansion area includes the same values as the existing ACEC.
Proposed ACECs						
Bannister Basin	5,840	Special status plant	Fish and wildlife resource; natural process or system	More than locally significant; fragile, sensitive or rare	Yes	Packard's milkvetch is endemic to this area, and is the only documented location. Soils are sensitive to ground disturbing activities, and invasive plants dominate almost half of the area.
Buckwheat Flats	200	Special status plant	Fish and wildlife resource; natural process or system	Fragile, sensitive or rare	Yes	The area contains the only known population of silverskin lichen in Idaho.
Cherry Gulch	3,070	Special status plants	Fish and wildlife resource; natural system or process	More than locally significant; fragile, sensitive or rare	Yes	Special status plants in this area are threatened by non-native invasive annual species.
Goodrich Creek	450	Unique ecological community	Fish and wildlife resource; natural process or system	Fragile, sensitive or rare	Yes	Ecological reference areas for native vegetation are becoming increasingly uncommon throughout the PA.
Lost Basin Grassland	60	Special status plant	Natural process or system	Fragile, sensitive or rare	Yes	Representative native plant community for special status plant habitat
Mountain Home	520	Unique ecological community	Natural process or system	Fragile, sensitive or rare	yes	Very few communities of biological soil crusts remain within the PA.
Rebecca Sand Hill	1,250	Special status plant	Fish and wildlife resource; natural process or system	Fragile, sensitive or rare	Yes	The area includes over 60% of Mulford's milkvetch identified on BLM lands.
Sheep Creek	1,970	Special status plant	Natural process or system	Fragile, sensitive or rare	Yes	The area contains one-third of all known occurrences of Indian Valley Sedge.
Summer Creek	630	Special status plant	Natural process or system	Fragile, sensitive or rare	Yes	Located within the Oxbow/Brownlee SRMA, contains multiple special status plant species.
Bennett Hills	33,460	Wildlife	Fish and wildlife resource		No	The proposed Bennett Hills ACEC meets relevance and importance criteria for Fish and Wildlife. However, because there is already a Conservation Plan for

Area	Acres	Value(s) of concern	Relevance Criteria	Importance Criteria	Recommended	Comments
						Greater Sage-grouse in Idaho, adopted by BLM for its management, special management attention through an ACEC designation is not necessary. This area would be protected under all alternatives through management actions proposed for sage grouse and big game winter range.
Crane Creek	unknown	Special status animal	N/A	N/A	No	Management prescriptions have been adopted for all sage grouse lekking, nesting, and brood-rearing habitats to restrict activities and protect those areas as well as protections for sharp-tailed grouse, deer and elk in the vicinity. Indian Valley sedge is addressed in the proposed Sheep Creek ACEC. Further, the proposed ACEC boundary was not delineated (in terms of size or precise location), and data regarding protections were not presented to BLM.
Long Tom Creek	13,580	Special status animal	Significant historic value; fish and wildlife resource	N/A	No	The proposed Long Tom Creek ACEC meets the relevance and importance criteria for fish and wildlife. However, management stipulations captured under the Special Recreation Management Area (SRMA), water quality/PFC management objectives, and remoteness and steepness of the area provide adequate protections to these Fish and Wildlife resource values. This area would be protected under all alternatives through management actions proposed for sage grouse and big game winter range.
String of Pearls	7,340	Migratory shore birds	Fish and wildlife resource; natural process or system	N/A	No	The proposed Audubon – String of Pearls ACEC meets the relevance and importance criteria for Fish and Wildlife; however, it doesn't meet the need for special management attention because the migratory bird mud flats

Area	Acres	Value(s) of concern	Relevance Criteria	Importance Criteria	Recommended	Comments
						can be protected through other actions. In addition, BLM ownership is limited around many of the sites and management would be difficult to impossible. Some are recommended as Watchable Wildlife sites.
Camp Creek	670	Riparian ecosystem; wildlife habitat	N/A	N/A	No	Does not meet relevance and importance criteria
Kuna Butte	unknown	Special status plant	Natural Process or System	N/A	No	Area is similar to adjacent Morley Nelson Snake River Birds of Prey National Conservation Area (NCA). The proposed ACEC boundary was not delineated (in terms of size or precise location), and data regarding protections were not presented to BLM.
North Fork Gray's Creek	200	Special status wildlife; unique riparian ecosystem	Fish and wildlife resource;	N/A	No	While special status wildlife are present, the area is surrounded by private lands and is difficult to effectively manage.
North Fork Payette River	200	Wildlife; native plant community	N/A	N/A	No	While special status wildlife and raptors inhabit the area, they also inhabit adjacent non-BLM lands and are not uncommon.
Slickspot Peppergrass Habitat	176,690	Special status plant	Natural Process or System	More than locally significant; fragile, sensitive or rare; warrants protection	No	Slickspot Peppergrass is a Federally listed Threatened species, and is managed under an existing conservation agreement with USFWS. Additional protections for this species under a land use plan are not warranted.
Wildhorse River	9,240	Special status wildlife	Significant scenic value; fish and wildlife resource; natural process or system	Warrants protection	No	The area contains crucial big game winter range and bull trout habitat (a Federally listed Threatened species). Management of the area is difficult owing to scattered land ownership. Existing protections for wildlife are adequate to protect the species.
Greater Sage-grouse Habitat		Special status wildlife	N/A	N/A		Greater Sage-grouse habitat was analyzed as an ACEC in the 2015 Greater Sage-grouse Resource Management Plan Amendment and was found to not warrant ACEC designation.

ACECs Accepted and Carried Forward

Area Considered	BANNISTER BASIN
General Location	Payette County, 16 miles east of Weiser, ID, 15 miles northwest of Emmett, ID.
General Description	The proposed ACEC is located in east-central Payette County. The area has seen extensive OHV use and has burned numerous times in the past
Acreage	5,840 acres (proposed BLM lands)
Values Considered	BLM special status plant (Packard's milkvetch) and animal (southern Idaho ground squirrel) species
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

BANNISTER BASIN - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:		
Relevance Value	**Yes/No**	**Rationale for Determination**
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Southern Idaho ground squirrel occur in and around the proposed ACEC.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Packard's milkvetch (*Astragalus cusickii* var. *packardiae)*, is endemic to the area. This is the only known location of this species.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

BANNISTER BASIN - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	Yes	Packard's milkvetch is only known to occur in a 10 square mile area in southwest Idaho. The proposed ACEC includes 100% of known EOs on public lands.
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Owing to wildfires in the past, invasive plants are prone to occupancy in the area. Packard's milkvetch inhabits the nearly barren substrate which is naturally prone to erosion. Invasive plants stabilize soils on these outcrops, eliminating suitable habitat. Soils are sensitive to excessive ground disturbing activities, and the area has seen extensive OHV use.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	BLM entered into a Candidate Conservation Agreement (CCA) with USFWS in 2013 regarding management of this species.
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	BOISE FRONT
General Location	Ada, Boise, and Elmore counties, foothills 2-10 miles north and east of Boise, ID
General Description	The ACEC was designated in the 1988 Cascade RMP. The ACEC encompasses lands in the foothills immediately east of the Boise River in northeast Ada County. In the 1993 Amendment to the Cascade RMP, adjacent areas, Hulls Gulch and Cartwright Canyon, were designated as ACECs for the protection of Aase's onion which is also within the Boise Front ACEC. The proposed expansion area includes additional BLM administered lands which contain the same relevant and important values for which the ACEC was originally designated and the Hulls Gulch and Cartwright Canyon ACECs.
Acreage	11,360 acres (current BLM lands); 24,630 acres (proposed expansion)
Values Considered	Ground water recharge area for Boise, wildlife habitat, erosive soils, scenic values, and BLM Type 2 special status plant (Aase's onion and Mulford's milkvetch) and wildlife (redband trout).

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

BOISE FRONT - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	Yes	Scenic backdrop for the city of Boise and surrounding areas.
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Crucial winter range for mule deer. Redband trout (*Oncorhynchus mykiss gairdneri*) are present in Dry Creek.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Important ground water recharge area for municipal water wells in Boise. Aase's onion (*Allium aaseae*) and Mulford's milkvetch (*Astragalus mulfordiae*), are present in the western portion of the ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	Yes	Moderate and highly erosive soils that are easily disturbed when dry or prone to washing away when saturated. Some areas are prone to landslides.

BOISE FRONT - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	The ACEC is home to numerous wildlife species and special status plants. As the scenic backdrop to the city of Boise, the area receives a variety of recreationists through all seasons. Wildfires are common and bare soils are highly erosive. Encroaching urban development and a variety of recreational uses continue to infringe on wildlife and special status plant habitat. Both sensitive plant species have experienced habitat loss and degradation owing to urban development, weed infestations and surface disturbing activities. Mulford's milkvetch was a federal candidate species until 1996, when a Candidate Conservation Agreement between BLM and USFWS was implemented for the management of Aase's onion, Mulford's milkvetch and Slickspot Peppergrass. Aase's onion and Mulford's milkvetch remain categorized as species that are imperiled rangewide and have a high likelihood of federal listing in the foreseeable future by USFWS.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	Yes	Sub-surface aquifers feed municipal wells, as well as springs which support perennial streams. Natural events or human caused activities that disturb or degrade watershed stability can adversely affect surface and ground water quantity and quality.
Poses a substantial threat to human life and safety or to property.	Yes	The Boise Front has multiple drainages that traverse residential and commercial developments before draining into the Boise River.

Area Considered	BUCKWHEAT FLATS
General Location	Washington County, 4 miles southwest of Midvale, ID, west of US Route 95.
General Description	The area was designated an RNA in the 1988 Cascade RMP. Buckwheat Flats RNA is comprised of two small parcels of land located adjacent to the Columbian Sharp-tailed Habitat ACEC and state Highway 95 in central Washington County
Acreage	200 acres (current and proposed BLM lands)
Values Considered	Representative native plant communities and BLM special status plant (Tolmei's onion and silverskin lichen) and animal (Columbian sharp-tailed grouse) species.

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

BUCKWHEAT FLATS - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Columbian sharp-tailed grouse (Tympanuchus phasianellus columbianus).
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	The ACEC contains intact ecological reference areas for upland vegetative communities including a diversity of native bunchgrasses and thyme-leaf buckwheat. The area includes the only known population of Silverskin lichen (*Dermatocarpon lorenzianum*) in Idaho.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

BUCKWHEAT FLATS - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Representative plant communities are unique and at risk throughout the PA because of wildfires and encroaching invasive grasses. Ground disturbing activities, wildfire, and invasive plants continue to threaten vegetation community integrity.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	CARTWRIGHT CANYON
General Location	Boise County, 12 miles north of Boise, ID.
General Description	Cartwright Canyon was designated an ACEC in the 1993 Amendment to the Cascade RMP for the protection of Aase's onion. The ACEC is located just east of State Highway 55 in Boise County.
Acreage	400 acres (current BLM lands); incorporated into Boise Front ACEC (proposed)
Values Considered	Special status plant species (Aase's onion) and big game crucial winter range.

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

CARTWRIGHT CANYON - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Crucial winter range that supports elk and mule deer.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Aase's onion (Allium aaseae) occurs on coarse, sandy soils in and around the ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

CARTWRIGHT CANYON - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Aase's onion has experienced habitat loss and degradation owing to urban development, weed infestations and surface disturbing activities. A Conservation Agreement between BLM and USFWS was implemented in 1989 for the management of Aase's onion. The species remains categorized as imperiled rangewide and has a high likelihood of federal listing in the foreseeable future by USFWS.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	CHERRY GULCH
General Location	Washington and Payette counties, 6 miles northeast of Payette, ID.
General Description	Includes relatively isolated BLM lands spanning Washington and Payette counties, approximately 4-miles from the Oregon border.
Acreage	3,070 acres (proposed)
Values Considered	BLM special status plants (Aase's onion and Mulford's milkvetch) and animal (southern Idaho ground squirrel) species.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

CHERRY GULCH - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Southern Idaho ground squirrel occurrences and suitable habitat.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Aase's onion and Mulford's milkvetch, BLM sensitive species that are endemic to southwestern Idaho, are present throughout the proposed ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

CHERRY GULCH - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Both sensitive plant species have experienced habitat loss and degradation owing to urban development, weed infestations and surface disturbing activities. Mulford's milkvetch was a federal candidate species until 1996, a Candidate Conservation Agreement between BLM and USFWS was implemented for the management of Aase's onion, Mulford's milkvetch and Slickspot peppergrass. Aase's onion and Mulford's milkvetch remain categorized as species that are imperiled rangewide and have a high likelihood of federal listing in the foreseeable future by USFWS.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	(HIXON) COLUMBIAN SHARP-TAILED GROUSE HABITAT
General Location	Washington County, 3-14 miles west of Midvale, ID.
General Description	The Hixon Columbian Sharp-tailed Grouse Habitat ACEC was designated in the 1988 Cascade RMP. Since that time, BLM has received funding from the Land and Water Conservation Fund (LWCF) to facilitate the purchase of adjacent non-federal lands to improve management of Columbian sharp-tailed grouse habitat. The Nature Conservancy has successfully pursued conservation easements with adjacent private landowners
Acreage	4,170 acres (current BLM lands), 21,100 acres (proposed)
Values Considered	Special status animal (Columbian sharp-tailed grouse, redband trout) and plant (wild crabapple) species

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

(HIXON) COLUMBIAN SHARP-TAILED GROUSE HABITAT - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Contains the largest, and one of the last known, populations of Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*), in southwestern Idaho. Important wildlife habitat for mule deer, elk, 180 bird species (including several other special status species), and redband trout (*Oncorhynchus mykiss gairdneri*).
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Wild crabapple (*Peraphyllum ramosissimum*) occurs in transition zones between grasslands and mountain shrub communities.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

(HIXON) COLUMBIAN SHARP-TAILED GROUSE HABITAT - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	Yes	The proposed ACEC represents 48% of sharp-tailed grouse habitat within 5 miles of active leks and includes or is within 4 miles of eight active leks representing 84% of breeding birds in the area. Sharp-tailed grouse occupy only 5-10% of their historic range and the nearest population is 190 miles away. The ACEC is recognized as a State Important Bird Area by the National Audubon Society and American Bird Conservancy.
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Sharp-tailed grouse are sensitive to human disturbance during critical periods (e.g., breeding, brood-rearing) and avoid areas with tall structures or regular human activity. Habitat alteration caused by wildfire, and ground disturbing activities has adversely affected habitat quantity and quality.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	GOODRICH CREEK
General Location	Adams County, 7 miles northeast of Cambridge, ID
General Description	Goodrich Creek was designated an RNA in the 1988 Cascade RMP is it contains one of the only intact ecological reference areas for upland and riparian vegetation. As many of these ecological areas have burned due to wildfire in the past, this is one of the few remaining ecological reference areas in the PA.
Acreage	360 acres (current BLM lands), 450 acres (proposed)
Values Considered	BLM special status species (redband trout) and representative native plant communities.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

GOODRICH CREEK - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Redband trout (*Onchorynchys mykiss gairdneri*) is present in Goodrich Creek.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Area contains a unique intact ecological reference areas for upland and riparian vegetative communities. Both riparian and upland communities are predominantly comprised of native vegetation.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

GOODRICH CREEK - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	The PA historically has had a high tendency for wildfires which have removed native plant communities. Goodrich Creek RNA has retained a unique ecological reference area for upland vegetation which makes it especially sensitive and rare.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	HULLS GULCH
General Location	Ada County, 5 miles northeast of Boise, ID.
General Description	The ACEC was designated in the 1993 Amendment to the Cascade RMP for the protection of Aase's onion. The ACEC is located immediately adjacent to the Boise Front ACEC.
Acreage	120 acres (current BLM lands); incorporated into Boise Front ACEC (proposed)
Values Considered	BLM special status plant species (Aase's onion)

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

HULLS GULCH - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	Yes	Scenic backdrop for the city of Boise and surrounding areas. Includes 1.5 miles of Hulls Gulch Interpretive Trail, a National Recreation Trail.
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Aase's onion (*Allium aase*ae) is present on south facing slopes throughout ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

HULLS GULCH Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Aase's onion has experienced habitat loss and degradation owing to urban development, weed infestations and surface disturbing activities. A Conservation Agreement between BLM and USFWS was implemented in 1989 for the management of Aase's onion. It remains categorized as a species that is imperiled rangewide and has a high likelihood of federal listing in the foreseeable future by BLM and the State of Idaho.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	KING HILL CREEK
General Location	Elmore County, 4-13 miles north of King Hill, ID.
General Description	The King Hill Creek ACEC was designated in the 2003 Shoshone Field Office Land Use Plan Amendment because of scenic and wildlife habitat values.
Acreage	840 acres (BLM lands in PA), 2,840 acres (proposed).
Values Considered	BLM special status animal (redband trout, greater sage-grouse) and plant (mourning milkvetch) species and representative riparian communities.

