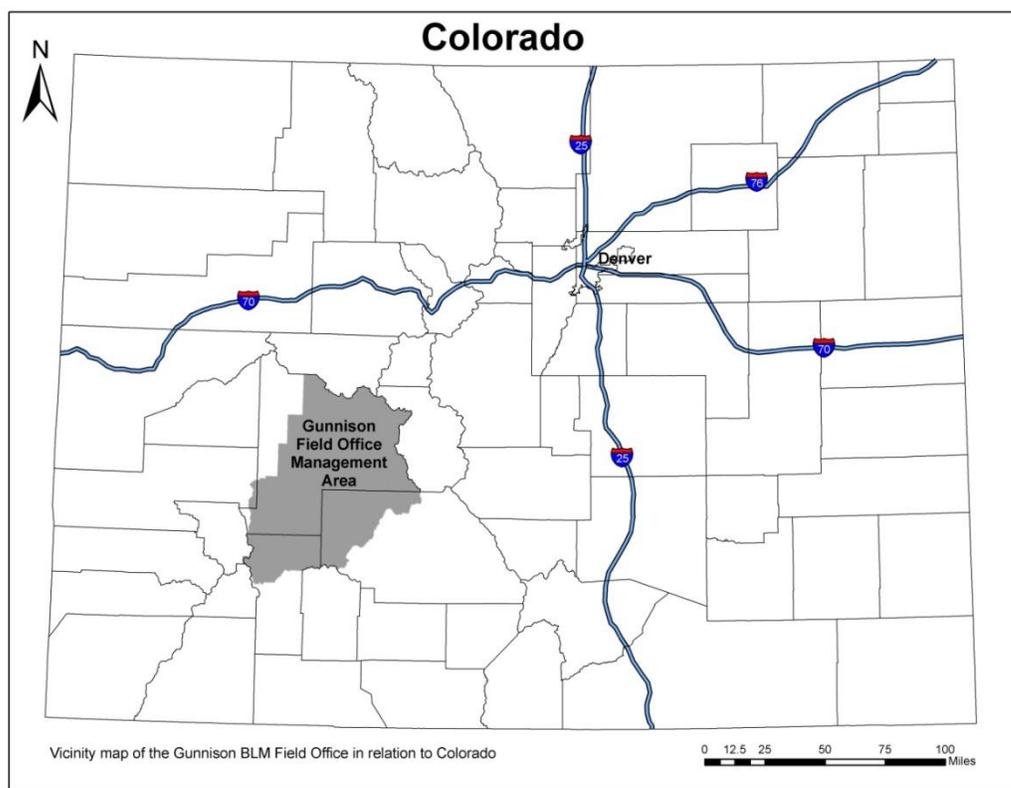


United States Department of the Interior
Bureau of Land Management

**Environmental Assessment of
Geothermal Lease Nomination, Gunnison County, Colorado
DOI-BLM-CO-S060-2010-0030-EA
October 2010**

Location: The Gunnison Field Office (GUFO) area is located in south-central Colorado. The GUFO area includes approximately 585,000 acres of public land in Gunnison, Hinsdale, Montrose, Ouray, and Saguache counties.



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**U.S. Department of the Interior
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Gunnison Field Office
DOI-BLM-CO-S060-2010-OO30-EA**

ENVIRONMENTAL ASSESSMENT

NUMBER: DOI-BLM-CO-S060-2010-OO30-EA

CASEFILE/PROJECT NUMBER: COC-73585

PROJECT NAME: Geothermal Lease Nomination, Gunnison County, CO

PLANNING UNIT: Gunnison Resource Area Resource Management Plan (RMP) Management Unit(s) 11 and 12

LEGAL DESCRIPTION:

Lease Nomination Area:

NMPM, T.48N., R.3E., sec. 1, lots 5-10;

T.49N., R.3E., sec. 25, E $\frac{1}{2}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$

T.48N., R.4E., sec. 5, lots 5-18,

sec. 6, lots 8-23,

sec. 7, N $\frac{1}{2}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$,

sec. 8, NW $\frac{1}{4}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ NW $\frac{1}{4}$,

T.49N., R.4E., sec. 19, SE $\frac{1}{4}$,

sec. 20, N $\frac{1}{2}$ N $\frac{1}{2}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$,

sec. 29, lots 1-4, S $\frac{1}{2}$ N $\frac{1}{2}$, S $\frac{1}{2}$,

sec. 30, lots 5-11, E $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$,

sec. 31, lots 5-11, NE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$,

sec. 32, lots 1-4, N $\frac{1}{2}$, N $\frac{1}{2}$ S $\frac{1}{2}$.

Additional Analysis Area:

NMPM, T.48N., R.4E., sec. 4, E $\frac{1}{2}$ E $\frac{1}{2}$;

sec. 9, N $\frac{1}{2}$ NE $\frac{1}{4}$;

T.49N., R.4E., sec. 19, NE $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, parts south and east of CR 887.

APPLICANT: USDI, Bureau of Land Management

1 INTRODUCTION

1.1 BACKGROUND/INTRODUCTION:

The BLM, Colorado State Office has received two block nominations of lands within the Gunnison Field Office for competitive geothermal leasing. One block includes approximately 4,586 acres of public lands and 400 acres of private land with federal minerals estate. The second block includes approximately 3,765 acres of National Forest Service (NFS) lands under which

the Gunnison Field Office (GUFO) manages the mineral estate; leasing of that block will be analyzed by the Forest Service, as the lead agency, in a separate environmental analysis.

In addition, the Colorado State Land Board has received an application for geothermal leasing on two sections of State mineral estate in the same vicinity. One section is split estate, with BLM surface and State minerals; the other section is entirely State land. The State Land Board may be analyzing the potential leasing of those lands in the future. However, currently the split-estate section has been deleted from the application due to concerns of unknown impacts to Gunnison sage-grouse. In addition, the State Land Board has issued a 3-year Non-Development Lease, which may be extended for an additional 10 years, on the State land section.

The nominated lands are all located in southeastern Gunnison County, north of Highway 50, in the general vicinity of Tomichi Dome and the Waunita Hot Springs.

The analysis area for this Environmental Assessment includes the nominated BLM and private lands and additional BLM lands within an area identified as having high potential for geothermal development. There are approximately 5,125 acres in the analysis area.

1.1.1 Proposed Action - The proposed action is to offer leases for geothermal resources on the federal mineral estate and to attach lease stipulations necessary to protect resource values. The issuance of a geothermal lease does not authorize any ground-disturbing activities to explore for or develop geothermal resources without further application, environmental review, and approval by the BLM.

1.1.2 Programmatic Environmental Impact Statement (PEIS) for Geothermal Leasing - In October 2008, the BLM and Forest Service completed a Programmatic Environmental Impact Statement (PEIS) for Geothermal Leasing in the Western United States. In December 2008, the BLM signed the Record of Decision (ROD). The decision amended 114 BLM land use plans to adopt the allocations, reasonably foreseeable development scenario, stipulations, BMPs, and leasing procedures provided in Appendix B – Proposed Action in the PEIS and as attached in Chapter 2 and Appendix A of the ROD. The decision incorporated the following actions and is subject to existing Federal, State, and local laws and regulations, as well as established BLM policies.

- Identified about 143 million acres of BLM-administered public lands as having geothermal resources with potential for indirect or direct applications.
- Designated about 111 million acres BLM-administered public lands with geothermal potential as open to geothermal leasing subject to existing laws, regulations, formal orders, stipulations attached to the lease form, and the terms and conditions of the standard lease form. While these lands are allocated as open, compliance with laws and regulations or the exercise of BLM discretion in response to site-specific considerations could nevertheless prevent some lands from being leased.
- Amended the Gunnison Resource Area Approved Resource Management Plan (RMP) to designate approximately 614,233 acres of BLM-administered public lands with geothermal potential as open to geothermal leasing subject to existing laws, regulations, formal orders, stipulations attached to the lease form, and the terms and conditions of the standard lease form.

- Established a reasonably foreseeable development scenario for geothermal development based on BLM planning areas.
- Adopted a comprehensive list of stipulations and procedures to serve as consistent guidance for future geothermal leasing on BLM-administered public lands, NFS lands, and other lands within the federal mineral estate.
- Provided a list of recommended BMPs that may be applied for subsequent exploration, drilling, development, and reclamation activities. Specifically, the BMPs can be incorporated, as appropriate, into the permit application by the lessee or can be included in the approved use authorization by the BLM as conditions of approval.
- Recognized that prior to making a leasing decision on lands in proximity to a National Park System unit, the BLM or other surface management agency must determine if there would be any impacts to thermal or hydrological features within the unit, in accordance with the Geothermal Steam Act Amendments (30 USC Section 1026).

Prior to making leasing decisions, the BLM assesses the adequacy of existing NEPA documentation and ensures that the proposed action is in conformance with the approved land use plan (i.e., through completion of a Determination of NEPA Adequacy) to determine if there is new information or new circumstances that warrant further analysis. The BLM determined that the existing NEPA documentation in the PEIS and the RMP were not adequate given site-specific resource conditions, particularly for the analysis of effects on Gunnison sage-grouse. The purpose of this NEPA analysis is to determine if the previous leasing availability decision is valid in light of the new information.

This Environmental Assessment is tiered to, and incorporates by reference, the Final Programmatic EIS (PEIS) and Record of Decision (ROD). The proposed action includes appropriate stipulations from the RMP, as amended by the ROD, based on the site-specific characteristics of the analysis area.

1.1.3 Reasonably Foreseeable Development Scenario (RFDS) – The BLM Wyoming State Office, Reservoir Management Group, prepared the Geothermal Resource Reasonably Foreseeable Development Scenario for Electrical Generation, Tomichi Dome and Surrounding Area in January 2010. Information from the RFDS will be used to assist the BLM and the Forest Service in assessing indirect and cumulative effects in the leasing analysis. In support of the leasing analysis, the RFDS technically evaluates the geothermal resource known to occur and potentially occurring within the Study Area, and projects future development potential and activity levels for the period 2010 through 2024. The geothermal lease nominator specifically stated that the proposed project targets electrical power generation via a binary power plant. As the RFDS is in response to this specific nomination, only this type of development was analyzed.

The RFDS assumed a Study Area that includes all lands nominated for geothermal leasing and additional surrounding lands determined to be a part of the local geothermal system. The Study Area contains approximately 38,628 acres, which includes approximately 28,691 acres of federal mineral ownership. The analysis area for this EA is entirely within the RFDS Study Area.

It is anticipated that the Study Area has the potential for the development of one geothermal resource project, which depending on the success of the associated exploratory efforts, could

culminate in a working commercial binary-cycle geothermal power plant likely sized to 5-10 megawatts. Such a plant would have as many as five operational wells (three production wells and two injection wells with one of each typically idle as a back-up) located on two pads. Once operational, the project as a whole would likely be limited to an area no larger than two sections with a much smaller area of actual surface disturbance within those sections (see below). The average ambient annual temperatures of the Study Area will allow for air cooling, rather than water cooling.

Projected Surface Disturbance: The projected amount of disturbance associated with a geothermal project in the Study Area will vary depending on a number of factors including the results of exploration efforts (which themselves will have associated surface disturbance). Geothermal resource development is a process which generally follows a specific series of steps, beginning with basic field work (e.g., geologic mapping, ground resistivity measurements, etc), followed by more detailed and targeted exploration (e.g., drilling of temperature gradient boreholes and similar data collection), testing (e.g., drilling of deeper "test" well(s), and evaluation of the hydrothermal component of the geothermal system), and ultimately culminating in the site selection and construction of a geothermal power plant and associated infrastructure (including transmission lines) and drilling of the production and injection wells. Failure at any point in the process generally condemns the project and development is abandoned. Thus, for instance, if the results of the temperature gradient boreholes suggest the system to be a poor candidate for resource development, further exploration (and disturbance) would not occur. For the purpose of the RFDS report, it was assumed that future exploration is successful, and that a binary cycle geothermal power plant will be constructed.

Table 1. Projected surface disturbance associated with various exploration/development activities in the RFDS Study Area.

Disturbance Factor	Number	Initial Disturbance	Initial Short-Term Disturbance		Final Long-Term Disturbance	
			Total Acres	Per Section	Total Acres	Per Section
Temperature gradient boreholes	62	0.043 ac per borehole	2.67	0.172 (4 boreholes per section)	0	0
Test wells	2	4 acres per well pad	8.00	8.00 (limited to one section only)	2.40	2.40 (limited to one section only)
Production wells	3	4 acres per well pad	12.00	12.00 (limited to one section only)	2.40	2.40 (limited to one section only)
Injection wells	2	4 acres per 2-well pad	4.00	4.00 (limited to one section only)	0.80	0.80 (limited to one section only)
Facilities	1 power plant	10 acres	10.00	10.00 (limited to one section only)	10.00	10.00
Roads	10 miles	3.6 acres/mile	36.00	N/A	36.00	N/A
Pipelines (above-ground)	6 miles	3 acres/mile	18.00	N/A	18.00	N/A
Transmission Lines	5 miles	6.1 acres/mile	30.50	N/A	30.50	N/A
TOTAL			Short-Term Disturbance: 121.17 acres		Long-Term Disturbance: 97.70 acres	

There are three primary existing electric transmission and distribution lines in the analysis area. The Gunnison County Electric Association distribution line could potentially accept the electricity generated from a 5-10 MW power plant. The line would likely require upgrades to handle the capacity (GCEA, 2010). There are two Western Area Power Administration transmission lines in the analysis area. Information regarding the capacity of those lines is currently unavailable (WAPA, 2010).

Because of the nature of geothermal resource exploration and development, the lack of data regarding the Study Area's geothermal system, and the areal extent of the geothermal system, predicting precisely where within the Study Area surface disturbance will occur is almost impossible. Unless otherwise stated, the potential development activities discussed above should be viewed as having equal chance of occurring on U.S.D.A. Forest Service, Bureau of Land Management, State of Colorado, or privately managed lands.

It must be emphasized that the reasonably foreseeable development projections of future activity presented are forecasted activities, and should not be considered to be worst-case scenarios or threshold for development, but reasonable and science-based projections of anticipated activity that use logical and technically based assumptions to make those projections (BLM, 2010).

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION:

The purpose of the proposed action is to make public lands geothermal resources in the analysis area available for lease in a manner that protects public land resources and resource values and mitigates impacts on other land uses while helping to meet the increasing interest in geothermal energy development. In addition, the purpose is to amend the RMP to include additional lease stipulations necessary to protect resources and resource values, particularly for Gunnison sage-grouse and its habitat, and to mitigate impacts on other land uses.

This action is needed because the area has been identified as having high potential for commercially viable geothermal capacity for electrical generation and is needed to respond to a nomination of lands for competitive geothermal leasing, in accordance with the Energy Policy Act of 2005.

The BLM determined that the existing NEPA documentation in the PEIS and the RMP were not adequate given site-specific resource conditions, particularly for the analysis of effects on Gunnison sage-grouse. The purpose of this NEPA analysis is to determine if the previous leasing availability decision is valid in light of the new information.

1.3 DECISION TO BE MADE:

The decision to be made is whether or not the public land geothermal resources in the analysis area will be offered for leasing, and if so, what stipulations will be attached to any geothermal lease in order to protect public land resources.

Lease stipulations are major or moderate constraints applied to a new geothermal lease. A lease stipulation is a condition of lease issuance that provides a level of protection for other resource values or land uses by restricting lease operations during certain times or at certain locations or

by mitigating unacceptable impacts, to an extent greater than standard lease terms or conditions. 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. Lease stipulations further implement the BLM's regulatory authority to protect resources or resource values (BLM, 2008b).

A geothermal lease is for the heat resource of the earth where there is Federal mineral estate. Unless specifically owned in fee, the Federal government does not own the hot water commonly associated with the heat; this falls under state water laws. Geothermal developers must obtain the appropriate water and/or geothermal rights and state permits, in addition to the Federal lease for the resource (BLM, 2008a).

A geothermal lease is issued for a primary term of 10 years and may be extended for two five-year periods. Each of these extensions is available provided the lessee meets the work commitment requirements or makes payment in lieu of minimum work requirements for each year. At any time a lease may receive a 5-year drilling extension. Once commercial production is established, the lease may receive a production extension of up to 35 years and a renewal period of up to 55 years. The lease must continue to produce to remain in effect. BLM may grant a suspension of operations and production on a lease when justified by the operator (see 43 CFR 3207).

On NFS lands, where the BLM leases the mineral estate, the FS forwards consent determinations to BLM as to which parcels should be offered for lease. The BLM cannot lease lands over the objection of the FS. The FS makes its consent decision after conducting an environmental analysis of leasing. The FS analysis determines if an area is administratively open to leasing and if so, what if any special stipulations are required (BLM, 2008a).

1.3.1 Step-Wise Analysis, Decision, and Permitting Process

Leasing geothermal resources by the BLM vests with the lessee a non-exclusive right to future exploration and an exclusive right to produce and use the geothermal resources within the lease area, subject to existing laws, regulations, formal orders, and the terms, conditions and stipulations in or attached to the lease form or included as conditions of approval to permits. Lease issuance alone does not authorize any ground-disturbing activities to explore for or develop geothermal resources without site-specific approval for the intended operation.

Lease issuance itself does not cause direct effects. None of the resource conditions described in the Affected Environment would change upon issuance of a lease. The regulations governing geothermal leasing and development provide for several decision stages prior to any ground-disturbing activities taking place and may include further compliance with applicable authorities during these decision stages. Under this regulatory scheme, until BLM receives and adjudicates an application for a permit to drill or other authorization that includes specific information about a particular project, impacts of actual development that might follow lease issuance are speculative, as so much is unknown as to location, scope, scale, and timing of that development. At each decision stage, the BLM retains the authority to approve, deny, or approve subject to conditions any permit, based on compliance with applicable authorities and policies. Therefore,

the analysis of effects of development in this EA reflects a more general approach, based on the analysis in the PEIS, on the RFDS, and on additional site-specific resource information.

A geothermal lease could be developed for electrical generation, an indirect use, or for any number of direct uses, such as heating spas, greenhouses, aquaculture facilities, and buildings, as well as drying agricultural products. Based on the geothermal lease nomination and the RFDS, this analysis focuses on electrical generation as the most likely use of a geothermal lease in the analysis area. However, any proposals for direct use (whether in addition to or instead of indirect use) would be subject to the same site-specific environmental analyses required for indirect use.

There are several stages of decision making necessary to approve geothermal resource development, each with its own site-specific environmental analysis. The four stages of geothermal resource development within a lease are exploration, drilling operations, utilization, and reclamation and abandonment. Each stage requires additional site-specific environmental analysis prior to issuance of a permit from the BLM. Also at each stage, the BLM can issue site-specific conditions of approval to protect resource values; the BLM would consult with the FS to issue site-specific conditions of approval on NFS lands. Geothermal exploration and production on Federal land conducted through leases is subject to terms and stipulations to comply with all applicable Federal and state laws pertaining to various considerations for tribal interests, sanitation, water quality, wildlife, safety, cultural resources, and reclamation.

In addition, Gunnison County also conducts a land use approval process. Gunnison County administers several land use regulations, including the Gunnison County Special Development Project Regulations and the *Gunnison County Land Use Resolution*. Proposed land use projects may be subject to those regulations, based upon the project's determined level of impact. As applicable, activities and structures may be regulated by other codes and regulations adopted and amended by Gunnison County.

Permitting and regulating of geothermal water resources falls under the jurisdiction of the State Engineer, who also serves as the Director of the Colorado Division of Water Resources (CODNR DWR, 2010).

It is also important to note that the lessee/operator might cease exploration and/or development at any stage. Most geological exploration projects do not reach the deep drilling phase, and of those that do, many do not reach the production phase. This observation is true for mineral and hydrocarbon exploration, and is also true for geothermal exploration. For example, even if high temperatures are found in the leased area, there may not be sufficient permeability of the producing formation to extract the heat. There are many reasons, from economics to exploration results, which would cause the lessee to cease exploration and development (Morgan, 2010).

In addition to lease stipulations, the BLM would include project-specific mitigation measures on permits related to any subsequent exploration, drilling, utilization, or reclamation and abandonment of geothermal resources. The agency's first priority is to avoid or mitigate impacts on site. When the agency determines that impacts cannot be avoided or mitigated to an acceptable level onsite, it may be necessary to deny the permit, ask the applicant to modify the proposal, or mitigate remaining impacts off-site. Best Management Practices are state-of-the-art

mitigation measures and may be incorporated into the permit application by the lessee or may be included in the approved use authorization by the BLM as conditions of approval. Conditions of approval are not lease stipulations, but they are site-specific and enforceable requirements to minimize, mitigate, or prevent impacts to resource values from an intended operation. Conditions of approval can limit or amend the specific actions proposed by the operator.

1.4 SCOPING AND PUBLIC INVOLVEMENT:

On February 3, 2010, BLM sent letters to 12 Federal and State agencies, local governments, and Tribes inviting them to be Cooperating Agencies with the BLM on the environmental analysis for the geothermal leasing proposal. The following parties agreed to be Cooperating Agencies with the BLM:

- US Fish and Wildlife Service
- Gunnison County
- Colorado Department of Natural Resources, including these agencies:
 - Division of Water Resources
 - Geological Survey
 - Division of Wildlife
 - State Land Board

Cooperating agencies are those that have special expertise and/or jurisdiction by law related to a specific proposal and/or land use planning on public (BLM) lands. The Forest Service is participating with BLM in this analysis under the terms of a national-level MOU for Geothermal Leasing.

On February 24, 2010, a joint Forest Service/BLM scoping letter was sent to 125 parties, including area landowners, FS and BLM grazing and recreation permittees, various interest groups, and State and National congressional representatives. The scoping letter provided information about the proposed project, notified recipients of an upcoming public meeting, and asked for comments to be sent to the FS and/or the BLM.

On March 11, 2010 the Forest Service and BLM hosted an open-house style public meeting. Both agencies presented some basic information about the proposal and the analysis process. Representatives from the State of Colorado, Governor's Energy Office and Colorado Geological Survey also gave presentations about the State's energy conservation and renewable energy programs, and about geothermal development in general and the potential for development in Colorado. The presentations were followed by an open house where attendees could review various maps of the analysis area and ask questions of the FS, BLM, and State agency employees. Approximately 75 people attended the public meeting.

The Forest Service conducted a 30-day scoping period which ended on April 5, 2010. They received comments from approximately 14 parties. Those comments were shared with the BLM, as most comments applied to both the FS and BLM lease nomination areas.

The BLM conducted a 30-day scoping period, which ended on June 24, 2010 with the publication of a Notice of Intent in the Federal Register. We received comments from

approximately 14 parties, 7 of which had also submitted similar comments during the FS scoping period.

On June 14, 2010, BLM held another public meeting at which the same information presented at the March 11 meeting was available again. Five people attended that meeting.

On September 2, 2010, the Forest Service and BLM hosted another public meeting. Both agencies had maps and other displays to provide information about the analyses conducted up to that point, including the proposed actions and alternatives that were developed, and any associated lease stipulations. In addition, a video of a tour of a geothermal electric production facility in Idaho was presented. The tour of that facility helped inform the respective Interdisciplinary Teams about potential impacts. Representatives from the State of Colorado, Governor's Energy Office and Colorado Geological Survey were in attendance to help answer questions, particularly related to State water rights and geothermal rights. The meeting was conducted as an open house where attendees could review the various maps and other displays, and ask questions of the FS, BLM, and State agency employees. Approximately 35 people attended the public meeting.

1.5 ISSUES AND CONCERNS:

1.5.1 Issues to be Analyzed

These are issues that were raised from public scoping that will lead to incorporating existing or new lease stipulations for resource protection under one or more alternatives. Due to the inability to predict future development scenarios, including types of development, timing, and location, the impact analyses will provide a general description of common impacts from geothermal resource development as projected in the RFDS.

1.5.1.1 Big Game Winter Range – The primary RMP Management Unit in the analysis area is MU 12, which contains elk and deer crucial winter range. The RMP includes direction to exclude activities that will result in unnecessary disturbances to big game from December 1 through April 30 in MU 12. However, the RMP does not include any stipulations to protect winter range and/or wintering elk and deer. Specific concerns include:

- Potential impacts on the quality and availability of winter range and winter concentration areas.
- Potential impacts to wintering elk and deer, i.e., moving to adjacent private lands due to disturbance.

1.5.1.2 Gunnison Sage-Grouse and Habitat – The analysis area is entirely within occupied Gunnison sage-grouse habitat. The US Fish and Wildlife Service recently determined that the species is warranted for listing, but that listing is precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. The GUSG has been added to the USFWS candidate species list. It is still a BLM sensitive species. The RMP includes stipulations that address protection of lekking and riparian brood-rearing Gunnison sage-grouse habitat. Specific concerns include:

- Potential impacts of lease development on habitat -including lekking, nesting, brood-rearing, and winter habitats – quality and connectivity.

- Potential impacts of lease development on mapped “priority habitat”.
- Potential impacts of lease development on population levels, locally, basin-wide, and region-wide.
- Potential impact of leasing decisions on the 2010 USFWS’s Gunnison Sage-grouse species status review, which was completed on September 28, 2010.

1.5.1.3 Riparian Areas and Water Resources –

Comments received during scoping focused on potential impacts to the water quality and quantity of streams and springs and their associated wetlands and riparian areas in the analysis area. Comments also focused on potential impacts to the water quality, quantity, and temperature of geothermal resources in the area. The RMP includes stipulations that address protection of riparian areas, including those within sage-grouse brood-rearing areas. Specific concerns expressed include:

- potential impacts to riparian areas, including Monson Gulch;
- potential water depletions and drying up of springs;
- altered surface and groundwater flow patterns and potential associated changes to groundwater infiltration and surface runoff;
- potential releases of toxic drilling fluids, water supplies for drilling, and proper disposition of effluent water; and,
- monitoring of water resources prior to and after geothermal development.

1.5.1.4 Soils, Particularly Gullies and Steep Slopes – The RMP includes stipulations that address steep slopes and erosive soils. However, there are no current stipulations that address protection of soil resources near gullies. Specific concerns include:

- Potential impacts to soil stability, including increased erosion and proper reclamation.

1.5.1.5 Geology, Particularly Areas of Geologic Hazard – The RMP does not include any stipulations that address areas of geologic hazard, such as landslides. Specific concerns include:

- Potential impacts from the siting of roads and facilities associated with geothermal resources on geologic hazards, which could result in loss of human life, property, and cause damage to resources.

1.5.1.6 Cultural Resources – The RMP includes stipulations that address protection of cultural and archaeological resources, including sites eligible for the National Register of Historic Places, traditional cultural properties, and Native American sacred sites. Specific concerns include:

- Potential impacts to cultural and archaeological resources.

1.5.2 Issues Not Analyzed in Detail

These are concerns that were raised from public scoping that either 1) do not require additional analysis because they were adequately addressed in the PEIS for Geothermal Leasing, 2) will not lead to incorporating existing or new lease stipulations under one or more alternatives, and/or 3) the impacts of the proposed action or alternatives can not readily be analyzed at this stage due to a lack of appropriate site-specific information.

Most of the resource concerns have BMP's (Best Management Practices) from the RMP that will lead to site-specific permit conditions under any subsequent exploration, drilling operations, utilization, and/or reclamation and abandonment permitting.

Issuance of a geothermal lease has no direct impacts on the environment; however, it is a commitment of the resource for potential future exploration, drilling operations and development, utilization, and reclamation and abandonment, subject to environmental review and permits. An analysis was provided in the PEIS of the potential impacts on resources of the various stages that may follow a leasing decision along with the potential cumulative impacts (BLM PEIS, 2008). That analysis, with consideration of the RFDS, is referenced and summarized, as applicable, in the following discussion of the issues not analyzed in detail.

1.5.2.1 Migratory Birds - The Migratory Bird Treaty Act (MBTA) of 1918 was passed to regulate the taking of native birds. In 2001, President Clinton signed Executive Order 13186 (66 FR 3853), which directs federal agencies to further implement the MBTA by considering the effects of projects and actions on migratory birds. Pursuant to this Executive Order, the US Fish and Wildlife Service and the BLM have developed a Memorandum of Understanding (MOU). This memorandum requires, among other things, that the BLM review the U. S. Fish and Wildlife Service *Birds of Conservation Concern* for species that may inhabit a project area, which includes raptors, evaluate the effects of the proposed action and alternatives on migratory birds, and implement conservation measures to minimize, reduce, or avoid unintentional take.

Leasing of geothermal resources does not affect migratory birds. These resources would be affected only by development of specific geothermal projects. The nature and extent of geothermal-related development activities that would affect migratory birds would vary by project, depending on several factors. Impacts to migratory birds and their habitat would be evaluated on a project-specific basis, as environmental analyses would be conducted for each of the potential phases of geothermal development activity: exploration, drilling operations, utilization, and reclamation and abandonment.

Impacts on migratory birds could include injury or mortality or could involve reduction or fragmentation of habitat, reduction or displacement of habitat features such as cover and forage, exposure to contaminants (e.g., diesel fuel or geothermal working fluid) from a spill, and destruction of individual biota (e.g., from drilling and clearing activities or from vehicle collisions). In accordance with the requirements specified in the MOU and other resource-specific regulations and guidelines, appropriate conservation measures would be identified and implemented prior to any geothermal activities to avoid unintentional take of migratory birds.

1.5.2.2 Terrestrial Wildlife – Some comments received during scoping focused on potential impacts to big game species, including winter range and elk calving habitat, potential impacts to other common, widespread wildlife species, and the potential for habitat fragmentation and disturbance. Big game winter range will be addressed in detail (see above, Issues to be Analyzed).

Leasing of geothermal resources does not directly affect wildlife. These resources would be affected only by development of specific geothermal projects. The nature and extent of

geothermal-related development activities that would affect wildlife would vary by project, depending on several factors. Wildlife and wildlife habitat would be evaluated on a project-specific basis, as environmental analyses would be conducted for each of the potential phases of geothermal development activity: exploration, drilling operations, utilization, and reclamation and abandonment. There are no identified elk calving areas in the analysis area.

The instances where individuals, communities, or populations can be affected from geothermal development activities involve the following stressors and associated impacts on vegetation and important habitats: habitat disturbance, introduction of invasive vegetation, injury or mortality, erosion and runoff, fire, noise, and exposure to contaminants.

In accordance with the requirements specified in resource-specific regulations and guidelines, appropriate conservation measures would be identified and implemented prior to any geothermal activities to avoid adverse impacts to wildlife (BLM, 2008a).

1.5.2.3 Threatened, Endangered, and Sensitive Plant and Animal Species - Some comments received during scoping focused on potential impacts to the following TES species and their habitats: Gunnison sage-grouse, Gunnison milkvetch, Gunnison's prairie dog, bald eagle, and Canada lynx. Gunnison sage-grouse will be addressed in detail (see above, Issues to be Analyzed).

Leasing of geothermal resources does not directly affect TES species or habitat. These resources would be affected only by development of specific geothermal projects. The nature and extent of geothermal-related development activities that would affect TES species or habitat would vary by project, depending on several factors. TES species and habitat would be evaluated on a project-specific basis, as environmental analyses would be conducted for each of the potential phases of geothermal development activity: exploration, drilling operations, utilization, and reclamation and abandonment. Because of the regulatory requirements of the Endangered Species Act (ESA) and various state regulations, and the requirements specified in BLM Manual 6840 Special Status Species Management and other resource-specific regulations and guidelines, appropriate survey, avoidance measures would be identified and implemented prior to any geothermal activities to avoid adversely affecting any TES species or the habitats on which they rely.

Geothermal exploration, drilling operations, utilization, and reclamation and abandonment could affect threatened, endangered, and sensitive species in the same manner that vegetation and wildlife resources could be affected. Threatened and endangered species could be affected as a result of 1) habitat disturbance, 2) the introduction of invasive vegetation, 3) injury or mortality, 4) erosion and runoff, 5) fugitive dust, 6) noise, 7) exposure to contaminants, and 8) interference with behavioral activities. Which species may be at risk to construction-related effects would depend on where a specific project is located and the specific habitat present at or near the site (BLM 2008).

An important distinction regarding impacts on special status species is that impacts on small localized areas or affecting only a few individuals can have adverse impacts on special status species. Many special status species are dependent on unique habitats or have small remaining

populations. Impacts that directly affect these unique habitats or individuals, even when small, can have significant impacts on special status species (BLM 2008a).