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

KING HILL CREEK - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	Yes	Extremely deep, vertical walled canyon with scenic vegetation and geology.
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Genetically pure redband trout is present in both King Hill and West Fork King Hill creeks. Greater sage-grouse (*Centrocercus urophasianus*) use uplands and some riparian areas for late brood-rearing habitat.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	A near pristine, low-elevation riparian area is present along King Hill Creek. Suitable mourning milkvetch (*Astragalus atratus* var. *inseptus*) habitat occurs in the ACEC. Several occurrences of mourning milkvetch are known in the King Hill Creek WSA which encompasses a portion of the ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

KING HILL CREEK - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	Yes	Isolated area with spectacular scenery. Genetically pure redband trout populations are an important source for reintroduction efforts elsewhere in the Pacific Northwest.
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Genetically pure redband trout populations are rare and provide and important source for reintroduction elsewhere. Outside of the WSA, scenic values are at risk from activities that degrade vegetation conditions, cause surface disturbances, or impact visual resources. The area serves as an important reference area for low-elevation riparian vegetation.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	LONG-BILLED CURLEW HABITAT
General Location	Canyon, Gem, and Payette counties between Emmett and Parma, ID.
General Description	The ACEC was designated in the 1988 Cascade RMP for the important use of the area by Long-billed Curlew as breeding and nesting grounds. Historically, the area was seasonally used by over 1,000 nesting pairs of these migratory birds. Reduction in population has resulted in numerous partnerships to monitor this species.
Acreage	45,460 acres (current BLM lands), 46,310 acres (proposed)
Values Considered	Special status animal (long-billed curlew) and plant (slickspot peppergrass) species.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

LONG-BILLED CURLEW HABITAT - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Long-billed curlew (*Numenius americanus*) flock to this area to breed, nest, and raise broods.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Slickspot peppergrass (*Lepidium papilliferum*), a USFWS listed (Threatened) special status plant species, occurs in much of the ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

LONG-BILLED CURLEW HABITAT - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	Yes	The ACEC provides habitat for what was once one of the densest nesting populations of long-billed curlew in Idaho. Declines in population have resulted in fewer birds in recent years.
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Reductions in long-billed curlew population has raised the sensitivity and awareness of this migratory bird. Ground-disturbing activities can reduce the amount and availability of suitable breeding and nesting habitat. Slickspots are sensitive to ground disturbing activities including cross-country off-highway vehicle use and livestock trampling. Invasive species, including noxious weeds, , degrade, EOs and associated pollinator habitat.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	Yes	Slickspot peppergrass is listed as Threatened under the Endangered Species Act.
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	LOST BASIN GRASSLAND
General Location	Adams County, 19 miles northwest of Council, ID.
General Description	The Lost Basin Grassland was designated an RNA in the 1988 Cascade RMP because of the presence of BLM sensitive plant species.
Acreage	60 acres (current and proposed BLM lands)
Values Considered	Representative native plant communities.

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

LOST BASIN GRASSLAND - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	The ACEC contains intact ecological reference areas for upland vegetative communities including a diversity of native bunchgrasses, mountain shrubs, and Douglas-fir.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

LOST BASIN GRASSLAND - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Representative plant communities are rare and at risk from wildfires and invasives. Ground disturbing activities threaten vegetation community integrity. Because of various historic and current land uses and disturbances, there are few reference native grass-dominated vegetative communities in the Snake River watershed.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	REBECCA SANDHILL
General Location	Weiser County, 2-7 miles east of Weiser, ID.
General Description	The Rebecca Sandhill RNA was designated in the 1988 Cascade RMP. The area contains a large percentage of Mulford's milkvetch, a BLM special status plant species on a steep sandy hill.
Acreage	240 acres (current BLM lands); 1,250 acres (proposed)
Values Considered	BLM Type 2 special status plant species (Aase's onion and Mulford's milkvetch).

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

REBECCA SANDHILL - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Southern Idaho ground squirrel occurrences and suitable habitat.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Aase's onion and Mulford's milkvetch are present throughout the proposed ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

REBECCA SANDHILL - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Both sensitive plant species have experienced habitat loss and degradation owing to urban development, weed infestations and surface disturbing activities. Mulford's milkvetch was a federal candidate species until 1996 and a Conservation Agreement between BLM and USFWS was implemented in 1989 for the management of Aase's onion. Both species remain categorized as species that are imperiled rangewide and have a high likelihood of federal listing in the foreseeable future by BLM and the State of Idaho.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	SAND-CAPPED KNOB
General Location	Ada County, 4 miles northeast of Eagle, ID.
General Description	This 40-acre parcel was designated the Sand-capped Knob ACEC in the 1993 Amendment to the Cascade RMP because of the presence of Aase's onion which was a USFWS Candidate species at that time.
Acreage	40 acres (current BLM lands); 180 acres (proposed)
Values Considered	BLM Type 2 special status plant species (Aase's onion)

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

SAND-CAPPED KNOB - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Aase's onion is present throughout the existing RNA boundary and proposed expanded ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	Yes	Moderate and highly erosive soils that are easily disturbed when dry or prone to washing away when saturated. Major portion of the land contains slopes of 30%-75%.

SAND-CAPPED KNOB - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Aase's onion has experienced habitat loss and degradation owing to urban development, weed infestations and surface disturbing activities. A Conservation Agreement between BLM and USFWS was implemented in 1989 for the management of Aase's onion. The species remains categorized as one that is imperiled rangewide and has a high likelihood of federal listing in the foreseeable future by BLM and the State of Idaho.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	SAND HOLLOW
General Location	Gem County, 3 miles east of Emmett, ID.
General Description	This 1,300-acre parcel was designated the Sand Hollow ACEC in the 1993 Amendment to the Cascade RMP because of the presence of Aase's onion which was a USFWS Candidate species at that time. This population represented the largest contiguous unit of Aase's onion on public lands.
Acreage	1,300 acres (current BLM lands; 1,330 acres (proposed)
Values Considered	BLM Type 2 special status plant species (Aase's onion).

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

SAND HOLLOW - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Aase's onion is present throughout the ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

SAND HOLLOW - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	The ACEC incorporates 30% of Aase's onion on BLM lands and is the largest contiguous population in the PA. Aase's onion has experienced habitat loss and degradation owing to urban development, weed infestations and surface disturbing activities. A Conservation Agreement between BLM and USFWS was implemented in 1989 for the management of Aase's onion and it remains categorized as a species that is imperiled rangewide with a high likelihood of federal listing in the foreseeable future by BLM and the State of Idaho.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	SUMMER CREEK
General Location	Adams County, 21 miles northwest of Council, ID, adjacent to the western boundary of the Sheep Peak ACEC/RNA administered by the Forest Service.
General Description	Summer Creek RNA was designated in the 1988 Cascade RMP. The area contains numerous BLM special status plant species and is located within the Oxbow/Brownlee SRMA.
Acreage	240 acres (current BLM lands; 630 acres (proposed)
Values Considered	Representative vegetation communities and BLM special status plant species (Cusick's camas, Snake River milkvetch).
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

SUMMER CREEK - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	The ACEC contains intact ecological reference areas for upland vegetative communities. Cusick's camas (*Camassia cusickii*) is present in damp meadow areas along Summer Creek will Snake River milkvetch (*Astragalus vallaris)* grows along ridgelines.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

SUMMER CREEK - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Representative plant communities are unique and at risk from wildfires and invasives. Ground disturbing activities continue to threaten the integrity of the native vegetation community.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	WILLOW CREEK
General Location	Gem County, 9 miles northwest of Eagle, ID.
General Description	The Willow Creek ACEC was designated in the 1993 amendment to the Cascade RMP for the protection of Aase's onion. The ACEC contains part of the Big Bend Ridge, which is a remnant section of a volcanic caldera.
Acreage	1,010 acres (current BLM lands); 1,120 acres (proposed)
Values Considered	BLM special status plant species (Aase's onion).

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

WILLOW CREEK - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Aase's onion, a BLM special status plant species, is present throughout the ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

WILLOW CREEK - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	The ACEC incorporates 25% of Aase's onion public land EOs in the PA. It has experienced habitat loss and degradation owing to urban development, weed infestations and surface disturbing activities. A Conservation Agreement between BLM and USFWS was implemented in 1989 for the management of Aase's onion. It remains categorized as a species that is imperiled rangewide and has a high likelihood of federal listing in the foreseeable future by BLM and the State of Idaho.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	WOODS GULCH
General Location	Ada County, 5 miles north of Eagle, ID.
General Description	The Woods Gulch ACEC was designated an ACEC in the 1993 Amendment to the Cascade RMP for the protection of Aase's onion.
Acreage	40 acres (current and proposed BLM lands)
Values Considered	BLM special status plant species (Aase's onion).

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

WOODS GULCH - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Aase's onion, a BLM special status plant species, is present in the ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

WOODS GULCH - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Aase's onion has experienced habitat loss and degradation owing to urban development, weed infestations and surface disturbing activities. A Conservation Agreement between BLM and USFWS was implemented in 1989 for the management of Aase's onion and it remains categorized as a species that is imperiled rangewide with a high likelihood of federal listing in the foreseeable future by BLM and the State of Idaho.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	SHEEP CREEK
General Location	Washington County, 22 miles southeast of Cambridge, ID.
General Description	The area is a subset of the Crane Creek ACEC nomination and is based on the presence of identified values referenced in the Crane Creek ACEC nomination. The area follows Road Gulch, a perennial tributary which feeds into Sheep Creek, just west of USFS lands.
Acreage	1,970 acres (proposed BLM lands)
Values Considered	BLM special status plant species (Indian Valley sedge); Greater Sage-grouse habitat.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

SHEEP CREEK - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Indian Valley sedge (*Carex aboriginum*) is one of Idaho's rarest plant species and is of high conservation concern. The proposed ACEC contains 87% of EOs on BLM lands, and 33% of all known occurrences. Indian Valley sedge is currently ranked as critically imperiled because of its extreme rarity.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

SHEEP CREEK - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	The plant was first collected in 1899, and was not reported again for 100 years until it was re-discovered. The plant occupies unique habitat: transitional zones between wet, flooded sites and dry, upland areas. The plant is susceptible to ground disturbing impacts, and has only one occurrence estimated to have long-term viability.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	MOUNTAIN HOME
General Location	Elmore County, 3 miles west of Mountain Home, ID.
General Description	Flat, mostly unburned Wyoming big sagebrush/Sandberg bluegrass vegetation with extensive biological soil crust understory. Sandberg bluegrass, invasive annuals, and crust dominate the southern tip of the proposed ACEC, where a fire occurred in 1984. The ACEC has not burned since 1984 and noxious weeds are uncommon. Rights of way are primarily associated with pipelines and access. The area is not part of a grazing allotment and has no livestock trailing.
Acreage	520 acres (proposed)
Values Considered	Representative biological soil crust community, historic, cultural, and scenic values.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

MOUNTAIN HOME - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	Yes	Few relic biological soil crust areas this large are known to exist on public land in southwest Idaho. Visually, the multi-colored lichens and mosses create unparalleled scenic views within the borders of the PA. Beyond the boundaries of this jurisdiction, the industrialized landscape contrasts starkly with this natural desert scenery.
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Biological soil crusts stabilize soil, fix atmospheric nitrogen, enhance infiltration, slow evaporation, store carbon, preserve suitable habitat for soil microorganisms, and inhibit exotic annual grass invasions. Though they once dominated the understory of xeric uplands throughout the lower Snake River Plain, today, they are among the most highly fragmented and displaced biological complexes on public land. They have been nearly eliminated in FRFO and elsewhere by chronic disturbances and frequent burning.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance	No	

criteria if it is determined through the resource management planning process that it has become part of a natural process).		

MOUNTAIN HOME - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Biological soil crusts are among the most highly fragmented and displaced biological complexes on public land. They have been nearly eliminated in the field office by chronic disturbances.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

ACEC Nominations Not Meeting the Need for Special Management Attention

Area Considered	BENNETT HILLS
General Location	Elmore County, 8-20 miles northeast of Mountain Home, ID.
General Description	The proposed ACEC lies on a moderately eroded bench and foothills between Highway 20 on the west and Bennett Mountain Road on the east in the Bennett Hills north of Mountain Home. The area contains critical elk winter habitat..
Acreage	33,460 acres (proposed BLM lands)
Values Considered	BLM Type 2 special status animal species (greater sage-grouse, redband trout), critical winter range for elk and mule deer.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

BENNETT HILLS - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Greater sage-grouse (*Centrocercus urophasianus*) use the area for late-brood-rearing and winter habitat. The area is identified as Important and General Habitat Management Areas (IHMA and GHMA). Redband trout (*Oncorhynchus mykiss gairdneri*) is present in perennial streams. The area is critical winter range for elk and mule deer.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	No	
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

BENNETT HILLS - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	Greater sage-grouse habitat is managed in accordance with the ARMPA (BLM 2015b) and critical big game habitat is managed in accordance with wildlife timing restrictions. These management considerations are designed to maintain the habitat conditions that address potential threats.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	CRANE CREEK
General Location[1]	Washington County, east of Cambridge, ID.
General Description	Located near Crane Creek Reservoir, in Indian Valley east of Cambridge. Sage grouse habitat present in this parcel, including active leks, should receive the highest protection possible. Other important wildlife present include sharp-tailed grouse, elk and mule deer as well as sensitive plant species such as Indian Valley Sedge.
Acreage	unknown- no map was provided
Values Considered	BLM Type 2 special status animal (greater sage-grouse, sharp-tailed grouse) and plant (Indian Valley sedge) species and big game habitat.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

CRANE CREEK - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	While the nomination indicates presence of Greater sage-grouse and Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) in the area, the lack of spatial information in the ACEC nomination does not allow for verification.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	No	While the nomination indicates presence of Indian Valley sedge (*Carex aboriginum*) in the area, the lack of spatial information in the ACEC nomination does not allow for verification.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

CRANE CREEK - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	LONG TOM CREEK
General Location	Elmore County, 9-15 miles north of Mountain Home, ID.
General Description	Area is comprised of a series of parallel ridges and valleys generally running in a northwest to southeast direction at the southern extent of the Bennett Mountains. Long Tom Reservoir lies just outside of the proposed area on private and state managed lands. The area was analyzed for wilderness character in 1980, and found to not contain outstanding opportunities for solitude and primitive recreation (BLM 1980).
Acreage	13,580 acres (proposed BLM lands)
Values Considered	BLM Type 2 special status animal species (greater sage-grouse, redband trout), critical winter range for elk and mule deer, and valuable ecological community.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

LONG TOM CREEK - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	Yes	The Oregon National Historic Trail traverses the southwest boundary of the proposed ACEC.
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Greater sage-grouse (*Centrocercus urophasianus*), a BLM Type 2 special status animal species, used the area prior to the fire. The area is identified as an Important Habitat Management Area and provided nesting, late brood-rearing, and winter habitats. Redband trout (*Oncorhynchus mykiss gairdneri*), a BLM Type 2 special status animal species, is present in perennial streams. The area is crucial winter range for elk and up to 1,975 mule deer.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	No	Although some upper elevation areas were representative communities, the Pony Fire altered conditions and recovery is ongoing.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process	No	

that it has become part of a natural process).		

LONG TOM CREEK - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	Greater sage-grouse habitat is managed in accordance with the ARMPA (BLM 2015b) and critical big game habitat is managed in accordance with wildlife timing restrictions. These management considerations are designed to maintain the habitat conditions that address potential threats.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	STRING OF PEARLS- 12 RESERVOIRS
General Location	Ada County Reservoirs: - Blacks Creek: 11 miles southeast of Boise, ID - Hubbard : 10 miles southwest of Boise, ID - Indian Creek: 18 miles southeast of Boise, ID Adams County Reservoir: - Ben Ross: 12 miles southeast of Cambridge, ID Elmore County Reservoirs: - Blair Trail: 20 miles southeast of Mountain Home, ID - Cow Creek: 4 miles northeast of Hill City, ID - Long Tom: 12 miles northeast of Mountain Home, ID - Morrow: 20 miles southeast of Mountain Home, ID - Mountain Home: 2 miles northeast of Mountain Home, ID Washington County Reservoirs: - Crane Creek: 15 miles southeast of Cambridge, ID - Mann Creek: 10 miles southwest of Midvale, ID - Paddock Valley: 18 miles east of Weiser, ID
General Description	Eight reservoirs and their surrounding uplands which serve as habitat for migrating shorebirds, wading birds, waterfowl, songbirds and raptors. (Twelve reservoirs were nominated; however, there are no BLM-administered lands associated with Mann Creek, Ben Ross, Hubbard, and Cow Creek reservoirs.)
Acreage	7,340 acres (proposed BLM lands)
Values Considered	Migratory bird habitat and connectivity.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

STRING OF PEARLS- 12 RESERVOIRS - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Reservoirs and their surrounding uplands support between 80 and 220 bird species, including a substantial number of migratory and/or special status species. They also provide important habitat for a diversity of amphibians, reptiles, insects, and mammals including several special status bat species.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Provides open water habitat for migratory birds. They provide important stopover points during spring and fall migration.

STRING OF PEARLS- 12 RESERVOIRS - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:		
Relevance Value	**Yes/No**	**Rationale for Determination**
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

STRING OF PEARLS- 12 RESERVOIRS - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	While these reservoirs serve as stop points during migration for a multitude of species, they do not represent critical habitat.
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	Many of the reservoirs are primarily used for irrigation purposes; therefore, water levels are managed by outside entities for commercial uses and wildlife is a secondary beneficial use.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	CAMP CREEK
General Location	Washington County, 4 miles northwest of Cambridge, ID.
General Description	Proposed ACEC includes public lands along Camp Creek, East of Highway 71.
Acreage	670 acres (proposed BLM lands)
Values Considered	Two species of grouse and a high elevation riparian ecosystem.
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

CAMP CREEK - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	Blue and ruffed grouse habitat; however, these species do not warrant special management. Camp Creek does not support salmonid species.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	No	No special status species are present. Although riparian areas provide a variety of important functions, Camp Creek does not provide functions that are not found in riparian areas throughout the PA.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

CAMP CREEK - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	Upland and riparian habitats are similar to those in the general area.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	KUNA BUTTE
General Location	Ada County, 2 miles southwest of Kuna, ID.
General Description	Identified lands include public lands within the PA immediately north of Kuna Butte, southwest of Kuna Idaho.
Acreage	1,580 acres (BLM lands)
Values Considered	BLM Type 1 special status plant species (slickspot peppergrass) and recreation and scenic values.
IDENTIFICATION CRITERIA	
To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

KUNA BUTTE - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Slickspot peppergrass (*Lepidium papilliferum*) occurs throughout the proposed ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

KUNA BUTTE - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	While the area does contain slickspot peppergrass EOs, they have been identified as in poor condition as compared with other EOs throughout the PA.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	Slickspot peppergrass is listed as Threatened under the Endangered Species Act and is managed in accordance with an existing Conservation Agreement between BLM and USFWS.
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	NORTH FORK OF GRAY'S CREEK
General Location	Adams County, 9 miles southeast of Council, ID.
General Description	Includes 0.25-mile segment of North Fork of Gray's Creek adjacent to USFS lands
Acreage	200 acres (BLM lands)
Values Considered	BLM Type 2 special status animal species (redband trout) and vegetative communities.