Impacts on threatened, endangered, and sensitive wildlife species could include injury or mortality or could involve reduction or fragmentation of habitat, reduction or displacement of habitat features such as cover and forage, exposure to contaminants (e.g., diesel fuel or geothermal working fluid) from a spill, and destruction of individual biota (e.g., from drilling and clearing activities or from vehicle collisions). Because of the regulatory requirements of the ESA and various state regulations, and the requirements specified in BLM Manual 6840 Special Status Species Management and other resource-specific regulations and guidelines, appropriate survey, avoidance measures would be identified and implemented prior to any geothermal activities to avoid if possible, minimize, or mitigate adversely affecting any sensitive species or the habitats on which they rely (BLM, 2008a)

Canada lynx: Canada lynx (*Lynx canadensis*) is designated as a threatened species under the Endangered Species Act. The analysis area partially overlaps with the Tomichi Dome Lynx Analysis Unit (LAU) which includes approximately 1,215 acres of BLM land and 43,464 acres of NFS land. The analysis area included approximately 253 acres that were initially mapped as “other” lynx habitat. However, after field review of the mapped habitat, it was determined that the site does not include the characteristic dense conifer overstory required for lynx habitat per the definition provided by Canada Lynx Conservation Assessment and Strategy (Ruediger, 2000). The sites that were mapped as habitat are characterized by dry Douglas-fir stands, decadent and dying aspen stands, and scree slopes. Therefore, the analysis area does not include any lynx habitat.

Gunnison’s prairie dog: The U.S. Fish and Wildlife Service determined in 2008 that the Gunnison’s prairie dog (*Cynomys gunnisoni*) is warranted for listing with threatened status over the montane portion of their range compliant with the Endangered Species Act, but that listing is precluded by pending actions for other species with higher listing priorities. Habitat within the boundaries of the Gunnison Field Office (GUFO) makes up a significant portion of this range. The analysis area was surveyed for prairie dogs in 2009; no active prairie dog colonies were identified in the analysis area.

Bald eagle: The bald eagle (*Haliaeetus leucocephalus*) is a BLM sensitive species that was removed from the Threatened species list by the US Fish and Wildlife Service in 2007. Bald eagles continue to be protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The analysis area includes approximately 258 acres mapped as bald eagle winter concentration area. Wintering bald eagles usually begin to arrive in southern Colorado after mid-November and remain through February (Righter et al, 2004). No critical winter roost sites have been identified in the area although bald eagles may occasionally roost and forage from the Douglas-fir trees in the analysis area. The portions of the mapped concentration areas along Hot Springs Creek and Tomichi Creek that overlap with the analysis area do not include the characteristic tall cottonwood overstory that eagles typically congregate in during winter and so do not provide the quality of winter habitat that would be considered a concentration area.

Gunnison milkvetch: The Gunnison milkvetch (*Astragalus anisus*) is a BLM sensitive plant that is endemic to and only known to occur in the Gunnison Basin. The plant is found throughout the sagebrush communities to approximately 9,500 feet. Within its range, it is widely scattered and fairly abundant, most commonly growing on south to southwestern-facing slopes of 2 to 20 degrees. It is typically found on dry, gravelly flats and hillsides at elevations ranging from 7,500 to 9,400 ft. Associated vegetation includes black sagebrush, big sagebrush, rabbitbrush, phlox, and grasses. Recent surveys show that populations appear to be healthy and well distributed throughout the Basin. Gunnison milkvetch has been identified in previous surveys in the analysis area.

Endangered Colorado River Fish Species: In May 2008, BLM prepared a Programmatic Biological Assessment (PBA) that addresses water depleting activities associated with BLM's fluid minerals program in the Colorado River Basin in Colorado. In response to BLM's PBA, the FWS issued a Programmatic Biological Opinion (PBO)(ES/GJ-6-CO-08-F-0006) on December 19, 2008, which determined that BLM water depletions from the Colorado River Basin are not likely to jeopardize the continued existence of the Colorado pikeminnow, humpback chub, bonytail, or razorback sucker, and that BLM water depletions are not likely to destroy or adversely modify designated critical habitat.

A Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin was initiated in January 1988. The Recovery Program serves as the reasonable and prudent alternative to avoid jeopardy and provide recovery to the endangered fishes by depletions from the Colorado River Basin. The PBO addresses water depletions associated with fluid minerals development on BLM lands, including water used for well drilling, hydrostatic testing of pipelines, and dust abatement on roads. The PBO includes reasonable and prudent alternatives developed by the FWS which allow BLM to authorize oil and gas wells that result in water depletion while avoiding the likelihood of jeopardy to the endangered fishes and avoiding destruction or adverse modification of their critical habitat. As a reasonable and prudent alternative in the PBO, FWS authorized BLM to solicit a one-time contribution to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program) in the amount equal to the average annual acre-feet depleted by fluid minerals activities on BLM lands.

Any projects, such as geothermal leasing, that involve potential water quality or habitat impacts are not covered under the PBO and would require a separate section 7 consultation. Any project, such as geothermal development, subject to the PBO would be entered into the Gunnison Field Office fluid minerals water depletion log which would be submitted to the BLM Colorado State Office at the end of the Fiscal Year.

1.5.2.4 Upland vegetation, including vegetation treatments - Some comments received during scoping focused on potential impacts to upland vegetation and to ecosystem health in general. Some comments were specific to the potential impacts to habitat improvement projects that have been conducted over the years in the analysis area, particularly along Monson Gulch.

Leasing of geothermal resources does not directly affect vegetation. These resources would be affected only by development of specific geothermal projects. The nature and extent of

geothermal-related development activities that would affect vegetation would vary by project, depending on several factors. Vegetation resources would be evaluated on a project-specific basis, as environmental analyses would be conducted for each of the potential phases of geothermal development activity: exploration, drilling operations, utilization, and reclamation and abandonment (BLM, 2008a).

Vegetation could be affected as a result of 1) habitat disturbance, 2) direct removal and injury, 3) the introduction of invasive vegetation, 4) fire, 5) erosion and 6) exposure to contaminants. Potential impacts due to geothermal development would depend on where a specific project is located, the size of the area that is disturbed, and the types of vegetation habitats and communities present at or near the site. The ability of an area to recover from disturbance would also affect the magnitude of the impacts (BLM, 2008a).

The RMP includes Best Management Practices (BMP's) that, after appropriate environmental review, could be incorporated into any permit applications or made conditions of approval for any future geothermal development permitting. The BMP's would be applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse impacts to vegetation resources (BLM, 2008a).

1.5.2.5 Noxious weeds - Some comments received during scoping focused on potential impacts to upland vegetation, riparian areas, and wildlife habitat and ecosystem health in general from the introduction or spread of invasive and noxious weeds. The sections above regarding wildlife, TES species, and upland vegetation recognize the potential impacts from noxious weeds. The Big Game Winter Range, Gunnison Sage-Grouse, Riparian Areas and Water Resources, and Soils sections of Chapter 3 also address the potential impacts of noxious weeds.

The RMP includes Best Management Practices (BMP's) that, after appropriate environmental review, could be incorporated into any permit applications or made conditions of approval for any future geothermal development permitting. The BMP's would be applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse impacts due to the introduction or spread of invasive and noxious weeds (BLM, 2008a).

1.5.2.6 Visuals – Some comments received during scoping focused on potential impacts to visuals in the analysis area, particularly due to roads, pipelines, facilities, and electric transmission lines.

Refer to the Cultural Resources section of Chapter 3, for a discussion of protection of the visual resources in the viewshed of the historic Old Spanish Trail.

The practice of Visual Resource Management (VRM), in BLM land-use planning, inventories landscape character according to the four basic visual elements of form, line, color, and texture, and is used to analyze impacts of development. The planning area is first evaluated and then assigned values for several visual elements, based on a numerical point system. The total points assigned to a given area are then used to determine an existing scenic quality class.

A review of the RMP indicates that most of the project area is classified as Visual Resources Management (VRM) class III and IV.

Class III Objective. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV Objective. The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

The proposed leasing project does not dominate the landscape therefore would not cause long term visual impact.

Receptors sensitive to disturbances of visual resources are varied and depend on the landscape's visual resources, the project's location, the view distance, angle, and duration, the location of travel routes, public areas of interest, the season, the topography, recreation activities, and the number of viewers. Because of this, it is important to note that site-specific impact assessment is needed to thoroughly assess impacts on visual resources from a particular project. Without precise information about a specific project, it is not possible to detail the visual impacts. However, by using the RFD scenario as a general description of expected geothermal resource development activities, a generalized assessment of the possible impacts on visual resources can be made by describing the range of expected visual changes (BLM PEIS, 2008).

If a binary cycle power plant is constructed in the analysis area, the cool, ambient air of Colorado would allow for a dry cooling system. The visual impact from a binary cycle power plant that is dry cooled would be due only to infrastructure (buildings, roads, increased traffic during construction, pipelines, wells, and lights from the power plant at night). A cloud of water vapor would not be emitted from a dry cooled power plant because the system is a closed loop process. Only a small power plant would likely be constructed within the Study Area, generating from 5 to 10 megawatts (BLM, 2010). The buildings for this type of small operation would also be small, and occupy less than 10 acres of developed land (BLM, 2010). The exact level of impact would depend on the actual intensity of geothermal resource development activity.

1.5.2.7 Conservation easements - Some comments received during scoping focused on the presence of numerous conservation easements on adjacent and surrounding private lands. Of particular concern were the potential impacts to resources protected by the easements, such as visuals and wildlife habitat provided by general open space. See the discussions on Migratory Birds, Terrestrial Wildlife, TES Plant and Animal Species, and Visuals in this chapter.

There are no conservation easements on any lands in the analysis area. There are approximately 4,089 acres of private land under conservation easements adjacent to and near the analysis area. These are located primarily along Hot Springs Creek and Tomichi Creek.

Leasing of geothermal resources would not directly affect the conservation easements. These resources would be affected only by development of specific geothermal projects. The nature and extent of geothermal-related development activities that would affect the conservation easements would vary by project, depending on several factors related to each project and to the specific terms and objectives of each conservation easement. Potential impacts to conservation easements would be evaluated on a project-specific basis, as environmental analyses would be conducted for each of the potential phases of geothermal development activity: exploration, drilling operations, utilization, and reclamation and abandonment.

1.5.2.8 Recreation - Some comments received during scoping focused on potential impacts to recreation opportunities, including hunting, in the analysis area.

Due to the inability to predict future development scenarios, including types of development, timing, and location, the following impact analysis provides a general description of common impacts on land use from geothermal resource development. Issuing geothermal leases would not create any surface disturbances, and current activities on federal lands could continue as long as they did not unduly interfere with the rights of the geothermal lessee. Under the DOI's Geothermal Resources Operational Orders, "the public shall have free and unrestricted access to geothermal leased lands, excepting however, where restrictions are necessary to protect public health and safety or where such public access would unduly interfere with the lessee's operations".

The proposed project area is within an Extensive Recreation Management Area (ERMA). Within ERMA's recreation is custodial in nature. Custodial recreation management is different from the structured recreation management within Special Recreation Management Areas (SRMAs). Custodial recreation management does not target specific recreation opportunities or beneficial outcomes but maintains recreation opportunities in these areas. ERMA's do not have prescriptions to maintain specific physical, social or operational recreation setting characteristics. BLM's general recreation management responsibility in ERMA's is to take care of: 1) dispersed recreation activities, 2) visitor safety, 3) use and user conflict, and 4) resource protection issues.

Existing recreation activities within the analysis area include OHV use, viewing wildlife, dispersed camping, and hunting. The entire analysis area has widespread moderate use during the fall hunting seasons by hunting enthusiasts. There are no anticipated impacts from the proposed action, to the health and safety of visitors.

1.5.2.9 Noise – Some comments received during scoping focused on potential impacts due to noise from geothermal development activities. Concerns were related to noise impacts both on humans and on wildlife, particularly Gunnison sage-grouse. Potential noise impacts on Gunnison sage-grouse are discussed under section 3.2 Gunnison Sage-Grouse and Habitat. Refer also to the Lease Notice under section 2.2.4 related to noise impacts in Gunnison sage-grouse habitat.

Sound is a physical phenomenon susceptible to objective, quantitative measurement. When either the level of sound, or the particular form of sound, is judged as inappropriate or unacceptable, they are defined as noise, a measure of importance. There are no anticipated sound impacts from the proposed leasing of BLM lands. Noise impacts would be generated by development of specific geothermal projects.

The project area is located in rural natural areas. There are few residences in the vicinity of the proposed project areas. Dispersed recreation does exist within the proposed areas. The main sources of noise in the vicinity of the sites are from vehicle traffic on roadways. Due to the nature of the proposed project and the surrounding area, no monitoring was undertaken to define the existing background noise levels in the vicinity of the proposed projects.

The federal law that directly affects noise control is the Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978 (42 USC 4901-4918). This Act delegates to the states the authority to regulate environmental noise. It also directs government agencies to comply with local community noise statutes and regulations, and to conduct their programs to promote an environment free of any noise that could jeopardize public health or welfare. More specifically, BLM regulations mandate that noise at one-half mile—or at the lease boundary, if closer—from a major geothermal operation shall not exceed 65 A-weighted decibels (43 CFR 3200.4[b]) (BLM, 2008).

Geothermal construction usually takes place during daylight hours for a varied range in time (weeks to months to years) (Kagel et. al., 2007). Geothermal drilling usually occurs 24 hours a day, seven days a week, and typically lasts from 45 to 90 days. Sound mufflers can also be installed on equipment to minimize noise pollution. Such devices may include noise shields, exhaust mufflers, insulation, and noise controls on equipment. With noise reduction equipment in place, surrounding neighborhoods should not be impacted by noise pollution from nearby geothermal projects (BLM, 2010).

Projects would be required to meet state-specific regulations, reducing any impacts on off-lease area sensitive receptors or residential areas. Impacts on onsite workers would be minimal through the use of required hearing protection in noise-intensive operations.

The geothermal noise regulation implemented by the Bureau of Land Management is for all types of geothermal power plants, including binary cycle geothermal power plants. According to the Geothermal Energy Association, geothermal power plants are “not considered a noise nuisance in surrounding residential communities” (Kagel, et al., 2007). At normal operations, a geothermal power plant has between 15-28 decibels A-weighted. The permissible exposure limit for eight hours without ear protection is 90 decibels A-weighted, established by the Occupational Safety and Health Administration (Kavanagh, 2009). Therefore, geothermal [power plants] have a negligible effect on noise pollution (BLM, 2010).

Best Management Practices (BMP's), after appropriate environmental review, could be incorporated into any permit applications or made conditions of approval for any future geothermal development permitting. The BMP's would be applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse impacts due to noise. In accordance

with BMPs, operators would be required to implement actions that would minimize impacts associated with noise. For example, operators would be required to take measurements to assess the existing background noise levels at a given site and compare them with anticipated noise levels. Operators would adequately muffle and maintain construction equipment and would notify nearby residents in advance of blasting or other noisy activities. It is expected that these measures would effectively minimize impacts on noise from geothermal related activities.

1.5.2.10 Air Quality - Comments received during scoping focused on potential impacts to air quality, both due to the potential decrease of greenhouse gas emissions from geothermal electrical production and due to potential impacts of dust, gas emissions, and fine solid particulates. See the Climate Change section below for a discussion of potential effects to greenhouse gas emissions.

While geothermal leasing itself would not impact air quality, the impacts of development on leased areas could affect air quality in the future. These potential effects on air quality are those that may result from pollutants that are typically generated by geothermal development.

At project level analysis and permitting, the BLM and FS would need to ensure that any proposed action, including construction emissions subject to state jurisdiction, conform to an approved State Implementation Plan (SIP). Emissions authorized by a Clean Air Act permit issued by the state or by the local air pollution control district would not be assessed under general conformity but through the permitting process.

The Clean Air Act and its subsequent amendments require the permitting of stationary sources. Permitting requirements for major air sources are contained in two different programs. The first program is the New Source Review program, which consists of two preconstruction programs: the Prevention of Significant Deterioration program for permitting sources in attainment areas, and the nonattainment area permitting program. The second program is the Operating Permits Program, for permitting a source once it is in operation.

For a specific project, the local air district would issue an Authority to Construct permit during the drilling operations stage of a project to address air emissions from stationary sources, which at that stage of development would be the production wells. For a power plant, an Authority to Construct is usually initially acquired for the power plant, including the wells. Once the power plant is operational and any initial operational problems have been worked out, the air district then issues a Permit to Operate. Depending on the type of project and the amount and type of air emissions, abatement systems may be required by the local air district during this phase of permitting (BLM, 2008a).

The RMP includes Best Management Practices (BMP's) that, after appropriate environmental review, could be incorporated into any permit applications or made conditions of approval for any future geothermal development permitting. The BMP's would be applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse impacts to air quality.

The Upper Gunnison Air Basin is defined as the area east of Blue Mesa Reservoir, bounded by the San Juan Mountain Range to the south, the Continental Divide to the East, and the Elk Mountains to the north.

Air quality directly effects human health and welfare. Improvement of air quality in the U.S. is an important regulatory goal that binds BLM actions in the GUFO. The Clean Air Act as amended in 1990 established a mandate to reduce emissions of specific pollutants via uniform federal standards. Under the Act, the U.S. Environmental Protection Agency (EPA) has set standards to ensure that BLM, like all local agencies, complies with the Act.

National Ambient Air Quality Standards

EPA's National Ambient Air Quality Standards (NAAQS) were established for six primary and secondary pollutants to protect public health and welfare. These criteria pollutants are sulfur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO), ozone (O₃), lead (Pb), and particulate matter (PM). Particulate matter (PM) is a broad class of substances that exist as discrete particles over a wide range of sizes. For regulatory purposes, PM is further sub-classified by the particle's aerodynamic diameter. PM₁₀ includes all PM with an aerodynamic diameter of 10 microns or less and is referred to as inhalable PM. PM_{2.5} includes all PM with an aerodynamic diameter of 2.5 microns or less, called fine PM, and is by definition a subset of PM₁₀.

All areas of the U.S., which includes the analysis area, have been classified by the EPA in terms of air quality, based on their *attainment* or *non-attainment* of NAAQS status. The EPA designates areas as being in attainment for a criteria pollutant if ambient concentrations of that pollutant are below the NAAQS. Areas are in nonattainment if criteria pollutant concentrations violate the NAAQS. Once nonattainment areas comply with the NAAQS, they are designated as maintenance areas. All counties in the GUFO, including the analysis area, are designated as attainment areas for the six criteria pollutants.

Federal Class I Areas

The Clean Air Act also established visibility protection for mandatory federal Class I areas, and specifically, requirements for *prevention of significant deterioration* (PSD). Class I areas that require PSD for visibility protection include large national parks and wilderness areas that were in existence on August 17, 1977. Three federal Class I visibility protection areas, Black Canyon of the Gunnison National Park, West Elk Wilderness, and the La Garita Wilderness, lie more than 18 miles away from the analysis area. These areas lie west and south of the analysis area.

The EPA has established regional haze regulations, and encouraged states to coordinate their implementation efforts through regional planning organizations. The Western Regional Air Partnership (WREP) is the voluntary organization that performs these functions in the GUFO. The WREP is comprised of 13 western governors (including Colorado), 11 tribal leaders, and two federal departments (USDA and USDI, including BLM). In the 1990 amendments to the Clean Air Act, the U.S. Congress directed the EPA to develop regional haze regulations to achieve the national visibility goal of "the prevention of any future, and the remedying of any existing impairment of visibility in mandatory Class I federal areas, which impairment results from manmade air pollution." The EPA developed the Regional Haze Rule in 1999 to improve

visibility in 156 mandatory federal Class I areas, including the 3 GUFO Class I areas, where visibility is an important value. Improvement in visibility must be made every 10 years for the 20% most impaired (haziest) days, and there must be no degradation for the 20% best (clearest) days, until the national visibility goal is reached in 2064.

Fugitive Dust from Unpaved Roads

Unpaved roads generate emissions of fugitive dust from vehicle traffic. Emissions depend on the types of vehicles, number of trips, and the mitigations to control dust. This information is unknown at this time. There are 15 miles of unpaved roads within the analysis area.

1.5.2.11 Climate change - Consideration of the effects of future actions that might occur under the alternatives also takes into account the phenomena of greenhouse gas (GHG) emissions, carbon sequestration, and climate change generally. The tools necessary to quantify climatic impacts from site-specific projects are presently unavailable (US Geological Survey 2008). As a consequence, impact assessment of specific effects of anthropogenic activities and specific levels of significance cannot be determined. Therefore, climate change analysis for the purpose of this document is limited to accounting for and disclosing GHG emissions (and other factors that contribute to climate change) that may result from future activities. Qualitative and quantitative evaluations of potential factors that may result from the future actions that may be taken to implement each alternative are included, where appropriate and practicable.

Some of the GHGs associated with geothermal exploration and development would be naturally sequestered, while the balance of those emissions would accumulate with GHG concentrations in the atmosphere. This, in turn, is believed to contribute to further manifestations of climate change. However, since geothermal energy is a renewable energy with low carbon output compared with nonrenewable sources that currently dominate the US energy landscape, the development of geothermal energy projects can result in a net decrease in GHG emissions if the energy supplied to the grid allows fossil fuel based power production, and its related GHG emissions, to be reduced.

While the GHG emissions of future actions that may be taken under each of the alternatives analyzed can be estimated, current science does not permit quantification (or in some cases, even articulation) of the relationship between these emissions and the phenomena associated with global climate change. That is, while the relationship appears on a global level, it is not possible to make the connections between GHG emissions and global climate change on a local or even regional level (US Geological Survey 2008) (BLM, 2008a).

1.5.2.12 Socioeconomics - Some comments received during scoping focused on potential impacts to the socioeconomic conditions in the Gunnison Basin. Factors of particular concern include:

- Potential economic impacts to existing private recreation providers, such as hot springs, guest ranches, hunting outfitter/guides;
- Potential impacts to land values of surrounding private lands and surrounding private lands with conservation easements on them;

- Potential secondary economic impacts, such as those from cascading and sequential geothermal uses and development(s), tourist and education opportunities, additional housing, and other infrastructure (i.e., powerlines), etc.;
- Potential impacts to the general quality of life, in particular of the residents near the analysis area;
- Potential impacts from additional jobs, directly and indirectly related to geothermal development
- Potential impacts from royalty payments to the County government

The degree of future geothermal development and the associated economic impacts are related to a number of uncertain economic factors.

Land values for private tracts of land bordering geothermal development areas could change. Some economic impacts may occur should income and employment associated with ranching, recreation, hunting, mining, or other land use activities be altered by geothermal development. Constructing geothermal facilities would alter the landscape and nonmarket values of the immediate area, however the extent of impact would vary with each project. In the short term, other land uses and income derived from these uses may be displaced by geothermal development. In the long term, many other land uses may be compatible with geothermal use due to the small footprint of geothermal plants; however the aesthetic value would be permanently altered (BLM, 2008a).

The existence of state- or federal-level renewable energy portfolios may increase the demand for renewable energy in the future (BLM, 2008). Colorado law requires large utilities to generate 30% of their electricity from renewable sources by the year 2020.

A major impact on socioeconomics from power plants would result from employment and income directly associated with geothermal electricity plant construction and operation. Construction employment for installing access roads, pipelines, transmission lines, drill sites, and power plants would likely occur, though the amount would vary depending on the resource potential. The type of employment and number of available jobs would also vary as the construction proceeds. Construction employment is expressed in person-month or person-year units. One person-month corresponds to the employment of one person during one month. Similarly, one person-year corresponds to the employment of one person during one year. Construction of a new geothermal plant averages 17 to 33 months and requires 37.4 person-months per megawatt, or 3.1 person-years per megawatt of power capacity installed. The personnel involved in well and transmission line construction would be temporary. Due to the variation in jobs available at different stages in construction, average employment would vary at any one time. Based on employment numbers in a 2005 survey of the geothermal industry, an average of .74 person-years per megawatt annually is required for geothermal power plant operation and maintenance (BLM, 2008a).

Geothermal development and leasing is covered under the U.S. Code of Federal Regulations 43, Subpart 3200. As such, resource development would provide royalties, rents, and tax revenue to the mineral rights holder of those lands developed. A company producing geothermal energy on public lands is required to pay 1.75 percent of gross revenue from electricity sales in royalties for

the first 10 years of a lease, and 3 percent thereafter. Under current law, fifty percent of that amount goes to the State of Colorado, 25 percent goes to the affected County, and the other 25 percent goes to the U.S. Treasury. However, until the magnitude of the resource is determined, the size of these revenue sources cannot be reliably estimated (BLM, 2010).

Negative impacts on socioeconomics or environmental justice would be minimized by implementing best management practices through conditions of approval for any future exploration, drilling, utilization, and reclamation and abandonment.

1.5.2.13 Access - Some comments received during scoping focused on specific concerns related to access for any geothermal exploration and development activities, including:

- access across adjacent private lands;
- level of road improvements; and,
- whether or not new roads would be open to the public.

While geothermal leasing itself would not have any impacts related to access, the impacts of development on leased areas could affect access roads in the future. The RMP includes Best Management Practices (BMP's) that, after appropriate environmental review, could be incorporated into any permit applications or made conditions of approval for any future geothermal development permitting. The BMP's would be applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse impacts due to access roads.

Any future lessee would be required to make a good faith effort to negotiate a surface use agreement with the surface owner of lands overlying leased federal minerals. Access across other, non-leased private lands would require permission of the landowner.

Management of any roads on the public lands would be guided by the recently completed Gunnison Basin Federal Lands Travel Management Plan (TMP). The TMP describes which routes are open to public travel, the mode of travel allowed, and applicable seasonal route closures. Any new proposed routes would require site-specific environmental analysis and public involvement, pursuant to NEPA.

1.5.2.14 Livestock Grazing – Some comments received during scoping focused on potential impacts to livestock grazing operations in the analysis area. Factors of particular concern include:

- direct injury to livestock; and,
- impacts due to new roads, fences, facilities, as well as increased traffic and noise.

While geothermal leasing itself would not have any impacts on livestock grazing, the impacts of development on leased areas could affect grazing in the future. The RMP includes Best Management Practices (BMP's) that, after appropriate environmental review, could be incorporated into any permit applications or made conditions of approval for any future geothermal development permitting. The BMP's would be applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse impacts on livestock grazing.

In accordance with BMPs, operators would employ dust control measures to reduce impacts on livestock forage during construction and demolition. Noxious weeds would be controlled and removed regularly during construction and operation. BMPs would also require that geothermal development be designed to minimize the number of structures. In addition geothermal companies should work with livestock permittees to mitigate impacts on water by producing off-site water developments. If appropriate, produced water from geothermal operations could be made available to livestock for use if water quality were sufficient. This additional water could increase livestock distribution and available forage for livestock that would otherwise be lost to development. It is expected that these measures would effectively minimize impacts on livestock grazing by reducing impacts on forage. (BLM , 2008a)

1.5.2.15 Private Surface Use and Split-Estate Concerns – Some comments received during scoping focused on potential impacts to the private surface, split-estate parcel that has been nominated for competitive geothermal leasing.

In split-estate situations, the surface rights and subsurface rights (such as the rights to develop geothermal minerals) for a piece of land are owned by different parties. In this case, the surface estate is privately held while the Federal government owns the underlying mineral estate. The lands involved in this lease parcel were originally patented under the Stock Raising Homestead Act of December 29, 1916 (patent number 905703). This act reserved the mineral rights to the Federal government while conveying the surface to private individuals. The Act reserved to the United States or its permittee “the right at all times to enter upon the lands patented under the Act for the purpose of prospecting for the coal or other minerals provided that he shall not injure, damage, or destroy the permanent improvements of the patentee and shall be liable to and shall compensate the patentee for all damages to the crops on the land by reason of such prospecting.” The BLM works to encourage coordination and cooperation among all parties that have rights and responsibilities in split estate situations.

The mineral owner must show due regard for the interests of the surface estate owner and occupy only those portions of the surface that are reasonably necessary to develop the mineral estate (43 CFR 3814.1(c)). For example, if the lessee/operator intends to conduct operations on private land, the lessee/operator is encouraged to contact the surface owner as early as possible when operations are contemplated. The lessee is required to certify that good faith effort has been made to negotiate a surface use agreement with the surface owner. If a good faith effort by the lessee/operator cannot be reached, the lessee/operator still has the right to enter upon the lands to perform these activities. The lessee/operator can post a Surface Owner Damages Bond to protect the surface owner against reasonable and foreseeable loss or damages. During permit review, the surface owner is entitled to the same level of resource protection provided on federally owned estate.

The BLM is responsible to ensure that authorized mineral development meets all statutory and regulatory requirements. Activities and use of the surface are not subject to the Federal Land Policy and Management Act (FLPMA) planning requirements, and the BLM does not have authority under FLPMA over use of the surface by the surface owner. However, the BLM is required to analyze in land-use planning and NEPA documents the impacts to surface resources, uses, and users from any BLM-authorized mineral development. See Manual Section 3101.91 for

further discussion of the BLM responsibilities for split-estate lands. Stipulations for surface protection will be applied where regulatory lease terms and conditions are not adequate to protect those resources. These stipulations are described in the planning documents and will be applied to any of the parcels that are leased. These additional protection needs are attached to any parcels offered for lease in the form of attached stipulations. To accommodate surface owner agreements identified at the onsite, exceptions, modifications, and waivers may be granted.

2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Under the Proposed Action (Alternative 1), and under Alternatives 2, 3, and 4, the nominated lands would be leased for geothermal development. Alternatives 1 through 4 differ in the specific stipulations that would be attached to any BLM geothermal lease sold in the analysis area. Under Alternative 5, the RMP would be amended to close the analysis area to geothermal leasing.

2.1 COMPARISON OF ALTERNATIVES

Element	Alt. 1, Proposed Action	Alt. 2, No Action	Alt. 3, Additional GUSG Habitat Protections	Alt. 4, Additional GUSG Occupied Habitat Protections	Alt. 5, Close to Leasing
Geothermal lease would be offered?	Yes	Yes	Yes	Yes	No
RMP would be amended?	Yes	No	Yes	Yes	Yes
No Surface Occupancy (NSO) Stipulations that would be attached to a geothermal lease					
GUSG ¹ 0.6 mile buffer of active leks	Yes	Yes	No	No	N/A
GUSG ¹ 0.6 mile buffer of all leks	No	No	Yes	No	N/A
GUSG ¹ occupied habitat	No	No	No	Yes	N/A
Cultural resources – designated or eligible for the NRHP	Yes	Yes	Yes	Yes	N/A
Important cultural and archaeological resources	Yes	Yes	Yes	Yes	N/A
Water and riparian resources	Yes	Yes	Yes	Yes	N/A
Steep slopes (> 40%) and erosive soils	Yes	Yes	Yes	Yes	N/A
Mapped elk winter concentration areas	Yes	No	Yes	Yes	N/A
Gullies and other chronic erosion areas	Yes	No	Yes	Yes	N/A
Geologic hazards	Yes	No	Yes	Yes	N/A
Mapped GUSG Summer-Fall Habitat	No	No	Yes	Yes	N/A
Timing Limitation Stipulations that would be attached to a geothermal lease					
• No construction or drilling	Yes	Yes	Yes	Yes	N/A

activities in GUSG ¹ habitat between March 15 and May 15					
<ul style="list-style-type: none"> Between March 15 and May 15, routine operation, maintenance, and other activities in GUSG¹ habitat will occur between 9:00 a.m. and 4:00 p.m. 	Yes	Yes	Yes	Yes	N/A
Controlled Surface Use (CSU) Stipulations that would be attached to a geothermal lease					
Within 500 feet of riparian or wetland vegetation	Yes	Yes	Yes	Yes	N/A
Protection of visual resources (VRM class II, Old Spanish Trail)	Yes	Yes	Yes	Yes	N/A
Slopes > 30%	Yes	Yes	Yes	Yes	N/A
Water and geothermal rights and geothermal features monitoring	Yes	No	Yes	Yes	N/A
Mapped GUSG Summer-Fall Habitat	Yes	No	No	No	N/A
Other Lease Stipulations that would be attached to a geothermal lease					
Endangered Species Act	Yes	Yes	Yes	Yes	N/A
Cultural Resources	Yes	Yes	Yes	Yes	N/A

¹ Gunnison sage-grouse

2.2 LEASE STIPULATIONS

Lease stipulations are major or moderate constraints applied to a new geothermal lease. A lease stipulation is a condition of lease issuance that provides a level of protection for other resource values or land uses by restricting lease operations during certain times or at certain locations or by mitigating unacceptable impacts, to an extent greater than standard lease terms or conditions. 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. Lease stipulations further implement the BLM's regulatory authority to protect resources or resource values (BLM, 2008a).