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

NORTH FORK GRAY'S CREEK - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Redband trout (*Onchorynchys mykiss gairdneri*) is present in the creek.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	No	Both riparian and upland communities are predominantly comprised of desirable vegetation; however, conditions are not unique relative to surrounding lands.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

NORTH FORK GRAY'S CREEK - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	Surveys indicate redband trout are present; however, the parcel is only 0.3 miles of a stream surrounded by private land. An ACEC designation on such a small parcel wouldn't provide protection for the redband trout.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	NORTH FORK PAYETTE RIVER
General Location	Valley County, 4 miles southwest of McCall, ID.
General Description	Isolated BLM parcels along the east side of the North Fork of the Payette River.
Acreage	200 acres (proposed BLM lands)
Values Considered	BLM special status animal species (bald eagle, redband trout) and other wildlife species (osprey, pileated woodpecker, sandhill cranes, and elk)
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

NORTH FORK PAYETTE - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	The entire North Fork of the Payette River provides habitat for native wildlife, this parcel does not represent an essential component of the habitat.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	No	
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

NORTH FORK PAYETTE - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	The entire river corridor provides habitat for wildlife, the identified parcels do not have qualities that make them unique or rare.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	No	
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	SLICKSPOT PEPPERGRASS HABITAT
General Location	All slickspot peppergrass habitat including Proposed Critical Habitat, Occupied Slickspot Peppergrass Habitat, Slickspot Peppergrass Habitat, and Slickspot Peppergrass Management Areas in the planning area portions of Ada, Canyon, Elmore, and Gem counties.
General Description	Slickspot peppergrass that only grows in the sage-brush-steppe habitats of southwestern Idaho. Slickspot peppergrass is found throughout the southern half of the planning area, generally along the Snake River Plain and bordering foothills. The plant was listed as Threatened in 2009, and BLM manages habitat in accordance with USFWS under the terms of a Conservation Agreement.
Acreage	176,690 acres (proposed BLM lands)
Values Considered	BLM Type 1 special status plant species (slickspot peppergrass).
IDENTIFICATION CRITERIA To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).	

SLICKSPOT PEPPERGRASS HABITAT - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	No	
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	No	
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	Yes	Slickspot peppergrass (*Lepidium papilliferum*) is present throughout the proposed ACEC.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

SLICKSPOT PEPPERGRASS HABITAT - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	Yes	Slickspots are sensitive to ground disturbing activities including cross-country off-highway vehicle use, livestock trampling, and other ground disturbing activities.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	Yes	Slickspot peppergrass is listed as Threatened under the Endangered Species Act and is managed in accordance with the 2014 Conservation Agreement between BLM and USFWS.
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Area Considered	WILDHORSE RIVER
General Location	Adams County, 20 miles northwest of Council, ID.
General Description	The unit contains 7,470 acres of BLM land with a patchwork of private ownership between the Wildhorse and Snake rivers. The proposed ACEC is comprised of a high ridge and steep slopes between the Snake and Wildhorse rivers.
Acreage	7,470 acres (proposed BLM lands)
Values Considered	BLM Type 1 and 2 special status animal species (bull trout, redband trout, and Rocky Mountain bighorn sheep), critical big game winter habitat, and scenic values.

IDENTIFICATION CRITERIA

To be considered as a potential ACEC and analyzed in resource management plan alternatives, an area must meet the criteria of relevance and importance, as established and defined in 43 CFR 1610.7-2. Existing ACECs are subject to reconsideration when plans are revised (BLM Manual 1613.2.21.A.1).

WILDHORSE RIVER - Relevance: An area meets the "relevance" criterion if it contains one or more of the following:

Relevance Value	Yes/No	Rationale for Determination
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).	Yes	Geologic formations, diverse topography and diversity of vegetation communities provide significant scenic values.
A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).	Yes	Bull trout (*Salvelinus confluentus*) and redband trout (*Oncorhynchus mykiss gairdneri*) are present in Wildhorse River and its tributaries. Crucial winter range for mule deer and elk. Core herd home range habitat for Rocky Mountain bighorn sheep.
A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geological features).	No	Riparian area conditions are similar to potential natural communities.
Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs. A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process).	No	

WILDHORSE RIVER - Importance: The value, resource, system, process, or hazard described above must have substantial significance and values in order to satisfy the "importance" criteria. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:		
Importance Value	**Yes/No**	**Rationale for Determination**
Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.	No	Scenic values are similar to those found in the nearby Hells Canyon National Recreation Area.
Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.	No	Riparian areas are vulnerable to livestock grazing and trampling and other surface disturbing activities; however, the BLM manages only small portions of Wildhorse River.
Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.	Yes	Bull trout are listed as Threatened under the Endangered Species Act. BLM currently manages Bull Trout habitat in accordance with the USFWS Upper Snake Recovery Unit Implementation Plan (USFWS 2015).
Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.	No	
Poses a substantial threat to human life and safety or to property.	No	

Appendix V - Wild and Scenic River Eligibility and Tentative Classification Report

The Wild and Scenic Rivers Act (October 2, 1968, Public Law 90-542) established the National Wild and Scenic River (WSR) System, designed to preserve free-flowing rivers with outstandingly remarkable values in their natural condition for the benefit of present and future generations, balancing the Nation's water resource development policies with river conservation and recreation goals. Federal agencies consider potential rivers by evaluating its eligibility, tentative classification, and suitability for designation under the Act. The evaluation process is part of the resource management planning effort for the Four Rivers Field Office (FRFO).

The 1988 Cascade Resource Management Plan (RMP) recommended an 8-mile section of the South Fork of the Payette River (from the confluence with the Middle Fork Payette River downstream to Banks) as eligible for WSR designation. This recommendation is carried forward in all RMP alternatives; and will not be re-evaluated here. The 25-mile segment of the Snake River, from King Hill Creek to the backwaters of C.J. Strike Reservoir (19 miles within the PA), forms the boundary between the Four Rivers and Jarbidge field offices. This segment was evaluated as part of the Jarbidge RMP (BLM 2015g) and found to be eligible. It is not reevaluated in this report.

This report evaluates the following 15 waterways in the Planning Area for inclusion in the WSR System: Payette River, North Fork Payette River, Weiser River, Wildhorse River, King Hill Creek, West Fork of King Hill Creek, Big Willow Creek, Little Willow Creek, Crane Creek, Mann Creek, Indian Creek (near Hells Canyon), Syrup Creek, Indian Creek (through the Treasure Valley), Canyon Creek and Long Tom Creek. Several waterways were evaluated as multiple segments in cases where a feature (reservoir, diversion dam, etc.) broke up the free flowing sections. For example, Mann Creek was evaluated in two segments; the reach above Mann Creek Reservoir and the reach below. The 15 waterways were divided into a total of 20 river segments for evaluation purposes.

Overview of the WSR Study Process

The first part of a WSR study is the eligibility determination — an analysis to see whether the river is eligible to be considered for WSR designation. To be eligible, a river must meet the criteria of being free-flowing and possess one or more outstandingly remarkable values.

The second part of the study is the classification analysis, which determines whether eligible rivers should be tentatively classified as a recreational, scenic or wild river, if it were designated by Congress. This tentative BLM classification is based on the level of development present in the river corridor.

The third part of the study, the suitability assessment, consists of comparing alternative ways of managing the river. The suitability phase examines several management issues, such as interest in designation, an agency's ability to manage the resources, land ownership and public access, long-term protection of resources, and traditional resource uses.

Eligibility Evaluation

According to the Wild and Scenic Rivers Act, eligible river segments must be free flowing and, with their immediate environment, possess one or more outstandingly remarkable values (ORVs), such as scenic, recreational, geological, fish habitat, wildlife, historic, ecological, or cultural resource values. "Free flowing" is defined as "existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping or other modification of the waterway that would encourage future construction of such structures." "Outstandingly remarkable values" are defined as natural and cultural resources that are either unique at a regional level or exemplary at the national level.

A river need not be "boatable or floatable" in order to be eligible. For eligibility determination purposes, the flow volume is sufficient if it is enough to maintain the ORVs identified within the segment. Rivers with intermittent flows exist within the National WSR System, and rivers representative of desert ecosystems having outstanding ecological or other values should be considered.

The BLM guidance contained in the Washington Office Instruction Memorandum 2004-196 states: ". . . judgment is required in determining eligibility of water courses that are free-flowing and have associated ORVs. As a general rule, the segment should contain regular and predictable flows (even though intermittent, seasonal, or interrupted). This flow should derive from naturally occurring circumstances, e.g., aquifer recharge, seasonal melting from snow and ice, normal precipitation, in-stream flow from spillways or upstream facilities. Use caution in applying the free-flow criterion to water sources that only flow during flash floods or unpredictable events. The segment should not be ephemeral (flow lasting only a few days out of a year). Evaluation of flows should focus on normal years, with consideration of drought or wet years during the inventory."

During the evaluation of a river segment, jurisdictional considerations must be taken into account. If less than 40 percent of the shoreline and adjacent land in a segment is BLM-managed public land (public land is not predominant), it may be difficult to ensure that outstandingly remarkable values can be maintained in the future. Another way to consider these segments is for State or local governments to complete the planning, and for the segment to be designated under Section 2 (a) (ii) of the Act, or as a joint study under Section 5(c).

Classification Analysis
If a river segment is eligible, the next step is to assign a tentative classification and management measures needed to ensure appropriate protection of the values supporting the eligibility and classification determinations. The three classifications for rivers designated under the WSR Act are defined as:

Wild River Areas
"Wild" rivers are rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic River Areas
"Scenic" rivers are rivers or sections of rivers that are free of impoundments with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational River Areas
"Recreational" rivers are rivers or sections of rivers that are readily accessible by road or railroad, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past.

Classification is based on the type and degree of human development and access associated with the river and adjacent land, at the time of the eligibility determination. The classification does not reflect the types of values present along the river segment. The table below describes the criteria used to determine a tentative classification. The classification assigned during the eligibility phase is tentative. Final classification is a congressional legislative determination, along with designation of a river segment as part of the National WSR System.

Attributes of the three classifications of Wild and Scenic rivers			
Attribute	**Wild**	**Scenic**	**Recreational**
Water Resource Development	Free of impoundment.	Free of impoundment.	Some existing impoundment or diversion.
			The existence of low dams, diversions or other modifications of the waterway is acceptable, provided the waterway remains generally natural and riverine in
Shoreline Development	Essentially primitive. Little or no evidence of human activity.	Largely primitive and undeveloped. No substantial evidence of human activity.	Some development. Substantial evidence of human activity.
	The presence of a few inconspicuous structures, particularly those of historic or cultural value, is acceptable.	The presence of small communities or dispersed dwellings or farm structures is acceptable.	The presence of extensive residential development and a few commercial structures is acceptable.
	A limited amount of domestic livestock grazing or hay production is acceptable.	The presence of grazing, hay production or row crops is acceptable.	Lands may have been developed for the full range of agricultural and forestry uses.
	Little or no evidence of past timber harvest. No on-going timber harvest.	Evidence of past or on-going timber harvest is acceptable, provided the forest appears natural from the riverbank.	May show evidence of past and on-going timber harvest.
Accessibility	Generally inaccessible except by trail.	Accessible in places by road.	Readily accessible by road or railroad.
	No roads, railroads or other provision for vehicular travel within the river area. A few existing roads leading to the boundary of the river area is acceptable.	Roads may occasionally reach or bridge the river. The existence of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.	The existence of parallel roads or railroads on one or both banks, as well as bridge crossings and other river access points, is acceptable.
Water Quality	Meets or exceeds federal criteria or federally approved state standards for aesthetics, propagation of fish and wildlife normally adapted to the habitat of the river, and primary contact recreation (swimming), except where exceeded by natural conditions.	No criteria prescribed by the Act. The Federal Water Pollution Control Act Amendments of 1972 have made it a national goal that all waters of the United States be made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable federal and State laws.	

It is a common misunderstanding that rivers designated as scenic are managed primarily for scenery, and that recreational rivers are managed to promote recreation use. These labels can be misleading. Regardless of the classification, management is designed to maintain or enhance the river-related values and character.

Suitability Determination

The purpose of the suitability phase is to determine whether eligible river segments are suitable or not for inclusion in the National WSR System, per the criteria of the Wild and Scenic Rivers Act.

The suitability evaluation does not result in actual designation, but only a determination. The BLM cannot administratively designate, via a planning or other agency decision, a stream as part of the National WSR System, and no segment studied will be automatically designated as part of the System.

Only Congress can designate a wild and scenic river. In some cases, the Secretary of the Interior may designate a river when the Governor of a state, under certain conditions, petitions that it be designated.

The Congress will ultimately choose the legislative language, if any suitable segments are presented to them. Water protection strategies and measures to meet the purposes of the Act will be their responsibility in any legislation proposed. Rivers found not suitable would be dropped from further consideration, and managed according to the objectives outlined in the resource management plan.

Table V-1: Summary of Wild and Scenic Rivers Evaluated

Summary of Wild and Scenic Rivers Evaluated					
River Segment	**Free Flowing**	**Outstandingly Remarkable Values**	**Eligible**	**Tentative Classification**	**Total Miles**
Payette River (Banks - Horseshoe Bend: 16 miles) (Banks to Beehive Bend: 7 miles)	Yes	Recreation	Yes	Recreational	16 (7)
Payette River (Horseshoe Bend Diversion - Black Canyon Reservoir)	Yes	None Identified	No		10
Payette River (Black Canyon Dam - Snake River)	No	None Identified	No		39
North Fork Payette River (Cascade Dam - USFS boundary)	Yes	Recreation	Yes	Recreational	28
Weiser River (Headwaters - Snake River)	Yes	None Identified	No		106
Wildhorse River (Headwaters - Snake River)	Yes	None Identified	No		14
King Hill Creek (WSA boundary in T3S, R11E, Sect 18 - Snake River 18 miles) (WSA boundary to private lands 11 miles)	Yes	Fish	Yes	Wild (9 miles) Recreational (2 miles)	18 (11)
West Fork King Hill Creek (Headwaters - King Hill Creek)	Yes	Fish	Yes	Wild	11
Big Willow Creek (Headwaters - Payette River)	Yes	None Identified	No		37
Little Willow Creek (Headwaters - Paddock Reservoir)	Yes	None Identified	No		9
Little Willow Creek (Paddock Reservoir - Payette River)	Yes	None Identified	No		22
Crane Creek (Crane Creek Res. - Weiser River)	Yes	None Identified	No		13
Mann Creek (Headwaters - Mann Creek Res.)	Yes	None Identified	No		17
Mann Creek (Mann Creek Reservoir - Weiser River)	Yes	None Identified	No		13
Indian Creek (Hells Canyon) (Headwaters - Snake River)	Yes	None Identified	No		14
Syrup Creek (Headwaters - Canyon Creek)	Yes	None Identified	No		10
Indian Creek (Headwaters - Indian Creek Reservoir)	No	None Identified	No		13
Indian Creek (Indian Creek Reservoir - Boise River)	No	None Identified	No		49
Canyon Creek (Headwaters to Snake River)	Yes	None Identified	No		38
Long Tom Creek (Headwaters to Canyon Creek)	Yes	None Identified	No		14

Four Rivers Field Office Wild & Scenic Rivers Findings

Fifteen rivers and streams (20 segments) were evaluated as part of this Wild and Scenic River Study. Table V-1summarizes the eligibility determinations and tentative classifications made by the interdisciplinary team. If a river was determined not to meet the free-flowing criteria, it was not

evaluated further. Rivers determined to be free-flowing were then evaluated as to their scenic, geological, recreational, cultural, fish and wildlife, water quality, and riparian resources within the Planning Area. In the analysis, BLM compared the rivers' resource values to similar features on other rivers in the region, and identified values that are unique or exemplary. To be "unique," a resource or combination of resources must be "one of a kind" within a region. To be "exemplary," a resource must be one of the better examples of that resource type at a national level.

Figure V-1 shows the location of the rivers and streams evaluated in this study. Three river segments were determined not to meet the definition of "free flowing" and were dropped from consideration. The remaining seventeen were then evaluated as to their river-related resources and whether any were considered "outstandingly remarkable." Four segments were determined to have resources that are unique or exemplary and, therefore, meet the eligibility criteria. Thirteen river segments were determined not to contain unique or exemplary resources and were found ineligible.

The four segments found eligible were evaluated as to the level of development within the river corridor and were assigned a tentative classification of wild, scenic or recreational. Each of the four eligible segments is presented with a description of its characteristics, identified ORVs, and tentative classification.

Payette River

The Payette River system, consisting of the Main and South and North forks, flows year round, and is a unique recreational opportunity, offering a complete range of flat and whitewater boating experiences in a natural setting, within an hour's drive of half of Idaho's population. The Main Payette segment offers the recreational boater the opportunity to learn basic and intermediate whitewater skills, and hone them for more challenging river segments. This segment also has exceptional scenic values, and is important wildlife habitat supporting elk, deer, mountain lion, bear, turkey, and bald eagle.

Description: From the confluence of the North and South forks of the Payette River, at Banks, Idaho, downstream to the diversion dam in Horseshoe Bend.

Total Length: 16 miles

Eligibility
This segment of the Payette River from Banks downstream to the diversion in Horseshoe Bend is free-flowing with no existing dams or other structures to modify the river channel. The section from Banks to Beehive Bend is known as the "Main Payette" by recreational river users. The majority of boaters put in at Banks and float a little over 7 miles to the Beehive Bend river access site. Below Beehive Bend, public access points are very limited.

The primary recreational use on the river is non-motorized boating (rafting and kayaking); however, motorized jet boating is also popular at certain water levels. Other recreational opportunities along the river include fishing, swimming, picnicking, photography, bird watching, and driving/sightseeing. Recreational use has steadily increased over the past twenty years. The majority of use is local and regional, but users also come from across the nation.

The river is paralleled by State Highway 55. This section winds through foothills, open valleys, and forested canyons next to rolling, whitewater rapids. The highway was designated by the State as the Payette River Scenic Byway in June 1997, and later designated a National Scenic Byway in June 2002. The designation acknowledges the significant scenic and recreational resources available along the river. BLM-administered lands along the Payette River corridor are managed under Visual Resource Management (VRM) Class II to retain the existing scenic, landscape character.

The *1999 Comprehensive State Water Plan: Payette River Basin*, developed by the Idaho Department of Water Resources and adopted by the Idaho Legislature, designated the Payette River segment from Banks to Beehive Bend boat access as a State recreational river. The plan recognized the significant recreational, scenic, and fishery resources associated with the river.

The stretch of river from Banks to Beehive Bend passes through approximately 5.5-miles of BLM administered lands. The remaining stretch of river from Beehive Bend to Horseshoe Bend consists of primarily privately owned lands, with only 2.2-miles of BLM-administered lands adjacent to the river. It is determined that this segment of the Payette River meets the criteria for being free-flowing and possesses outstandingly remarkable recreational values. It thus meets the minimum eligibility requirements to be considered for suitability study.

Tentative classification: Recreational - There is a State highway along the entire length of the river and a railroad along a majority of it. There are also commercial businesses and residential housing along the shoreline.

North Fork Payette River

Description: From the Highway 55 bridge, just below Cascade Dam, downstream to the Boise National Forest boundary.

Total Length: 28 miles

Eligibility

The North Fork Payette River is 26 miles of free-flowing river with no existing dams. Approximately 1 mile below Cascade Dam, a whitewater park was constructed in summer 2010. The park added rock structures to the river bed to create whitewater features for users. While the park added to the river bed, it did not modify the river channel itself. It was determined that this park does not change the river's free-flowing nature.

This stretch initially flows on the east side of Cascade, Idaho, winds through the pastoral setting of Round Valley, and then drops into the forested, mountain canyon that characterizes this section's lower half. The river joins and parallels State Highway 55 for the lower 9 miles, from Rainbow Bridge downstream to the Boise National Forest boundary. The highway parallels the churning whitewater of the famous Class V section of the North Fork.

Highway 55 was designated by Idaho as the Payette River Scenic Byway in June 1997, and later designated a National Scenic Byway in June 2002. The designation acknowledged the significant scenic and recreational resources available along the river.

The section's upper reach is a nice, flat water stretch suitable for recreational boaters of any skill level. Canoes are popular from Cascade downstream to the Cabarton Bridge. The river from Cabarton Bridge to Smith's Ferry, known as "Cabarton" by recreational river users, is classified as Class III whitewater (ISRD), and characterized by numerous high and irregular waves, rocks and eddies, and rapids with clear but narrow passages, requiring expertise in maneuvering, and usually needing scouting for safe passage.

The primary recreational use is non-motorized boating (rafting and kayaking). Other recreational activities include fishing and bird watching. Recreational use has steadily increased over the past twenty years. The majority of use is local and regional. The section below Smith's Ferry is known as the "North Fork." This is an expert-only, Class V stretch of river. Kayakers come from across the U.S. and other countries to test their skills on this whitewater stretch.

The *1991 Comprehensive State Water Plan: Payette River Reaches*, developed by the Idaho Department of Water Resources and adopted by the Idaho Legislature, designated the Payette River segment from Cabarton Bridge to Banks as a State recreational river. The plan recognized its outstanding recreational, scenic, and fish and wildlife resources. The *1999 Idaho Comprehensive State Water Plan: Payette River Basin* updated the earlier plan, and carried forward the State's previous designation.

The North Fork Payette segment is predominantly private land for its entire length. The BLM administers only about 6 miles (14 percent) of the shoreline.

Rural ranches and residences encompass many miles of the shoreline. The Cabarton Bridge to Smith's Ferry section is a very popular Class III whitewater reach. Downstream from Smith's Ferry is the start of the nationally known Class V, expert-only whitewater stretch.

In 2010, the Boise National Forest issued the Amended Forest Plan which included a recommendation for eligibility of the North Fork Payette River from the forest boundary to the confluence with the Main Payette River (at Banks) to be eligible for consideration in the National system, classified as recreational.

It is determined that the North Fork Payette River meets the criteria for being free-flowing and possesses outstandingly remarkable recreational values. It thus meets the minimum eligibility requirements for consideration into the National system.

Tentative classification: Recreational - There is a State highway runs alongside half of the river; a railroad parallels about two-thirds of it. The river flows on the eastern side of Cascade, Idaho with commercial and residential structures along the shoreline.

King Hill Creek

Description: From the northern Wilderness Study Area (WSA) boundary downstream to the confluence with the Snake River.

Total Length: 19 miles

Eligibility

The King Hill Creek segment, from the northern Wilderness Study Area (WSA) boundary downstream to the Snake River, is a free-flowing river with no existing dams or other structures to modify the river channel. King Hill Creek flows from the Bennett Mountains' upper end through a deep basalt canyon before opening into the Snake River area. Visually, it offers visitors scenic vistas similar to that found in the Owyhee and Bruneau canyon lands to the south. The unique feature of King Hill Creek is its fisheries habitat for a pure strain of redband trout.

The area surrounding King Hill Creek was studied for wilderness consideration under Section 603 of the Federal Land Policy and Management Act (FLPMA), and included in the Jarbidge Resource Management Plan and Environmental Impact Statement (EIS) filed in October 1987. The area was designated as a WSA, and is managed to maintain the area's identified wilderness characteristics.

The area contains scenic, highly convoluted topography, with a maze of drainages, ridges, hills, and peaks. The WSA provides outstanding opportunities for solitude in most places. The topography provides excellent screening among visitor groups and excellent potential for dispersing recreational uses. The WSA, in combination with its diverse landforms and scenic quality, also provide outstanding opportunities for primitive and unconfined recreation. The natural features attract people interested in backpacking, day hiking, nature photography, wildlife viewing, hunting, fishing, and shed antler hunting.

King Hill Creek, within the WSA, is visually characterized as a deep, rocky basalt canyon among a sagebrush plateau. South of the boundary, the canyon is crossed by a major power line before opening into a more pastoral setting with several adjacent farms and ranches. The majority of King Hill Creek is BLM-managed, with the lower section being mostly private. The upper reaches, through the WSA, are managed by BLM to protect wilderness values of naturalness, solitude, and primitive, unconfined recreation. Since most of the lower 4 miles is privately owned, recognition as a Wild and Scenic River would not aid BLM in managing or protecting the river-related values should development or other threats be proposed in the future. Currently, there are no known future potential threats to identified values.

King Hill Creek represents an exceptional environmental resource that provides habitat for unique populations of native fish, migratory waterfowl, and other wildlife, including redband trout. Redband trout are native rainbows with a brick-red, side band that dwell in the King Hill Creek watershed. They represent a unique natural history, reflecting a Pleistocene connection between eastern Oregon's lake basins and the Snake and Columbia rivers. Genetically pure redband trout populations are rare and provide and important source for reintroduction elsewhere in the Pacific Northwest.

It is determined that King Hill Creek meets the criteria for being free-flowing and possesses outstandingly remarkable fish values. It thus meets the minimum eligibility requirements for consideration into the National system.

Tentative classification: Wild – 8 miles within the WSA. There are no roads and very few trails within this segment. The area is largely primitive with little evidence of human activity.

Recreational – 2 miles from the southern WSA boundary to where King Hill Creek crosses onto privately owned lands. King Hill Creek's lower section is accessible by both paved and gravel roads. There is obvious evidence of human development, including a major power line. The private land on the lower section is developed agricultural land.

West Fork King Hill Creek

Description: From the northern WSA boundary downstream to the confluence with King Hill Creek.

Total Length: 11 miles

Eligibility

The West Fork King Hill Creek is entirely with the Wilderness Study Area (WSA) boundary. It is a free-flowing stream with no existing dams or other structures to modify the river channel.

The area surrounding King Hill Creek was studied for wilderness consideration under Section 603 of FLPMA, and included in the Jarbidge Resource Management Plan and Environmental Impact Statement (EIS) filed in October 1987. The area was designated as a WSA, and is managed to maintain the area's identified wilderness characteristics.

The area contains scenic, highly convoluted topography with a maze of drainages, ridges, hills, and peaks. The WSA provides outstanding opportunities for solitude in most places. The topography provides excellent screening among visitor groups and excellent potential for dispersing recreational uses.

The WSA, in combination with its diverse landforms and scenic quality, also provide outstanding opportunities for primitive and unconfined recreation. The natural features attract people interested in backpacking, day hiking, nature photography, wildlife viewing, hunting, fishing, and shed antler hunting. The West Fork King Hill Creek is visually characterized as a rocky, basalt canyon among a sagebrush plateau.

The West Fork represents an exceptional environmental resource that provides habitat for unique populations of native fish, migratory waterfowl, and other wildlife resources, including redband trout. Redband trout are native rainbows with a brick-red, side band that dwell in the King Hill Creek watershed. They represent a unique natural history, reflecting a Pleistocene connection between eastern Oregon's lake basins and the Snake and Columbia rivers. Genetically pure redband trout populations are rare and provide and important source for reintroduction elsewhere in the Pacific Northwest.

It is determined that the West Fork King Hill Creek meets the criteria for being free-flowing and possesses outstandingly remarkable fish values. It thus meets the minimum eligibility requirements for consideration into the National system.

Tentative classification: Wild – entire length. There are no roads and very few trails within the WSA. The area is largely primitive with little evidence of human activity.

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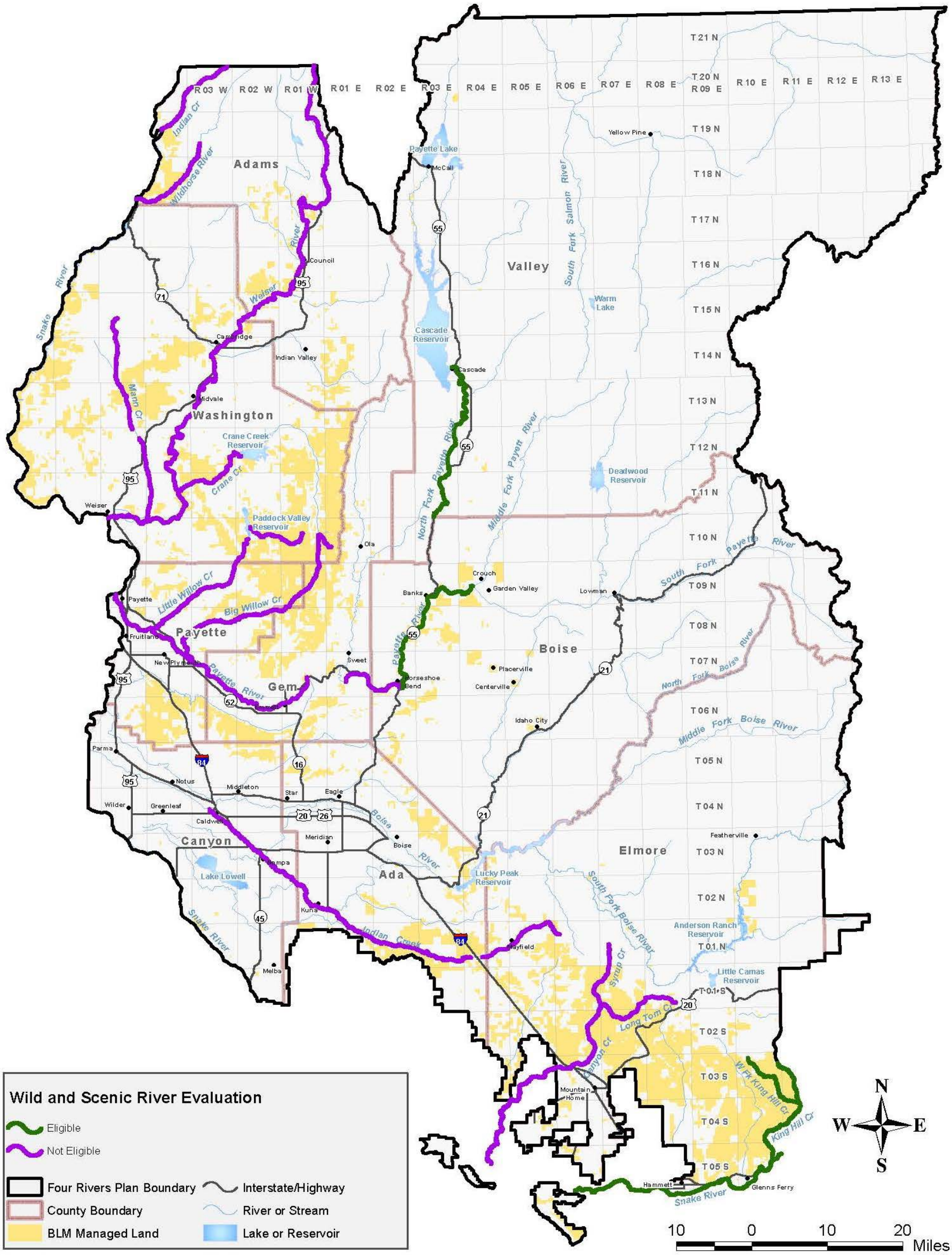

Figure V-1. Rivers Evaluated for Wild and Scenic River Designation

Appendix W - Wilderness CharacteristicsTechnical Report

INTRODUCTION

Section 201 of the *Federal Land Policy and Management Act* of 1976 (FLPMA) as amended, requires the Secretary of the Interior to "prepare and maintain on a continuing basis an inventory of all public lands and their resource and other values." Lands within the Four Rivers Field Office (FO) had previously been inventoried for wilderness characteristics in 1979 and 1980. The initial inventory identified areas that might meet criteria for identification as Wilderness Study Areas (WSAs). These areas were then examined in a series of intensive inventories to determine which should be identified as such.

Following this inventory process, two WSAs were designated: Box Creek WSA under Section 202 of FLPMA and King Hill Creek WSA under Section 603 of FLPMA. The King Hill Creek WSA was analyzed in the 1987 Jarbidge Wilderness Environmental Impact Statement (EIS) and the Box Creek WSA was analyzed in the 1989 Proposed Plan Amendments and EIS for Small Wilderness Study Areas Statewide.

King Hill Creek: The King Hill Creek WSA contains 29,309 acres of public land of which 23,815 acres are in the Boise District and 5,494 acres are in the Twin Falls District. The 1991 Idaho Wilderness Study Report described the wilderness characteristics for King Hill Creek WSA as having scenic, highly convoluted topography with a maze of drainages, ridges, hills, and peaks. Predominant vegetation in the lower elevations of the southern edge of the area include Wyoming big sagebrush, Sandberg bluegrass, and cheatgrass, while the ridges generally have low sagebrush-bluebunch wheatgrass sites with a few junipers. The peaks in the northern part of the area are covered with mountain big sagebrush with bluebunch wheatgrass or Indian fescue depending on slope aspect. Small clumps of Douglas-fir and aspen are present at higher elevations. Riparian areas contain poison ivy, rushes, sedges, grasses, and willows. The ground surface is extremely rocky.

Monitoring has detected numerous new (post-inventory) motor vehicle routes and evidence of extensive cross-country vehicle use within the WSA. These activities, primarily associated with hunting and shed-antler collecting, are causing erosion, soil loss, wildlife disturbance and loss of wildlife habitat. BLM policy is to limit motorized and mechanized vehicles to roads and ways identified in the original wilderness inventory, and to prohibit all cross-country vehicle travel. Lack of clear OHV designations in previous land use plans resulted in a 2010 Federal Register notice restricting OHV use to only those routes and ways identified during the original wilderness inventory for the King Hill Creek WSA as depicted in the Jarbidge Wilderness Final EIS (1987) and the Idaho Wilderness Study Report (1991). Maps showing the travel restrictions were posted at key access points to the WSA and are available at BLM Offices and on the internet.

Box Creek: Box Creek WSA is located in Valley County approximately ten miles northeast of McCall, Idaho. The WSA includes 440 acres of public lands. The WSA is bounded on the east with the Payette National Forest and on all other sides by lands administered by the Idaho Department of Lands. The WSA consists of rolling to extremely steep and broken terrain supporting a mixed conifer forest of Douglas-fir, subalpine fir, Englemann spruce, and lodgepole pine. Ponderosa pine, larch and aspen are also present. The forest cover is frequently broken by large granite outcrops. Elevation ranges from 5,700 to 6,700 feet. The perennial stream, Box Creek, flows through the southern portion of the WSA. The surrounding State land restricts motorized access near the WSA. This tends to limit the number of people visiting this WSA.

The wilderness inventory conducted in 1979 identified Box Creek as a small unit located northeast of Payette Lake containing mountainous terrain. The WSA was dependent upon the contiguous USFS roadless area, which was recommended for wilderness, to meet the size criteria. Box Creek was designated as a Wilderness Study Area because of its natural character; however it was dependent on the contiguous USFS roadless area to meet the size, solitude, and recreation criteria. Box Creek was analyzed by the BLM as part of the statewide small wilderness study area EIS in 1989. At that time 20,000 acres of the adjacent USFS Secech roadless area had been designated for management as a semi-primitive motorized area. Since the prior WSA recommendation was highly dependent on the contiguous USFS area, the EIS decision was to not recommend Box Creek for wilderness designation.

The WSA receives very little visitor use due to limited motorized access and the challenging cross-country travel required to get to the WSA. This minimizes possible human impacts to the area. The greatest potential threat to the wilderness values are from activities on adjacent USFS or Idaho State lands; primarily timber harvesting.

In 2003, the BLM issued two Instructional Memorandums (IMs) that relate to wilderness characteristics. Instructional Memorandum (IM) 2003-274 states that BLM will not designate any new WSAs but also reiterates BLM's authority to inventory resources or other values, including areas with wilderness characteristics, as a part of managing the public lands and land use planning. According to IM 2003-275, the BLM may consider information on wilderness characteristics when preparing land use plans. In addition, the current land use planning handbook (H-1601-1, March 11, 2005) states land use plans should identify decisions to protect or preserve wilderness characteristics (naturalness, outstanding opportunities for solitude, and outstanding opportunities for primitive and unconfined recreation), including goals and objectives to protect the resource, management actions necessary to achieve these goals and objectives, and conditions of use for authorized activities that would avoid or minimize impacts on wilderness characteristics.