The BLM has the authority to enforce some, but not all, surface protection stipulations on split-estate lands (private surface over federal minerals). Generally, stipulations designed for the protection of surface resources, as required by federal law, are enforced on split-estate lands. Such protections include those mandated by the National Historic Preservation Act (NHPA), the Native American Graves Protection and Repatriation Act (NAGPRA), and the Endangered Species Act (ESA).

2.2.1 Lease Exceptions, Waivers, and Modifications

To ensure leasing decisions remain appropriate in light of continually changing circumstances and new information, the BLM develops and applies lease stipulation exception, waiver, and

modification criteria. An exception, waiver, or modification may not be approved unless, (1) the authorized officer determines that the factors leading to the stipulation's inclusion in the lease have changed sufficiently to make the protection provided by the stipulation no longer justified; or (2) the proposed operations would not cause unacceptable impacts (43 CFR 3101.1-4).

- An **exception** is 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. An exception is a limited type of waiver.
- A **waiver** is a permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.
- A **modification** is 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.

An exception, waiver, or modification may be approved if the record shows that circumstances or relative resource values have changed or that the lessee can demonstrate that operations can be conducted without causing unacceptable impacts and that less restrictive requirements would meet resource management objectives.

During the review process, coordination with other local (including Gunnison County), state, or Federal agencies would be undertaken, as appropriate, and documented. For example, it may be appropriate to coordinate the review of wildlife exceptions, waivers, and modifications with the local office of the Colorado Division of Wildlife. Staff review and recommendations would be documented along with any necessary mitigation and provided to the authorized officer for approval or disapproval. The applicant would then be provided with a written notification of the decision. Public notification is generally not required for exceptions because an exception is seldom a substantial modification or waiver of a lease term or stipulation (43 CFR 3101.1-4), particularly if the exception criteria is outlined in the lease or the land use plan. Nor is public review required for waivers or modifications that the authorized officer determines are not substantial and do not substantially waive or modify the terms of the lease. "Substantial" in this case would include the exception, waiver, or modification having an effect on the environment that was not previously considered. Public notice, if determined necessary by the BLM, would include identification of the modified lease terms and a description of the affected lands or a map.

The BLM must analyze and document how the exception, waiver, or modification is in conformance with the land use plan and identify the plan decision (including goals, objectives, or desired outcomes) supported by the proposed exception, waiver, or modification. If existing NEPA analysis does not support the exception, waiver, or modification, the BLM must conduct the appropriate environmental review and NEPA analysis. If the proposed exception, waiver or modification is not in conformance with the land use plan or that document does not disclose the conditions under which such proposed change would be allowed, BLM must either amend the plan or deny the exception, waiver, or modification.

It may be necessary to add, delete, or modify lease stipulations in the land use plan as a result of pre-lease issuance parcel reviews, statewide lease stipulation consistency reviews, plan

amendments, changed circumstances on the ground, or changed resource protection priorities. This is accomplished and documented either through the plan maintenance process (for minor changes consistent with an approved land use plan) or the plan amendment process (for changes resulting in modification of terms, conditions, or decisions in an approved land use plan) (BLM, 2008a).

Criteria Specific to Gunnison Sage-grouse Lease Stipulations:

Under Alternatives 1, 2, 3, and 4, there are various lease stipulations (NSO, CSU, and timing limitations) for the protection of Gunnison sage-grouse and their habitat. The following criteria would be applied when considering any exceptions, waivers, or modifications.

NSO Stipulations (these apply to a buffer distance from sage-grouse leks)

EXCEPTION: The authorized officer may grant an exception if an environmental review in coordination with appropriate local, state, and federal agencies determines that the action, as proposed or conditioned, would not impair the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities. An exception may also be granted by the authorized officer if the proponent, BLM, State wildlife agency, and where necessary, other affected interests, develop non-monetary compensation or mitigation that satisfactorily offsets anticipated impacts to Gunnison sage-grouse habitats and/or breeding activities.

MODIFICATION: The authorized officer may modify the area subject to the stipulation if an environmental analysis in coordination with appropriate local, state, and federal agencies finds that a portion of the NSO area is nonessential, or that the proposed action could be conditioned so as not to impair, the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities.

WAIVER: This stipulation may be waived, if after consulting with the State wildlife agency, it is determined that the site has been permanently abandoned or unoccupied for a minimum of 10 years; site conditions have changed such that there is no reasonable likelihood of future site occupation, or Gunnison sage-grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS and it is determined that habitat protection is no longer necessary or desired.

CSU and Timing Limitation Stipulations (these apply to mapped summer-fall habitat and to lekking, nesting, and early brood-rearing seasons)

EXCEPTION: The authorized officer may grant an exception if an environmental review in coordination with appropriate local, state, and federal agencies determines that the action, as proposed or conditioned will not affect nest attendance, egg or chick survival, nesting/brood-rearing success. An exception could also be granted by the Authorized Officer if the proponent, BLM, and State wildlife agency and where necessary, other affected interests, develop non-monetary compensation or mitigation that would satisfactorily offset the anticipated losses of nesting habitat or nesting activities. Actions designed to enhance the

long-term utility or availability of suitable Gunnison sage-grouse habitat may be exempted from the timing limitations.

MODIFICATION: The authorized officer may modify the size and shape of the timing limitation area if an environmental analysis in coordination with appropriate local, state, and federal agencies indicates the actual habitat suitability for nesting/ brood-rearing is greater or less than the 4-mile radius. Timeframes may be modified based on studies documenting local periods of actual use.

WAIVER: This stipulation may be waived, if after consulting with the State wildlife agency, it is determined that the described lands are incapable of serving the long-term requirements of Gunnison sage-grouse nesting habitat and that these ranges no longer warrant consideration as components of Gunnison sage-grouse nesting/brood-rearing habitat.

2.3 LEASE STIPULATIONS COMMON TO THE PROPOSED ACTION AND TO ALTERNATIVES 2, 3, AND 4:

The following list of lease stipulations would apply under the Proposed Action, as well as under Alternatives 2, 3, and 4. These stipulations are taken from the RMP or from the Record of Decision (ROD) for Geothermal Leasing in the Western US, which amended the RMP. See the descriptions below of the various alternatives for any additional stipulations that would apply to individual alternatives. The following stipulations would be attached to any BLM geothermal lease sold in the analysis area.

2.3.1 No Surface Occupancy (NSO) Lease Stipulations

No Surface Occupancy (NSO) stipulations are considered a major constraint, as they do not allow for surface development. An NSO is appropriate when the standard terms and conditions, other less restrictive lease stipulations, and best management practices for permit approval are determined to be insufficient to achieve the resource protection objectives (BLM, 2008b). A NSO stipulation would apply to any exploration, drilling, utilization, or reclamation and abandonment activities, including such things as pipelines and powerlines¹.

Gunnison sage-grouse leks (RMP, pg.K-3): No surface occupancy or use is allowed within a $[0.6]^2$ mile radius of [active] sage-grouse lek sites/courtship sites. For the purpose of protecting grouse courtship sites from disturbances that would force strutting sage-grouse onto less desirable sites, or disturbances that would interfere with mating processes, or disturbances that could result in lek site destruction. An exception may be granted by the Authorizing Officer, dependant upon the active status of the leks or the geographical relationship of topographical barriers and vegetation screening to the site. Any changes to this stipulation would be made in accordance with the land use plan and/or the regulatory provisions for such changes.

¹ NSO stipulations do not apply to existing roads open to public vehicle use or to existing authorized facilities, such as powerlines, administrative access roads, livestock and/or wildlife water developments, fences, etc.

² The 1993 Gunnison RMP specifies a NSO buffer for sage-grouse leks within a 0.25-mile radius of leks. The 2005 Gunnison Sage Grouse Rangewide Conservation Plan specifies a NSO buffer within a 0.6-mile radius of active leks. Per the 1997 Public Land Health Standards Amendment to the RMP and BLM policy to implement the RCP, the *0.6-mile* sage-grouse *active* lek buffer would be implemented.

If new leks are found after the onset of activities, there would be no increase in ground-disturbing activities or constructed features beyond what existed when the lek was first identified. This would not apply to operation and maintenance of production facilities.

Cultural resources – designated or eligible (ROD, pg. 2-5): No surface occupancy or use is allowed within the boundary of properties designated or eligible for the National Register of Historic Places, including National Landmarks and National Register Districts and Sites, and additional lands outside the designated boundaries to the extent necessary to protect values where the setting and integrity is critical to their designation or eligibility.

Cultural and archaeological resources (ROD, pg. 2-5): No surface occupancy or use is allowed within areas with important cultural and archaeological resources, such as traditional cultural properties and Native American sacred sites, as identified through consultation.

Water and riparian resources (ROD, pg.2-5): No surface occupancy or use is allowed within water bodies, riparian areas, wetlands, playas, and 100-year floodplains.

Steep slopes and erosive soils (ROD, pg.2-6): No surface occupancy or use is allowed within slopes in excess of 40 percent and/or soils with severe to very severe erosion potential.

2.3.2 Timing Limitations and Controlled Surface Use (CSU) Lease Stipulations

Where standard lease terms and permit-level decisions are deemed insufficient to protect sensitive resources, but where an NSO is deemed overly restrictive, the BLM ... would apply seasonal or time limited stipulations or controlled surface use stipulations to leases. In general, timing limitations are used to protect resources that are sensitive to disturbance during certain periods. Such stipulations are generally applicable to specific areas, seasons, and resources. They are commonly applied to wildlife activities and habitat, such as winter range for deer, elk, and moose; nesting habitat for raptors and migratory birds; and breeding areas. Buffer zones are also used to further mitigate impacts from any human activities. The size of buffers can also be specific to species and location, and can change based on findings of science or movement of species. The BLM would consult with the appropriate agencies (e.g., state wildlife agencies) in establishing the periods and extent of area for timing limitations.

A controlled surface use stipulation allows the BLM to require that any future activity or development be modified or relocated from the proposed location if necessary to achieve resource protection. The project applicant would be required to submit a plan to meet the resource management objectives through special design, construction, operation, mitigation, or reclamation measures, and/or relocation. Unless the plan is approved, no surface occupancy would be allowed on the lease (BLM, 2008b).

Protection of Gunnison sage-grouse (RCP, pg. I-7): There are two timing limitations that would be applied within occupied Gunnison sage-grouse habitat to protect the grouse during the critical lekking season.

- Construction or drilling activities will not be allowed in occupied Gunnison sage-grouse habitat between March 15 and May 15.

- Routine operations, maintenance, and other activities in occupied Gunnison sage-grouse habitat will be allowed between 9:00 a.m. and 4:00 p.m. during the period between March 15 and May 15. This restriction applies to human activity, and not to continuing operation of equipment and facilities, such as well pumps, power plant, and cooling equipment.

Protection of riparian and wetland habitat (ROD, pg. 2-6 and RMP, pg. K-3): This stipulation would be applied within 500 feet of riparian or wetland vegetation to protect the values and functions of these areas, which include important Gunnison sage-grouse brood-rearing habitat. Measures required will be based on the nature, extent, and value of the area potentially affected.

Protection of visual resources (ROD, pg. 2-7): This stipulation would be applied to BLM Visual Resource Management Class II areas (Visual Resource Management Class III management objectives would be met through conditions of approval applied during the permit approval process, and may be referenced in a lease notice); NFS lands with a Scenery Management System integrity level of High; and other sensitive viewsheds such as within the visual setting of National Scenic and Historic Trails or near residential areas.

A visual assessment will be required for future activities to determine whether or not the activity would adversely affect the visual integrity of the Old Spanish Trail.

Protection of slopes greater than 30 percent (ROD, pg.2-7): This stipulation would be applied to minimize the potential for adverse impacts to slopes greater than 30 percent.

2.3.3 Other Lease Stipulations

Endangered Species Act Stipulation (ROD, pg.2-8) In accordance with BLM Instruction Memorandum No. 2002-174, the BLM will apply the following stipulation on any leases where threatened, endangered, or other special status species or critical habitat is known or strongly suspected. Additionally, the BLM will provide a separate notification through a lease notice to prospective lessees identifying the particular special status species that are present on the lease parcel offered.

- The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. 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. 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. 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 USC 1531 et seq., including completion of any required procedure for conference or consultation.

Sensitive Species Stipulation (ROD, pg. 2-8): For agency-designated sensitive species (e.g., sage-grouse), a lease stipulation (NSO, controlled surface use, or timing limitations) would be imposed for those portions of high value/key/crucial species habitat where other existing measures are inadequate to meet agency management objectives. See the NSO stipulation above for Gunnison sage-grouse leks and the timing limitation for Gunnison sage-grouse lekking season.

Cultural Resources Stipulation (ROD, pg. 2-8): In accordance with BLM Instruction Memorandum No. 2005-003, the BLM will apply the following stipulation to protect cultural resources:

- 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 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.

2.3.4 Lease Notices

Other “Lease Notices” are to advise the potential lessee of additional resource concerns, to the extent practical at the initial leasing stage. Such concerns would be more specifically addressed when and if a lessee proposes surface disturbance, through Best Management Practices, permit conditions of approval, applicable laws and regulations, standard lease terms, and special stipulations. The lease notices include:

Gunnison sage-grouse habitat: The lease may in part, or in total, contain important Gunnison sage-grouse habitats, as identified by the BLM, either currently or prospectively. The operator may be required to implement specific measures to avoid if possible, minimize, or mitigate impacts of geothermal operations on Gunnison sage-grouse populations and habitat quality. Such measures shall be developed during the Application for Permit to Drill (APD) on-site and environmental review process, or during the environmental review process for sundry notices and associated rights-of-way, and will be consistent with lease rights granted.

In addition to the lease stipulations described under the various alternatives, there are other resource protection concerns that will be addressed in any subsequent permitting of surface disturbing activities in GUSG habitat. These concerns include:

- Avoid, if possible, minimize, or mitigate impacts to nesting sage-grouse, particularly within a 4-mile buffer of active leks between May 15 and June 30.
- Avoid, if possible, minimize, or mitigate impacts to critical winter GUSG habitat.

- Attempts should be made to minimize continuous noise by reducing levels to 10 dBA or less at the edge of the 0.6-mile lek buffer (RCP, 2005) or to a maximum of 49dBA measured 30 feet from the source in areas between 0.6 and 4.0 mile radius from a lek buffer (DOW, 2010). Any equipment should produce minimal noise; all compressors, vehicles, and other sources of noise should be equipped with effective mufflers or noise suppression devices.
- Avoid, if possible, minimize, or mitigate additional fragmentation of GUSG habitat.
- Incorporate new scientific information as it becomes available.
- Incorporate additional management guidance in the event that the Gunnison sage-grouse is listed as a Threatened or Endangered species by the USFWS.

Cultural resources - inventory: Before any development begins, a cultural inventory of the remaining unsurveyed acres within the proposed development area is required. Survey prior to submitting development applications alleviates future delays in development activities in order for a required cultural inventory to be completed, a possible delay of up to six months.

Cultural resources – traditional cultural places: The following tribes were notified of the geothermal lease analysis via certified letter and map package on March 9, 2010: the Ute Indian Tribe, the Southern Ute Indian Tribe, and the Ute Mountain Ute Indian Tribe. They were asked to identify traditional cultural places or any other areas of traditional cultural importance that need to be considered within the area of potential effect. The BLM-GUFO did not receive any comments or concerns from the three tribes. However, comments were received by the USFS concerning the adjoining lease area managed by the USFS. In a phone call to the USFS Tribal Liaison, the Ute Mountain Ute Tribal Historic Preservation Officer (THPO) stated the proposed lease area is within an archaeologically sensitive area that includes Tomichi Dome and its nearby hot springs. Although not designated a Traditional Cultural Property (TCP), the Upper and Lower Waunita Hot Springs qualify as a TCP and the integrity of the springs needs to be maintained. The dome itself was probably used as a “migration marker” and the Ute Mountain Utes feel that any construction around it would “reshape the landscape” (Crum, 2010). With these concerns raised, the BLM will continue tribal consultation specific to any potential subsequent geothermal exploration, drilling, utilization, and/or reclamation and abandonment activities in the analysis area.

Big game winter range: The RMP (pg. 2-33) provides guidance that activities that will result in unnecessary disturbances to big game will be excluded from December 1 through April 30. This direction applies to Management Unit 12, which comprises most of the analysis area.

Noxious weeds: The Gunnison Field Office has a newly approved Integrated Weed Management Plan (August 2010) that guides management of noxious weeds. The plan includes Standard Operating Procedures, Best Management Practices, design features, mitigation measures, monitoring measures, and conservation measures that need to be followed when managing noxious weeds on BLM lands in the Gunnison Field Office.

State and local statutes, rules, and regulations: The lessee is hereby notified that prior to development of a geothermal resource, the lessee will have to comply with applicable provisions of the Colorado Geothermal Resources Act § 37-90.5-101-108, C.R.S., as amended by Colorado

Senate Bill 10-174, other state and local statutes, and rules and regulations, now in existence or as may be modified in the future, consistent with lease rights.

2.4 DESCRIPTION OF PROPOSED ACTION:

2.4.1 Alternative 1 - Proposed Action:

Under the proposed action the BLM would: 1) lease the nominated lands with existing and additional stipulations; and 2) amend the RMP to include additional stipulations necessary for resource protection.

The existing stipulations are listed above under section 2.2 Lease Stipulations Common to the Proposed Action and to Alternatives 2, 3, and 4. The existing stipulations are taken from the RMP, or from the Record of Decision (ROD) for Geothermal Leasing in the Western US, which was amended to the RMP.

The additional stipulations to be amended to the RMP include protections of big game winter range, gullies, geologic hazards, Gunnison sage-grouse mapped summer-fall habitat, and geothermal features and senior water rights, as follows:

Big game winter range NSO lease stipulation (to be amended to the RMP): There are mapped elk winter concentration areas³ within the analysis area. In order to protect those areas and limit disturbance to wintering elk, the following stipulation has been developed.

- No surface occupancy will be allowed in mapped elk winter concentration areas.

Gullies and other areas of chronic erosion NSO lease stipulation (to be amended to the RMP):

- No surface occupancy would be allowed within 50 feet of a gully or other area of chronic erosion if adjacent and surrounding slopes are less than 30%.
- No surface occupancy would be allowed within 100 feet of a gully or other area of chronic erosion if adjacent and surrounding slopes are in excess of 30%.

Geologic hazards NSO lease stipulation (to be amended to the RMP):

- No surface occupancy would be allowed within identified geologic hazards.

Gunnison sage-grouse mapped summer-fall habitat CSU stipulation (to be amended to the RMP): This stipulation would be applied to mapped GUSG summer-fall habitat in the analysis area. The stipulation is to protect these areas that likely “represent the areas of most concentrated and consistent use by GUSG” (BIO-Logic, 2010).

³ Elk winter concentration areas are mapped by Colorado Division of Wildlife.

- The project applicant will be required to submit a plan to meet the resource management objectives through special design, construction, operation, mitigation, or reclamation measures, and/or relocation. Unless the plan is approved, no surface occupancy would be allowed in the mapped GUSG summer-fall habitat.

Geothermal features and senior water rights CSU lease stipulations (to be amended to the RMP): The analysis area is in close proximity to the Lower Waunita Hot Springs and the Waunita Hot Springs Ranch Resort, which includes the Upper Waunita Hot Springs. There are concerns that development of a geothermal lease may interfere with water quality, quantity, and/or temperature of those hot springs. Both hot springs may be hydraulically connected to the hydrothermal reservoir in the analysis area. There were also concerns expressed related to potential impacts on other water rights in the analysis area.

To prevent potential material injury to senior water or geothermal rights under Colorado state law, and to ensure that existing geothermal features are protected under the terms of BLM's applicable Resource Management Plan, as amended by the Record of Decision and Resource Management Plan Amendments for Geothermal Leasing in the Western United States, 2008, as appropriate, this lease is restricted as follows.

- A comprehensive geologic and hydrogeologic study, and interpretation that assesses hydraulic relationships in the area, will be required prior to the lessee/operator being approved by the BLM to install any production or injection wells.
- Monitoring by the lessee prior to and during all lease operations, including development and utilization of a geothermal resource may be required as directed by the BLM in consultation with the Colorado State Engineer's Office, and the burden of proof shall be on the lessee, to ensure compliance with federal and state statutes, rules, and regulations.

Material injury may be determined by the relevant Colorado Water Court, and such an order from the Water Court may result in limitations on the use of the resource.

The lessee/operator must also demonstrate to the BLM that they have made a good faith effort to work with the owners of the Upper and Lower Waunita Hot Springs to develop an effective monitoring program. The monitoring program would be designed to determine if there are any impacts to water quality, quantity, and/or temperature of the Waunita Hot Springs during any exploration, development, and production of the lease.

Applicants for geothermal development and production on public or NFS lands will develop a project-specific operations plan that incorporates the applicable mitigation and best management practices provided in relevant BLM and FS mitigation guidance. Additional mitigation measures will be incorporated into the operations plan and into the conditions of approval or project stipulations. The operations plan will include site plans, location of facilities, wells, pipelines, transmission lines, roads, and other infrastructure (BLM, 2008b).

BLM has the discretion to modify surface operations to change or add specific mitigation measures when supported by scientific analysis. All mitigation/conservation measures not

already required as stipulations would be analyzed in a site-specific NEPA document, and be incorporated, as appropriate, into conditions of approval of the permit, plan of development, and/or other use authorizations.

2.5 DESCRIPTION OF ALTERNATIVES ANALYZED IN DETAIL:

2.5.1 Alternative 2 – No Action: Lease with Existing Stipulations

Under this alternative, a geothermal lease would be offered with existing lease stipulations. The existing stipulations are listed above under section 2.2 Lease Stipulations Common to the Proposed Action and to Alternatives 2, 3, and 4. These stipulations are taken from the RMP, or from the Record of Decision (ROD) for Geothermal Leasing in the Western US, which was amended to the RMP.

Applicants for geothermal development and production on public or NFS lands will develop a project-specific operations plan that incorporates the applicable mitigation and best management practices provided in relevant BLM and FS mitigation guidance. Additional mitigation measures will be incorporated into the operations plan and into the conditions of approval or project stipulations. The operations plan will include site plans, location of facilities, wells, pipelines, transmission lines, roads, and other infrastructure (BLM, 2008b).

2.5.2 Alternative 3 – Lease with Existing and Additional NSO Stipulations for All Gunnison Sage-grouse Leks and for Mapped Summer-Fall Habitat

Under this alternative the BLM would: 1) lease the nominated lands with existing and additional stipulations; and 2) amend the RMP to include additional stipulations necessary for resource protection.

The existing stipulations are listed above under section 2.2 Lease Stipulations Common to the Proposed Action and to Alternatives 2, 3, and 4. The existing stipulations are taken from the RMP, or from the Record of Decision (ROD) for Geothermal Leasing in the Western US, which was amended to the RMP.

The additional stipulations that would be amended to the RMP include 1) the additional stipulations described under Alternative 1, Proposed Action, except for the Gunnison sage-grouse NSO stipulation, and 2) additional stipulations for protection of Gunnison sage-grouse leks to include all leks, regardless of activity status, and for protection of mapped summer-fall habitat, as follows:

Gunnison sage-grouse lek sites NSO stipulation (to be amended to the RMP):

- No surface occupancy or use is allowed within a 0.6 mile radius of all Gunnison sage-grouse leks, regardless of status⁴, including active, inactive, historic, and unknown status leks.

⁴ The status of a lek, whether active, inactive, unknown, or historic, is determined according to criteria in the RCP.

If new leks are found after the onset of activities, there would be no increase in ground-disturbing activities or constructed features, beyond what existed when the lek was first identified, within a 0.6 mile radius of the lek. This would not apply to operation and maintenance of production facilities.

Gunnison sage-grouse mapped summer-fall habitat NSO stipulation (to be amended to the RMP): This stipulation would be applied to mapped GUSG summer-fall habitat in the analysis area. The stipulation is to protect these areas that likely “represent the areas of most concentrated and consistent use by GUSG” (BIO-Logic, 2010).

- No surface occupancy or use is allowed within mapped summer-fall GUSG habitat.

Applicants for geothermal development and production on public or NFS lands will develop a project-specific operations plan that incorporates the applicable mitigation and best management practices provided in relevant BLM and FS mitigation guidance. Additional mitigation measures will be incorporated into the operations plan and into the conditions of approval or project stipulations. The operations plan will include site plans, location of facilities, wells, pipelines, transmission lines, roads, and other infrastructure (BLM, 2008b).

BLM has the discretion to modify surface operations to change or add specific mitigation measures when supported by scientific analysis. All mitigation/conservation measures not already required as stipulations would be analyzed in a site-specific NEPA document, and be incorporated, as appropriate, into conditions of approval of the permit, plan of development, and/or other use authorizations.

2.5.3 Alternative 4 – Lease with Existing and Additional NSO Stipulations for all Occupied Gunnison Sage-grouse Habitat)

Under this alternative the BLM would: 1) lease the nominated lands with existing and additional stipulations; and 2) amend the RMP to include additional stipulations necessary for resource protection. The existing stipulations are listed above under section 2.2 Lease Stipulations Common to the Proposed Action and to Alternatives 2, 3, and 4.

The additional stipulations that would be amended to the RMP include 1) the additional stipulations described under Alternative 3, Additional NSO Stipulations for Gunnison Sage-grouse Leks and Habitat, and 2) an additional stipulation for protection of all occupied Gunnison sage-grouse habitat. The additional Gunnison sage-grouse NSO lease stipulation would be as follows:

Gunnison sage-grouse occupied habitat NSO stipulation (to be amended to the RMP):

- No surface occupancy or use is allowed within any occupied Gunnison sage-grouse habitat.

This stipulation would essentially be an NSO on the entire analysis area since it is all occupied Gunnison sage-grouse habitat.

Applicants for geothermal development and production on public or NFS lands will develop a project-specific operations plan that incorporates the applicable mitigation and best management practices provided in relevant BLM and FS mitigation guidance. Additional mitigation measures will be incorporated into the operations plan and into the conditions of approval or project stipulations. The operations plan will include site plans, location of facilities, wells, pipelines, transmission lines, roads, and other infrastructure (BLM, 2008b).

BLM has the discretion to modify surface operations to change or add specific mitigation measures when supported by scientific analysis. All mitigation/conservation measures not already required as stipulations would be analyzed in a site-specific NEPA document, and be incorporated, as appropriate, into conditions of approval of the permit, plan of development, and/or other use authorizations.

2.5.4 Alternative 5 – Close to Leasing

Under this alternative the BLM would amend the RMP to close the analysis area to geothermal leasing.

2.6 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL:

2.6.1 Postpone Lease Offer

Under this alternative, a lease for geothermal resources in the analysis area would not be offered at this time; however, no change would be made to the RMP and the analysis area would remain open to geothermal leasing. This alternative was suggested by various members of the public for several reasons, including:

- leasing is not appropriate until additional guidance comes from the BLM Colorado State Office regarding Gunnison sage-grouse management
- leasing is not appropriate until the US Fish and Wildlife Service makes a final determination on listing Gunnison sage-grouse as a Threatened or Endangered species
- leasing is not appropriate until the BLM Gunnison Field Office's RMP is revised

This alternative was not carried forward for detailed analysis. Postponing a lease offering would not substantially advance conservation and management of Gunnison sage-grouse. Further, the Proposed Action includes stipulations for managing Gunnison sage-grouse habitat that are consistent with current BLM policy, RMP objectives, and management guidelines detailed in the Gunnison Sage-Grouse Rangewide Conservation Plan.

BLM, Colorado State Office, issued an Instruction Memorandum on August 17, 2010 that provided additional guidance to Colorado field offices on sage-grouse habitat management. The GUSG has incorporated that guidance in the Proposed Action.

The US Fish and Wildlife Service (USFWS) completed their status review of Gunnison sage-grouse on September 28, 2010. The FWS determined that the species is warranted for listing, but that listing is precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. The GUSG has been added to the USFWS candidate species list.

It is still a BLM sensitive species. This geothermal lease nomination was information known to the USFWS at the time of its species status review.

The Rangewide Conservation Plan, which is a foundation of current sage-grouse management, does not prohibit mineral leasing in sage-grouse habitat, and specifies protections that are carried forward as lease stipulations and/or recommended mitigation measures. The Proposed Action includes an Endangered Species Act stipulation that addresses necessary protection of any proposed or listed plant or animal species. If the USFWS were to decide to list the Gunnison sage-grouse in the future, that stipulation and compliance with the Endangered Species Act would ensure appropriate protections would be applied to BLM-approved geothermal development activities. Additional consideration of this issue can be found in the sage-grouse habitat analysis section (section 3.2).

Further, the BLM Gunnison Field Office RMP was amended for geothermal leasing by the ROD for Geothermal Leasing in the Western United States (BLM, 2008b) which identified these lands as open for geothermal leasing.

2.6.2 Consider Leasing Alternative Locations

A suggestion was made during public scoping to consider areas within the Gunnison Basin other than the Tomichi Dome area for geothermal leasing. The BLM and FS are responding to a nomination to lease specific lands, according to the established process in 43 CFR 3200, and other applicable statutory requirements. Considering leasing other lands which have not been nominated would be inconsistent with the regulatory direction, and would not meet the Purpose and Need of the proposed action.

2.7 PLAN CONFORMANCE REVIEW:

The Proposed Action and alternatives are subject to and have been reviewed for conformance with the following plan (43 CFR 1610.5, BLM 1617.3). The plan conformance review included consideration of Standard Management (pgs. 2-1 to 2-19), Management Unit Prescriptions (pgs. 2-19 to 2-39), and Standards for Public Land Health (pgs. 4-7). The Proposed Action and Alternatives 3, 4, and 5 would not be consistent with the current RMP. Since amending the RMP is an element of each of those alternatives, the proposed plan amendments would bring the Proposed Action and/or Alternatives 3, 4, and 5 into conformance with the RMP, as amended. Alternative 2 has been found to be in conformance with the current RMP.

Name of Plan: Gunnison Resource Area Resource Management Plan (including Adoption of Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado)

Date Approved: February 1993 (amended February 1997, 2000, December 2008, January 2009)

Management Unit(s): 11 (consists of sage-grouse high production areas);
12 (contains elk and deer crucial winter range).

Decision Number/Page:
Standard Management Direction, pg. 2-1 to 2-19;

Decision Language: (pg. 2-1) “Federal oil, gas, and geothermal estate on both federal surface and split-estate lands, that is, private or other nonfederal surface estate overlying federal mineral estate, will be open to leasing with standard lease terms. Other special stipulations and conditions for leasing such as no surface occupancy and seasonal restrictions are assigned or specified in each management unit prescription and as deemed necessary; these special stipulations and conditions will also apply to federal surface and split-estate lands. Additional conditions consistent with lease terms will be considered when BLM processes and develops mitigation for operational field applications. Operational field applications and activities include Applications For Permit To Drill (APDs), Sundry Notices, applications for rights-of-way, and Notices Of Intent (NOIs) for geophysical operations. See Appendix K for special stipulations and conditions for leasing on both federal surface and split-estate lands, and for an explanation of how stipulations assigned to split-estate lands will be applied, reviewed, waived, modified, or excepted, based on verification of surface and mineral estate resource information by BLM during review of Applications for Permit to Drill (APD).

Management Unit 11 Direction, pg. 2-32;

Decision Language: “... federal oil and gas estate within a [0.6] mile radius of ... sage-grouse leks in the unit will be open to leasing with a no surface occupancy stipulation to prevent disturbance to strutting sage-grouse.