Consistent with the two IMs and the land use planning handbook, the Four Rivers FO initiated the identification and evaluation of lands with wilderness characteristics outside existing Wilderness Study Areas (WSAs). These lands will be considered in the resource management planning process for the Four Rivers FO, which may result in several outcomes, including, but not limited to: 1) emphasizing other multiple uses as a priority over protecting wilderness characteristics; 2) emphasizing other multiple uses while applying management restrictions (conditions of use, mitigation measures) to reduce impacts on some or all of the wilderness characteristics; or 3) emphasizing the protection of some or all of the wilderness characteristics as a priority over other multiple uses (though the area will not be designated a WSA). This inventory will not be used to designate new WSAs or allocate additional lands to be managed under the non-impairment standard prescribed in BLM Handbook 8550-1, and in accordance with BLM Interim Management Policy for Lands under Wilderness Review.

Definitions

Wilderness Characteristics
Features of the land associated with the concept of wilderness that may be considered in land use planning when BLM determines those characteristics are reasonably present, of sufficient value, and practical to manage.

Solitude and Primitive/Unconfined Recreation
Visitors may have outstanding opportunities for solitude or primitive and unconfined types of recreation when the sights, sounds, and evidence of other people are rare or infrequent; where visitors can be isolated, alone, or secluded from others; where the use of the area is through non-motorized, non-mechanical means; and where no or minimal developed recreation facilities are encountered.

Naturalness

Lands and resources exhibit a high degree of naturalness when affected primarily by the forces of nature and where the imprint of human activity is substantially unnoticeable. BLM has authority to inventory, assess, and monitor the attributes of the lands and resources on public lands, which, taken together, are an indication of an area's naturalness. These attributes may include the presence or absence of roads and trails, fences, and other improvements; the nature and extent of landscape modifications; the presence of native vegetation communities; and the connectivity of habitats.

PROCESS FOR EVALUATING WILDERNESS CHARACTERISTICS

Identification of areas for evaluation for wilderness characteristics

This wilderness characteristics inventory focused on BLM-managed lands within the Four Rivers FO. Lands within the two WSAs in the Four Rivers FO were not re-inventoried.

As part of this wilderness characteristics inventory, the ID Team reviewed the Idaho Initial Wilderness Inventory and information that could be obtained from the inventory files. No wilderness legislation has been introduced in Congress that proposes wilderness designation for any lands within the Four Rivers FO, and no citizens' wilderness proposals have been received.

The first criterion used to identify BLM-managed lands that would be evaluated for wilderness characteristics are roadless areas greater than 5,000 acres.

This initial criterion was used because a lack of roads and the size of a tract are related to an area's naturalness and opportunities for solitude and primitive and unconfined recreation. Using the most current Idaho BLM corporate GIS data, the following process was used to arrive at roadless polygons of BLM-managed land of 5,000 acres or greater. Idaho BLM Resource Base Data Roads (derived from roads illustrated on USGS 24,000 topographic maps and include routes that fall into the BLM categories of "road" and "primitive road") were buffered by one (1) foot to create a web that represents roads covering the Planning Area. By removing these buffered roads from the GIS layer, BLM specialists were able to quickly identify contiguous polygons of BLM-managed land. Polygons greater than 5,000 acres were selected for further evaluation. This GIS exercise resulted in 27 polygons (Figure EE.1, "Wilderness Evaluation").

Next, 2009 aerial imagery and power transmission line data layers were analyzed to identify roads not in the roads data layer, transmission lines crossing through a polygon, and any other significant man-made structures (e.g., small reservoirs) inside polygons. Following this process, the initial 27 polygons were narrowed down to five (5) polygons of significant size for further consideration. One polygon was the existing King Hill Creek WSA and was not evaluated further.

This resulted in four (4) areas 5,000 acres or greater that would be evaluated as to whether or not it had wilderness characteristics. The four areas totaled 73,960 acres.

Evaluating areas for wilderness characteristics

An interdisciplinary (ID) team assessed whether the four areas that met the preliminary criterion described above had wilderness characteristics (opportunities for solitude, opportunities for primitive and/or unconfined recreation, and naturalness). The ID Team agreed that an area would need to have all three characteristics to be identified as having wilderness characteristics. Absence of one or more of these criteria would render it as lacking wilderness character.

During these reviews, the ID Team relied primarily on institutional knowledge, as the majority of the ID Team had substantial on-the-ground experience within the identified areas. In addition, Idaho BLM corporate GIS data were used for reference when necessary. Some examples of GIS data used to help facilitate this review include land status, range infrastructure (pipelines, fences, water developments, etc.), grazing allotments, wildfire history, wildlife habitat data, and vegetation maps. Field verification with photographic documentation was also used.

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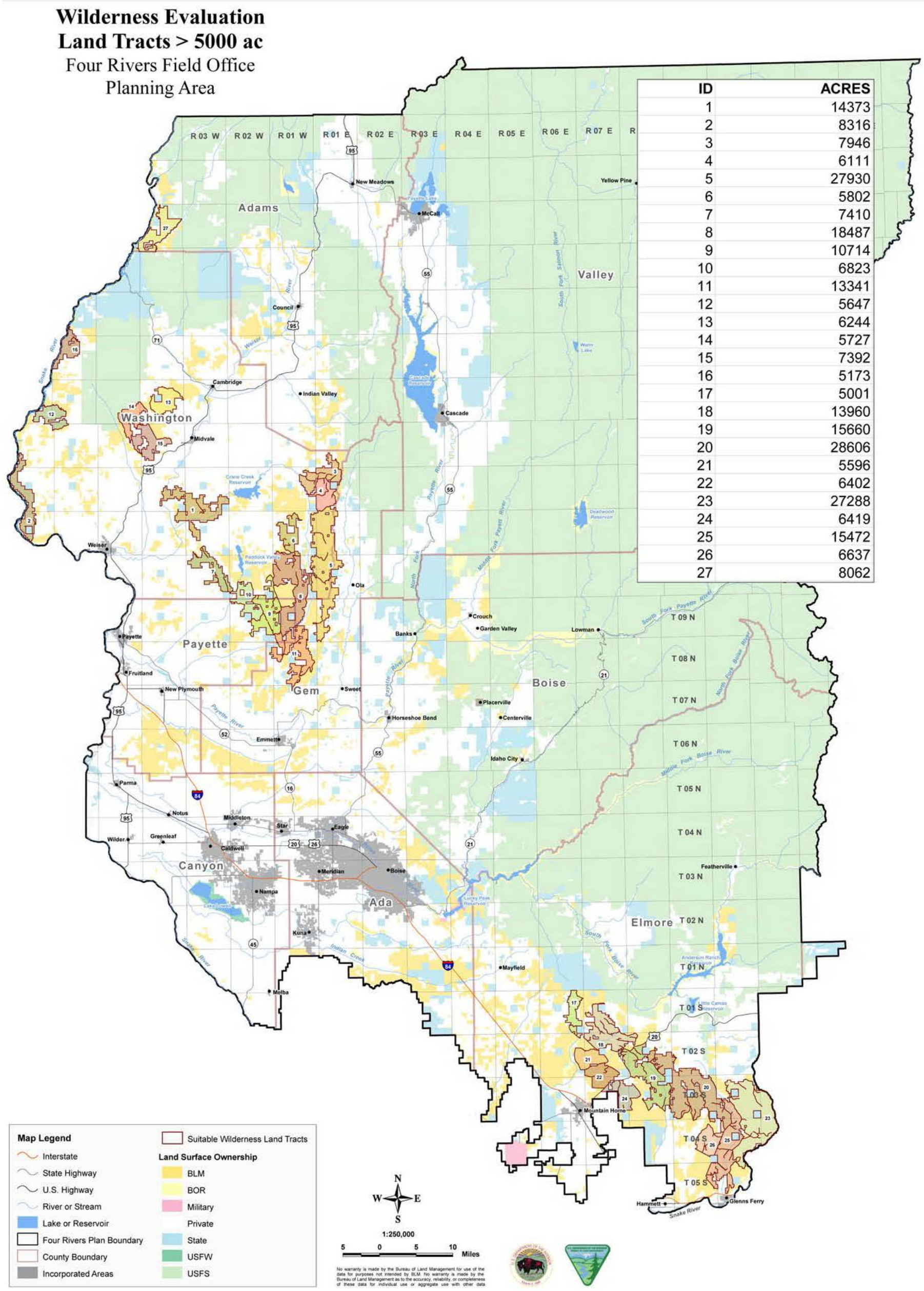

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12	5647
13	6244
14	5727
15	7392
16	5173
17	5001
18	13960
19	15660
20	28606
21	5596
22	6402
23	27288
24	6419
25	15472
26	6637
27	8062

Figure W.1. Wilderness Evaluation

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The ID Team evaluated wilderness characteristics according to the following criteria.

Opportunities for solitude

The ID Team evaluated the extent to which outstanding opportunities for solitude exist in the area. Questions posed included:

- Does the area possess a landform that is of moderate to rugged relief that would provide some degree of screening from other people who might be in the area?
- Does the area possess adequate vegetation that would provide some degree of screening from other people who might be in the area?
- Does the size of the area contribute to creating opportunities for visitors to enjoy the area without frequent contact with others in the area?
- Are sights, sounds, and evidence of other people in the area rare or infrequent?
- Are sights, sounds, and evidence of low-flying aircraft infrequent?
- Does the area allow visitors to be isolated, alone, or secluded from others?
- If vehicle routes are present, is the distance from such routes, existing vegetative cover, and/or infrequent use of the route adequate to allow for solitude?
- Is the area distant from communities and urbanization or difficult to reach by motor vehicle?

Opportunities for primitive and/or unconfined recreation

The ID Team evaluated the extent to which outstanding opportunities for primitive and/or unconfined recreation exist in the area. Questions posed included:

- Is the current recreational use of the area mostly non-motorized, non-mechanical?
- Does the area have minimal or no developed recreation facilities?
- Is the size of the area conducive to primitive and unconfined types of outdoor recreation activities?
- Are there features or attractions within the area that lend themselves to primitive and unconfined types of outdoor recreation activities?

Naturalness

The ID Team evaluated the extent to which past and present human activities have been established and the degree to which they might affect naturalness in the area. Questions posed included:

- Are motor vehicle travel routes absent from the area?
- Are fences, pipelines, powerlines, or other developments absent from the area? If they are present, do they cross through the middle of a polygon or only near an edge?
- Are other landscape modifications, such as vegetative treatment areas, active or inactive mines, spoils, or prospects, etc., absent from the area?
- Are native vegetation communities present?
- Does the area provide or contribute to the connectivity of habitats?
- Do developments create visual contrast levels that cause them to be 'substantially noticeable'?

Other Values:
Other values that were considered as contributing to the characteristics of an area were also captured during the course of this process. These values have been included in the description of the areas, but were not used for the evaluation of wilderness characteristics.

During the review, the ID Team used these criteria to determine whether each polygon had opportunities for solitude, opportunities for primitive and/or unconfined recreation, and naturalness. Several conditions led to an area not having a particular wilderness characteristic.

Opportunities for solitude
Conditions that led to a lack of opportunities for solitude included:

- influence of developed adjacent land
- proximity to roads
- high levels of motorized vehicle use
- high probability of user contact

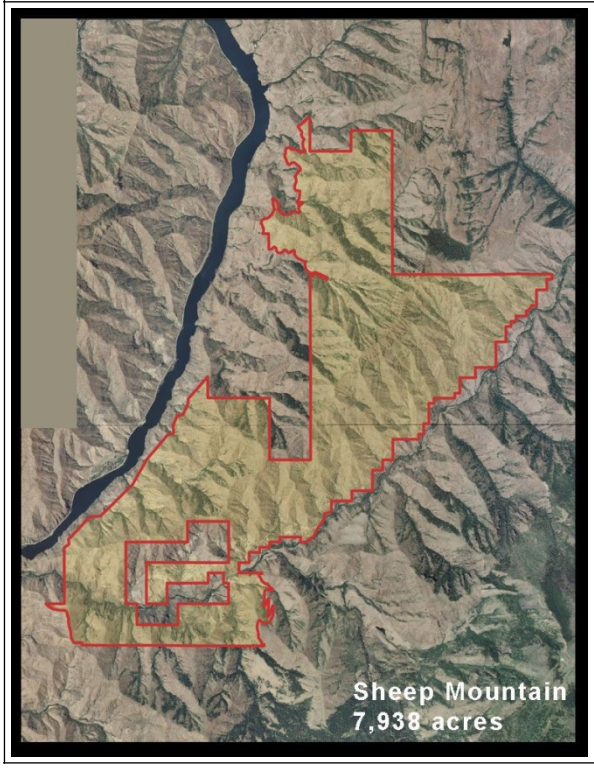
Opportunities for primitive and/or unconfined recreation
Conditions that led to a lack of opportunities for primitive and/or unconfined recreation included:

- motorized recreation present
- lack of attractive opportunities for primitive and/or unconfined recreation
- confinement due to natural features
- high levels of fall hunting use utilizing OHVs

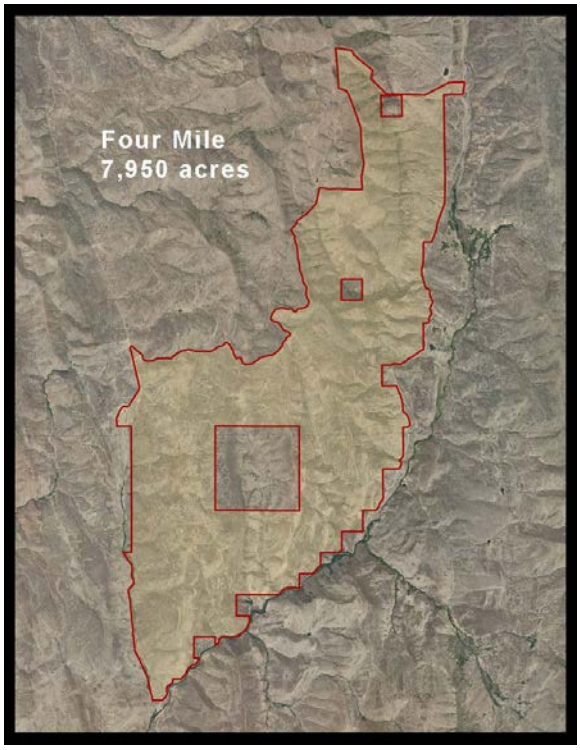
Naturalness
- Conditions that led to a lack of naturalness included:
- limited native vegetation
- large areas of seeded non-native perennial grasses
- obvious presence of range improvements
- adjacent powerlines and wind turbines
- fences that cut through the polygon
- high frequency of fire and rehabilitation projects
- significant “cherry stem” routes within an area

The results of the ID Team's evaluation of each of the four polygons are summarized in the tables below. A vicinity map is included for reference. The ID Team identified 1 of the 4 polygons (Sheep Mountain - approximately 7,930 acres) as having wilderness characteristics.

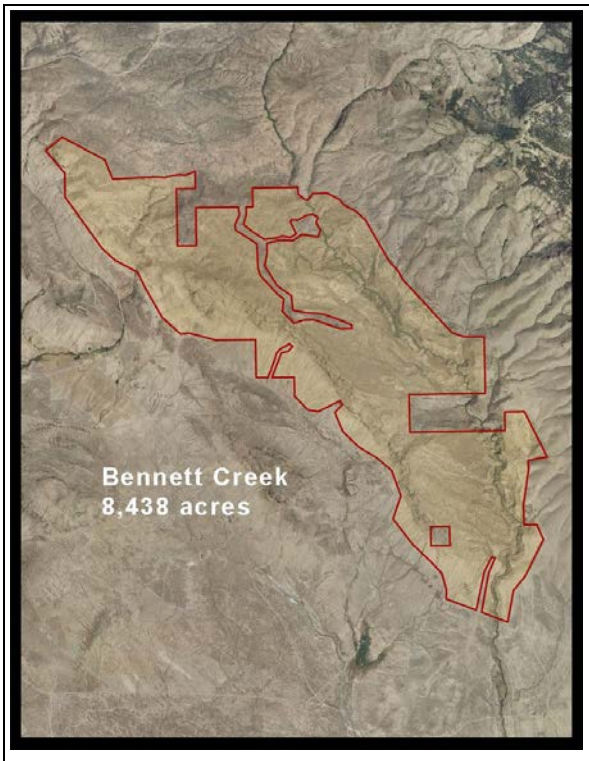
Sheep Mountain	Size: 7,938 acres
Wilderness Characteristics Present? Yes	
Wilderness Characteristic Evaluation Summary	
Opportunities for Solitude Yes. The area provides opportunities for solitude. The size of the area, topographic relief, low visitor use levels, and vegetative screening allows visitors to enjoy the area without frequent contact with others. Use increases in the area during fall hunting season, but is infrequent enough to provide low probability of user contacts.	
Opportunities for primitive and/or unconfined recreation Yes. The area provides outstanding opportunities for primitive and/or unconfined recreation. No developed recreation facilities exist within the area and there are minimal primitive trails in the area. Most travel is cross-country and user defined. The size and topography of the area lends itself well to unconfined activities.	
Naturalness Yes. The area supports a high level of naturalness. There are few range improvements or fences in the area. Habitat fragmentation is minimal and native vegetation predominates. No permanent developments are present which create visual contrast levels that cause them to be substantially noticeable. Steep terrain limits motorized use in the area lending to a natural landscape.	

Other Characteristics The area is located in the upper reaches of Hells Canyon. The steep terrain and long ridge line vistas provide high scenic value to the area.


Four Mile	Size: 7,950 acres
Wilderness Characteristics Present? No	
Wilderness Characteristic Evaluation Summary	
Opportunities for Solitude No. The area provides limited opportunities for solitude. While the area meets the minimum size requirement for wilderness consideration, and a visitor could be a considerable distance from others, the general landscape is primarily very open, rolling hills covered with low grass vegetation. The area is bordered by gravel roads that receive steady vehicle traffic which is visible from most areas. The area is part of a wild horse Herd Management Area and is frequently accessed by motorized vehicles. These factors severely limit one's opportunities for solitude.	
Opportunities for primitive and/or unconfined recreation No. The area does not provide opportunities for primitive and/or unconfined types of recreation. While the area has no recreational facilities and is large enough to be conducive to primitive and unconfined types of recreation, four-wheel drive vehicles and ATV use is common throughout most of the area.	
Naturalness No. The area shows evidence of human manipulation of the landscape. The area is crossed by multiple ATV trails used for wild horse and livestock management, pasture fences, and stock water facilities. The majority of the area has burned and lacks much native vegetation.	
Other Characteristics No other unique characteristics were identified.	



Bennett Creek	Size: 8,438 acres
Wilderness Characteristics Present? No	
Wilderness Characteristic Evaluation Summary	
Opportunities for Solitude No. The area provides limited opportunities for solitude. While the area meets the minimum size requirement for wilderness consideration, and a visitor could be a considerable distance from others, the topography is very open with long open views of the surrounding valley's urbanization. The rolling hills are covered with low grass vegetation offering limited vegetative screening. The area is bordered by a State highway and gravel roads that receive steady vehicle traffic, which is visible from most areas. The shape of the area is long and narrow with border roads usually in view. These factors severely limit one's opportunities for solitude.	
Opportunities for primitive and/or unconfined recreation No. The area does not offer opportunities for primitive recreation. Most recreational use is motorized, associated with hunting season. The long, narrow shape allows views of adjacent facilities and developments.	
Naturalness No. The area offers limited naturalness characteristics. Motor vehicle travel routes are mostly absent from the area, but cross-country OHV travel occurs primarily during fall hunting season. Range management is evident from pasture fences. Vegetation treatments are apparent from past fire rehabilitation efforts. The most natural area is the riparian zone along Bennett Creek itself.	
Other Characteristics No other unique characteristics were identified.	



Cold Springs	Size: 22,347 acres
Wilderness Characteristics Present?	

Wilderness Characteristic Evaluation Summary

Opportunities for Solitude

Yes. The area offers the visitor opportunities for solitude. The topography possesses many ridge lines and valleys to provide screening from others. The upper elevations are timbered which also provides screening from others. The size is large enough to provide ample space for users to have infrequent contacts. Most of the time sights and sounds of others are also uncommon. With the exception of the east side, most of the area is difficult to access.

Opportunities for primitive and/or unconfined recreation

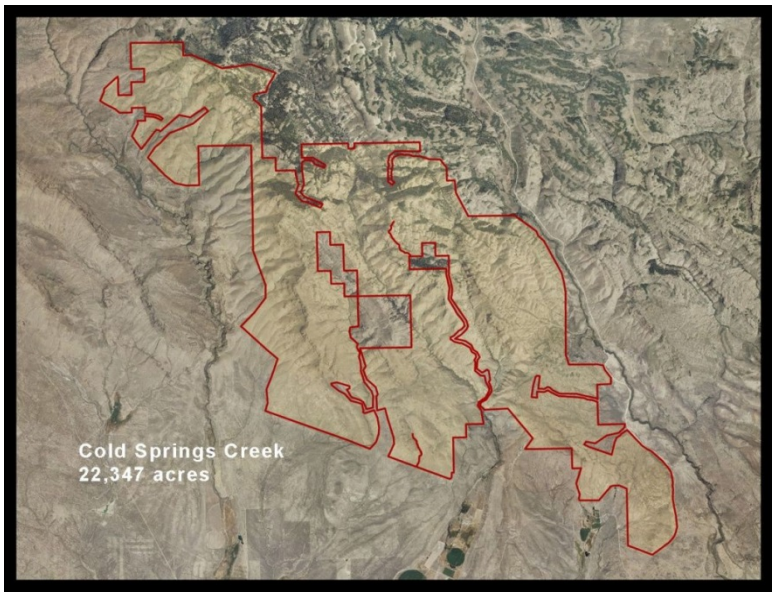
No. The area offers limited opportunities for primitive recreation. The area has minimal developments within the area and is of sufficient size to be conducive to primitive and unconfined types of recreation. However, most of the use in the area is motorized and penetrates well into the interior of the polygon.

Naturalness

No. Much of the area appears natural while other sections show obvious signs of human manipulation. Native vegetation occurs in much of the area and provides connectivity of habitats for deer, elk, moose, and bear. However, there are many "cherry stem" roads that penetrate the polygon; two of which almost traverse the entire polygon. These routes receive little use due to limited public access. Range management fences are present, but in limited places. Timber management projects occur in the upper elevations of the polygon.

Other Characteristics

No other unique characteristics were identified.



Appendix X – Assumptions for Analysis

Common to All Alternatives and Resources:

- Key planning issues identified in Chapter 1 provide the focus for the scope of impact analyses in this chapter.
- In general, the BLM considers adverse impacts described in this chapter important if they result from or relate to the key planning issues described in Chapter 1 and their context or intensity (see *Glossary*) indicate that they may result in impacts to public health and safety; a potential for violating legal standards, laws, or protective status of resources; or potential impacts to unique resources.
- The use of the term 'mitigation' throughout the effects analysis is used in the context of Council of Environmental Quality regulations found at 40 CFR 1508.20 which defines mitigation as (a) Avoiding the impact altogether by not taking a certain action or parts of an action. (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation. (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment. (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action. (e) Compensating for the impact by replacing or providing substitute resources or environments.
- The analysis of impacts focuses on the anticipated incremental and meaningful impact of management actions and allowable uses proposed for each alternative. The description of existing conditions in Chapter 3 encompasses the impacts of past and present actions.
- When adverse impacts to other resources would occur, "on a case-by-case basis" then an action would only be allowed when impacts can be adequately mitigated consistent with other resource goals and objectives.
- For impact analysis, short-term is generally defined as being less than 5 years and long-term as being greater than 5 years, unless otherwise noted for a specific resource; the life of the plan is assumed to be 15 to 20 years.
- Existing state and federal environmental legislation and regulatory programs would remain relatively unchanged and in effect (i.e., analyses are based on current, rather than projected, future regulations).
- To the extent possible and within legal and regulatory parameters, BLM management and planning decisions will be consistent with the planning and management decisions of other agencies, state and local governments, and Native American tribes with jurisdictions intermingled with the Planning Area.
- Funding would be available to implement the alternatives described in Chapter 2.
- The BLM would implement any of the alternatives in compliance with standard practices, best management practices (BMPs) and required design features, guidelines for surface-disturbing activities, and standard operating procedures (SOPs) (Appendix H). The practices and guidelines included in Appendix H are a component of each alternative.
- Concentrated livestock and native ungulate grazing, off-highway vehicle (OHV) use, and fire may remove vegetation and expose the soil surface leading to increased erosion.
- Ongoing natural and human-caused changes to vegetation communities would continue in the absence of management intervention.
- Vegetation treatments would be performed only in habitats that would benefit from such treatments.

- The successful application of treatments to specific areas/watersheds would result in the maintenance or reestablishment of the desired range of conditions for the major vegetation communities in approximately the desired proportions.
- An oil and gas lease grants the lessee the "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease (BLM Form 3100-11, Lease for Oil and Gas). Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, the BLM imposes restrictions on the lease terms. Lease stipulations are only subject to change prior to lease issuance. Once a lease has been issued, stipulations will not be modified absent voluntary agreement by the lessee.
- The BLM cannot predict the exact locations of future surface-disturbing activities at the RMP level. Unless a management action for a vegetation type specifies otherwise, surface-disturbing activities are assumed to occur in vegetation types in proportion to their availability within the Planning Area. Impact acreage for vegetation types are not absolute, but serve as a relative comparison among alternatives.

Cultural Resources

- All authorizations for land and resource use must comply with all relevant cultural resource laws, regulations, protocols, and policies. Protection of cultural resources must also conform to SHPO coordination requirements, with input from the local public, other interested parties, and Native American Tribes and groups.
- The degree of potential adverse impacts on cultural sites is directly related to the amount of surface-disturbing or other disruptive activities.
- Population growth could increase activities that could potentially disturb cultural resources.
- Cultural sites would continue to be impacted by natural weathering and erosion.
- Qualitative information indicates areas where there is a higher probability for cultural resources to be present. Highly disturbed or recently developed areas would be less likely to include intact cultural resources.
- All efforts would be taken to avoid disturbance to cultural resources, however in the event avoidance is not possible, some resources could be adversely affected. These effects would be disclosed during the site specific environmental analysis.
- Class III cultural resource surveys would be completed prior to any permitted ground disturbing activities.
- Impacts on cultural resources from any permitted activities would be long-term, and would vary by type and size of the activity.

Paleontological Resources

- Impacts on paleontological resources from any surface or subsurface activities would be long-term, and vary by type and size of the activity.
- Impacts on paleontological resources from management actions would be similar to those discussed in the Section 4.1, "Tribal Interests/ Cultural Resource Management".

Vegetation Resources

- Wildfire ignitions (starts) would occur at the same rate averaged over the last 30 years.

- The Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management would be used to inform management of livestock in a manner that would maintain habitat to support sustainable populations of special status wildlife across the PA.
- Past disturbances rates are the best predictor for future disturbance, at least in the near-term. Table 4.1 describes the average disturbance acres from 2008-2017 for Alternative A, and expected disturbance acres in Alternatives B, C & D based on management actions associated with those alternatives.
- Acres open or available for a resource use would result in some level of the allowed use. Proposals for public land use and the level of allowed use have been estimated and are described in Tables 4.1.1 through 4.1.8 (reasonably foreseeable acres tables, Appendix M) for Alts A, B, C, D.

Special Status Animals

- The Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management would be used to inform management of livestock in a manner that would maintain habitat to support sustainable populations of special status wildlife across the PA.

  Riparian areas which have achieved PFC provide quality habitat for special status wildlife compared to riparian areas which have not achieved PFC. PFC is the minimum needed for proper riparian function.
- SOPs would be implemented consistently for all projects across the PA including timing and buffer restrictions, habitat guidelines for sage-grouse and other protections outlined in the appendixes.
- For this analysis sage-grouse are considered an umbrella, or indicator species for other shrub-obligate wildlife. Special status wildlife that are associated with each plant community described in Chapter 3, are indicators for other wildlife that rely on the same plant community for life history requirements. These species would experience the effects of management actions to their associated plant community.
- Human disturbance or occupancy increases displacement of wildlife and temporal or spatial habitat fragmentation. Although differing among species, some level of this use would cause habitat restriction and loss.
- Acres open or available for a resource use would result in some level of the allowed use. Proposals for public land use and the level of allowed use can only be qualitatively predicted.

Special Status Plants

- Occupied SSP habitat and associated acreage is assumed from all areas mapped by Idaho Fish and Wildlife Information System data [IFWIS 2010], except for slickspot peppergrass where occupied habitat is mapped by the BLM [BLM 2011c] and includes areas mapped by IFWIS with a 1/2–mile buffer. EOs of SSP with a historical or extirpated rank or poor location precision (G-precision) were not included in the analysis.
- Slickspot peppergrass is a BLM Type 1 species. Management actions designated to benefit Type 1 SSP would benefit slickspot peppergrass.

Fish and Wildlife

- The BLM would continue to manage fish and wildlife habitats in coordination with IDFG.
- Management actions that propose surface disturbance activities would have a direct impact on fish and wildlife.
- Restrictions pertaining to winter range would be in effect across the PA.

- Management activities that result in adverse or beneficial impacts on vegetation would have a corresponding adverse or beneficial impact on wildlife species.

Aquatic Resources

- There are generally direct associations with the health of riparian vegetation, stream channel stability, and water quality.
- Maintaining riparian areas and wetlands in PFC protects water quality.
- Actions that protect soil and vegetation in the watershed would reduce adverse impacts on water resources.
- Riparian areas are dynamic systems that undergo natural changes frequently.
- Short-term impacts would be five years or less, based on the average rate of recovery for riparian areas. Long-term impacts would be greater than five years.
- Livestock concentrations along perennial streams increases bacterial loads to the waterbody.
- Streams and wetlands in PFC generally support IDEQ designated beneficial uses.
- The primary indicators used include activities that could directly or indirectly impact water quality and the functioning condition of streams and wetlands, such as vegetation restoration activities (upland and riparian), riparian area protection measures, and surface-disturbing activities (e.g., OHV use and ROW development).

Wild Horses

- Maintenance of wild horse populations at appropriate management levels would be accomplished through the current wild horse gathering schedule and application of other population control practices, such as fertility control.
- No wild horses would leave the Four-Mile HMA.
- No wild horses would inhabit the West Crane Creek HA; there would be no impacts to wild horses within the West Crane Creek HA.

Wildfire Ecology and Fuels

- Fire and non-fire treatments would be effective.
- The increasing presence of invasive plant species, including cheatgrass, can change fire behavior and shorten natural fire return intervals.
- Changes in land tenure adjustments and consolidation of public land would improve wildland fire management efficiency by maintaining or improving access for fire suppression and fire and non-fire treatments.
- Wildland-Urban Interface (WUI) areas would be treated to improve public and firefighter health and safety, which may or may not improve fire regime.
- Recreational use of public land would continue to increase.
- Counties and communities-at-risk would continue to create defensible space and wildland fire-compatible, fire-wise homes and communities, so that damage from wildland fires originating on public land, and risk of fires escaping from private land to public land, are diminished.
- Based upon the rate of habitat restoration response within the Planning Area, short-term impacts would be within a 10-year period, and long-term impacts would extend beyond the 10 years.

Visual Resources Management Assumptions

- Visual resources would be managed according to BLM Manual Handbook 8410-1, Visual Resource Inventory, and BLM Manual 8400, Visual Resource Management. These VRM values are established through two main components, the Scenic Quality Evaluation and Sensitivity Level Analysis.
- All proposals to develop public land or construct improvements would be evaluated on a project-specific basis to ensure compliance with BLM VRM policy.
- Conflicts regarding fuels treatments and retention of scenic beauty would increase as rural development increases.
- The demand for recreational use would continue to increase over the life of the plan, which would increase the demand of scenic value of open spaces and undeveloped landscapes.
- Short-term impacts would be those not visible within a 10-year period; long-term impacts would be those visible beyond this period.
- While VRM inventories may include all land jurisdictions and ownerships, BLM visual management decisions would only apply to BLM-managed lands.

Forestry Assumptions

- This analysis is focused on the conifer forest. Since the woodlands are not managed for a commercial product, instead that analysis is covered under the Vegetation and Wildfire Ecology/Fuels Management sections.
- Management actions related to protection of resources could affect the acres and output of forest products.
- Approximately 10 percent of BLM forested lands are anticipated to be harvested over the life of the RMP, which would represent less than one percent of public land within the Planning Area.
- Timber harvest would occur on 250 to 1,000 acres annually; with an anticipated average of approximately 500 acres.
- Timber harvest volume would range from 0.25 to 5 million board feet (MMBF) annually; with an anticipated average of approximately 1.7 MMBF.
- Public-demand sales for firewood, Christmas trees, posts and poles, and other forest products would continue.
- Restrictions for sensitive wildlife species and habitat are the same for all alternatives.
- Restrictions for sensitive plant species and habitat are the same for all alternatives.
- Restrictions for stream and aquatic buffers are the same for all alternatives.
- Management that restricts or excludes ROW development could affect timber harvest activities and road construction.

Livestock Grazing Assumptions

- The Planning Area is comprised of 783,160 acres of public land, of which 100% are currently available to livestock grazing.
- Livestock grazing would be managed to meet the Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management.

- The short- and long-term period of impacts were determined based upon average vegetation treatment response rates within the Planning Area because many of the actions that would impact livestock are based on vegetation management. Short-term impacts would be within a 10-year period, and long-term impacts would be those extending beyond 10 years.
- Funding and labor would be made available for proposed rangeland restoration and wildland fire rehabilitation activities over the life of the plan.

Recreation Assumptions

- Current recreational uses within the PA would continue but some activities are expected to increase, including motorized recreation, wildlife viewing, non-motorized boating, hiking, camping, and activities based on new technologies.
- Recreation demand would increase at a rate greater than the population growth of surrounding area. This is due to the combination of the high population growth driving the development of private lands (ie. about half of Ridge to Rivers Trail System area is private lands) and conservation need for wildlife and plants to include travel management planning which reduces available routes to the public reducing opportunities and access (IDPR 2018 pg. 34).
- Certain recreational uses are inherently incompatible with others in the same area (i.e., intense motorized uses and opportunities for solitude).
- Demand for SRPs would stay constant or increase during the life of the plan.
- Non-traditional or emerging recreation activities such as stand up paddle boarding (SUPs), utility task vehicle (UTVs), drone flying, and E-bikes will need national policy for management specific to these activities and users on BLM managed lands.

Travel and Transportation Management Assumptions

- Motorized vehicle use in the Planning Area would continue to increase, based on current and anticipated trends in use and population growth. The future rate of increase would also be influenced by other factors, such as new technologies.
- The BLM would continue to recognize valid, existing access rights to private and State lands.
- The BLM would continue to recognize and authorize necessary access for permitted uses, such as livestock grazing, land use authorizations, and ROWs. Developments considered as components of range infrastructure would not include transportation routes, unless specified.
- Objectives for motorized vehicle management would protect resources, promote user health and safety, and minimize user conflicts.
- The absence of roads is an inventory criteria used when identifying non-WSA lands with wilderness characteristics. Because there has not been a demand for routes through these areas to date, it is assumed that no new routes would be created.

Lands and Realty Assumptions

General Assumption

1. Realty actions would continue to occur under all alternatives. The Lands and Realty program is a resource use rather than an environmental resource. The program responds to land use requests and can initiate land tenure adjustments with public or private entities. Impacts to the Lands and Realty program under each alternative would be limited to management actions that affect or influence realty actions or land tenure adjustments.

2. Application of standard operating procedures and best management practices (Appendix H) would reduce the potential impact of lands and realty actions that would otherwise result degradation of important and sensitive resources. These would be determined in accordance with NEPA prior to approval by the BLM and included as Conditions of Approval in the permit.

Land Tenure Assumptions

1. Public lands in the Planning Area would likely no longer support agricultural entries, such as a Desert Land Entry, due to one or more of the following factors: unsuitable soils, lack of available irrigation water, rugged topography, lack of access, small parcel size, sensitive resources, or economic viability.
2. Public interest in land tenure adjustments would continue.
3. Lands proposed for disposal would be examined for the presence of high value natural or cultural resources and potential mineral value. Lands containing high value resources would be retained in federal ownership, unless they could be exchanged for lands containing resources of equal or greater value.