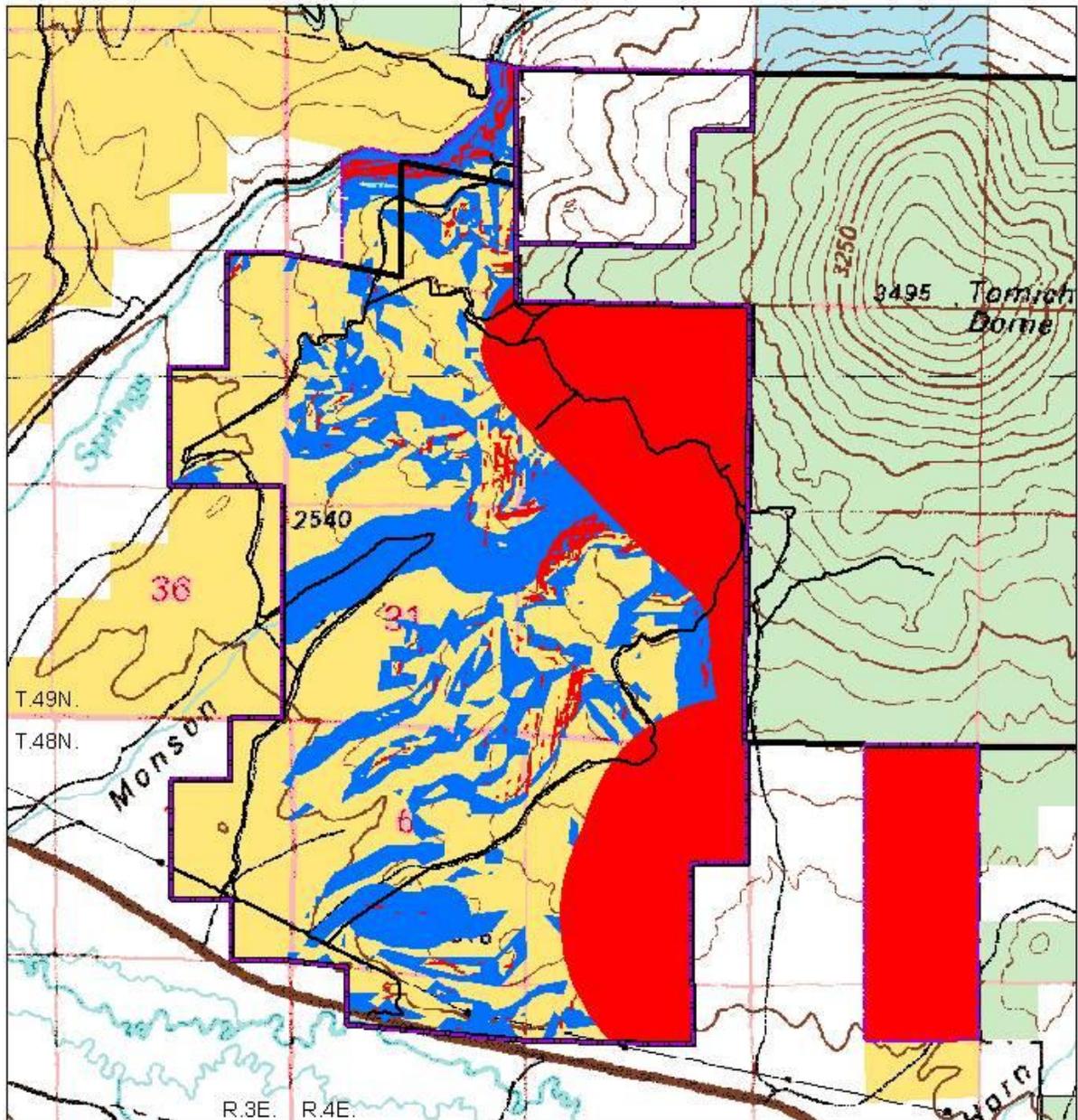
Management Unit 12 Direction, pg. 2-32 to 2-33;

Decision Language: Activities that will result in unnecessary disturbances to big game will be excluded from December 1 through April 30 (pg. 2-32).

Federal oil and gas estate ... within [0.6] mile radius of sage-grouse lek sites will be open to leasing with a no surface occupancy stipulation to prevent disturbance to strutting sage-grouse. Variances to these stipulations may be granted (see Appendix K) (pg. 2-33).

2.8 MAPS OF ALTERNATIVES 1, 2, AND 3:

Alternative 1 - Proposed Action



This map is intended for general reference only. It may not depict all resources, now or in the future, that would be protected by lease stipulations.

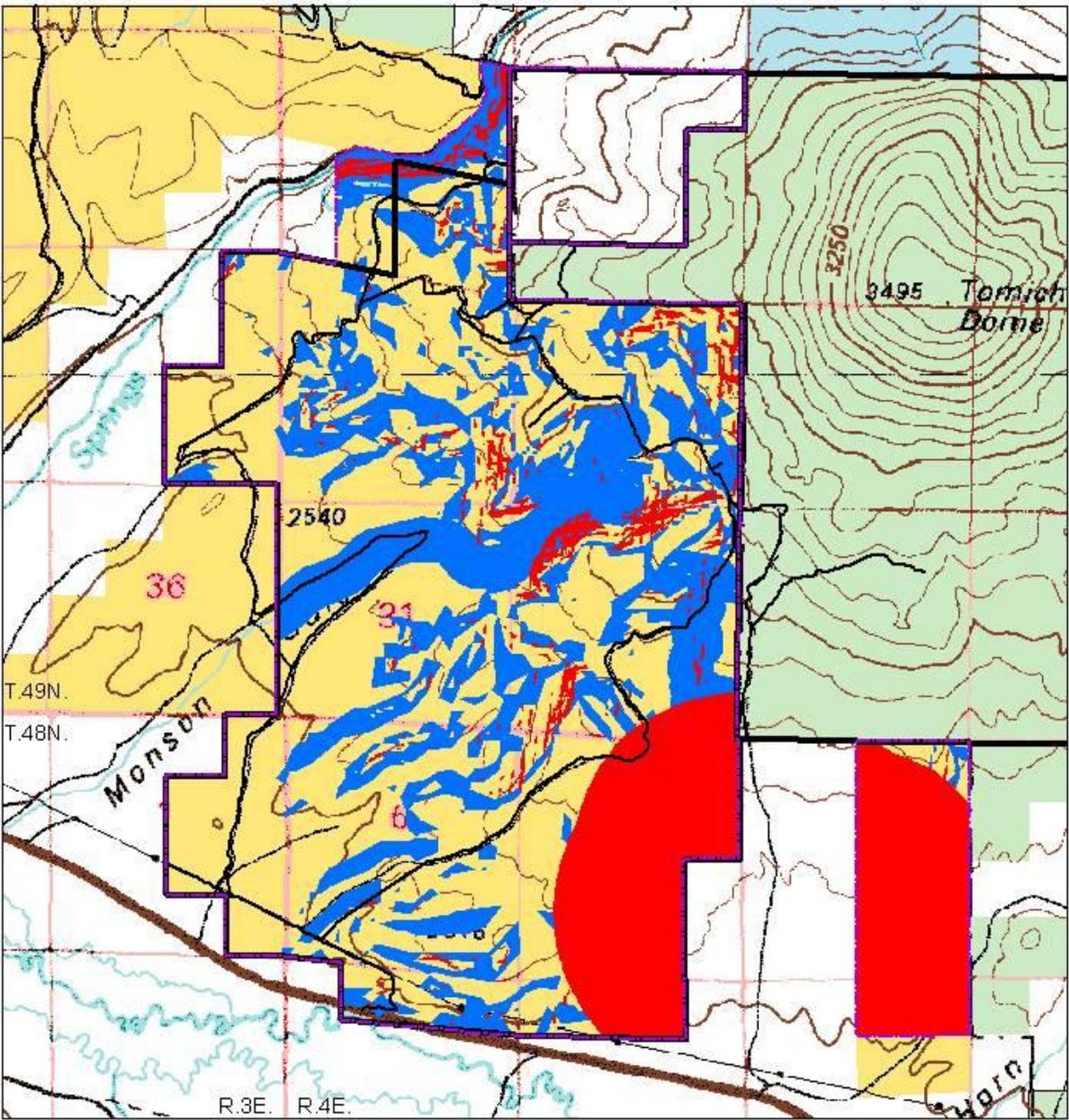
No warranty is made on the accuracy, reliability and completeness of these data for individual use or aggregate use with other data. Spatial data may not meet National Map Accuracy Standards. This information may be updated without notification.



- NSO Lease Stipulations
- CSU Lease Stipulations
- Lease Nomination Area
- Analysis Area
- Roads

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Alternative 2 - No Action



This map is intended for general reference only. It may not depict all resources, now or in the future, that would be protected by geothermal lease stipulations.

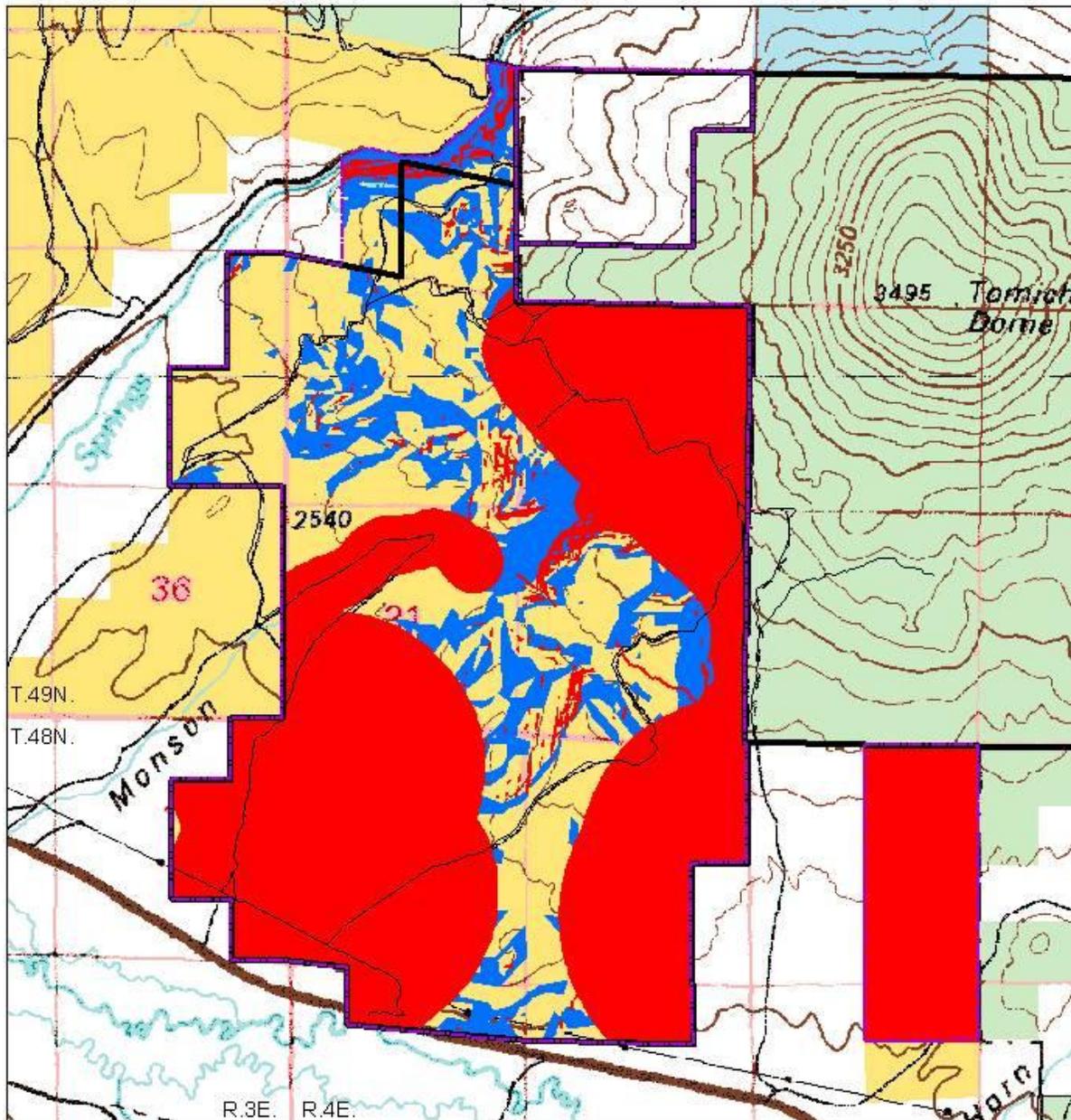
No warranty is made on the accuracy, reliability and completeness of these data for individual use or aggregate use with other data. Spatial data may not meet National Map Accuracy Standards. This information may be updated without notification.



-  NSO Lease Stipulations
-  CSU Lease Stipulations
-  Lease Nomination Area
-  Analysis Area
-  Roads

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Alternative 3 - NSO for All GUSG Leks and Summer-Fall Habitat



This map is intended for general reference only. It may not depict all resources, now or in the future, that would be protected by geothermal lease stipulations.

No warranty is made on the accuracy, reliability and completeness of these data for individual use or aggregate use with other data. Spatial data may not meet National Map Accuracy Standards. This information may be updated without notification.



- NSO Lease Stipulations
- CSU Lease Stipulations
- Lease Nomination Area
- Analysis Area
- Roads

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3 AFFECTED ENVIRONMENT / ENVIRONMENTAL EFFECTS

Issuance of a geothermal lease has no direct impacts on the environment; however, it is a commitment of the resource for potential future exploration, drilling operations and development, utilization, and reclamation and abandonment, subject to environmental review and permits. An analysis was provided in the PEIS of the potential impacts on resources of the various stages that may follow a leasing decision along with the potential cumulative impacts (BLM, 2008a). That analysis, with consideration of the RFDS, is referenced and summarized, as applicable, in the following discussions.

3.1 BIG GAME WINTER RANGE

The primary RMP Management Unit in the analysis area is MU 12, which contains elk and deer crucial winter range. Management direction for this Unit includes improving habitat conditions and increasing the productivity and diversity of shrub species in upland and riparian vegetative types to support wintering populations of deer and elk. The RMP includes direction to exclude activities that will result in unnecessary disturbances to big game from December 1 through April 30 in MU 12. However, the RMP does not include any stipulations to protect winter range and/or wintering elk and deer. Specific concerns include:

- Potential impacts on the quality and availability of critical winter range.
- Potential impacts to wintering elk and deer, i.e., moving to adjacent private lands due to disturbance.

Note that the terminology in the 1993 RMP refers to “crucial” winter range, while the DOW and BLM currently use the term “critical” winter range.

3.1.1 Affected Environment:

Elk

The analysis area is located in Colorado Division of Wildlife Game Management Unit 551. For elk, GMU 551 is managed with GMU 55 in the data analysis unit (DAU) E-43. The elk population in E-43 has remained stable or slightly declining over the last 15 years (Figure 1). The current management objectives are based on DAU plans that were written in 2001 that were based on previously sanctioned population models. The Division of Wildlife has recently modified their methods for modeling big game populations resulting in population estimates that are no longer in sync with current management plans. The Division of Wildlife plans to update elk DAU plans in the near future and it is likely that objectives will be set slightly higher than currently are in place.

The analysis area is located entirely within elk critical winter range. Critical winter range is the portion of year long range which is key to survival because it provides food and/or cover during the critical survival period during the winter. Elk use most of the lease nomination area during the winter months, especially during higher snowfall winters.

Within the analysis area there is also 984 acres of elk winter concentration. Winter concentration areas⁵ are where elk are found to be most abundant during winters. Most of this area is in the northeast portion of the lease nomination where there is sagebrush and scattered trees

⁵ Defined by the CDOW as “that part of the winter range of elk in Colorado where densities are at least 200% greater than the surrounding winter range density during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site specific period of winter as defined for each DAU”.

transitioning into forest. Elk are found in this concentration area throughout winter and spring and there are approximately 50-150 elk within or adjacent to the analysis area during this time. There is also considerable elk use between the mapped concentration areas and Highway 50 to the south, in more open sagebrush habitats. During the severe winter of 2007-08, the Division of Wildlife was baiting more than 400 elk in the Monson Gulch area in order to prevent game damage on adjacent private properties.

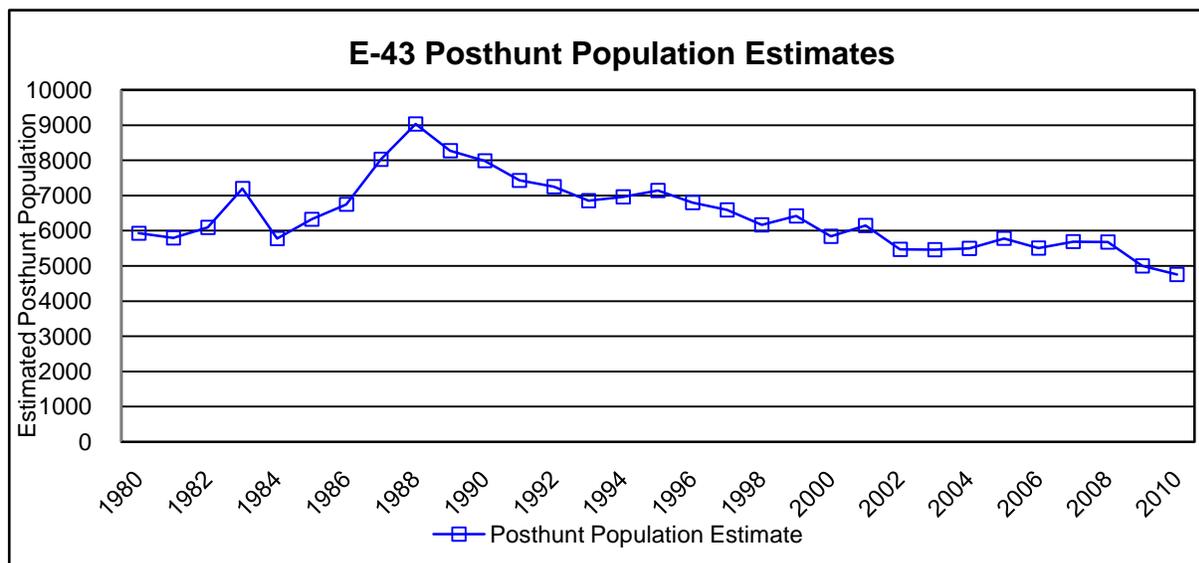


Figure 1. Post-hunt population estimates for DAU E-43

Mule Deer

The analysis area is located in Colorado Division of Wildlife Game Management unit 551. For mule deer, GMU 551 is managed with GMU 55 in data analysis unit D-22. Deer populations within this DAU have fluctuated within the last four years mainly due to a severe winter in 2007/2008 which resulted in increased winter mortality and a shift of the population to be below set objectives. The following is the post-hunt population estimates for the DAU:

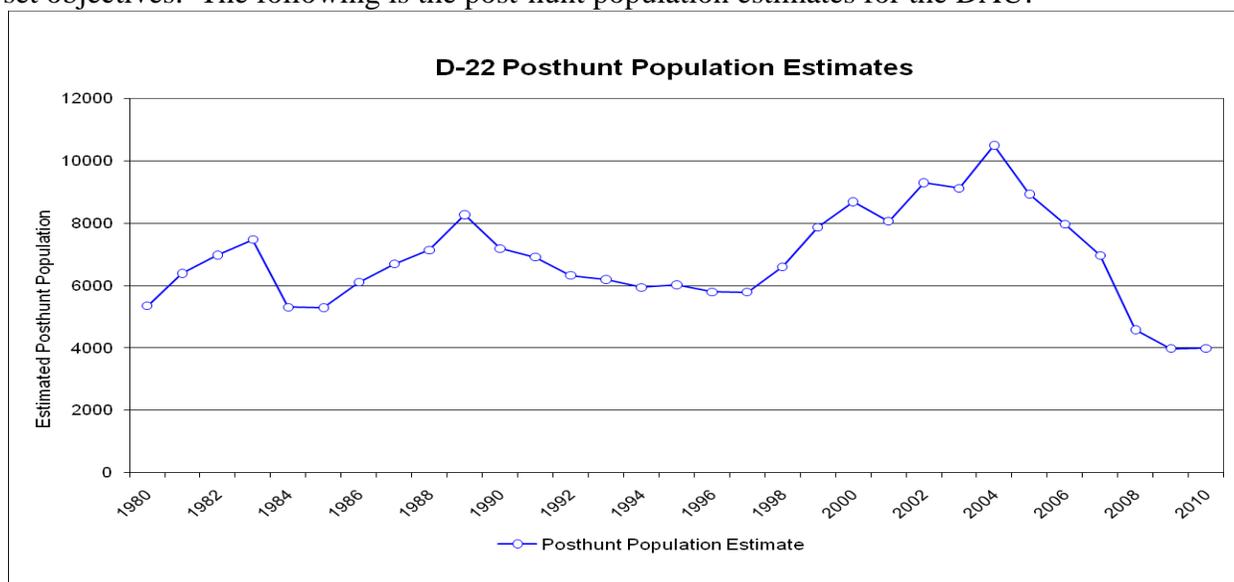


Figure 2. Post-hunt population estimates for DAU D-22

The analysis area contains 5,033 acres of mule deer critical winter range. Although there is no mapped winter concentration, during the severe winter of 2007-08 there was one feed site within the analysis area because of the concentrations of deer in the area. Most deer concentrations in the region during winter are located to the east of the lease nomination area. Although the analysis area is not heavily used by deer during the winter, deer do move into the area during fall. The area is a popular place in the fall used by both deer and elk hunters.

3.1.2 Environmental Effects/Mitigation:

3.1.2.1 Alt. 1 Proposed Action (Lease with Existing and Additional Stipulations)

Direct and Indirect Effects

The proposed action contains stipulations to protect elk winter concentration areas and active sage-grouse leks. There are 984 acres of elk winter concentration NSO and 892 acres of sage-grouse lek NSO totaling 1,876 acres of protected area. Although development may displace animals from suitable critical winter range, the RFDS proposes a site much smaller in size than the lease area, and the stipulations would ensure that the main wintering area used by the elk is protected. This alternative should also help from moving elk to adjacent private lands.

Cumulative Effects

Cumulative effects on vegetation would impact big game as habitats are fragmented, degraded, or destroyed from development. These effects are seen more intensive near the development footprint but would lead to increased loss of big game habitat. Access roads, pipelines and transmission lines all add to this fragmentation. Other development in the region such as building on private land can increase the effects of even a small geothermal operation. Best management practices as conditions of approval at the next stages of permitting would help to minimize these impacts.

3.1.2.2 Alt. 2 Lease with Existing Stipulations (No Action Alternative)

Direct and Indirect Effects

Currently, there are no lease stipulations for the protection of big game. Without the additional big game stipulation, wintering elk herds may be displaced to adjacent private land or moved to less suitable winter concentration areas. With elk herds up to 600 using the lease area, important concentrations areas have the possibility to be lost and would have large impacts to the overall elk population.

Cumulative Effects

Cumulative effects on vegetation would impact big game as habitats are fragmented, degraded, or destroyed from development. These effects are seen more intensive near the development footprint but would lead to increased loss of big game habitat. Access roads, pipelines and transmission lines all add to this fragmentation. Other development in the region such as building on private land can increase the effects of even a small geothermal operation. Best management practices as conditions of approval at the next stages of permitting would help to minimize these impacts.

3.1.2.3 Alt. 3 Lease with Existing and Additional NSO Stipulations for All Gunnison sage-grouse leks

Direct and Indirect Effects

Alternative 3 contains stipulations to protect elk winter concentration areas and additional stipulations to protect all Gunnison sage-grouse leks. This offers a larger area of protection (2,967 acres within the lease area) for big game although these areas are not connected. Although development may displace animals from suitable critical winter range, the RFDS proposes a site much smaller in size than the lease area and the stipulations would ensure that the main wintering area used by elk is protected. This alternative with the additional big game stipulation should also help from moving elk to adjacent private lands.

Cumulative Effects

Cumulative effects on vegetation would impact big game as habitats are fragmented, degraded, or destroyed from development. These effects are seen more intensive near the development footprint but would lead to increased loss of big game habitat. Access roads, pipelines and transmission lines all add to this fragmentation. Other development in the region such as building on private land can increase the effects of even a small geothermal operation. Best management practices as conditions of approval at the next stages of permitting would help to minimize these impacts.

3.1.2.4 Alt. 4 Lease with Existing and Additional NSO Stipulations for Occupied Gunnison Sage-grouse Habitat

Direct and Indirect Effects

Alternative 4 would have no effect on big game. The entire lease nomination area is occupied Gunnison sage-grouse habitat and therefore, there would be no surface disturbance.

Cumulative Effects

Alternative 4 would have no cumulative effects on big game.

3.1.2.5 Alt. 5 Close to Leasing

Direct and Indirect Effects

Alternative 5 would have no effect on big game.

Cumulative Effects

Alternative 5 would have no cumulative effects on big game.

3.2 GUNNISON SAGE-GROUSE AND HABITAT

The analysis area is entirely within occupied Gunnison sage-grouse habitat as defined and mapped by Colorado Division of Wildlife. The species is currently under review by the US Fish and Wildlife Service for potential listing as a Threatened or Endangered Species. Specific concerns identified in the public scoping process include:

- Potential impacts of lease development on habitat -including lekking, nesting, brood-rearing, and winter habitats – quality and connectivity.
- Potential impacts of lease development on mapped “priority habitat”.
- Potential impacts of lease development on population levels, locally, basin-wide, and region-wide.
- Potential impact of leasing decisions on the USFWS’s species status review.

Determination of Appropriate Level of Analysis

When the environmental assessment process was started on this geothermal lease nomination, the BLM, U.S. Fish and Wildlife, and Colorado Division of Wildlife held a conference call to determine if large scale population analysis was needed to determine the effects that leasing and lease development could have on Gunnison sage-grouse populations. In the Gunnison Sage Grouse Rangewide Conservation Plan (RCP), a population viability assessment (PVA) was performed to determine current and future risk of sage-grouse population decline or extinction. BLM consulted with both agencies to determine if performing a PVA with current risk factors in the analysis area would aid in determining if the proposed action would have an effect on the overall population. BLM’s intent was to determine if a decision to lease or subsequent development of a lease would impact the USFWS GUSG listing decision.

Interagency sage-grouse biologists determined that the PVA would not be beneficial for this exercise. A valid PVA would need more specific regional sage-grouse demographic data (such information was unavailable for the RCP PVA) than could economically be collected. The analysis that could be accomplished with this tool, would have assumed loss of habitat for the entire analysis area and the percent of population that loss might affect. Habitat loss alone was not sensitive enough at this scale to suggest an increase in risk of extinction to the entire Gunnison Basin population thru the existing PVA. The analysis area has a very low density of sage-grouse compared to many other areas in the Gunnison Basin (a conclusion reaffirmed by the habitat assessment summarized later in this document) and as a result of low population densities, the model used for a PVA likely would not function well for the analysis area. In short, it was felt that a PVA was not an effective analysis tool for this scale and resolution of analysis.

BLM also intended to determine the potential impact of geothermal leasing and any subsequent lease development on Gunnison sage-grouse habitat. The BLM and cooperating agencies began their analysis with limited sage-grouse habitat data for the analysis area. As a result, BLM contracted an environmental consultant company to perform a habitat evaluation of the lease nomination area. This is the same company that has performed all of the habitat evaluations for the Colorado Division of Wildlife and U.S. Fish and Wildlife Service’s private land owner Candidate Conservation Agreement with Assurances program. A summary of the habitat assessment is provided in the section titled “*Sage Grouse Habitat Description*”.

Existing Gunnison RMP and Gunnison Sage Grouse Rangewide Conservation Plan Guidance

The 1993 Gunnison Field Office (GUFO) Resource Management Plan (RMP) addresses sage-grouse habitat. Under the RMP’s Standard Management, direction for management of identified sage-grouse brood-rearing, nesting, and winter habitat is provided (pg. 2-5 and Appendix A), as well as direction to maintain and protect sage-grouse (and other special status species) habitat (pg. 2-4). In addition, two specific management units were designated for emphasizing

management of sage-grouse habitat. The RMP designates 57,525 acres in *Management Unit 11* as sage-grouse high-production areas (pg. 2-32). “This unit is located within sagebrush-dominated uplands. This management unit will be managed to improve and maintain sagebrush vegetative communities in order to optimize sage-grouse populations. Sagebrush treatments and management to improve sage-grouse habitat will be considered in all activity plans, such as AMPs or CRMAs, and their design, implementation, and management will incorporate as a minimum the sage-grouse habitat management guidelines in Appendix A” (pg. 2-32). The RMP also designates 2,667 acres in *Management Unit 14* as important sage-grouse brood-rearing habitat (pg. 2-36). This unit is located along 25 miles of public land riparian corridors. “This unit will be managed to protect, restore, and enhance these riparian areas on public lands in order to optimize sage-grouse populations” (pg. 2-36).

Subsequent to the 1993 RMP, the Gunnison sage-grouse (*Centrocercus minimus*) was recognized as a separate species. In 1994, in response to concerns about declining sage-grouse populations in the Gunnison Basin, the Gunnison Basin Gunnison Sage Grouse Working Group was formed. This group consisted of representatives from a variety of federal, state, and county agencies and entities, stockgrowers, environmental groups, academia, and members of the public. In June 1997 the Working Group completed the Gunnison Sage Grouse Conservation Plan (hereafter, the Local Plan). In March of 1998 representatives of the groups involved in development of the plan signed a Memorandum of Agreement to implement the conservation actions outlined in the Plan to restore Gunnison sage-grouse distribution and numbers.

Concurrently, public land health standards were being developed for all public lands in Colorado. The BLM State Office, in partnership with the Resource Advisory Councils, prepared an EA for the Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado, dated June 28, 1996. In January 1997, these Standards and Guidelines (S&G) were incorporated into all of Colorado’s RMPs through a statewide RMP amendment.

In 1998 the GUFO staff began incorporating Gunnison sage-grouse (GUSG) habitat guidelines from the Local Plan into grazing permit renewal Environmental Assessments (EAs). This was consistent with the Local Plan Memorandum of Agreement and the Public Land Health Standards RMP Amendment. The RMP provides minimum sage-grouse habitat guidelines and implies that additional guidelines may be applied in the future as knowledge is gained about the bird’s habitat requirements. Although the Local Plan was not a decision document, incorporating the Local Plan’s habitat guidelines into EA’s provided a means to facilitate meeting Colorado Standards for Public Land Health. Specifically, incorporating the Local Plan habitat guidelines into grazing permit renewal EA’s was a means to provide best management practices to facilitate meeting Standard 4 which addresses threatened, endangered, and special status species, and Standard 3 which addresses plant and animals.

In 2000, the Gunnison sage-grouse was designated as a separate species. It was also designated as a BLM sensitive species and as a Federal candidate for listing species.

In April 2005, an interagency Steering Committee comprised of biologists from the BLM, Colorado Division of Wildlife (CDOW), Forest Service, National Park Service (NPS), Natural Resources Conservation Service (NRCS), Utah Division of Wildlife, and U. S. Fish and Wildlife

Service (FWS) completed the Gunnison Sage Grouse Rangewide Conservation Plan (RCP). The RCP was widely accepted as providing the latest scientific information on the GUSG throughout its range. The plan is intended to be dynamic and updated to include new and ongoing research or information about the species. The final document includes individual Conservation Agreements developed and signed by State or Regional Directors of the CDOW, BLM, NPS, and Forest Service. Each Agreement contains different wording, but each agency stated their intent and commitment to implement the Rangewide Plan. On July 12, 2005, the BLM issued IM-No.CO-2005-038 which directs Field Offices to implement the RCP through the NEPA process. Specifically, the IM states that “BLM Colorado will utilize the RCP as the basis for managing the multiple uses of public lands in identified sage-grouse habitat. Effective immediately, RCP guidance and strategies will be applied through site-specific analysis, consistent with the National Environmental Policy Act (NEPA), to all proposed projects or actions in identified GUSG habitat.”

Consistent with the guidance in the IM and new information contained in the RCP, the GUSG habitat objectives incorporated into Gunnison Field Office NEPA documents were revised in 2006 using habitat guidelines from the RCP and RMP. Upland habitat objectives for breeding and summer-fall habitats follow the guidelines in the RCP and the RMP. The RCP does not provide specific habitat guidelines for riparian or wet meadow habitat used by GUSG during the summer brood-rearing period, rather it states that “BLM and USFS currently have riparian and/or wet meadow management guidance which is consistent with the needs of the GUSG”. Under the GUFO RMP, guidelines for riparian habitat only apply to Management Unit 14 which consists of 25 miles of brood-rearing habitat. To be consistent with other habitat guidelines in the RCP, these guidelines are expanded to cover all riparian areas within 4 miles of a lek. For example, the RMP only applied sage-grouse upland habitat objectives to Unit 11, however the RCP upland objectives apply to all sagebrush habitat within 4 miles of a lek. As was the case with the Local Plan’s habitat guidelines, incorporating the RCP guidelines into EAs provides a means to facilitate meeting Colorado Standards for Public Land Health.

US Fish and Wildlife Service Species Status Reviews

In their determination of whether or not to list a species, the FWS evaluates five listing factors. One of these is the *Inadequacy of Existing Regulatory Mechanisms*. Under this factor in the Federal Register notice finding the GUSG not warranted for listing (April 18, 2006), the FWS cites that the BLM is implementing the RCP under direction of IM-No.CO-2005-038. This was provided as support that the BLM had adequate regulatory mechanisms in place; i.e., implementation of the RCP contributed to the *not warranted* listing determination made by the FWS. With the decision to not list, the GUSG was no longer designated as a Federal candidate for listing species, but was again designated as a BLM sensitive species.