Withdrawal Assumptions

1. Existing withdrawals would be retained throughout the life of the plan unless: (1) an administrative withdrawal review compels their complete or partial revocation, (2) Congressional action extends the withdrawal or re-designates the withdrawn lands, or (3) the withdrawal expires.
2. Withdrawals to other federal agencies are not analyzed in this plan.

Land Use Authorization Assumptions

1. The number of land use applications filed annually with BLM would increase over the life of the plan due to expected population growth within the Planning Area.
2. Areas outside of either an exclusion or avoidance area would be considered open to LUA proposals. Open areas would be subject to standard conditions of approval and seasonal restriction guidelines (Appendix F) as determined through the project level NEPA process.
3. Pre-existing land use authorizations within exclusion areas could be renewed and/or amended with appropriate conditions of approval.
4. The feasibility of renewable energy projects would be, in part, a function of the availability of facilities to transmit the energy generated.
5. Industrial scale solar energy development in the Planning Area is expected to be low. Commercial and private solar energy development in the Planning Area could be moderate to low.

Minerals Management Assumptions

- Where an area is leased, it would be developed.
- Impacts are considered in areas with high and medium potential for oil and gas, this comprises 87,590 acres within the Planning Area; areas with low and low-to-no potential for oil and gas would not likely be developed.
- Impacts are considered in areas with moderate, moderate to high, and high potential areas for geothermal resources, this comprises the entire Planning Area.
- Based on the geothermal potential for the Planning Area, it is reasonable to assume that a 50-MW plant (estimated disturbance of between 147 and 181 acres) and a 20-MW geothermal power plant (estimated disturbance of between 60 and 75 acres) might be developed over the life of the plan.
- Solid mineral leasing activity is expected to remain low to nonexistent in the Planning Area; therefore, impacts on solid leasable mineral resources are not discussed further.
- Actions that restrict mineral exploration and development could have long-term adverse impacts on mineral resource use, if mineral development were precluded in areas which were desirable.

- Fluid Minerals leasing would be conducted as described in Appendix L-Fluid Minerals Leasing, Terms, and Stipulations. General guidance for lease activities would be contained in timing and surface occupancy restrictions that would be included as stipulations to the standard lease terms and conditions. The leasing of Fluid Minerals resources commits a resource for possible future development but does not directly create or result in any surface disturbance or authorization to conduct exploration and development.
- BLM does not have the authority to withdraw lands from mineral entry, however BLM does make recommendations that may result in withdrawal based on Secretary of the Interior or Congressional action. The process for withdrawal includes recommendation, segregation, then withdrawal which at each juncture requires decision beyond BLM authority. For the purposes of evaluating impacts the effects analysis assumes that a recommendation for withdrawal would ultimately result in an actual withdrawal.

Hazardous Materials and Public Safety Assumptions

- All alternatives would treat hazardous fuels in the Planning Area in accordance with the 2005 *Federal Wildfire Management Policy and the Boise District Fire Management Plan*.
- Vegetation treatments would be consistent with the ROD for the *Final PEIS for Vegetation Treatment Using Herbicides on BLM-managed lands in 17 Western States*, and all herbicides would be applied with strict adherence to label stipulations and Boise District policy.
- All project-specific actions would be conducted in accordance with State and federal regulations.

Special Designations Assumptions

- Recreational tourism use would increase over time.
- Management decisions would not be proposed that would affect Congress's ability to make a Wilderness determination for Box Creek or King Hill Creek WSAs.
- OHV users would follow OHV and trail designations.

Socioeconomic Assumptions

Assumptions for Quantitative Analysis of Impacts to Marketable Goods and Services

- All economic values are expressed in 2017 constant dollars, except as otherwise noted.
- As land exchanges are required by law to result in acquisition of lands of equal or greater value as those traded for BLM lands, land exchanges are assumed to incur no economic loss.
- Lands and Realty actions are assumed to be constrained more by administrative capacity to effect transactions than by the amount of land available for disposal. The amount of land involved in realty transactions is not assumed to vary between alternatives, and the locations are not predictable.
- Lands and Realty actions are assumed to result in no changes to AUM and timber harvest levels.
- The BLM would continue to make saleable minerals available to governments and communities. Haul distances might increase slightly if pit closures are required for environmental reasons, but economic impact would be negligible.
- Even though locations of vegetative restoration, invasive species control, or riparian improvement treatments are selected for maximum marginal productivity, the environmental and economic benefits that result from these actions are assumed to be similar in size and value, regardless of treatment type or location.

- As acres of vegetative and soils restoration treatments and stream and spring improvements are constrained by budget rather than goals, BLM expenditures and economic impacts are assumed not to vary appreciably between alternatives.
- Timber harvest would be expected to remain stable at historical averages (i.e., 400 acres and 500,000 board feet per year). While locations might vary, total harvest volume and value would not vary appreciably between alternatives.
- Gas and geothermal well developers are assumed to have a two-stage response to increased proportions of acres closed or NSO. First, they will use more expensive directional drilling technologies (which increase costs by 25 to 40 percent) at a rate equal to the difference in percent of acres closed or NSO between alternatives. For example, if Alternative B closes 10 percent of acres and Alternative C closes 3 percent, then there is an 7 percent expectation that directional drilling will be used successfully to develop the well. Second, the probability of a gas well project proving infeasible increases at a rate equal to one-half the percentage of acres closed or NSO, e.g., if Alternative B closes 10 percent of acres, then there is a 5 percent expectation that the well will prove economically infeasible, and impacts fall to zero. However, it is noted that directional drilling can be more efficient and cost-effective over the long term than traditional vertical drilling, as a single directional drilling well pad can access several wells, which decreases surface disturbance and aboveground infrastructure maintenance costs. Additionally, directional drilling increases production rates as compared to vertical drilling due to greater wellbore lengths being exposed to the pay zone [Goode 2014]. Therefore, initial higher costs may be recaptured through increased returns due to the higher efficiency of directional drilling.
- IMPLAN calculations assume that development of a single gas well will result in 11 total jobs. The number of jobs associated with drilling a well is averaged over the life of the plan as the rate of drilling is unknown.
- Gas well development includes the drilling and completion activities that result in producing gas product. IMPLAN calculations assume that production of $1,000,000 of gas sales results in 16 total jobs. For purposes of analysis it is assumed that a single well will produce on average $1,000,000 of sales per year and that each well drilled on federal minerals will remain in production during the life of the plan. Therefore, the calculation of annual jobs associated with gas production is a result of the total number of jobs associated with a single well producing $1,000,000 of sales annually averaged over the life of the plan, 20 years.

	Exploration Jobs	Production Jobs	Total Jobs
Alternative A	0 jobs over life of plan	0 jobs over life of plan	0
Alternative B	44 jobs over life of plan (4 wells drilled) equals 2 jobs annually	240 jobs over life of plan (up to 4 producing wells) equals 12 jobs annually	14 Annually 284 Total
Alternative C	363 jobs over life of plan (22 wells drilled) equals 18 jobs annually	4,048 jobs over life of plan (up to 22 producing wells) equals 203 jobs annually	221 Annually 4,411 Total
Alternative D	363 jobs over life of plan (22 wells drilled) equals 18 jobs annually	4,048 jobs over life of plan (up to 22 producing wells) equals 203 jobs annually	221 Annually 4,411 Total

Analysis of Impacts to Non-market Ecosystem Goods and Services

For analysis of impacts to non-market ecosystem goods and services, the following assumptions were made:

- Protections for natural resources are likely to result in protections to non-market ecosystem services. Protections for non-market ecosystem services are likely to increase the welfare and/or utility for individuals in an area.
- Management actions that result in extraction of natural resources or other land-disturbing actions are likely to negatively impact ecosystems goods and services in short- and long-term timeframes. Without rehabilitation of these areas, these impacts are likely to be permanent. Negative impacts to ecosystems goods and services are likely to be detrimental to the welfare and/or utility for individuals in an area.

The following indicators were used for the analysis of economic condition in the socioeconomic analysis area:

- Changes to output
- Changes to employment
- Changes to income

Analysis of economic impacts for each resource includes an estimation of how management decisions would impact ecosystem goods and services and therefore the welfare or utility (i.e., satisfaction or enjoyment) of individuals residing in or visiting the socioeconomic analysis area. Some ecosystem services directly or indirectly contribute to other services that are marketable (e.g., timber), but the ecological services themselves are not traded or exchanged through a market.

There are several types of ecosystem services. This analysis will describe, where applicable, how management actions would generally affect ecosystem services such as the following [Daily 1997] [Millennium Ecosystem Assessment 2005]:

- Supporting services, such as:
  - Nutrient cycling
  - Soil formation
  - Primary biomass production
  - Support of biodiversity
  - Support of pollinator species
- Provisioning services, such as:
  - Food
  - Fresh water
  - Wood and fiber
  - Fuel
  - Groundwater recharge
- Regulating services, such as:
  - Climate regulation
  - Flood regulation
  - Disease regulation
  - Water purification
  - Erosion control

Though this document will focus mainly on the general effects of the management decisions on the list above, cultural services, such as the following, are also a result of interactions with humans and the

environment and are also considered non-market ecosystem goods and services [Summers et al. 2012][Millennium Ecosystem Assessment 2005]:

- The existence value of natural features such as wildlife, plants, quiet places, and view sheds/scenic vistas
- The role of ecosystems in influencing local, national, indigenous, and global cultures
- The role of ecosystems in assisting in the building of knowledge (e.g., scientific and cultural discovery) and the evolution of non-scientific human understanding (i.e., philosophy)
- The role of ecosystems in allowing for the expression and practice of spirituality and religion
- The role of ecosystems in fostering creativity (e.g., music, art, and literature)

The economic valuation of ecosystems goods and services is problematic in that without the support of ecosystems at many scales, life (including human life and therefore economic activity) would not be possible (Daily 1997). However, estimation of how actions impacting ecosystems goods and services could affect human welfare or utility can give a partial view of the value of ecosystems and allow for some comparison between alternative actions. Ecosystems goods and services affect human well-being in ways that are measurable (such as the "willingness to pay" of an individual for a particular service) as well as in ways that are difficult or impossible to measure. As no data collection has yet occurred that would allow the BLM to estimate monetary value of non-market environmental goods and services in the socioeconomic analysis area, impacts to these goods and services under each alternative will be discussed qualitatively.

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Appendix Y - Tables

Table 2.3 Leasable Minerals Restriction Acres

	Alternative A	Alternative B	Alternative C	Alternative D
Closed to Leasable Minerals (Geothermal and Oil and Gas)				
Oregon Trail Protection Zone		50,210		
WSR Corridors		7,630		
WSA	23,270	23,270	23,270	23,270
LWC		7,940		
King Hill Creek ACEC	840	2,840		
IDWR Critical Groundwater Area		29,390		
Total*	**23,380**	**112,220**	**23,270**	**23,270**
Open with No Surface Occupancy				
S Idaho Ground Squirrel		206,560		
IHMA	83,260	83,260	83,260	83,260
GRSG Leks- 0.6 mile GHMA	1,930	1,930	1,930	1,930
Plant EOs type 1-4	14,910			
Plant EOs Type 2 and 3		5,920		
Bald Eagle Nests 1-mile	2,140			
EO Type 2 – 0.25 mile		17,570		
Oregon Trail Protection Zone	18,760		12,730	24,910
Oregon Trail Management Corridor		114,740		
Watchable Wildlife		14,330		
WSR			6,630	6,630
IDWR Critical Groundwater Area				27,500
Vegetation Management Areas	240			
0.25-mile Lucky Peak Reservoir	270			
Islands	180			
Placerville Townsite	10			
R&PP Lease Areas	340			
Developed Recreation Sites	20			880
Bannister Basin ACEC		840		
Boise Front ACEC		23,960		
Buckwheat Flats RNA/ACEC	200	200		
Cartwright Canyon ACEC	400			
Cherry Gulch ACEC		3,070		
CSTG Habitat ACEC		20,620		
Goodrich Creek RNA/ACEC	360	450		
Hulls Gulch ACEC	120			

	Alternative A	Alternative B	Alternative C	Alternative D
Lost Basin Grassland RNA/ACEC	60	60		
Mountain Home ACEC		520		
Rebecca Sandhill RNA/ACEC	240	1,250		
Sand-capped Knob ACEC	40	180		
Sand Hollow RNA/ACEC	1,300	1,330		
Sheep Creek ACEC		1,970		
Summer Creek RNA/ACEC	240	630		
Willow Creek ACEC	1,010	1,120		
Woods Gulch ACEC	40	40		
Total*	**100,840**	**373,770**	**80,300**	**118,280**
Open with Timing Limitations and/or Controlled Surface Use				
Plant EO CSU			14,910	14,910
Oregon Trail Management Corridor CSU			75,440	
Long-billed Curlew ACEC TLS	45,460	46,230	26,730	26,730
Sage Grouse GHMA TLS	385,500	385,500	385,500	385,500
Sage Grouse GHMA 2 mile CSU	16,750	16,750	16,750	16,750
Bald Eagle 1 mile TLS		2,140	2,140	2,140
Burrowing Owl 0.25 mile TLS	1,040	1,040	1,040	1,040
Ferruginous Hawk 1 mile TLS	19,680	28,070	28,070	28,070
Golden Eagle 0.5 mile TLS	6,990	3,680	3,680	3,680
CSTG 3.1 mile TLS	54,180	54,180	54,180	54,180
Mule Deer Winter Range TLS	343,980	343,980	343,980	343,980
Elk Winter Range TLS	473,930	473,930	473,930	473,930
Pronghorn Crucial Winter TLS	9,350			
Long-billed Curlew Nesting Area TLS	60,430			
Prairie Falcon 0.75 mile TLS	270			
Great Blue Heron Rookerie 0.5 mile TLS	10			
Total*	**557,380**	**233,390**	**561,750**	**538,770**

***Numbers are not additive because of overlapping restrictions**

Table 2.4 Locatable Mineral Restriction Acres

	Alternative A	Alternative B	Alternative C	Alternative D
Areas Recommended for Withdrawal				
Oregon Trail Protective Zone	18,760	47,840		
Oregon Trail Management Corridor		114,700		
Watchable Wildlife Area		14,330		
WSR		6,630		
WSA		23,270		
LWC		7,940		
Bannister Basin ACEC		5,840		
Buckwheat Flats RNA/ACEC		200		
Cartwright Canyon ACEC	400			
Cherry Gulch ACEC		3,070		
CSTG Habitat ACEC		20,620		
Goodrich Creek RNA/ACEC		450		
Hulls Gulch ACEC	120			
King Hill Creek ACEC		2,840		
Long-billed Curlew ACEC		46,230		
Lost Basin Grassland RNA/ACEC		60		
Mountain Home ACEC		520		
Rebecca Sandhill RNA/ACEC		1,250		
Sand-capped Knob ACEC	40	180		
Sand Hollow ACEC	1,300	1,330		
Sheep Creek ACEC		1,970		
Summer Creek RNA/ACEC		630		
Willow Creek ACEC	1,010	1,120		
Woods Gulch ACEC	40	40		
Placerville Townsite	10			
Total*	**21,370**	**290,860**	**0**	**0**

***Numbers are not additive because of overlapping restrictions**

Table 2.5 Saleable Minerals Restriction Acres

	Alternative A	Alternative B	Alternative C	Alternative D
Closed to Mineral Material Disposals (Saleable Minerals)				
S Id Ground Squirrel		206,560		
Plant EOs type 2 & 3		5,920		
EO Type 2 – ¼-mile buffer		17,570		
OT Protection Zone	18,760	47,740	12,670	24,820
OT Management Corr		114,620	710	
Watchable Wildlife		14,320		
WSR		6,630	3,800	3,800
WSA	23,270	23,270	23,270	23,270
LWC		7,940		
Bannister Basin ACEC		5,840		
Boise Front ACEC		23,960		
Buckwheat Flats RNA/ACEC		200		
Cartwright Canyon ACEC	400			
Cherry Gulch ACEC		3,070		
CSTG Habitat ACEC		20,580		
Goodrich Creek RNA/ACEC		450		
Hulls Gulch ACEC	120			
King Hill Creek ACEC	840	2,840		
Long-billed Curlew ACEC		46,220		
Lost Basin Grassland RNA/ACEC		60		
Mountain Home ACEC		520		
Rebecca Sandhill RNA/ACEC		1,250		
Sand-capped Knob ACEC	40	180		
Sand Hollow ACEC	1,300	1,330		
Sheep Creek ACEC		1,970		
Summer Creek RNA/ACEC		630		
Willow Creek ACEC	1,010	1,120		
Woods Gulch ACEC	40	40		
Total*	**45,050**	**463,590**	**36,650**	**48,090**

***Numbers are not additive because of overlapping restrictions**

Table 2.6 LUAs-ROWs Restriction Acres

	Alternative A	Alternative B	Alternative C	Alternative D
LUA/ROW Exclusion Areas				
T&E Critical Habitat		1,040		
S Idaho Ground Squirrel		207,520		
Plant EOs Types 1-4	15,010			
Plant EOs Types 2 & 3		5,930		
Bald Eagle Nest – 1 mile buffer	2,140			
EO Type 2 - 0.25 mile buffer		17,580		
Oregon Trail Protection Zone		47,850		
WSA	23,270	23,270	23,270	23,270
LWC		7,940		
Bannister Basin ACEC		5,840		
Boise Front ACEC		2,190		
Buckwheat Flats RNA/ACEC		200		
Cherry Gulch ACEC		3,070		
CSTG Habitat ACEC		21,110		
Goodrich Creek RNA/ACEC		450		
King Hill Creek ACEC	840	2,840		
Lost Basin Grassland RNA/ACEC		60		
Mountain Home ACEC		520		
Rebecca Sandhill RNA/ACEC		1,250		
Sand-capped Knob ACEC		180		
Sand Hollow ACEC		1,330		
Sheep Creek ACEC		1,970		
Summer Creek RNA/ACEC		630		
Willow Creek ACEC		1,120		
Woods Gulch ACEC		40		
Total*	**40,430**	**309,150**	**23,270**	**23,270**
LUA/ROW Avoidance Areas				
T&E Critical Habitat			1,040	1,040
Plant EOs			15,010	15,010
IHMA	83,270	83,270	83,270	83,270
Sage-grouse Leks 2 mile buffer	19,160	19,160	19,160	19,160
Oregon Trail Protection Zone	5,750		12,730	24,910
Oregon Trail Management Corridor		114,760	75,460	137,700
WSR		6,640		
LWC				7,940
Boise Front ACEC		24,630		
Buckwheat Flats RNA/ACEC	200			