In November 2006, San Miguel County (Colorado), Center for Biological Diversity, WildEarth Guardians and others filed a lawsuit regarding the not-warranted finding. Per a stipulated settlement agreement, on November 23, 2009, the FWS initiated a status review of the Gunnison sage-grouse to determine whether or not the species warrants protection under the Endangered Species Act. A key part of the status review process is to request information from land management agencies about proposed projects that may constitute a risk to the species or its habitat. As part of its information response to FWS, BLM provided information pertaining to the

geothermal lease nomination. A determination from the FWS is expected this fall. However, BLM policy requires that the agency will take no action to result in the listing of a special status species.

The FWS has repeatedly indicated that if the GUSG is listed under the Endangered Species Act, the RCP would likely provide the basis for a Recovery Plan. The Alternatives summarized in this EA contain management strategies taken directly from the RCP as well as additional strategies determined necessary to accomplish the purpose and need of the proposed action. The FWS Candidate Conservation Agreements with Assurances that the CDOW is using to protect GUSG habitat on private lands also rely upon habitat objectives from the RCP. The Gunnison County Gunnison Sage-grouse Strategic Committee has advocated that BLM continue applying similar objectives to adjacent public lands. Therefore, implementing the RCP now helps ensure GUSG management of GUSG habitats will be consistent with a future Recovery Plan if the species is listed.

The US Fish and Wildlife Service (USFWS) completed their status review of Gunnison sage-grouse on September 28, 2010. The FWS determined that the species is warranted for listing, but that listing is precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. The GUSG has been added to the USFWS candidate species list. It is still a BLM sensitive species. In the USFWS Determination, under the discussion of “A The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range”, there is a discussion of the impacts of Renewable Energy – Geothermal, Solar, Wind; see the Environmental Effects discussion below.

In compliance with BLM policy, the alternatives represent varying levels of management designed to both implement geothermal leasing and avoid the need to list Gunnison sage-grouse or any other special status species.

3.2.1 Affected Environment:

Gunnison Sage-grouse Overall Basin Population

There are currently an estimated 3,656 Gunnison Sage-grouse in the Gunnison Basin (DOW 2010). The Gunnison Basin contains the core habitat for the Gunnison Sage-grouse. Currently there are no strongholds for the Gunnison Sage-grouse and it has been recommended that intensive management to conserve existing habitats and populations and restoring habitat is needed to conserve the grouse (Wisdom et al. 2010)

Proximity of Gunnison Sage-grouse Leks and Populations

The lease nomination area is entirely classified as occupied habitat according to CDOW data. Within the lease area, there is one active lek (Vito), one unknown lek (Monson Gulch), and one historic lek (Monson Gulch East Ridge). There has been no attendance of males on Monson Gulch East Ridge since 1998. Monson Gulch has only had attendance from a few males (2001, 2; 2003, 2; 2009, 1) since 1998. Vito has been active each year. The following is the high male counts (HMC) of the Vito lek for the last several years:

Table 2. Vito lek high male counts

Year	Vito Lek HMC
2010	5
2009	7
2008	8
2007	11
2006	12
2005	20
2004	12

Using the data for the Vito lek, the following is the estimated population that the leks within the geothermal area represent for the overall Basin population:

Table 3. Analysis area population estimates

Lek	2010 HMC	2010 HFC	Est. male Pop.	Est. female Pop.	Est. Total Pop.
Vito	5	2	9	15	24

Although the leks found within the lease area represent less than 1% of the Basin population, there are several leks within the surrounding area and birds from these leks could utilize the area for nesting, brood rearing, and winter habitat. The RCP uses a 4 mile buffer of leks to show the area grouse utilize throughout the year when seasonal habitats have not been mapped. This buffer represents the core area a grouse uses for breeding and summer-fall seasonal habitats and accounts for 81% of the nest location data as presented in the RCP. The following is the population data for all active leks that are within 4 miles of the geothermal lease nomination area based on the 2010 lek counts.

Table 4. GUSG population data within 4 miles

Lek	HMC	HFC	Est. Male Pop.	Est. Female Pop.	Est. Total Pop.
Razor Creek	41	12	77	124	201
Razor Cr. Divide	41	9	77	124	201
Vito	5	2	9	15	24
Waunita	32	17	60	97	157
Waunita NW	10	3	19	30	49
Woods Gulch	6	4	11	18	29
Est. Total Pop.					661

The 661 estimated birds within 4 miles of the analysis area account for 18 % of the Gunnison Basin population. The RCP has a minimum target population in the Gunnison Basin of 3,000 breeding birds for a stable population with less than a 1% chance of extinction. The current estimated Basin population is 3,656; the estimated Basin population has ranged between 2,443 and 5,205 over the last 10 years. At any point during seasonal movements, the analysis area has the possibility to see use from GUSG. It is important to note that the Razor Creek and Razor Creek Divide leks are located south of U.S. Hwy 50 which does create a possible barrier or obstacle for movement. However, CDOW demographic data has shown that at least one female bird moved from the South Parlin area to the geothermal lease nomination area across the highway, showing that long distance movements and traveling across the highway are possible.

Sage Grouse Habitat Description

The following information summarizes the habitat assessment completed by an independent environmental consulting agency (Bio-Logic, 2010) and additional data from the BLM.

Sagebrush comprises the largest community and is composed of Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) and black sagebrush (*Artemisia nova*) with a small amount of mountain big sagebrush (*Artemisia tridentata vaseyana*) in the higher elevations of the northeast part of the area. A variety of grasses, mostly native, are present in the understory. Forbs are relatively sparse and comprise low species diversity overall, but are more common on mesic sites. Dwarf rabbitbrush, green rabbitbrush, antelope bitterbrush, snowberry, horsebrush, and Utah serviceberry are also present in the sagebrush stands.

Big sagebrush varies greatly in height and cover across the area. Contiguous older stands of big sagebrush (averaging 18-22 inches in height) are present in the north half of the area but elsewhere are common only in small patches on hillsides or along the margins of intermittent drainages. Shorter stands (about 10 inches in height) are more common in the south and are often mixed with black sagebrush. Black sagebrush is present across most of the area, absent only in the north and northeast portions. Most black sagebrush is mixed with big sagebrush, but it also occurs alone in large patches on ridgelines.

Sagebrush units that were mechanically treated by the BLM in 2003 and 2004 using a Lawson aerator are found within the nomination area. The treated units were seeded with non-native grasses afterwards. Some additional units in the north and northwest appear to have also been treated, although BLM does not have data on these sites. Terraces were cut in the past across the landscape to manipulate runoff and improve livestock forage. This area was also seeded with non-native grasses. North and east of this area, sagebrush cover and height appear much reduced.

Wet meadow is limited on the area and is confined to narrow bands along Monson Gulch and two other unnamed intermittent drainages. Wet meadows are confined to drainage reaches that are not deeply incised. Sedges, grasses, rushes, and forbs form dense herbaceous vegetation in the best developed wet meadows. Willows and a few narrowleaf cottonwoods or aspen are present in places along the stream channel.

Forest on the area is comprised of aspen and Douglas-fir stands in the north and northeast margins. The aspen stands are of varying ages and some appear to be damaged by drought, Sudden Aspen Decline (SAD), and intensive browsing by big game. These forested areas would not be considered sage-grouse habitat.

Table 5. Vegetation communities and acreages on the Monson Gulch Site.

Sagebrush	Wet Meadow	Forest	Sagebrush Treated
4,446 acres	14 acres	236 acres	361 acres

Sagebrush cover and total shrub cover were variable across all of the area. Sagebrush cover (range 9-30%, mean 17%) and total shrub cover (10-35%, mean 21%) are within the RCP guidelines for Sage grouse breeding habitat, but near the lower end of the recommended range. Shrub cover is within guidelines for summer-fall habitat, but very few reach the 30-40% recommended for winter habitat. Similarly, sagebrush height (range 3-27 inches, mean 12 inches) is generally at the low end for breeding habitat, suitable for summer-fall habitat, and below recommendations for winter habitat.

Herbaceous vegetation characteristics were generally at the low end or below recommended ranges. Forb cover (range 1-18%, mean 5%) and especially grass cover (range 3-18%, mean 8%) are marginal or below recommendations, even for arid sites. Forb height (range 0.3-2 inches, average 1 inch) and grass height (range 2-7 inches, mean 4 inches) are similarly at the low end or below recommendations for all seasonal habitats.

Habitat in the analysis area is currently fragmented by numerous 2-track dirt roads, a 2-lane gravel County road, US Highway 50, buried phone lines, overhead powerlines, and barbed wire fences. Habitat in the region around the analysis area is similarly fragmented.

Table 6. Linear Man-Made Features on Public Lands in the Analysis Area

Feature	Description	Length
Roads	2-track dirt roads – existing	82.6 miles
	2-track dirt roads – open to public vehicle use	15.2 miles
	2-lane gravel road (County Road 887)	0.9 mile
	2-lane paved road (US Highway 50)	0.5 mile
Utilities	buried phone lines – alongside CR 887 and US Hwy 50	1.4 miles
	overhead powerlines	2.0 miles
	overhead powerlines – alongside CR 887 and US Hwy 50	1.7 miles
Fences	across analysis area	6.5 miles
	around analysis area – along BLM property boundary	12.9 miles
	around analysis area – along CR 887	0.9 mile

The analysis area is traversed by numerous 2-track dirt roads. These roads are characterized as single-lane, low-speed, high-clearance roads. There are approximately 82.6 miles of 2-track dirt roads within the analysis area. Of those, only 15.2 miles are open to public vehicle use. There are also approximately 2.8 miles of 2-track roads within the private land portion of the analysis area.

U.S Highway 50, which runs generally east-west to the south of the analysis area, crosses approximately 0.5 mile of the analysis area. County Road 887, a 2-lane gravel road, which runs generally northeast-southwest to the west of the analysis area, coincides with approximately 0.9 mile of the analysis area boundary.

A buried phone line (0.9 mile) is located along County Road 887. Another buried phone line is located along US Hwy 50 (0.5 mile), and a low-voltage distribution overhead powerline (0.8 mile) is located approximately 100 to 300 feet north of US Hwy 50. A high-voltage transmission overhead powerline (2.0 miles) crosses the southwest corner of the analysis area.

Approximately 6.5 miles of barbed wire fences are located within the analysis area. There are approximately 13.8 miles of barbed wire fences along the analysis boundary, primarily along the public land boundary with a shorter section along CR 887. In addition, there are approximately 3.5 miles of barbed wire fence along the private land boundary within the analysis area.

Sage Grouse Seasonal Habitat Description

Within the lease nomination area, nesting and early brood-rearing habitat was mapped on 4,006 acres of the area. All areas of the sagebrush community were included, except black sagebrush “balds” on the ridgelines and areas where sagebrush had been mechanically treated. These areas were excluded because sagebrush cover and height in these areas are largely well below the minimum recommendations in the RCP. However, the mapped nesting habitat is not uniformly suitable. Nesting habitat on the area is best developed in pockets where older stands of big sagebrush are abundant. Nesting habitat is more contiguous in the north and northeast quarter of the area, and increasingly less so to the south and southwest where patches of taller big sagebrush are smaller and more scattered, often surrounded by extensive stands of black sagebrush or mixed black sagebrush and similar-sized big sagebrush.

Summer-fall habitat was mapped at the interfaces between suitable natural wet meadows and adjacent sagebrush stands. These areas are likely to represent the areas of most concentrated and consistent use by sage-grouse. These interfaces are limited in the area by the paucity of surface water, and 367 acres of summer-fall habitat was mapped. The best-developed wet meadow and sagebrush complex in the area is along lower Monson Gulch, where permanent streamflow and a shallow, broad floodplain create a fairly wide wet meadow more than 1 mile long.

Sage grouse winter habitat was mapped on 3,361 acres, focusing on south and west-facing aspects below about 9,000 feet elevation. We excluded the mechanically treated areas, where sagebrush cover and height are generally well below RCP recommendations for winter habitat. Sagebrush cover and height within the mapped winter habitat are quite variable, and would not meet RCP recommendations in many locations. However, sage-grouse winter habitat use may be quite variable depending on local topography and daily variation in weather, snowpack, and wind conditions. It is likely that sage-grouse would find suitable habitat within the mapped area during at least some period in typical winters.

Other Sage Grouse Habitat Considerations

Existing structures within the area present potential adverse impacts to sage-grouse habitat. A 115 kV transmission line crosses the area near the south boundary, and could represent a visual deterrent to sage-grouse use or an aerial raptor perch. Several four-wheel drive roads cross the area, although public use is prohibited during sage-grouse breeding season (between March 15 and May 15) and quite light at most other times with the exception of hunting season. Several pasture fences cross the area or border it, and represent potential collision hazards for sage-grouse. Big game use is heavy at times at the upper elevations on the area, particularly by elk in late winter and spring at the sagebrush-forest interface.

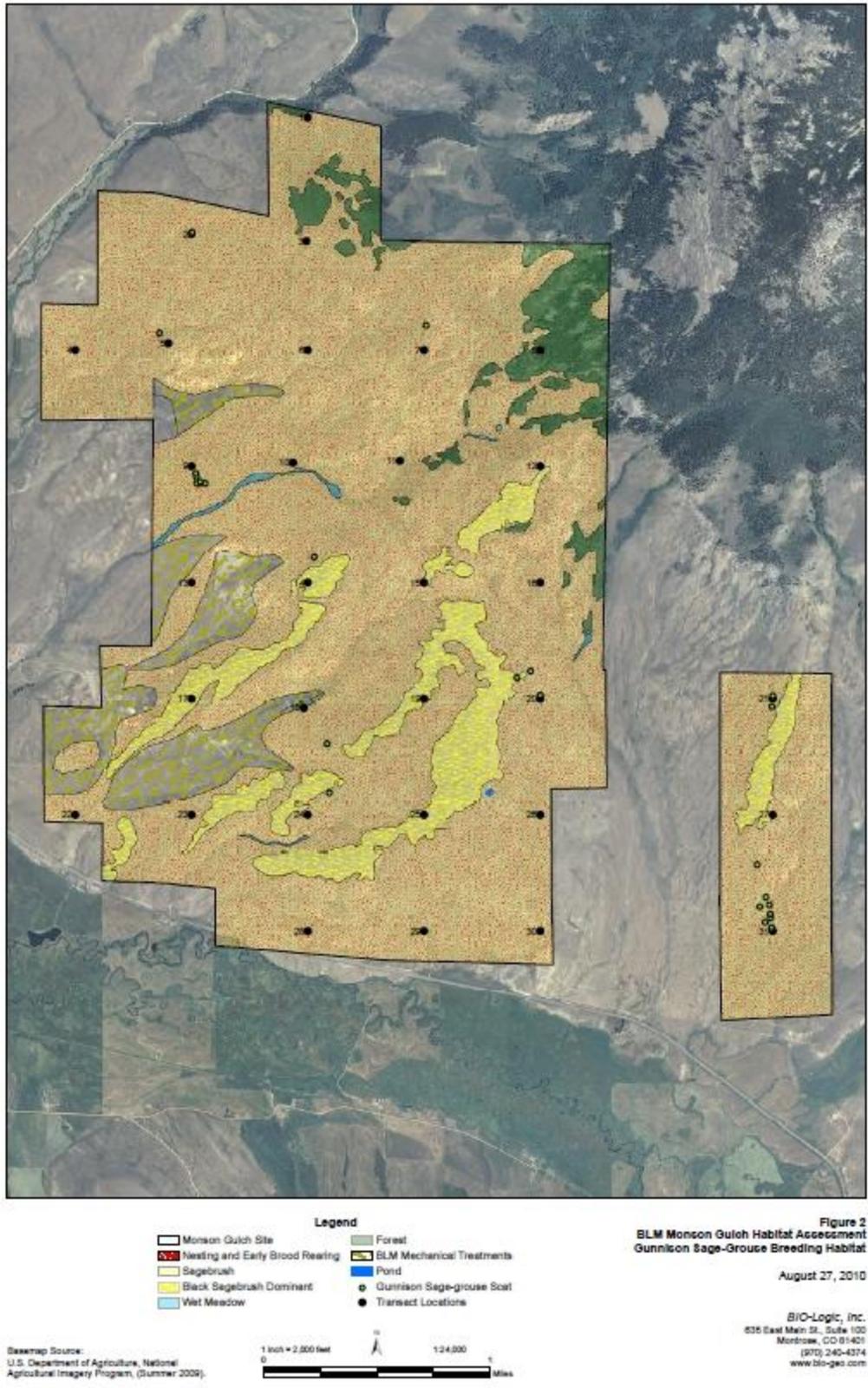


Figure 3. Gunnison sage-grouse breeding habitat

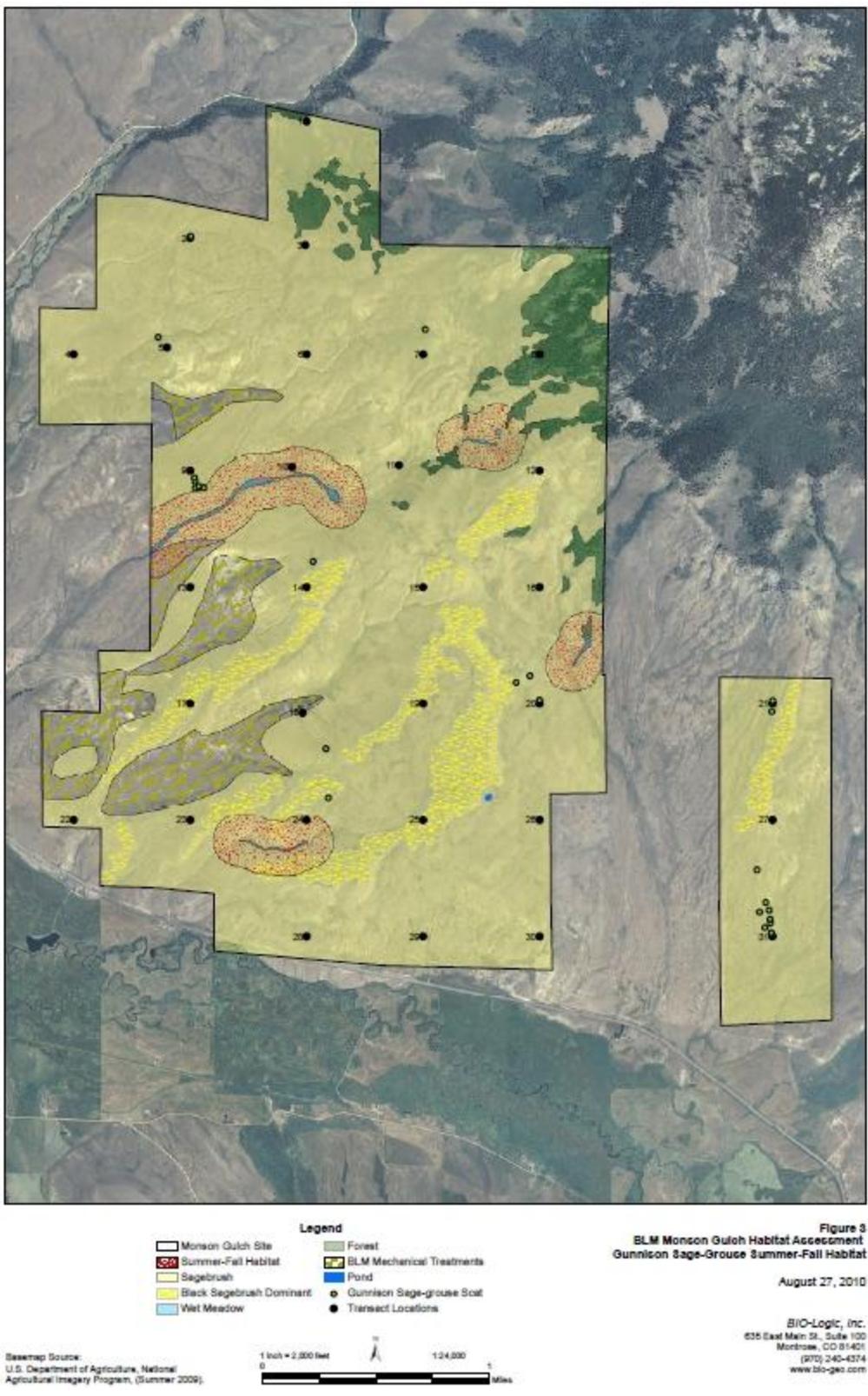


Figure 4. Gunnison sage-grouse summer-fall habitat

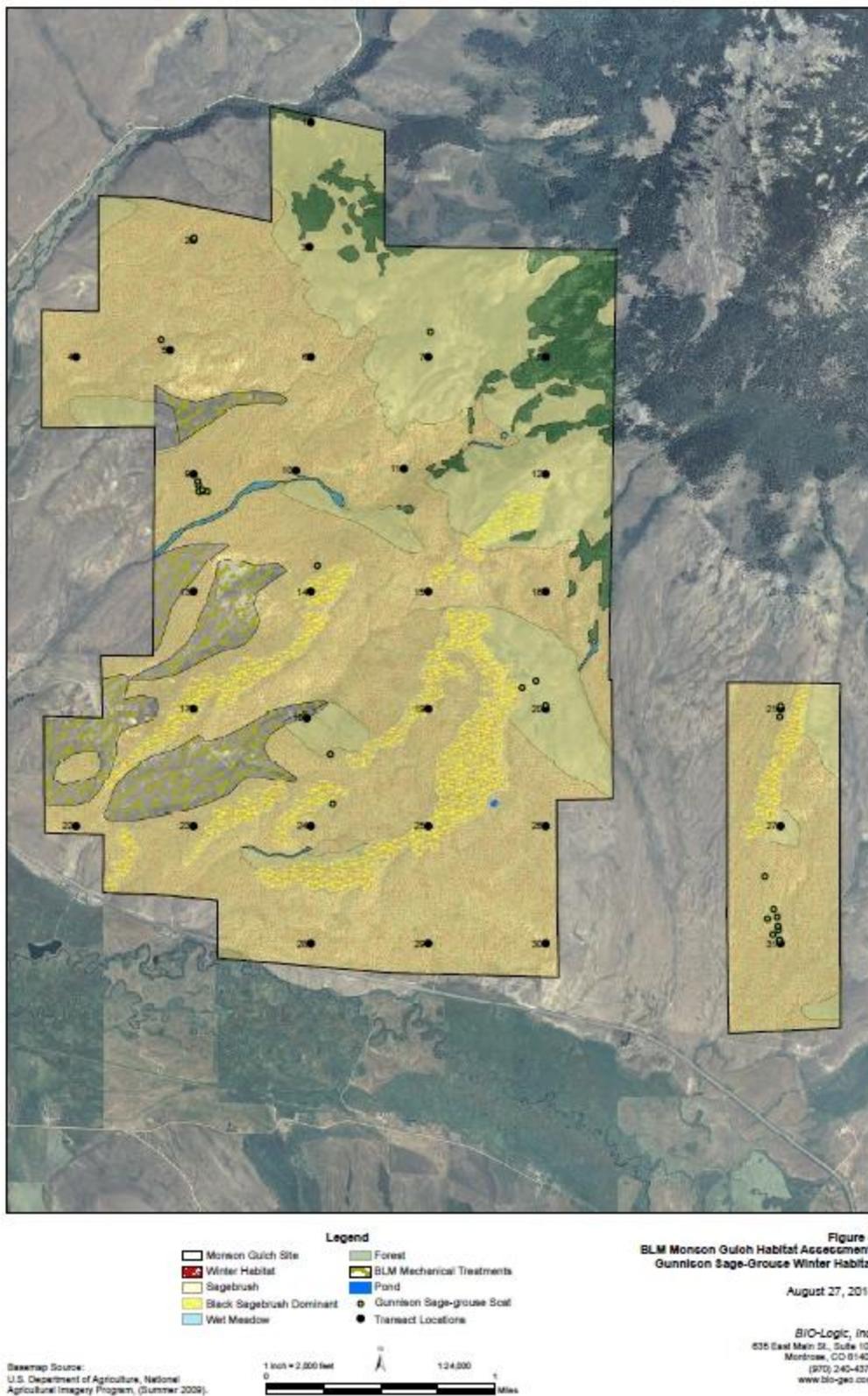


Figure 5. Gunnison sage-grouse winter habitat

Habitat Use/Quality

Sage grouse occupy the area, probably on a regular basis. It is not known which season or seasons receive the most sage-grouse use. The proximity of the area to two active leks, with the Waunita Lek being attended by a high number of males, makes it likely that sage-grouse nest at least occasionally on the area, and perhaps regularly. However, the vegetation sampling data indicate that sagebrush stand structural characteristics are considered marginal on average for sage-grouse breeding habitat. The better breeding habitat is confined to taller sagebrush in the northeast quarter of the area, and to patches of taller and denser sagebrush which are increasingly small and fragmented to the south and southeast. Besides limitations of shrub cover and height, herbaceous vegetation is also often below RCP recommendations for breeding habitat. Overall, breeding habitat on the nomination area (including areas used for nesting and early brood-rearing) is less than ideal, and the better quality habitats are scattered and fragmented.

Later in summer, sage-grouse may regularly use the wet meadow interfaces, particularly along lower Monson Gulch where the wet meadow is extensive and in good condition. There were abundant sage-grouse fecal deposits in one area just north of the wet meadow. While the wet meadows are in good condition and retain good residual height due to minimal grazing pressure, the adjacent sagebrush stands are variable in providing adequate escape cover. This, along with the relatively small area of summer-fall habitat on the area, may be a limitation to summer-fall use of the area by sage-grouse.

Assessing winter habitat quality on the area is problematic, due to limitations on the knowledge of sage-grouse winter habitat needs with respect to vegetation characteristics. There was an extensive amount of winter habitat mapped on the area, although only portions of the mapped habitat are likely to be suitable at any given time. Because sagebrush and total shrub cover on the area are mostly well below the RCP recommendations, the winter habitat is generally of low quality on the area.

Sage grouse habitats on the area are fairly well connected to other habitats in the Gunnison Basin. To the west and south are extensive sagebrush-dominated landscapes, mostly in federal public ownership. However, private lands bordering the area to the west and south, and Highway 50 along the south margin of the nomination area, represent partial barriers to sage-grouse movement on and off of the area. There is a large ranch to the southwest of the area that is completely fenced using sheep wire and it has removed all sagebrush. Although the road may limit some movement, it is reasonable to assume that sage-grouse regularly move between the area and other sagebrush landscapes in the Gunnison Basin, albeit with potentially increased risk of mortality from vehicle collisions or predation in non-suitable habitat patches.

Based on the analysis described above, it is determined that the sage-grouse occupied habitat on the nomination area is overall of less than average quality relative to sage-grouse habitat throughout the Gunnison Basin, particularly for nesting and early brood-rearing and during winter. The presence of sage-grouse birds and sign on the area indicates fairly regular use, but it is presumed that the density of sage-grouse on the area is low compared to higher quality habitats elsewhere in the Gunnison Basin.

3.2.2 Environmental Effects/Mitigation:

3.2.2.1 Alt. 1 Proposed Action (Lease with Existing and Additional Stipulations)

Direct and Indirect Effects

Under the proposed action to lease geothermal mineral rights with stipulations, there would be NSO stipulations for wildlife totaling 1,876 acres. There would be additional NSO stipulations for several other factors such as geologic hazard and steep slopes that would increase this total protecting additional acres for wildlife. These acres are not all connected but offer protection of the active sage-grouse lek and surrounding areas used for resting and cover during lekking within the lease area and also provides protection of the northeast portion of the lease nomination area which includes habitat for all seasonal uses by sage-grouse except breeding. The RFDS indicates the likelihood of a site much smaller in size than the lease area and additional site-specific analysis would be conducted before a lease would occur. With the wildlife stipulations in place, the already lower quality sage-grouse habitat, and lower bird occurrence than other areas in the Gunnison Basin, the proposed action to lease geothermal mineral rights is unlikely to cause adverse impacts to the overall grouse population.

The lease notice related to GUSG habitat (see section 2.3.4) specifies additional resource protection concerns that would be addressed in any subsequent permitting of surface disturbing activities in GUSG habitat.

The potential impacts of noise from any subsequent permitted exploration and development activities would be avoided or minimized by application of lease stipulations that provide for no surface occupancy within 0.6 mile of GUSG leks. In addition, best management practices applied as Conditions of Approval to any subsequent permitting would help to avoid, minimize, or mitigate these impacts.

Geothermal development has the potential to fragment sage-grouse habitat through the construction of facilities, pipelines, and roads. The area is already fragmented by two-track roads, fences, and power lines. Geothermal lease stipulations and application of BMP's as Conditions of Approval on any subsequent geothermal development permits would minimize additional fragmentation.

According to the USFWS, "a portion of the Gunnison Basin population will likely be adversely affected by proposed geothermal development if it is implemented. Because of the current preliminary status of geothermal development, we lack the specific project details to evaluate the extent to which this activity will affect the population's overall viability. Therefore, we do not consider renewable energy development to be a threat to the Gunnison sage-grouse at this time. Geothermal energy development could become a future threat to the species, but we do not know to what extent future geothermal energy development will occur. Future geothermal development could be encouraged by a new Colorado State law, signed April 30, 2010, that will facilitate streamlining of the State permitting process" (USFWS, 2010).

Cumulative Effects

Cumulative effects on vegetation would impact sage-grouse as habitats are fragmented, degraded, or destroyed from development. These effects are seen more intensive near the development footprint but would lead to increased loss of occupied sage-grouse habitat. Access roads, pipelines and transmission lines all add to this fragmentation. Other development in the region such as building on private land can increase the effects of even a small geothermal operation. Best management practices applied as conditions of approval at the next stages of permitting would help to minimize these impacts.

In addition to the existing habitat fragmentation in the analysis area, according to the estimates in the RFDS, as much as an additional 10 miles of roads, 6 miles of above-ground pipelines, and 5 miles of powerlines could be constructed during any subsequent geothermal development. These could be located within the analysis area, within the nominated Forest Service lands, or elsewhere within the RFDS Study Area.

3.2.2.2 Alt. 2 Lease with Existing Stipulations (No Action Alternative)

Direct and Indirect Effects

Effects of this alternative would be similar to the Proposed Action. Under Alternative 2, there would be a total of 892 acres of NSO wildlife stipulations. This would aid in protecting the active sage-grouse lek in the area. There would be no protection of other sage-grouse habitats within the lease area under this alternative. However, site-specific analysis would need to be conducted in future plans and placement of infrastructure would be based on further wildlife analysis. With the wildlife stipulations in place, and considering the already lower quality sage-grouse habitat and lower bird occurrence compared to other areas in the Gunnison Basin, this alternative is unlikely to cause adverse impacts to the overall grouse population but may fail to adequately protect patches of higher quality habitat, such as mapped summer-fall habitat, within the nomination area.

Cumulative Effects

Cumulative effects on vegetation would impact sage-grouse as habitats are fragmented, degraded, or destroyed from development. These effects are seen more intensive near the development footprint but would lead to increased loss of occupied sage-grouse habitat. Access roads, pipelines and transmission lines all add to this fragmentation. Other development in the region such as building on private land can increase the effects of even a small geothermal operation. Best management practices applied as conditions of approval at the next stages of permitting would help to minimize these impacts.

In addition to the existing habitat fragmentation in the analysis area, according to the estimates in the RFDS, as much as an additional 10 miles of roads, 6 miles of above-ground pipelines, and 5 miles of powerlines could be constructed during any subsequent geothermal development. These could be located within the analysis area, within the nominated Forest Service lands not constrained by NSO stipulations, or elsewhere within the RFDS Study Area.

3.2.2.3 Alt. 3 Lease with Existing and Additional NSO Stipulations for All Gunnison sage-grouse leks

Direct and Indirect Effects

Effects of this alternative would be similar to the Proposed Action. Under this alternative, there would be increased wildlife NSO stipulations totaling 2,967 acres of habitat. The active, historic, and unknown leks within the lease area would be protected from direct disturbance. Although having a NSO stipulation for all leks, regardless of status, would increase protection of all habitats within the lease area, only 5 males have used the unknown lek since 2001 and no females were observed. There have been no birds using the historic lek. Therefore, this alternative would increase protection of sage-grouse occupied habitat, but would offer little advantage to managing breeding habitat over the proposed action.

Cumulative Effects

Cumulative effects on vegetation would impact sage-grouse as habitats are fragmented, degraded, or destroyed from development. These effects are seen more intensive near the development footprint but would lead to increased loss of occupied sage-grouse habitat. Access roads, pipelines and transmission lines all add to this fragmentation. Other development in the region such as building on private land can increase the effects of even a small geothermal operation. Best management practices applied as conditions of approval at the next stages of permitting would help to minimize these impacts.

In addition to the existing habitat fragmentation in the analysis area, according to the estimates in the RFDS, as much as an additional 10 miles of roads, 6 miles of above-ground pipelines, and 5 miles of powerlines could be constructed during any subsequent geothermal development. These could be located within the analysis area, within the nominated Forest Service lands not constrained by NSO stipulations, or elsewhere within the RFDS Study Area.

3.2.2.4 Alt. 4 Lease with Existing and Additional NSO Stipulations for Occupied Gunnison Sage-grouse Habitat

Direct and Indirect Effects

Since the entire analysis area is within Gunnison sage-grouse occupied habitat, there would be no effect on sage-grouse under this alternative.

Cumulative Effects

Since the entire lease nomination area is within Gunnison sage-grouse occupied habitat, there would be no cumulative effects on sage-grouse under this alternative.

In addition to the existing habitat fragmentation in the analysis area, according to the estimates in the RFDS, as much as an additional 10 miles of roads, 6 miles of above-ground pipelines, and 5 miles of powerlines could be constructed during any subsequent geothermal development. These could only be located within the nominated Forest Service lands not constrained by NSO stipulations, or elsewhere within the RFDS Study Area.

3.2.2.5 Alt. 5 Close to Leasing

Direct and Indirect Effects

Since no lease nomination would be allowed, there would be no effect on Gunnison Sage-grouse.

Cumulative Effects

Since no lease nomination would be allowed, there would be no cumulative effects on Gunnison Sage-grouse.

3.3 RIPARIAN AREAS AND WATER RESOURCES

The RMP includes stipulations that address protection of riparian areas, including those within sage-grouse brood-rearing areas. Specific concerns include:

- Potential impacts to riparian areas, including Monson Gulch.

Comments received during scoping focused on potential impacts to the water quality and quantity of streams and springs and their associated wetlands and riparian areas in the analysis area. Comments also focused on potential impacts to the water quality, quantity, and temperature of geothermal resources in the area. Comments also focused on potential impacts to existing water rights and geothermal rights. Specific concerns expressed related to:

- potential water depletions and drying up of springs
- altered surface and groundwater flow patterns and potential associated changes to groundwater infiltration and surface runoff
- potential releases of toxic drilling fluids, water supplies for drilling, and proper disposition of effluent water
- monitoring of water resources prior to and after geothermal development.

Leasing land does not involve ground-disturbing activities or any type of construction, so there would be no direct impact on water resources. Impacts would result from activities pursued after leasing. Due to the inability to predict future development scenarios, including types of development, timing, and location, the following impact analysis provides a general description of common impacts on water resources from geothermal resource development. The degree of impact would vary greatly depending on local conditions including presence of sole source aquifers, hot springs, and the existing water quality. (BLM FEIS, 2008).

If exploration determines that a viable geothermal resource is present, then geothermal fluids will be produced from the geothermal reservoir from production wells. The heat from the thermal water will be used for electrical generation. The water will then be re-injected into the geothermal reservoir via injection wells to fulfill the closed-loop system. Ultimately, no water will be lost in the process if a dry cooled system is established. If a water cooled system is used, minimal water loss will occur due to evaporation (BLM RFDS, 2010).

The RMP includes Best Management Practices (BMP's) that, after appropriate environmental review, could be incorporated into any permit applications or made conditions of approval for any future geothermal development permitting. The BMP's would be applied on a site-specific basis to avoid or minimize adverse impacts to water quality and quantity of streams and springs and their associated wetlands and riparian areas in the analysis area. There are also BMP's that address testing and monitoring of water resources.

In addition, the BLM is inventorying the springs and riparian areas in the analysis area this summer. The springs will be monitored for changes in water quality and quantity.

3.3.1 Affected Environment:

Climate

The project area covers parts of the Hot Spring Creek and Middle Tomichi Creek watersheds (Figure 6). Elevations within the watersheds range from 8,100 feet at US Highway 50 to 11,475 feet at the top of Tomichi Dome. Mean annual precipitation is 14.7 inches with approximately 1 inch falling each month of the year (USDA RMRS, 2010). Between October and April, precipitation falls in the form of snow and this precipitation primarily recharges the springs in the area. Between December and April, maximum and minimum temperatures remain below freezing. June through August is the warmest period of the year as mean daily maximum temperatures remain below 80 degrees Fahrenheit.

Hydrology

The primary surface water body is Hot Springs Creek, which emanates north of the project boundary. Nine-tenths of one mile of the stream flows through lands managed by the BLM, but lies outside the analysis area. Spring sources on BLM lands within and outside the project area were inventoried using a modified version of the protocol developed by USDA Forest Service (2009). The inventory identified that that main ground water discharges on BLM lands within the watersheds are 21 springs. Precipitation (primarily from snowfall) on Tomichi Dome recharges the springs east of Hot Springs Creek; while precipitation in the upgradient drainages recharges those west of the Creek. The springs west of the creek have a much smaller recharge zone than those on the east side of the creek. The springs emanate from two bedrock geologic map units: Mancos Shale and Dakota Sandstone (Figure 6 and Table 7). Springs within the watersheds are either one of the following types (Table 7):

- Helocrene-Emerges from low gradient wetlands; often indistinct or multiple sources seeping from shallow, unconfined aquifers.
- Hillslope-Emerges from confined or unconfined aquifers on a hillslope (30–60 slope); often indistinct or multiple sources
- Limnocrene-Emergence of confined or unconfined aquifers in pools (Springer et al., 2008).

Table 7. Springs within and outside of the Tomichi Geothermal Lease Area.

NAME	WSI ID	SPRING TYPE	GEOLOGIC MAP UNIT	LITHOLOGY SOURCE 1	LITHOLOGY SOURCE 2
Chad	183	Helocrene/ Limnocrene	Dakota Sandstone	Sedimentary	Shale
North Dome	184	Helocrene/ Limnocrene	Dakota Sandstone	Sedimentary	Shale
Munson	186	Helocrene/ Hillslope	Mancos Shale	Sedimentary	Shale
Hopper	187	Helocrene	Mancos Shale	Sedimentary	Shale
Slump	188	Helocrene	Mancos Shale	Sedimentary	Shale
Aldred No. 2	189	Helocrene	Mancos Shale	Sedimentary	Shale
Aldred No. 1	190	Helocrene	Mancos Shale	Sedimentary	Shale

Aldred No. 3	192	Helocrene	Mancos Shale	Sedimentary	Shale
Jarles	193	Helocrene	Mancos Shale	Sedimentary	Shale
Hondo	199	Helocrene/ Hillslope	Mancos Shale	Sedimentary	Shale
Clay	983	Helocrene	Dakota Sandstone	Sedimentary	Sandstone/Shale
Kalinda	984	Helocrene	Dakota Sandstone	Sedimentary	Sandstone/Shale
Red Currant	985	Helocrene	Dakota Sandstone	Sedimentary	Sandstone/Shale
Hersh	986	Limnocrene	Dakota Sandstone	Sedimentary	Sandstone/Shale
NE Spring Exclosure	987	Limnocrene	Dakota Sandstone	Sedimentary	Sandstone/Shale
Blue Monday		Helocrene	Dakota Sandstone	Sedimentary	Sandstone/Shale
Coats Spring		Hillslope	Dakota Sandstone	Sedimentary	Sandstone
Quarter Corner		Helocrene	Dakota Sandstone	Sedimentary	Shale
(360382) (4263550)		Hillslope	Dakota Sandstone	Sedimentary	Sandstone/Shale
(359522) (4262857)		Helocrene	Dakota Sandstone	Sedimentary	Sandstone/Shale
(360459) (4263392)		Helocrene	Dakota Sandstone	Sedimentary	Sandstone/ Conglomerate

Between May 10 and July 14, 2010, water quality, depth, and discharge were measured weekly. Four springs were dry when monitoring began and continued to be dry: Aldred Spring Numbers 2 and 3; Jarles Spring; and Quarter Corner Reserve.

Riparian Areas

Within the analysis are 17 acres of riparian areas, which accounts for 0.3% of the land within the analysis area (Figure 8). As such, the riparian areas provide critical habitat for wildlife and livestock. Because groundwater is the source of water within the analysis area, these riparian areas depend on groundwater from the springs. Most of the riparian areas are confined to the springs themselves. Aside from the riparian area associated with Monson Gulch, the other springs range in area between 0.02 acres and 2.7 acres. Monson Gulch has a riparian area of 8.5 acres with a width of between 2 and 15 feet. This riparian area extends for 1.6 miles within the analysis area. Hondo spring, which has the highest average discharge of 59.60 cfs supplies the water for this riparian area (Figure 10a).

Riparian communities at the higher elevation are associated with aspen stands. Within Monson Gulch, riparian vegetation includes yellowed *Poa* spp.; *Carex* spp.; and *Bromus* spp. In areas with steeper slopes and more shade, the riparian community of Monson Gulch has willow understory and aspen overstory. Flatter, unconfined areas primarily have just willows.

Ponded Springs

Seven of the springs had no flowing water, as the springs had been excavated to supply water for livestock: Blue Monday; Clay; Coats Spring; North Dome, and Spring #s (360382)(4263550), (359522)(4262857), and (360459)(4263392). Water depth, water temperature, dissolved oxygen (DO), pH, and conductivity for each spring are summarized in the following sections (Figures 4a-e).

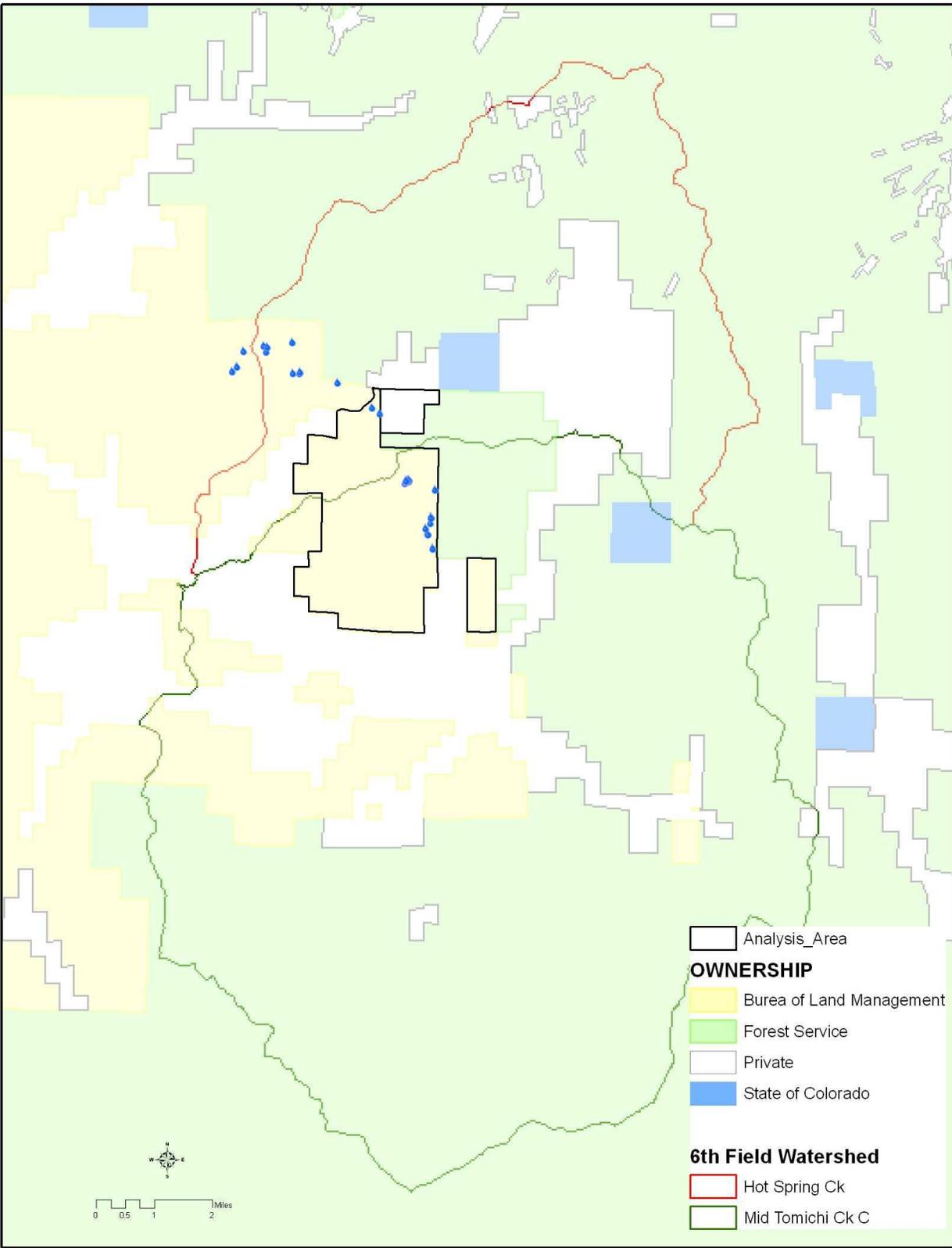


Figure 6. Cumulative Watershed Effects Area for the Gunnison Resource Area.

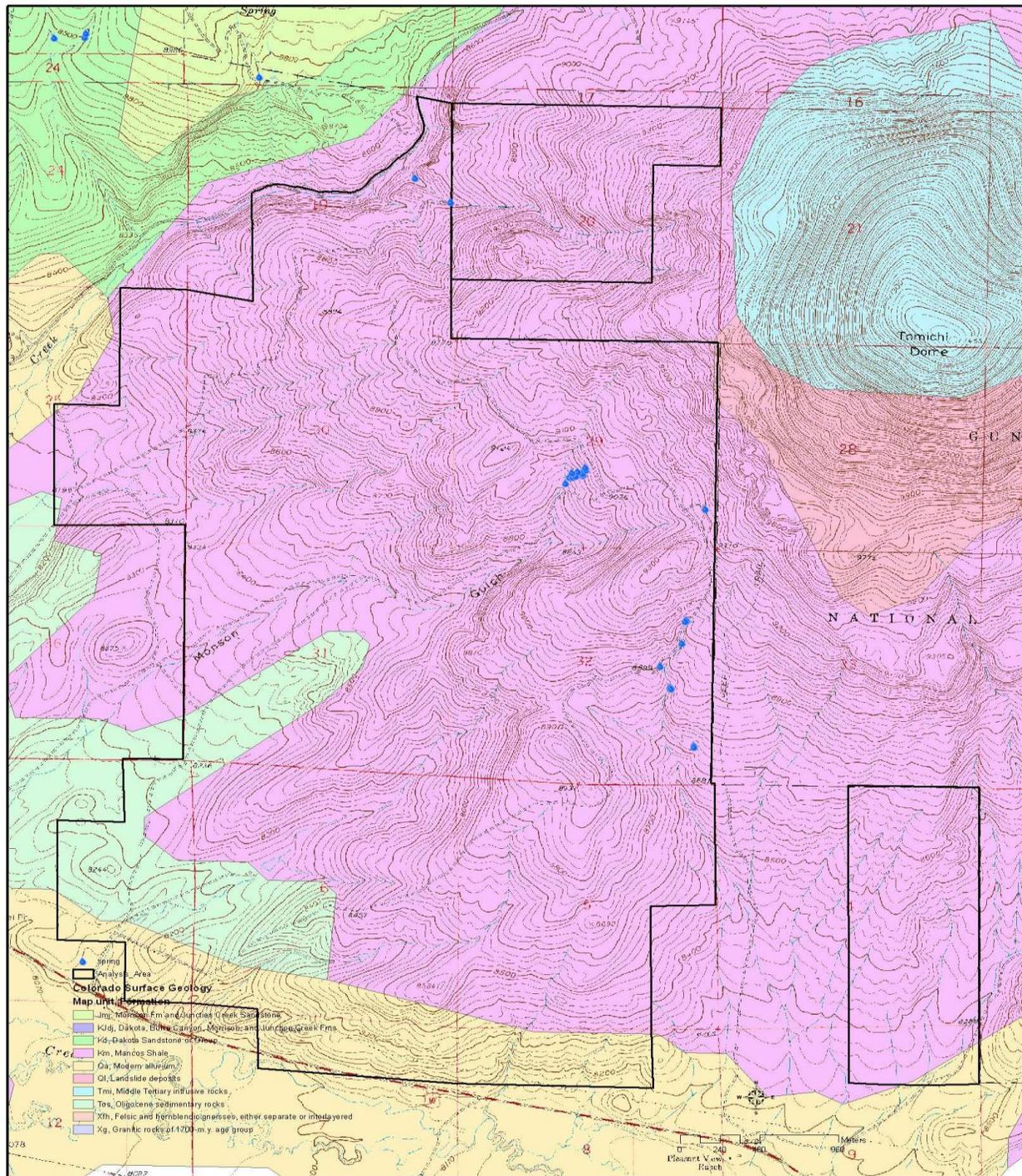


Figure 7. Springs within the hydrogeologic area of the analysis area.

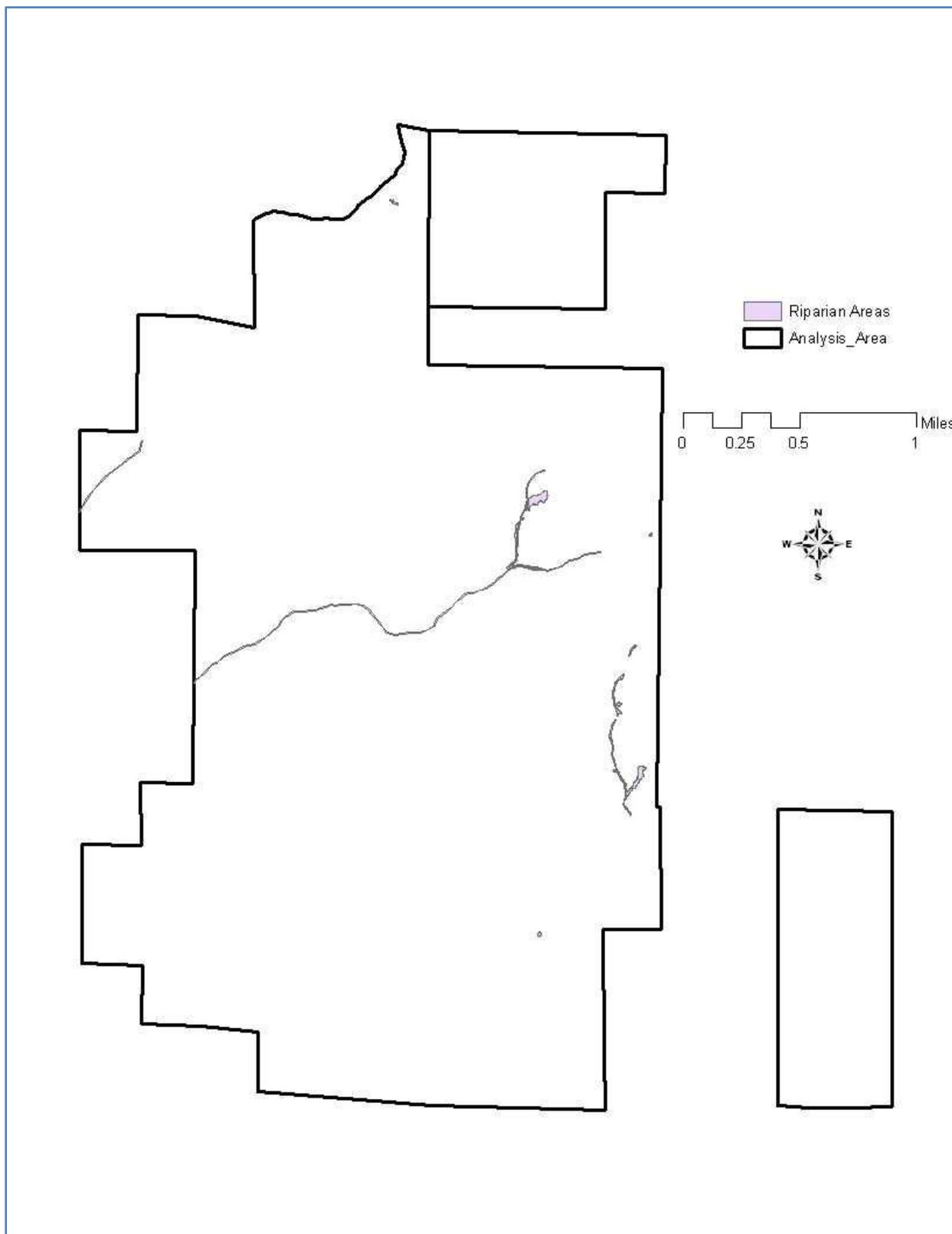


Figure 8. Riparian areas within the analysis area.

Depth: Water depth in these springs ranged from 2 inches in #(360382)(4263550) and #(359522)(4262857) to 42 inches in North Dome spring (Figure 9a). Peak water depth varied throughout the area. For instance, North Dome had a peak depth of 42 inches on June 28, while Red Currant, Blue Monday, #(359522)(4262857), and #(360459)(4263392) peaked at the end of July. These springs emanate from Dakota Sandstone.

Water Quality: Water temperature, conductivity, and pH, were measured between May 10 and July 26, 2010; and measurements of DO began on June 21, 2010. Table 8 summarizes State of Colorado numerical water quality standards. Bedrock geology mainly influences pH and conductivity, while air temperature at the time of measurements significantly influences water temperature. Shade and aspect also influence water temperature. An inverse relationship exists between water temperature and DO.

Table 8. Physical and Biological Numeric Standards for waters of the Upper Gunnison River Basin

Parameter	Standard
Dissolved Oxygen	6 to 7 mg/L
pH	6.5-9.0

Water Temperature: Water temperature of the springs fluctuated weekly for each spring; and air temperature at the time of measurements influenced those readings. Water temperatures ranged between 7.8 °C and 27.3°C (Figure 9b). This temperature range indicates that the Tomichi geothermal aquifer is likely not connected to these springs.

Dissolved Oxygen: Dissolved oxygen was measured at all the springs, but only the ones with flow are summarized in affected environment. Data from the ponded springs is unreliable at this point.

pH: All the springs generally meet Colorado numerical water quality standards for pH, which measures the acidity and basicity of liquids and has a range between 0 and 14 (Table 8). A reading between 6.5 and 8.5 typically indicates neutral water quality, while a pH above or below that range, respectively, indicates basic and acidic solutions. All the springs are generally neutral with a range between 6.6 and 8.7 (Figure 9d). However, the pH of #(359522)(4262857) and #(360459)(4263392) exceeded 9 once and twice, respectively, during the sampling period.

Conductivity: Although the State of Colorado doesn't have a numerical water quality standard for conductivity, this measurement can be useful as a water quality indicator. Conductivity measures the ability of water to pass an electrical current and the presence of cations and anions influences this ability. Water, including ground and surface that flows through a geologic formation with a high concentration of ions generally has high conductivity. Average conductivity for the springs ranged between 117 $\mu\text{s/cm}$ in #(360382)(4263550) to 864 $\mu\text{s/cm}$ in North Dome Spring (Figure 9e). Highest reading was 1016 $\mu\text{s/cm}$ in North Dome Spring and lowest was 70 $\mu\text{s/cm}$ #(360382)(4263550).

Flowing Springs

The following nine springs had flowing water and, with the exception of Munson, had not been excavated: Chad, Munson, Hopper, Slump, Aldred 2, Hondo, Kalinda, and Hersh (Figures 10a-e). Discharge and water quality for each are summarized below.

Depth: Discharge was measured in the remaining spring channels using the volumetric method and with a Marsh-McBurney flow meter. Flows from the springs support near-spring riparian areas with the exception of Hondo spring, which is the headwater spring to Monson Gulch. Average discharge in Hondo spring equaled 56.4 gallons per minute (gpm) and ranged between 43.5 gpm and 84.5 gpm (Figure 10a). The other springs had a discharge between 0.1 gpm and 7.5 gpm. Because of the late start for taking measurements, the peak discharge from the springs was likely missed. With the exception of Hondo spring, highest discharge for the springs occurred between mid-May and the end of May (Figure 10a).

Water Quality: Water temperature, conductivity, pH, and dissolved oxygen were measured between May 10 and July 26, 2010 (Figures 10b-e).

Water Temperature: Average water temperature of the springs ranged between 5.9 °C at Chad spring and 22.9°C at Hopper spring (Figure 10b). This temperature range indicates that the Tomichi geothermal aquifer is likely not connected to these springs. Highest average water temperatures were observed in Munson and Hopper springs, which have with minimal shade to keep air temperature and water temperatures low (Figure 5b).

Dissolved Oxygen: Average dissolved oxygen (DO) in the springs ranged between a low of 4.6 mg/L (milligrams per liter) in Munson and Hopper springs to 7.7 mg/L in Chad and Hondo springs (Figure 5c). DO fluctuated at each spring, except at Chad, Munson, Slump, and Hondo springs. All the springs with the exception of Slump spring meet Colorado numerical water quality standards for DO (Table 8). DO in Slump spring ranged between 3.4 mg/L and 4.8 mg/L.

pH: All the springs meet Colorado numerical water quality standards for pH with an average pH between 7.3 in Kalinda and Aldred 2 springs and 8.1 in Hopper spring (Figure 10d). Kalinda had the lowest pH reading of 6.5 and Hopper had the highest reading of 8.7 on July 12.

Conductivity: Average conductivity for the springs ranged between 74 $\mu\text{s}/\text{cm}$ in Hondo spring to 764 $\mu\text{s}/\text{cm}$ in Chad Spring (Figure 10e). Highest reading was 890 $\mu\text{s}/\text{cm}$ in Chad Spring on July 26 and lowest reading was 35 $\mu\text{s}/\text{cm}$ in Kalinda spring the previous week.

Water Rights

Permitting and regulating of geothermal water resources falls under the jurisdiction of the State Engineer, who also serves as the Director of the Colorado Division of Water Resources (CODNR DWR, 2010). Any new application for geothermal resources in Colorado cannot result in “material injury” of prior water or geothermal water rights. Within the watershed analysis area are 38 water rights on BLM, NFS, and private lands (Figure 11). Water rights on private lands account for 22 of the 38 water rights (Table 9).

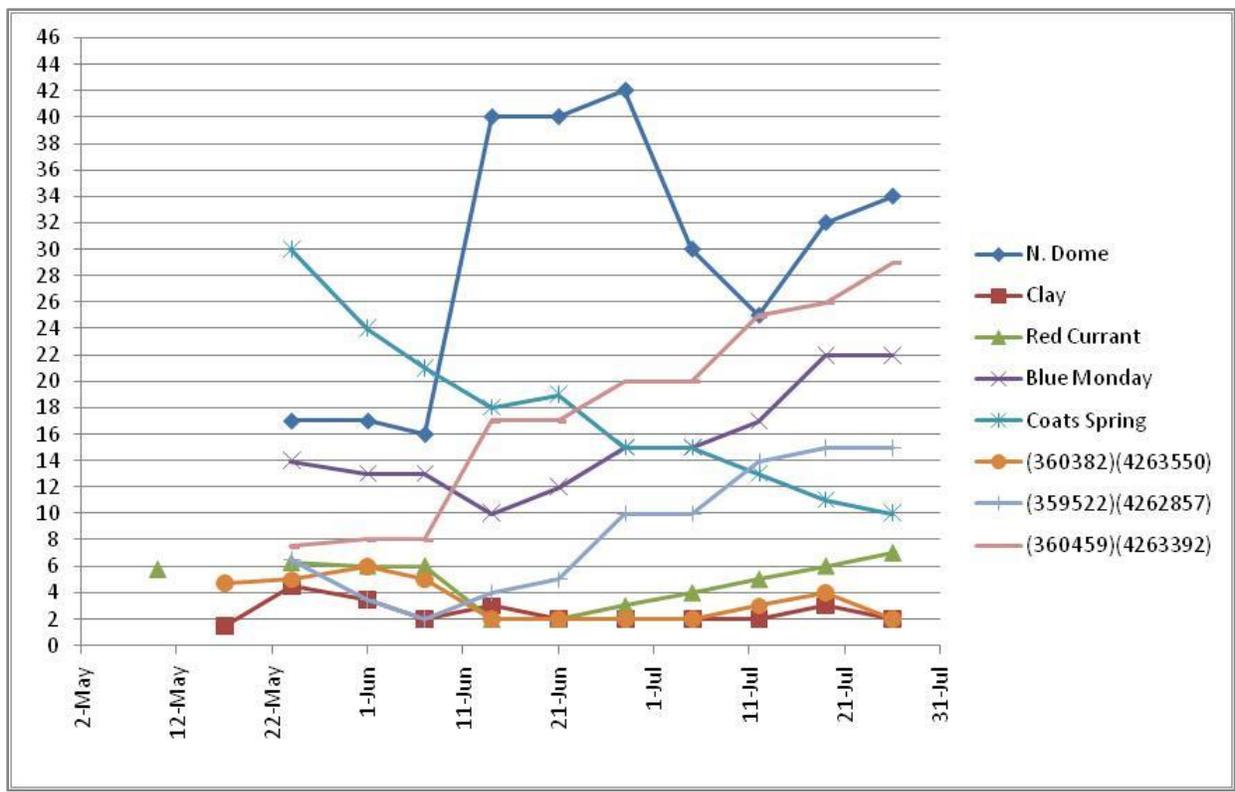


Figure 9a. Water depth (inches) of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between May 10 and July 26, 2010.

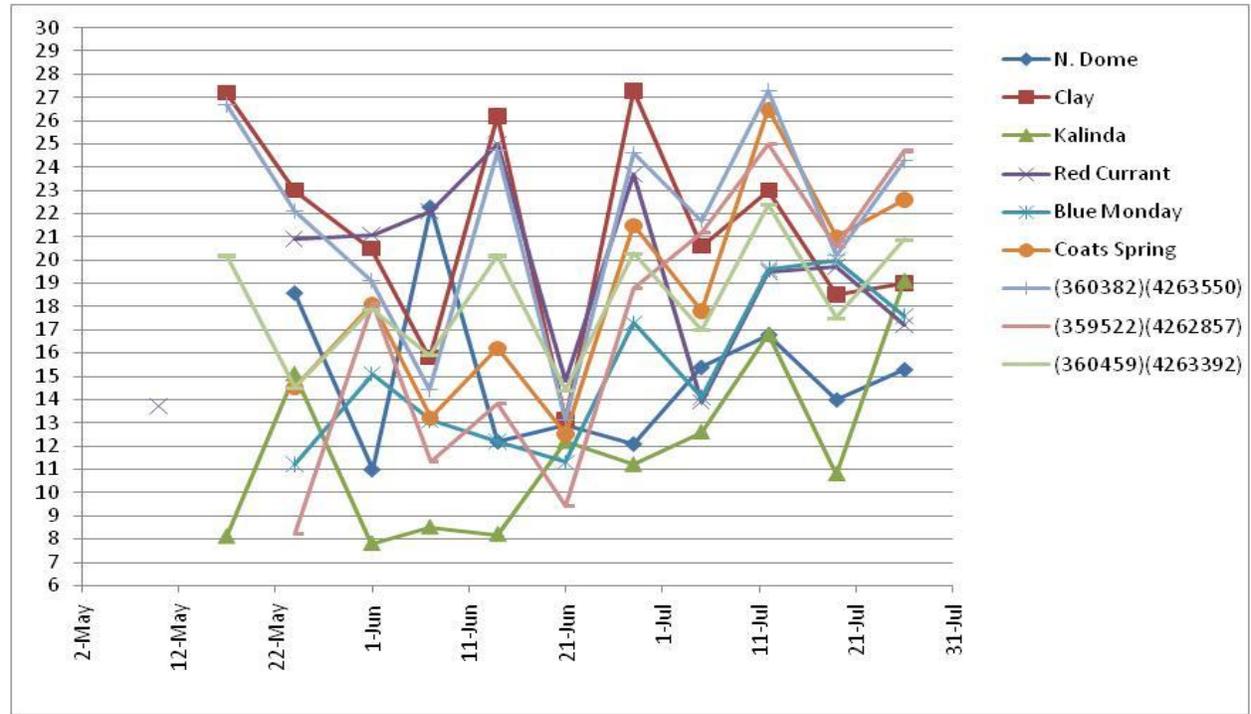


Figure 9b. Water temperature (degrees centigrade) of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between May 10 and July 26, 2010.