	Alternative A	Alternative B	Alternative C	Alternative D
LUA/ROW Avoidance Areas				
CSTG ACEC	4,170		12,870	18,660
Goodrich Creek RNA/ACEC	360			
Long-billed Curlew ACEC	45,460	46,310	26,810	26,810
Lost Basin Grassland RNA/ACEC	60			
Rebecca Sandhill RNA/ACEC	240			
Sand-capped Knob ACEC	40			
Summer Creek RNA/ACEC	240			
Bald Eagle 1 mile		2,140	2,140	2,140
Burrowing Owl 0.25 mile	1,040	1,040	1,040	1,040
Ferruginous Hawk (0.75 mile in Alt A; 1 mile in Alts B-D)	19,690	28,100	28,100	28,100
Golden Eagle (0.75 mile in Alt A; 0.5 mile in Alts B-D)	6,990	3,680	3,680	3,680
CSTG 3.1 mile lek buffer	54,680	54,680	54,680	54,680
Mule Deer Winter Habitat	345,270	345,270	345,270	345,270
Elk Winter Habitat	474,800	474,800	474,800	474,800
Pronghorn Crucial Winter Habitat	9,960			
Long-billed Curlew nesting areas	60,510			
Prairie Falcon 0.75 mile	270			
Great Blue Heron Rookerie 0.5 mile	10			
Placerville Townsite	10			
Recreation Sites	1,940			
R&PP Lease Site	960			
Special Management Areas	240			
Total*	**609,120**	**366,480**	**614,160**	**623,460**

***Numbers are not additive because of overlapping restrictions**

Table 2.7 Solar Energy Restriction Acres[1]

	Alternative A	Alternative B	Alternative C	Alternative D
Solar Energy Exclusion Areas				
T&E Critical Habitat		1,040		
S Idaho Ground Squirrel		207,520		
Plant EOs type 2 & 3		5,930		
EO Type 2 - ¼ mile buffer		17,580		
Oregon Trail Protection Zone		47,850	12,730	24,910
Oregon Trail Management Corridor		114,760		
Watchable Wildlife		14,810		
WSR		6,640		
WSA		23,270	23,270	23,270
LWC		7,940		
Bennett Hills BCA/ERMA		123,430		85,930
Bannister Basin ACEC		5,840		
Boise Front ACEC/SRMA		24,630		25,260
Buckwheat Flats RNA/ACEC		200		
Cherry Gulch ACEC		3,070		
CSTG Habitat ACEC		21,110	12,870	18,660
Goodrich Creek RNA/ACEC		450		
King Hill Creek ACEC		2,840		
Long-billed Curlew ACEC		46,310	350	26,810
Lost Basin Grassland RNA/ACEC		60		
Mountain Home ACEC		520		
Rebecca Sandhill RNA/ACEC		1,250		
Sand-capped Knob ACEC		180		
Sand Hollow ACEC		1,330		
Sheep Creek ACEC		1,970		
Summer Creek RNA/ACEC		630		
Willow Creek ACEC		1,120		
Woods Gulch ACEC		40		
Total*		**525,620**	**49,220**	**180,280**

	Alternative A	Alternative B	Alternative C	Alternative D
Solar Energy Avoidance Areas				
T& E Critical Habitat			1,040	1,040
Special Status Plan EOs			15,010	15,010
IHMA		83,270	83,270	83,270

[1] Previous Planning efforts did not specify solar energy restrictions, for purposes of the analysis, see restrictions identified in Table 2.6 Alternative A for ROWs and LUAs.

	Alternative A	Alternative B	Alternative C	Alternative D
Solar Energy Avoidance Areas				
Sage Grouse Leks 2 mile buffer		19,160	19,160	19,160
Bald Eagle 1 mile		2,140	2,140	2,140
Burrowing Owl 0.25 mile		1,040	1,040	1,040
Ferruginous Hawk 1 mile		28,100	28,100	28,100
Golden Eagle 0.5 mile		3,680	3,680	3,680
CSTG 3.1 mile		54,680	54,680	54,680
Mule Deer Winter Range		345,270	345,270	345,270
Elk Winter Range		474,800	474,800	474,800
Total*		**209,910**	**561,390**	**469,500**

***Numbers are not additive because of overlapping restrictions**

Table 2.8 Wind Restriction Acres[2]

	Alternative A	Alternative B	Alternative C	Alternative D
Wind Energy Exclusion Areas				
T& E Critical Habitat		1,040		
S Idaho Ground Squirrel		207,520		
Plant EOs Types 2 & 3		5,930		
EO Type 2 - ¼ mile buffer		17,580		
Oregon Trail Protection Zone		47,850	12,730	24,910
Oregon Trail Management Corridor		114,760	75,450	137,700
Watchable Wildlife		14,810		
WSR		6,640		
WSA		23,270	23,270	23,270
LWC		7,940		
Bennett Hills BCA/ERMA		123,430		85,930
Bannister Basin ACEC		5,840		
Boise Front ACEC/SRMA		24,630		25,260
Buckwheat Flats RNA/ACEC		200		
Cherry Gulch ACEC		3,070		
CSTG Habitat ACEC		21,110	12,870	18,660
Goodrich Creek RNA/ACEC		450		
King Hill Creek ACEC		2840		
Long-billed Curlew ACEC		46,310	26,810	26,810
Lost Basin Grassland RNA/ACEC		60		
Mountain Home ACEC		520		
Rebecca Sandhill RNA/ACEC		1,250		
Sand-capped Knob ACEC		180		
Sand Hollow ACEC		1,330		
Sheep Creek ACEC		,1970		
Summer Creek RNA/ACEC		630		
Willow Creek ACEC		1,120		
Woods Gulch ACEC		40		
Total*		**525,620**	**151,120**	**297,050**
	Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
Wind Energy Avoidance Areas				
T&E Critical Habitat			1,040	1,040
IHMA		83,270	83,270	83,270
Sage-grouse Leks 2 mile buffer		19,160	19,160	19,160

[2] Previous Planning efforts did not specify wind energy restrictions, for purposes of the analysis, see restrictions identified in Table 2.6 Alternative A for ROWs and LUAs.

	Alternative A	Alternative B	Alternative C	Alternative D
Wind Energy Avoidance Areas				
Bald Eagle 1 mile		2,140	2,140	2,140
Burrowing Owl 0.25 mile		1,040	1,040	1,040
Ferruginous Hawk 1 mile		28,100	28,100	28,100
Golden Eagle 0.5 mile		3,680	3,680	3,680
CSTG 3.1 mile		54,680	54,680	54,680
Mule Deer Winter		345,270	345,270	345,270
Elk Winter		474,800	474,800	474,800
Total*		**209,910**	**485,940**	**352,720**

***Numbers are not additive because of overlapping restrictions**

Table 2.9 Land Tenure Restriction Acres

	Alternative A	Alternative B	Alternative C	Alternative D
Acres Available for Disposal	5,710	530	9,690	2,820
Acres Available for Land Tenure Adjustment	10	32,020	101,270	75,320
Acres Available for Desert Land Entry	40	-		
Acres to be Retained	777,400	750,610	672,200	705,020
Total*	**783,160**	**783,160**	**783,160**	**783,160**

Table 2.10 OHV Restriction Acres

	Alternative A	Alternative B	Alternative C	Alternative D
Open to OHV				
Weiser Dunes	100	100	100	100
Clay Peak Cycle Park	340	340	340	340
Little Gem	1,750	1,750	1,750	1,750
Parma	70		70	70
Dewey	30			
Big Willow Open Area	130	130	130	130
Rock Crawl			560	560
Total	**2,410**	**2,310**	**2,940**	**2,940**
Closed to OHV				
Clay Peak Cycle Park - buffer	620	620	620	620
Big Willow Closed Area	5,620	5,620	5,620	5,620
Blacks Creek Reservoir	260	260	260	260
WSA	23,270	23,270	23,270	23,270
LWC		7,940		
Bannister Basin ACEC		5,840		
Boise Front ACEC		120		
Buckwheat Flats RNA/ACEC	200	200		200
Goodrich Creek RNA/ACEC	360			
Hulls Gulch ACEC	120			
King Hill Creek ACEC	840	2,840		
Lost Basin Grassland RNA/ACEC	60	60		
Mountain Home ACEC		520		
Rebecca Sandhill RNA/ACEC	240	1,250		
Sand-capped Knob ACEC	40	180		
Sand Hollow ACEC		1,330		
Summer Creek RNA/ACEC	240	630		
Willow Creek ACEC		1,120		
Woods Gulch ACEC	40	40		
4th of July Meadow	110	110	110	110
Chief Parrish rec site	5			
Sagebrush Hill	10	10	10	10
Peraphyllum Rock	40	40	40	40
North Fork Campground	5			
Total	**31,340**	**43,010**	**29,930**	**30,120**

Table 2.11 Grazing Restriction Acres

	Alternative A	Alternative B	Alternative C	Alternative D
Acres Available	783,160	660,860	783,160	783,160
Acres Unavailable	0	122,300	0	0
Reasons for unavailable (acres in B will not add to total due to overlap)				
	Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
Oregon Trail Protective Zone		47,850		
Indian Creek Reservoir		40		
WSR Corridors		2,830		
King Hill Creek WSA		22,830		
Box Creek WSA		440		
LWC		7,940		
Bannister Basin Exclosures		440		
Goodrich Creek RNA/ACEC		450		
King Hill Creek ACEC		2,840		
Lost Basin Grassland RNA/ACEC		60		
Mtn Home ACEC		520		
Rebecca Sandhill RNA/ACEC		1,250		
Sand-capped Knob ACEC		180		
Sand Hollow ACEC		1,330		
Sheep Creek ACEC		1,970		
Willow Creek ACEC		1,120		
Woods Gulch ACEC		40		
Un-allotted BLM		35,750		
Vacant Allotments		1,080		

Reasonably Foreseeable Development Tables

Table 4.1.1 Forestry

	Alternative A	Alternative B	Alternative C	Alternative D
Harvest Volume, Average Annual MBF	1700	1,580	1,300	1,460
Harvest Acres, Average Annual	500	464	430	430
Clearcut Limitations	40 acres	0 acres	40 acres	80 acres

Table 4.1.2 Fuels Treatments

	Alternative A	Alternative B	Alternative C	Alternative D
Fuel Breaks	20,000 Acres	10,000 Acres	20,000 Acres	20,000 Acres
Fuel Treatments	7,000 Acres	6,640 acres	6,430 acres	6,430 acres

Table 4.1.3 Vegetation

	Alternative A	Alternative B	Alternative C	Alternative D
Restoration Treatments (annual acres treated)	Restore 10 acres of exotic annual grassland	Restore 8,000 acres exotic annual grassland	Restore 1,000 acres of exotic annual grassland	Restore 4,000 acres of exotic annual grassland
Habitat Rehabilitation treatments	2,000 acres shrub-steppe& Perennial grassland 100 acres evergreen forest/ aspen & mountain shrub 5 acres riparian and wetland	15,000 acres shrub-steppe& Perennial grassland 1,000 acres evergreen forest/ aspen & mountain shrub 75 acres riparian and wetland	10,000 acres low and mid elevation vegetation 250 acres evergreen forest/ aspen & mountain shrub 5 acres riparian and wetland	15,000 acres low and mid elevation vegetation 500 acres evergreen forest/ aspen & mountain shrub 30 acres riparian and wetland

Table 4.1.4 Noxious and Invasive Weeds Treatments

	Alternative A	Alternative B	Alternative C	Alternative D
Manual Treatments	150-300 acres annually	150-300 acres annually	150-300 acres annually	150-300 acres annually
Biological Control	25-100 acres annually	25-100 acres annually	25-100 acres annually	25-100 acres annually
Herbicide Application	1000-5000 acres annually	1000-5000 acres annually	1000-5000 acres annually	1000-5000 acres annually

Table 4.1.5 Fisheries

	Alternative A	Alternative B	Alternative C	Alternative D
Barrier Removal/ Replacement (Perched Culverts)	1-2 per year	1-2 per year	1-2 per year	1-2 per year
Stream Restorations	½ mile per year	½ mile per year	½ mile per year	½ mile per year

Table 4.1.6 Livestock Grazing

	Alternative A	Alternative B	Alternative C	Alternative D
General management direction	Existing 10-year average for number and types of projects will continue at the same level	Increase in water development projects over existing work accomplished, but keep same general mix of projects	Fewer new projects, emphasis on protecting existing water sources, both seeps and fencing-off reservoirs, and fence conversions rather than new fencing (to improve big game movement	Mixture of projects from Alternatives B and C
Spring/seep protection and development	<1 project/year, disturb < 1 acre	<1 project/year, disturb < 1 acre	<4 projects/year, disturb 4 acres	2 projects/year, disturb < 2 acres
Reservoir/pit development	<1 project/year, disturb 1 acre	<1 project/year, disturb 1 acre	3 projects/year, disturb 3 acres	2 project/year disturb 2 acres
Well development	< 1 project/year, disturb <1 acre	< 1 project/year, disturb <1 acre	2 project/year, disturb <2 acre	<1 project/year, disturb <1 acre
Fencing development and conversion	4 projects or 8 miles/year, disturb up to 8 acres	4 projects or 8 miles/year, disturb up to 8 acres	16 projects or 32 miles/year, disturb up to 32 acres	8 projects or 16 miles/year, disturb up to 16 acres
Pipeline development	< 1 project (1.5 miles)/year, disturb < 2 acre	< 1 project (1.5 miles)/year, disturb <2 acre	4 projects/year, up to 12 miles and disturb up to 8 acres	2 projects/year, up to 6 miles and disturb up to 4 acres
Reservoir maintenance	1 to 5 projects/year, disturb up to 1 acre each.	5 to 10 projects/year, disturb up to 1 acre each.	15 projects/year, disturb up to 2 acres each up to 30 acres	10 projects/year, disturb up to 1 acre each up to 10 acres
Totals for all Projects	1-13 projects/year, disturbing 13-18 acres and 1 to 9.5 miles	13-18 projects/year, disturb 13-23 acres, and/or 9.5 miles	up to 44 projects/year, disturb up to 77 acres, and/or 44 miles.	up to 25 projects/year, disturb up to 35 acres, and/or up to 22 miles.

Table 4.1.7 Lands and Realty

	Alternative A	Alternative B	Alternative C	Alternative D
Communication Site Development (number of sites/acres) Last five years: 27/5.7 acres each	100 proposals/ 6 acres each over the life of the plan	60 proposals/ 6 acres each over the life of the plan	100 proposals/ 6 acres each over the life of the plan	100 proposals/ 6 acres each over the life of the plan
Powerline Development (number of sites/acres) Last five years: 180/47 acres each	720 proposals/ 50 acres each over the life of the plan	450 proposals/ 50 acres each over the life of the plan	700 proposals/ 50 acres each over the life of the plan	700 proposals/ 50 acres each over the life of the plan
Pipeline Development (number of sites/acres) Last 5 years: 18/45 acres each	75 proposals/ 50 acres each over the life of the plan	45 proposals/ 50 acres each over the life of the plan	75 proposals/ 50 acres each over the life of the plan	75 proposals/ 50 acres each over the life of the plan
Road Development (number of sites/acres) Last 5 years: 157/86 acres each	650 proposals/ 85 acres each over the life of the plan	400 proposals/ 85 acres each	1,000 proposals/ 85 acres each over the life of the plan	1,000 proposals/ 85 acres each over the life of the plan
Disposals Last 5 years: 1 at 86 acres	4 proposals/ 80 acres each over the life of the plan	30 proposals/ 80 acres each over the life of the plan	100 proposals/ 80 acres each over the life of the plan	70 proposals/ 80 acres each over the life of the plan
R&PP Leases Last 5 years: 2 at 500 acres each	10 proposals/ 500 acres each over the life of the plan	10 proposals/ 500 acres each over the life of the plan	10 proposals/ 500 acres each over the life of the plan	10 proposals/ 500 acres each over the life of the plan
Wind site testing Last 5 years: 1	20 proposals/0.5 acres each over the life of the plan	20 proposals/0.5 acres each over the life of the plan	20 proposals/0.5 acres each over the life of the plan	20 proposals/0.5 acres each over the life of the plan
Wind Farm Proposal	2- 10-turbine windpower generation projects. Disturb app. 8 acres per turbine short term; 2 acres/turbine long term	2- 10-turbine windpower generation projects. Disturb app. 8 acres per turbine short term; 2 acres/turbine long term	2- 10-turbine windpower generation projects. Disturb app. 8 acres per turbine short term; 2 acres/turbine long term	2- 10-turbine windpower generation projects. Disturb app. 8 acres per turbine short term; 2 acres/turbine long term

Table 4.1.8 Minerals Development

	Alternative A	Alternative B	Alternative C	Alternative D
Oil and Gas Dev	Up to 5 seismic surveys; no producing wells	1 seismic survey; Up to 4 producing wells/ (7.5 acres/well; 30 acres disturbance	Up to 10 seismic surveys; up to 22 producing wells (7.5 acres/well; 165 acres disturbance	Up to 10 seismic surveys; up to 22 producing wells (7.5 acres/well; 165 acres disturbance
Geothermal	1- 50MW plant within High potential (up to 180 acres) 1-20 MW plant within moderate to high potential (up to 75 acres)	1- 50MW plant within High potential (up to 180 acres) 1-20 MW plant within moderate to high potential (up to 75 acres)	1- 50MW plant within High potential (up to 180 acres) 1-20 MW plant within moderate to high potential (up to 75 acres)	1- 50MW plant within High potential (up to 180 acres) 1-20 MW plant within moderate to high potential (up to 75 acres)
Locatable	70,000 acres	70,600 acres	70,600 acres	70,600 acres
Saleable	47 saleable sites / 1,070 acres	47 saleable sites / 1,070 acres	75 saleable sites / 1,700 acres	60 saleable sites / 1,375 acres