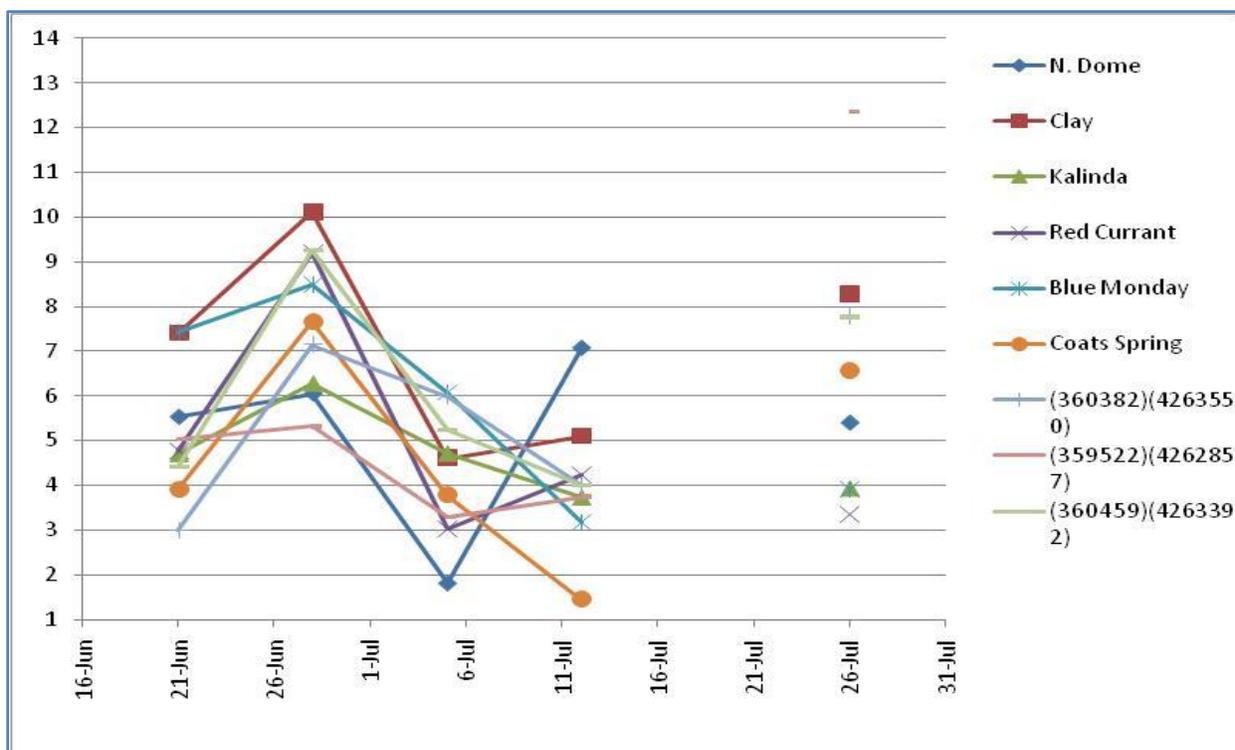


Figure 9c. Dissolved oxygen (mg/L) of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between June 21 and July 26, 2010.

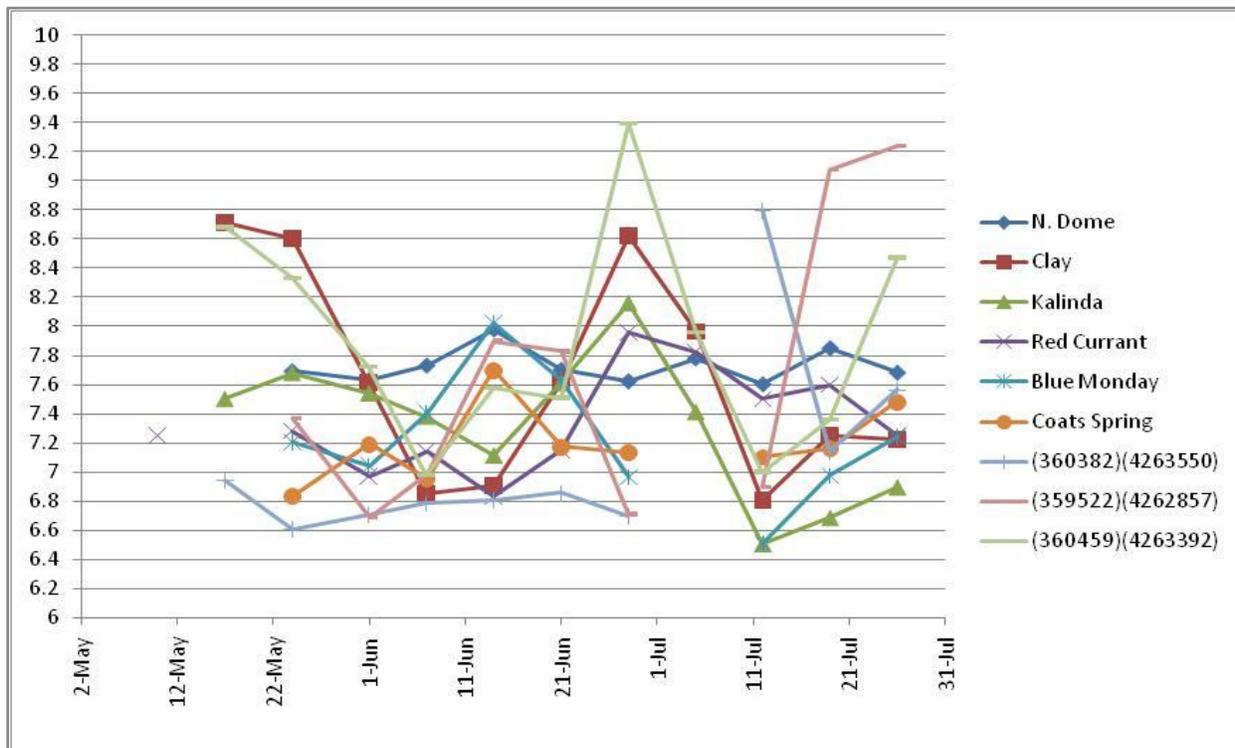


Figure 9d. pH of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between May 10 and July 26, 2010.

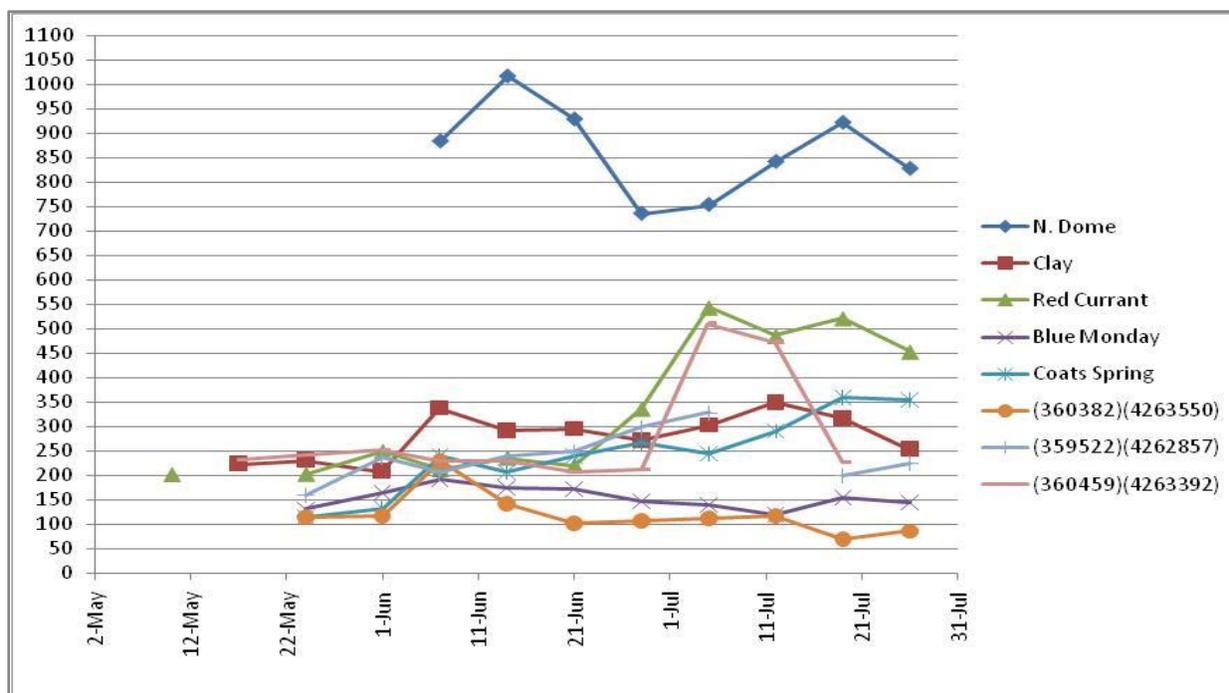


Figure 9e. Conductivity ($\mu\text{S}/\text{cm}$) of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between May 10 and July 26, 2010.

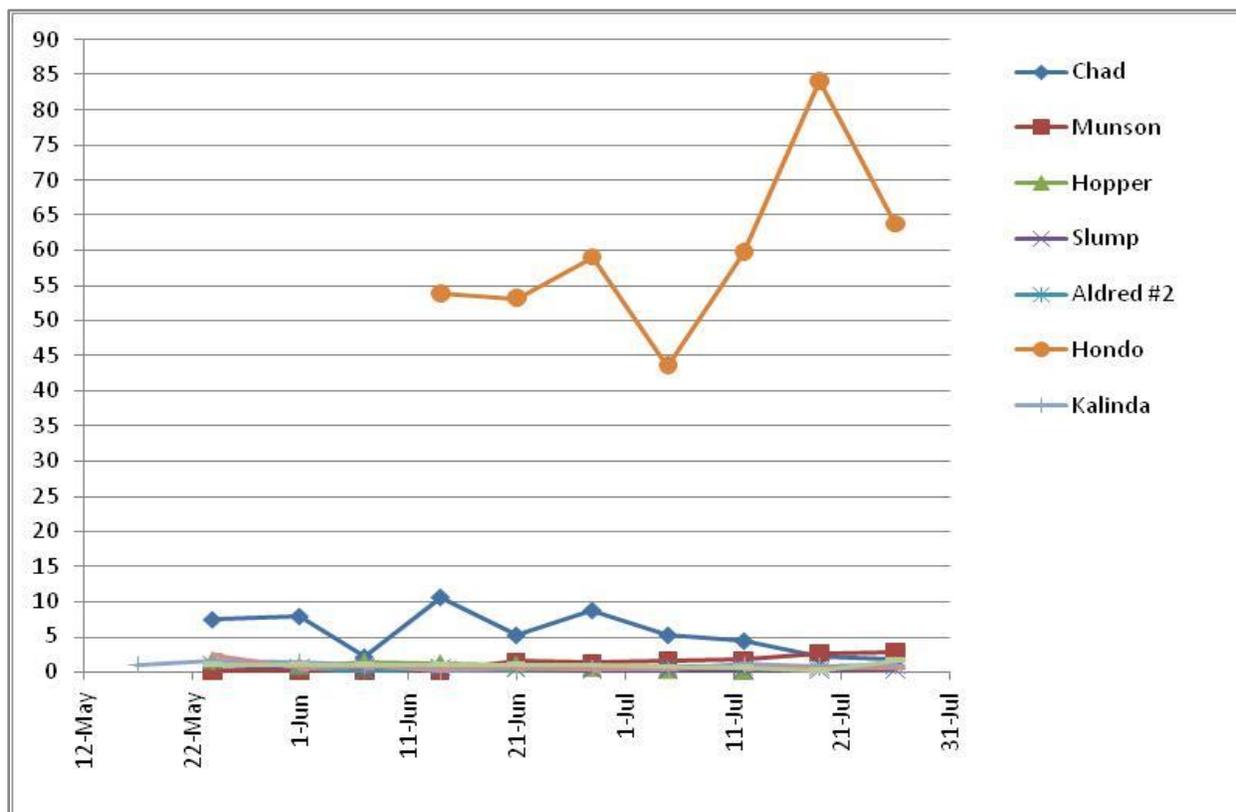


Figure 10a. Discharge (gallons per minute) of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between May 17 and July 26, 2010.

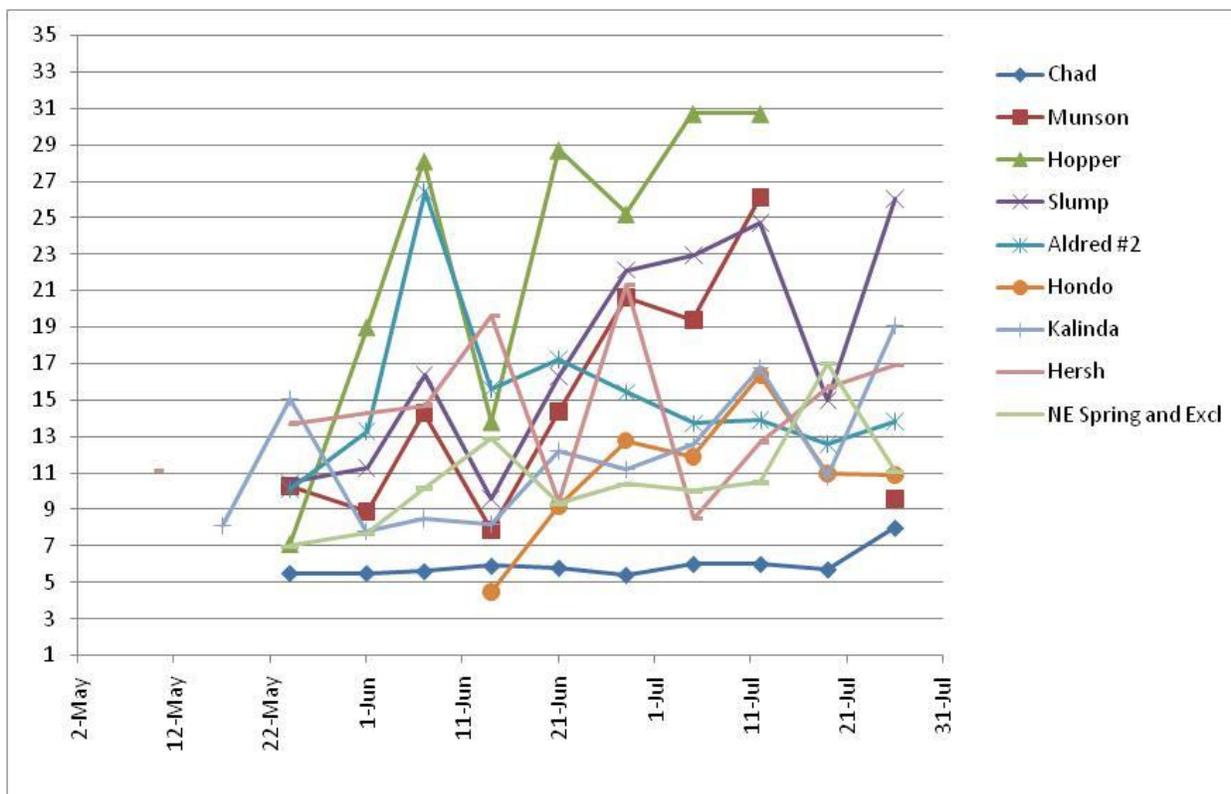


Figure 10b. Water temperature (degrees centigrade) of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between May 10 and July 26, 2010.

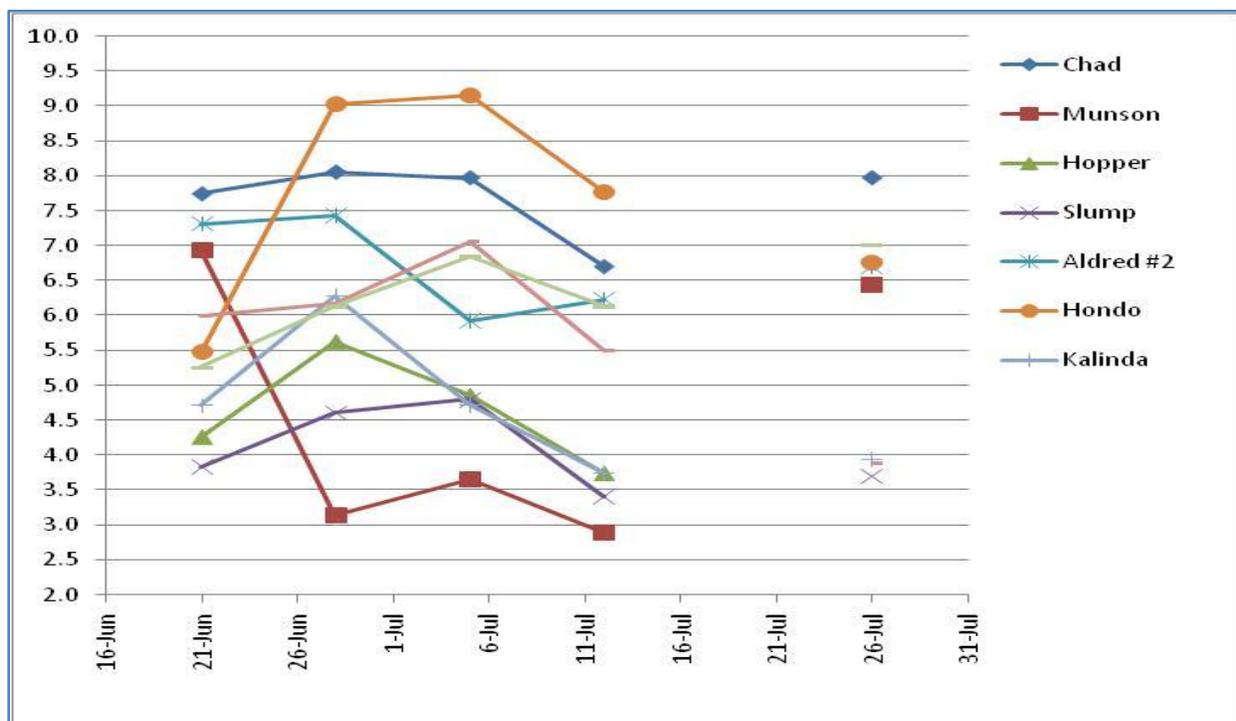


Figure 10c. Dissolved oxygen (mg/L) of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between June 21 and July 26, 2010.

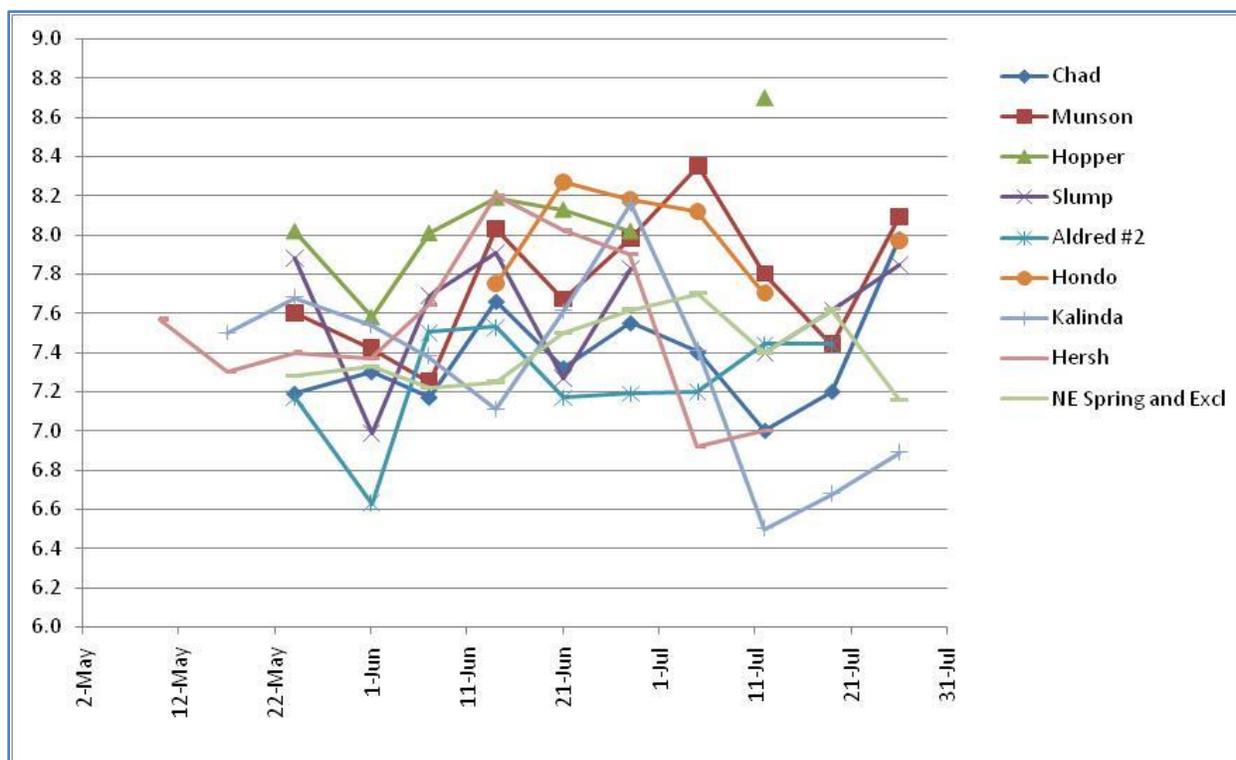


Figure 10d. pH of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between May 10 and July 26, 2010.

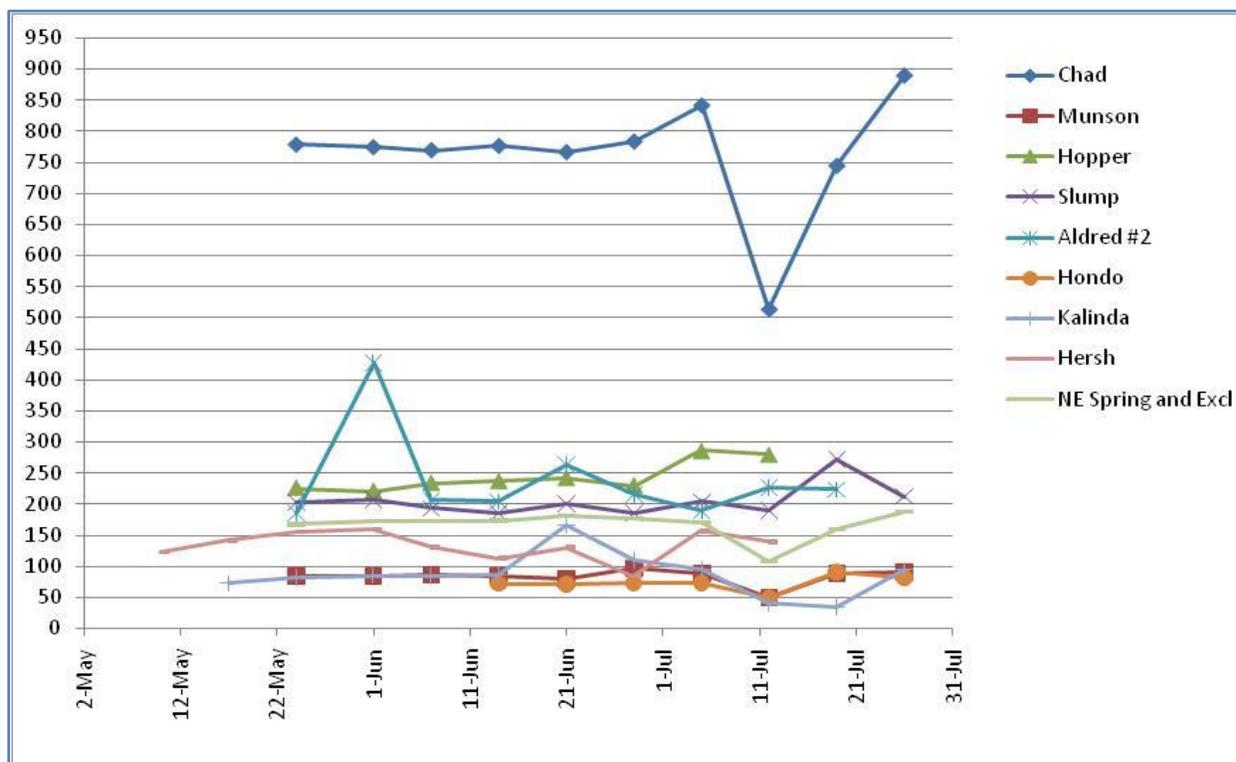


Figure 10e. Conductivity ($\mu\text{S}/\text{cm}$) of selected springs within the watershed analysis boundary of the Tomichi Geothermal Lease EA between May 10 and July 26, 2010.

There is one geothermal production well within the watershed analysis area (well permit number 528-G). Waunita Power Company owns the well and the “permit is for appropriation of geothermal fluids for utilization of geothermal energy, using in-hole technology with no surface diversions (CDWR, 2010).”

There are other decreed geothermal rights on Hot Springs Creek, including Waunita Hot Springs Pipeline No’s. 1, 2, and 3. These pipelines are surface rights out of hot springs tributary to Hot Springs Creek, and were not tabulated with a geothermal use but heating uses are mentioned in their decrees (case numbers 80CW59 and 80CW60). Another decree that includes geothermal uses is 03CW40 which lists Bath House Spring No 12 and Concrete Pond Spring No 11. There may or may not be others but that can’t be determined with certainty until every decree in the analysis area is read (Irby, 2010).

The State Engineer, who is also the Director of the Colorado Division of Water Resources, is the regulatory authority for the purposes of permitting and administering the use of a geothermal resource in regard to the potential to impact other water users or geothermal resource users. First, this means that before any party can construct a geothermal resource well (“geothermal well”) or any type of well, that party needs to obtain a permit to construct a well from the State Engineer. As a part of this permitting responsibility for well construction, the State Engineer has the authority to adopt rules to protect the public health, safety, and welfare and the environment and to prevent the waste of any geothermal resource [§ 37-90.5-106, C.R.S.] The State Engineer has adopted these rules and uses them for permitting geothermal wells (State of Colorado DWR, 2010).

Second, when performing this well construction permitting function, the State Engineer must evaluate the use of the geothermal resource with regard to the potential to cause *material injury* to other water rights and geothermal rights. The geothermal fluid, when it exists as *tributary* ground water is a public resource and as a result, the State Engineer must be mindful of the potential for *material injury* to other water rights. To manage this important evaluation process, before a party can produce geothermal fluid from a well, the State Engineer requires that the party obtain a permit to appropriate the geothermal fluid [§ 37-90.5-107, C.R.S.] (State of Colorado DWR, 2010). The State permits would be required in addition to the appropriate BLM permits/authorizations.

3.3.2 Environmental Effects/Mitigation:

The effects of each alternative on riparian areas and springs are similar, so they will be discussed together. Water rights will be discussed separately.

Each of the five alternatives would have an effect on riparian areas, springs (water quantity and water quality); and water rights. Alternatives 1, 2, and 3 are discussed together, while Alternatives 4 and 5 are discussed together. The effects of the first three alternatives on riparian areas, springs, and water rights are the same, while the same holds true for alternatives 4 and 5.

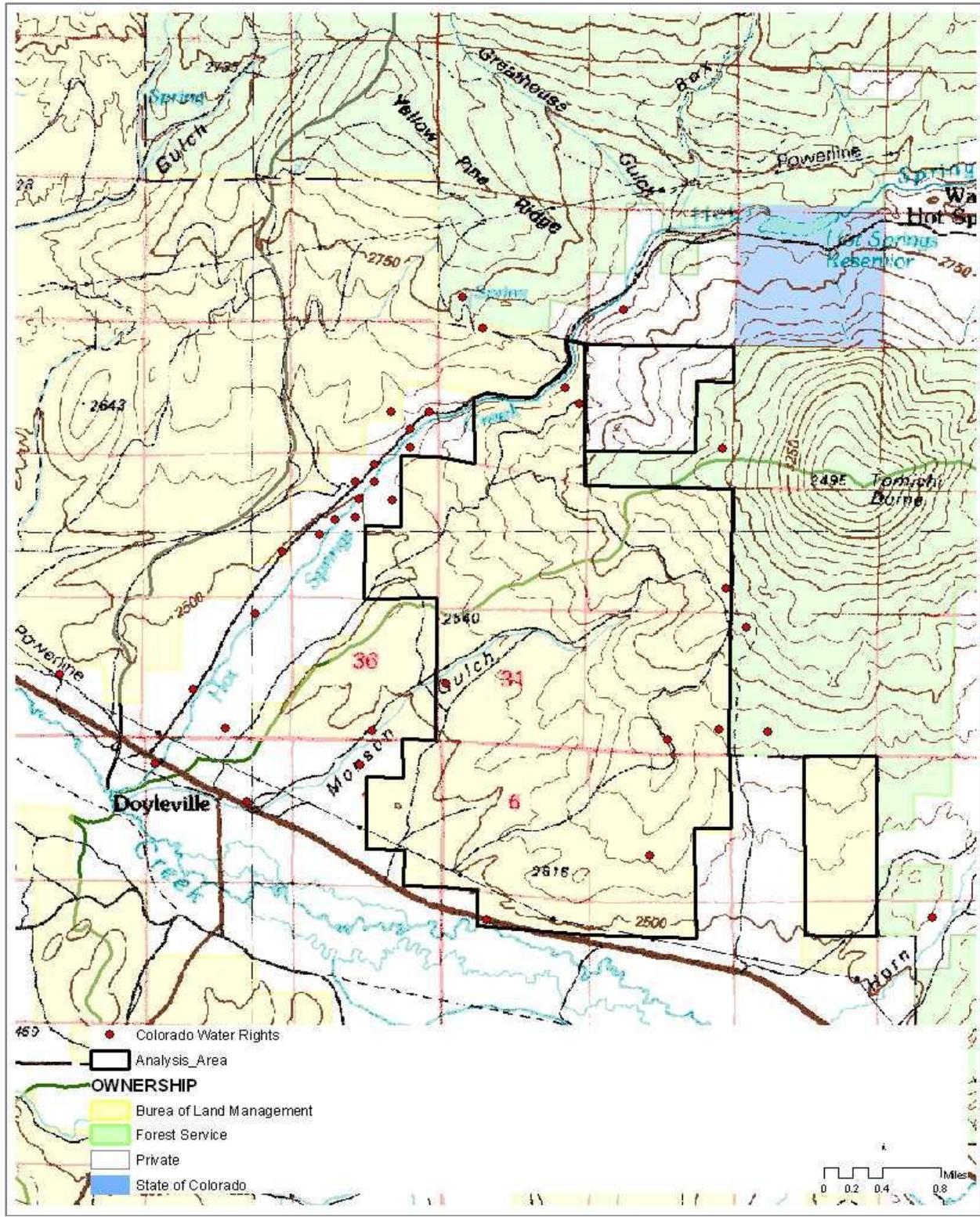


Figure 11. Water rights within the watershed analysis area of the Tomichi Geothermal Lease Area.

Table 9. Private Water rights within the Watershed Analysis Area

Name	Source
BENNETT MORTON DITCH	HOT SPRINGS CREEK
COX IRRIGATING DITCH	HOT SPRINGS CREEK
HOT SPRINGS NO 1 DITCH	HOT SPRINGS CREEK
HOT SPRINGS NO 2 DITCH	HOT SPRINGS CREEK
J T HORN DITCH	HORN GULCH
L L BUSH DITCH NO 1	HOT SPRINGS CREEK
L L BUSH DITCH NO 2	HOT SPRINGS CREEK
L L BUSH DITCH NO 3	HOT SPRINGS CREEK
L L BUSH DITCH NO 4	HOT SPRINGS CREEK
L L BUSH DITCH NO 5	HOT SPRINGS CREEK
MUNSON CREEK DITCH	MONSON GULCH
ROGERS METROZ DITCH	QUARTZ CREEK
WICKS ROWSER DITCH	HOT SPRINGS CREEK
L L BUSH NOS 1,2,3,4&5 D	HOT SPRINGS CREEK
LIJA SPRING NO 2	HOT SPRINGS CREEK
L L BUSH DITCH NO 6	HOT SPRINGS CREEK
J.PILONI SPRING	HOT SPRINGS CREEK
PAPPA SPRING	TOMICHI CREEK
HOT SPRINGS NO 2 DITCH AP	HOT SPRINGS CREEK
WICKS ROWSER DITCH AP	HOT SPRINGS CREEK
TROUT POND SPRING	MONSON GULCH

As previously mentioned throughout this EA, no surface disturbance would occur as a result from any of these alternatives. The main differences between the alternatives are the types of protection measures for each resource.

Riparian Areas and Springs

Alternatives 4 and 5 would provide the highest protection of riparian areas and springs, as no surface disturbance would occur or no lease would be issued and the area would be closed to geothermal exploration and development. There would be no potential negative effects on riparian areas and springs as a result.

Alternatives 1, 2 and 3 provide the second highest level of protection to riparian areas and springs, as a controlled surface use of 500 feet of riparian areas, including springs would be implemented; and no surface occupancy would occur within riparian areas and springs. If a lease is issued, the lessee would have to develop a site-specific plan for the protection of riparian areas and springs. This site plan would have to be approved by the BLM to ensure that the hydrologic function of springs and riparian areas is maintained. Stipulations and BMPs would ensure the protection of riparian areas and springs, however, there could still be some level of risk to these resources areas.

Water Rights

Alternatives 4 and 5 would provide the highest protection of water rights, including the geothermal water right held by Waunita Power Company, as no surface disturbance would occur or no lease would be issued. There would be no potential for material injury or any changes to water quality or quantity from geothermal exploration and development.

Alternatives 1, 2, and 3 would still provide protection to water rights as the State Engineer would ensure “material injury” of prior water or geothermal water rights” would not occur. There could still be measureable changes to water quantity or water quality (temperature or taste) although these effects cannot be quantified with the data available at this time.

3.4 SOILS, PARTICULARLY GULLIES AND STEEP SLOPES

The RMP includes stipulations that address steep slopes and erosive soils. However, there are no current stipulations that address protection of soil resources near gullies. Specific concerns include:

- Potential impacts to soil stability, including increased erosion and proper reclamation.

3.4.1 Affected Environment:

Soil resources on public lands administered by the BLM in the GUFO were mapped and characterized by the USDA Natural Resources Conservation Service (Figure 1). The Natural Resource Conservation Service (NRCS) mapped 10 soil map units within the analysis area (NRCS, 2010 and Figure 12). These soil map units are a subset of the NRCS soil survey, which covers 865,000 acres, including public lands administered by the GUFO. Textures of the soils within the analysis area are primarily loam and sandy loam (Table 10). The dominant soil map unit is the Big Blue loam, 1 to 5 percent slopes, which encompasses 4,831 acres (94%) of the soil survey (Figure 12).

Soils vary in salt content, organic matter content, parent material and risk to erosion. Soil erosion risk and productivity represent key soil resource values in the GUFO. These values dictate the kinds of plant communities on which wildlife habitat is based in combination with precipitation and temperature; drive plant growth conditions; potentially limit stocking rates for livestock; and may determine reclamation potential in areas of surface disturbance.

Soil productivity on BLM lands in the analysis area both affect and/or are affected by land use and land cover. A land use such as new land cover, due to construction of a road, camp ground, or well pad construction may subtly or dramatically affect soil properties such as its structural stability, nutrient content, and biological activity. Land use and land cover may also influence other physical and chemical soil properties such as soil porosity through compaction, soil nutrient cycling, and soil organic matter content accumulation.

Erosion

Table 10 summarizes some key soil properties for potential geothermal exploration and development if a geothermal lease is offered through this process.

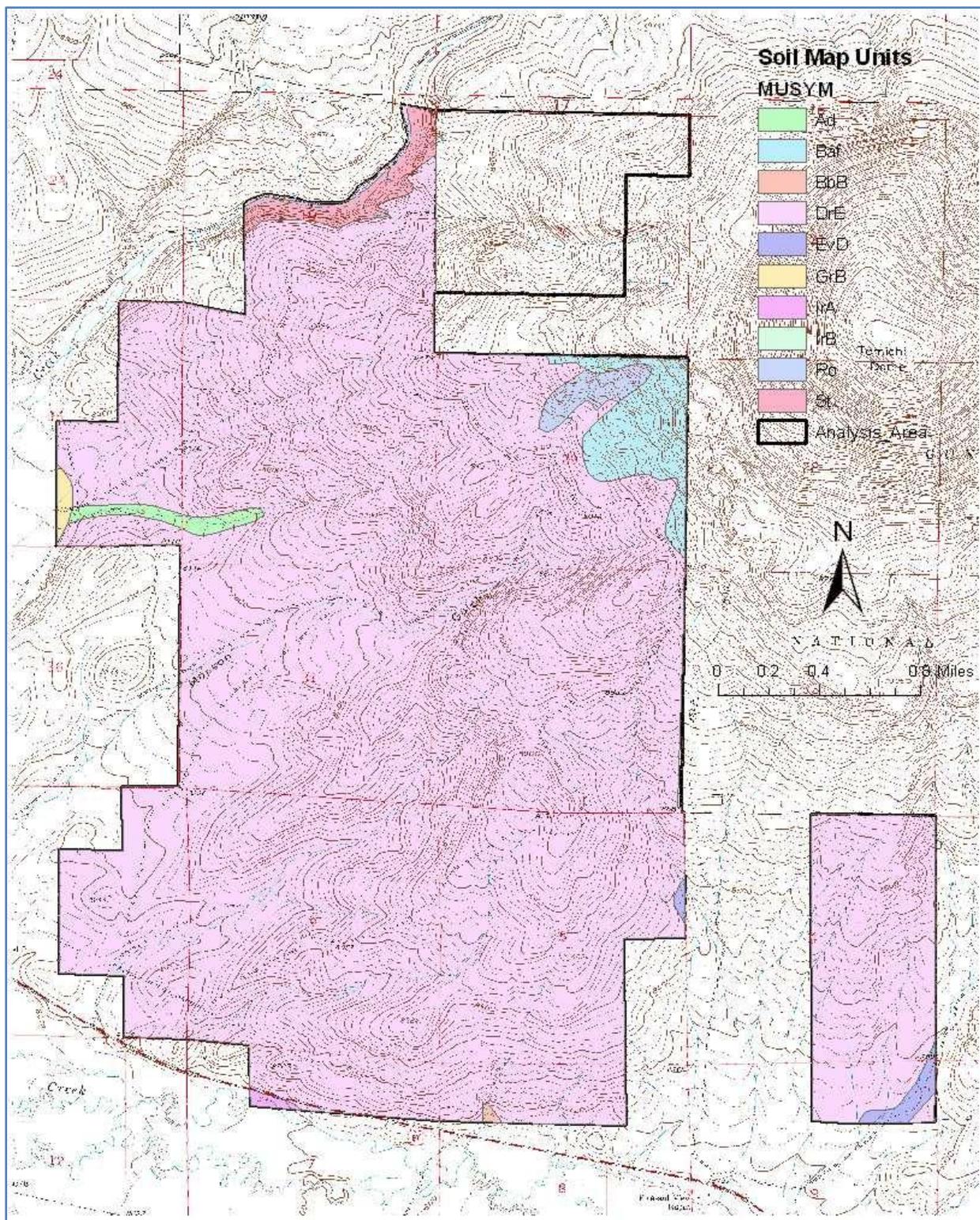


Figure 12. Soil Map units within Tomichi Geothermal Lease Area.

Table 10. Soil Map Key to Figure 1 and erosion properties of soil map units.

MUSYM	Name	Area (acres)	Percentage (%)	Kw		Wind Erodibility Index	Wind Erodibility Group
				low	high	#	Annual Tons
Ad	Alluvial land	7.4	0.1	0.05	0.28	5	56
BaF	Bead fine sandy loam, 10 to 50 percent slopes	60.4	1.2	0.05	0.28	3	86
BbB	Big Blue loam, 1 to 5 percent slopes	4830.5	94.3	0.17	0.24	8	0
DrE	Duffson- Corpening loams, 5 to 35 percent slopes	152.7	3.0	0.28	0.43	6	48
EvD	Evanston loam, 5 to 20 percent slopes	9.4	0.2	0.24	0.43	6	48
GrB	Gold Creek silty clay loam, 0 to 5 percent slopes	27.6	0.5	0.05	0.28	4L	86
IrA	Irim loam, 0 to 1 percent slopes	21.1	0.4	0.15	0.24	8	0
IrB	Irim	5.3	0.1	0.15	0.24	8	0
Ro	Rock outcrop	4.0	0.1			8	0
St	Stony Rock Land	2.2	<0.1			8	0
Total		5120.7					

Wind Erosion

Wind erodibility index provides an indicator for soil erosion due to wind. Average annual erosion (tons/year) from wind is measured by wind erodibility group. These two soil properties are important for soil productivity, and also for air quality, in mitigating emissions of fugitive dust from the removal of vegetation (see air quality section). A high wind erodibility value indicates that the surface soils are less susceptible to soil erosion and the converse holds true. Ninety-five percent of the soils have a wind erodibility of 8 and one percent has a wind erodibility of 3.

Potential Erosion Hazard

Potential soil erosion from sheet erosion and rill erosion was determined via GIS by assessing the slopes and the erosion K factor (Kw). Erosion K factor (Kw) “indicates the erodibility of the whole soil (NRCS, 2010).” The NRCS uses this erosion factor and slope to develop erosion hazard ratings. The erodibility factor "Kw", is a function of the texture, organic-matter content, structure, and permeability of the soil or surface material. The presence of coarse sized material (gravel, stones etc. > 2mm diameter) at the surface acts to reduce “Kw” by providing a degree of protective cover that is resistant to raindrop impact. “Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water (NRCS, 2010).” Ninety-seven percent of soils within the lease area have a Kw less than 0.29 (Table 10). Soil map units Duffson-Corpening loams, 5 to 35 percent and Evanston loam, 5 to 20 percent are the two soil map units with a Kw greater than 0.28 (Table 10).

For the most part, slope plays the larger role in determining potential erosion hazard. Slopes, measured in percent, vary throughout the potential geothermal lease area. Closer to Highway 50 are lower gradient slopes and steeper slopes are generally found closer to Tomichi Dome and along the east side of Hot Springs Creek (Figure 13). Breakdown of slopes within the area are listed below:

- 45% of the area has a slope less than 15%.
- 43% of the area has a slope between 15% and 30%.
- 12% of the area has a slope greater than 30%.

Table 11 summarizes the ratings for determining potential soil erosion hazard. One hundred seventy-three (173) acres of land within the analysis area have an erosion hazard rating of severe or very severe. Listed below are the definitions of these erosion hazard ratings:

- Severe—Erosion is very likely; control measures for vegetation re-establishment on bare areas and structural measures are advised.
- Very Severe—Significant erosion is expected; loss of soil productivity and off-site damages are likely; control measures are costly and generally impractical (NRCS, 1998).

Table 11. Soil Rating Criteria for Potential Erosion Hazard (Off of Roads and Trails)

Soil Erodibility Factor	Percent slope			
	Slight	Moderate	Severe	Very Severe
Kw < 0.35	0-14	15-35	36-50	>50
Kw >= 0.35	0-9	10-25	26-40	>40

Source: Exhibit 537-3 in NRCS (1998).

Areas with Chronic Erosion including Gullies

Gullies are defined as the erosion of soil or soft rock material by concentrated flow, subsequently forming distinct, narrow channels deeper than one foot. Rills form from the same processes but are less than one foot in depth. Ten areas of chronic erosion were mapped, of which 7 are gullies

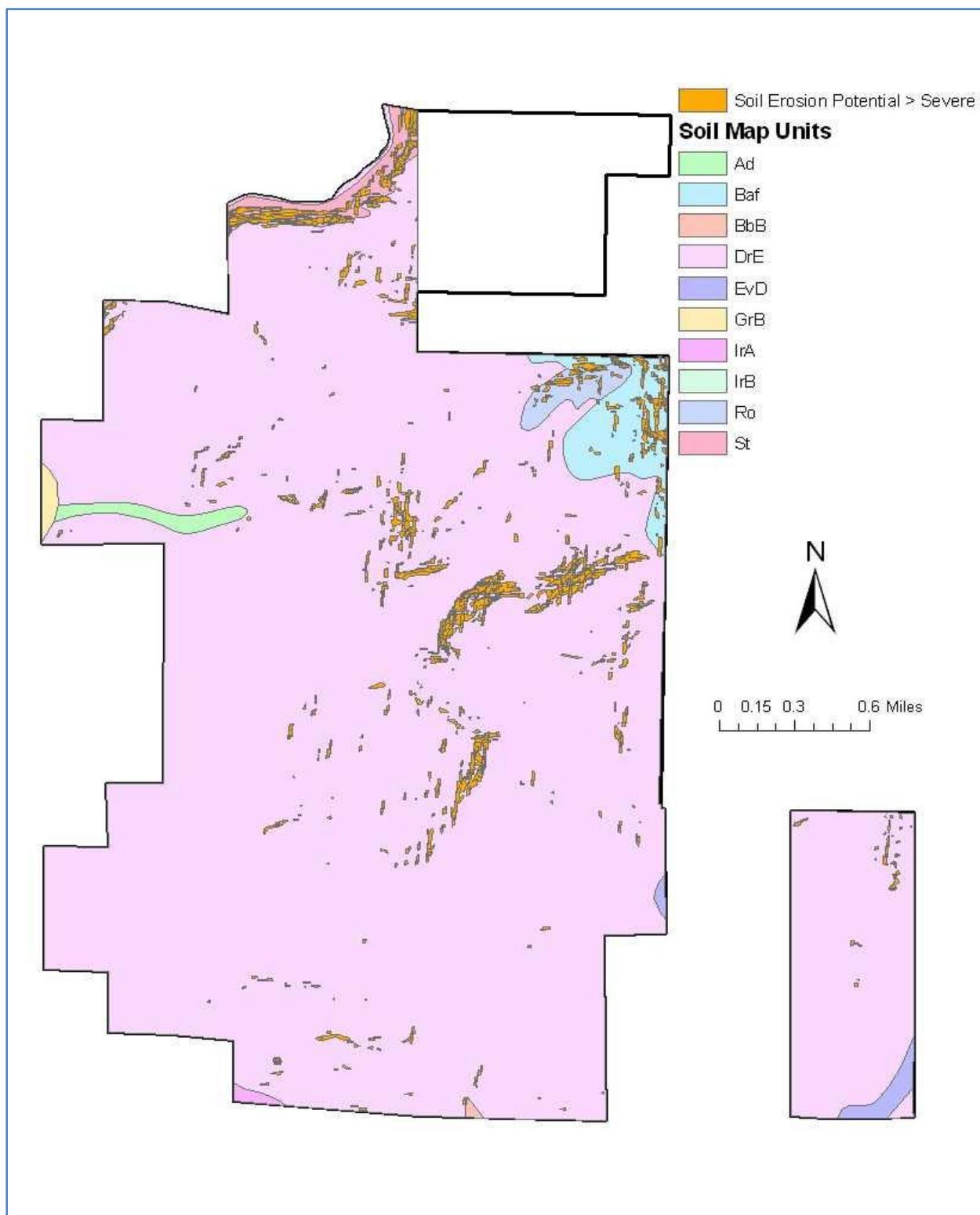


Figure 13. Areas with severe and very severe erosion potential within the Tomichi Geothermal Lease Area.

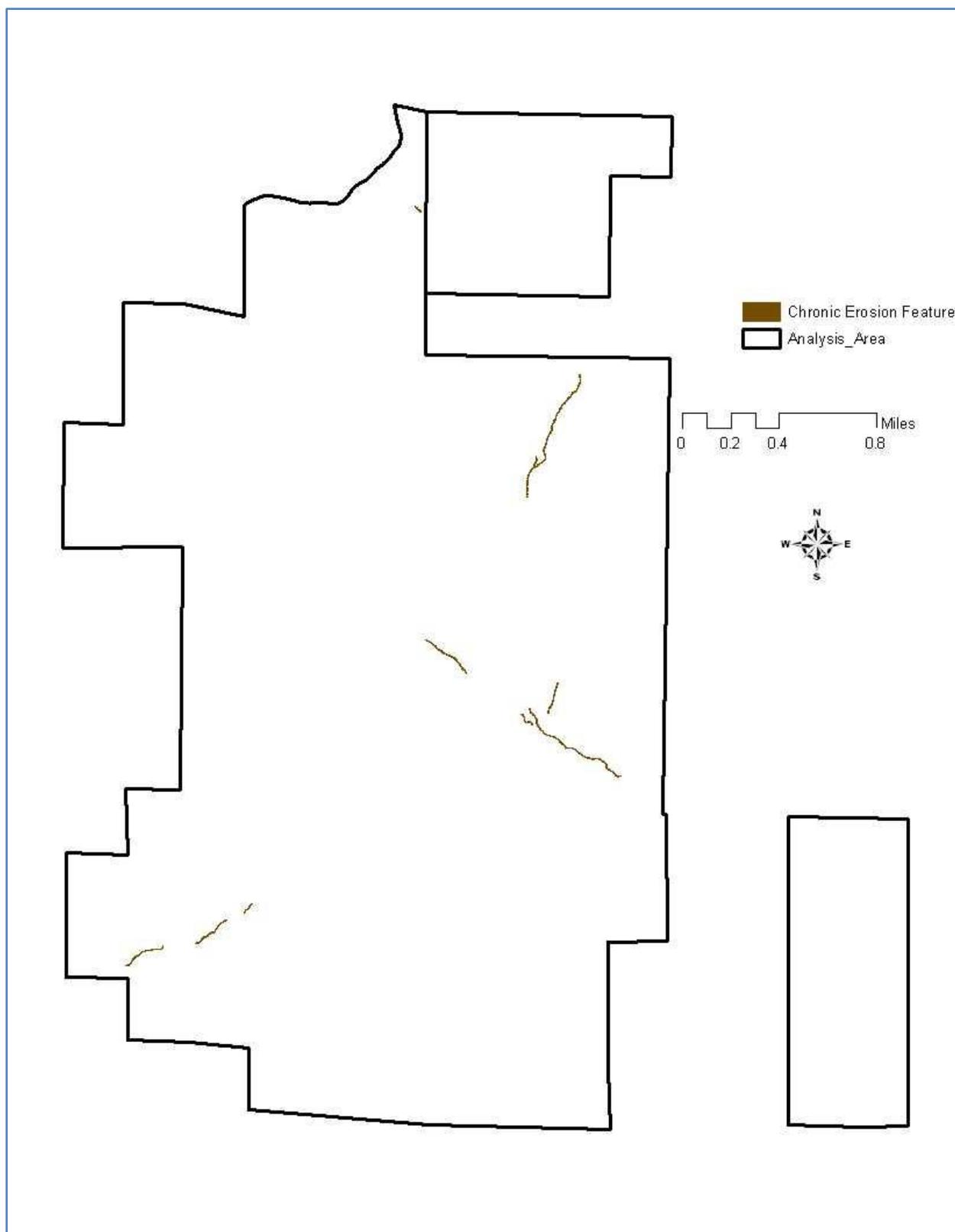


Figure 14. Chronic erosion features within the geothermal analysis area.

(Figure 14). Most of these features have vegetative cover that prevents further erosion. Any loss of vegetation especially on steeper slopes is risk for increased erosion and enlargement of these rills and gullies. Total area of rills and gullies encompasses 1.6 acres. Listed below are average dimensions of the erosional features:

- 4.1 feet in depth.
- 6.1 feet in width.
- 9.7 % in gradient.

3.4.2 Environmental Effects/Mitigation:

The effects of each alternative on soils with severe and very severe erosion hazard; and areas with chronic erosion including gullies will be discussed together. Alternatives 1, 2, and 3 are analyzed collectively, as are alternatives 4 and 5. The effects of the first three alternatives on soils with severe and very severe erosion hazard; and areas with chronic erosion including gullies are the same, while the same holds true for Alternatives 4 and 5.

As previously mentioned throughout this EA, no surface disturbance would be authorized to occur as a result from any of these alternatives. The main differences between the alternatives are the types of protection measures for each resource that would be applied to any subsequent ground-disturbing activities authorized by BLM after further site-specific environmental analysis.

Alternatives 1, 2, and 3

Alternatives 1, 2, and 3 provide the second highest level of protection to erosive soils, which are gullies or those that have a high potential for erosion. An erosion hazard rating of severe or very severe indicates a high potential for erosion from the loss of ground or canopy cover or other disturbance. Under these three alternatives, there would be no surface occupancy of 173 acres of soils with an erosion hazard rating of severe and very severe. As a result, ground and canopy cover would be maintained and there would be a low risk of accelerated erosion, such as rills and gullying from these areas on soils with a high potential for erosion.

No surface occupancy would occur within 50 feet or 100 feet of gullies, which have an area of 1.4 acres. The buffer depends on the adjacent and surrounding slopes. If surrounding slopes are less than 30%, a 50 foot buffer around the gullies would be implemented. A 100 foot buffer would apply to adjacent slopes in excess of 30%. Protective ground cover, which allows for the infiltration of precipitation and reduces runoff velocities, would remain intact. As a result, there is a low risk of enlargement of these gullies and the loss of soil productivity.

Alternatives 4 and 5

Alternatives 4 and 5 would provide the highest protection to erosive soils, which are gullies or those that have a high potential for erosion, as no surface disturbance would occur or no lease would be issued and the area would be closed to geothermal exploration and development. Consequently, potential or future exploration and development of geothermal resources would not occur and there would be no risk of accelerated soil erosion on areas with gullies or soils with a high erosion potential.

3.5 GEOLOGY, PARTICULARLY AREAS OF GEOLOGIC HAZARD

The RMP does not include any stipulations that address areas of geologic hazard, such as landslides. Specific concerns include:

- Potential impacts from the siting of roads and facilities associated with geothermal resources on geologic hazards, which could result in loss of human life, property, and cause damage to resources.

3.5.1 Affected Environment:

In addition to the 630 acres of slopes of 30% (17°) or greater, there are approximately 130 acres of identified geologic hazards, which consist of landslide deposits from the adjacent Tomichi Dome. The areas were identified using topographic maps, aerial photographs, geologic data and field observations and then compiling the data using GIS technology. There are currently two small road segments located within the identified hazards; these road segments are in poor condition even from minimal vehicle use. Roads or facilities located on the geologic hazards would be subject to failure or damage due to the unstable nature of the hazards and cause subsequent damage to other resources.

3.5.2. Environmental Consequences/Mitigation:

3.5.2.1 Alt. 1 Proposed Action (Lease with Existing and Additional Stipulations)

Direct and Indirect Effects

Construction of roads or facilities in the areas of identified geologic hazards would require disturbance of the geologic hazards. These disturbances would make the hazards unstable, resulting in potential damage to the constructed roads or facilities; over time, the unstable slides would move, causing additional resource damage. The lease should therefore stipulate that these areas are to be excluded from development of the proposed lease area.

Cumulative Effects

The addition of additional roads or facilities within the identified areas of geologic hazards would cause more instability of the area. With the lease stipulation, however, there would be no cumulative effects since the areas of geological hazards would be excluded from the construction of roads or facilities.

3.5.2.2 Alt. 2 Lease with Existing Stipulations (No Action Alternative)

Direct and Indirect Effects

Construction of roads or facilities in the areas of identified geologic hazards would require disturbance of the geologic hazards. These disturbances would make the hazards unstable, resulting in potential damage to the constructed roads or facilities; over time, the unstable slides would move, causing additional resource damage. There are currently no stipulations preventing development of roads or facilities on geologic hazards.

Cumulative Effects

The addition of additional roads or facilities within the identified areas of geologic hazards would cause more instability of the area.

3.5.2.3 Alt. 3 Lease with Existing and Additional NSO Stipulations for All Gunnison sage-grouse leks

Direct and Indirect Effects

Alternative 3 would have the same direct and indirect effects as Alternative 1, the Proposed Action.

Cumulative Effects

Alternative 3 would have the same cumulative effects as the proposed action.

3.5.2.4 Alt. 4 Lease with Existing and Additional NSO Stipulations for Occupied Gunnison Sage-grouse Habitat

Direct and Indirect Effects

Alternative 4 would have no effect as there would be no surface disturbance.

Cumulative Effects

Alternative 4 would have no cumulative effects as there would be no surface disturbance.

3.5.2.5 Alt. 5 Close to Leasing

Direct and Indirect Effects

Alternative 5 would have no effect as there would be no geothermal leasing.

Cumulative Effects

Alternative 5 would have no effects as there would be no geothermal leasing.

3.6 CULTURAL RESOURCES

The RMP includes stipulations that address protection of cultural and archaeological resources, including sites eligible for the National Register of Historic Places, traditional cultural properties, and Native American sacred sites. Specific concerns include:

- Potential impacts to cultural and archaeological resources.

3.6.1 Affected Environment:

The cultural resources in the Gunnison Field Office (GUFO) span approximately 12,000 years and are represented by Paleo-Indian, Archaic, Formative, Ute and Euro-American cultures. Sites include lithic scatters, quarries, temporary camps, extended camps, village, rock shelters, rock art, wickiups, scarred trees, hunting sites, kill/butchering sites, processing areas, tree platforms, eagle traps, vision quest sites, caves, trails, roads, water resource sites, homesteads, ranches, cabins, mills, railroads, transmission lines, mines, trash dumps, aspen art, isolated artifacts, graves, etc. More specifically, the known cultural resources within the analysis area include a diverse array of prehistoric and historic archaeological sites that make up a unique cultural landscape. Prehistoric site types include open lithic and open camp sites. A high proportion of these sites date to the Archaic and the potential for the creation of an archaeological district exists. Historic site types include homestead and ranch complexes, transmission lines, and a

cemetery. In addition, a segment of the Old Spanish Trail – Northern Branch is located approximately 3 miles west of the southwestern edge of the proposed lease area boundary.

Cultural resource information was reviewed and analyzed for the Area of Potential Effect (APE), which is defined as all BLM lands in the analysis area. Recently, two 1,000-acre inventories were completed in the proposed APE and in adjacent areas defined as having a medium to high potential for geothermal activity to occur (BLM, 2010) thus greatly increasing the cultural resource information of the area. To date, 1,904 acres (34%) of the total 5,530 acres in the analysis area have been surveyed at the Class III (most intensive) level. The remaining acres lacking inventory were compared with similar nearby areas. This analysis included an assessment of elevation, topography, vegetation and water resources. From this analysis a cultural sensitivity model was developed that can assist in predicting the potential for occurrences of cultural resources within the areas that have not been previously inventoried (RMC 2009).

The analysis area contains historic resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, and other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect cultural properties eligible to the National Register of Historic Places (NRHP) until it completes its obligations under applicable requirements of the NHPA and other authorities. Once a project specific proposal is submitted, an additional Section 106 cultural resource assessment would be completed where site-specific issues would be addressed as appropriate. 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.

Based on the results of previous cultural resource inventories, the potential for locating additional cultural resources within the APE ranges from low to high. Analysis of the impacts of the Reasonably Foreseeable Development Scenario (BLM, 2010) on both identified and unidentified cultural properties resulted in the recommendation of a No Surface Occupancy stipulation within the boundaries of cultural resources determined to be eligible for listing on the NRHP.

Native American Religious Concerns

The following tribes were notified of the geothermal lease analysis via certified letter and map package on March 9, 2010: the Ute Indian Tribe, the Southern Ute Indian Tribe, and the Ute Mountain Ute Indian Tribe. They were asked to identify traditional cultural places or any other areas of traditional cultural importance that need to be considered within the area of potential effect. The BLM-GUFO did not receive any comments or concerns from the three tribes. However, comments were received by the USFS concerning the adjoining lease area managed by the USFS. In a phone call to the USFS Tribal Liaison, the Ute Mountain Ute Tribal Historic Preservation Officer (THPO) stated the proposed lease area is within an archaeologically sensitive area that includes Tomichi Dome and its nearby hot springs. Although not designated a Traditional Cultural Property (TCP), the Upper and Lower Waunita Hot Springs qualify as a TCP and the integrity of the springs needs to be maintained. The dome itself was probably used

as a “migration marker” and the Ute Mountain Utes feel that any construction around it would “reshape the landscape.” (Crum, 2010)

With these concerns raised, the BLM will continue tribal consultation specific to any potential subsequent geothermal exploration, drilling, utilization, and/or reclamation and abandonment activities in the analysis area.

3.6.2 Environmental Effects/Mitigation:

3.6.2.1 Alt. 1 Proposed Action (Lease with Existing and Additional Stipulations)

Direct and Indirect Effects

All subsequent ground disturbing activities are subject to Section 106 of the NHPA. Under the provision of Section 106 and its implementing regulations (36CFR800), the BLM is required to identify, evaluate, and mitigate effects to historic and prehistoric properties within the APE for any undertaking. An intensive cultural inventory would be conducted over all ground disturbing project areas within the proposed lease. Results would be evaluated and mitigated so that effects and impacts of the undertaking would be minimized. Per existing stipulations, all eligible and listed cultural resources would be avoided within the proposed lease area.

A visual assessment would be required for subsequent activities to determine whether or not the activity would adversely affect the visual integrity of the North Branch of the Old Spanish Trail.

Cumulative Effects

With the lease stipulations regarding the protection of cultural resources, there would be no cumulative effects since all significant resources would be avoided.

3.6.2.2 Alt. 2 Lease with Existing Stipulations (No Action Alternative)

Direct and Indirect Effects

Alternative 2 would have the same direct and indirect effects as the proposed action

Cumulative Effects

Alternative 2 would have the same cumulative effects as the proposed action.

3.6.2.3 Alt. 3 Lease with Existing and Additional NSO Stipulations for All Gunnison sage-grouse leks

Direct and Indirect Effects

Alternative 2 would have the same direct and indirect effects as the proposed action

Cumulative Effects

Alternative 2 would have the same cumulative effects as the proposed action.

3.6.2.4 Alt. 4 Lease with Existing and Additional NSO Stipulations for Occupied Gunnison Sage-grouse Habitat

Direct and Indirect Effects

Alternative 4 would have no effect as there would be no surface disturbance.

Cumulative Effects

Alternative 4 would have no cumulative effects as there would be no surface disturbance.

3.6.2.5 Alt. 5 Close to LeasingDirect and Indirect Effects

Alternative 5 would have no effects as there would be no geothermal leasing.

Cumulative Effects

Alternative 5 would have no effects as there would be no geothermal leasing.

3.7 CUMULATIVE IMPACTS SUMMARY:

The cumulative impacts are the impacts on the environment which result from the incremental impacts of the proposed action or alternatives when added to other past, present, and reasonably foreseeable future actions.

Known past activities in the analysis area and adjacent private and Forest Service lands in sagebrush habitats include:

- livestock grazing
- vegetation treatments, including:
 - Lawson aerator treatments with subsequent seeding (approximately 360 acres on BLM lands in 2003-04)
 - Lawson aerator treatments with subsequent seeding on adjacent private lands (approx. 60 acres in 2004)
 - fertilization (approx. 200 acres on BLM lands in 1996)
 - seeding (approx. 20 acres on BLM lands in 1991)
 - seeding meadow-sagebrush interface areas on adjacent private lands (approx. 110 acres in 2006)
 - prescribed burns on adjacent private and Forest Service lands in 1989 and 1983, respectively
 - sagebrush control via 2,4-D application on adjacent private and Forest Service lands (approx. 1,220 acres in 1984-86)

Current activities include:

- livestock grazing
- 2-track roads
- fences
- overhead electric lines
- recreation, primarily during hunting season

Reasonably foreseeable activities related to the potential geothermal lease development include those impacts described in the RFDS. These impacts include those related to geothermal development of the nominated BLM, Forest Service, and private lands. Again, it must be

emphasized that the reasonably foreseeable development projections of future activity presented are forecasted activities, and should not be considered to be worst-case scenarios or threshold for development, but reasonable and science-based projections of anticipated activity that use logical and technically based assumptions to make those projections (BLM, 2010).

4 CONSULTATION AND COORDINATION:

The following tribes, individuals, organizations, and agencies were sent a joint BLM/Forest Service scoping letter on February 24, 2010.

NORTHERN UTE TRIBE
UTE MOUNTAIN UTE TRIBE

SOUTHERN UTE TRIBE

SENATOR MICHAEL BENNET
STATE SENATOR GAIL SCHWARTZ
REPRESENTATIVE JOHN SALAZAR

SENATOR MARK UDALL
STATE REPRESENTATIVE KATHLEEN CURRY

BOARD OF GRAZING ADVISORS
GUNNISON BASIN WEED COMMISSION
GUNNISON COUNTY
HINSDALE COUNTY
TOWN OF LAKE CITY
USDI FISH AND WILDLIFE SERVICE
US EPA REGION 8
WSC DEPT OF NATURAL AND ENVIRONMENTAL SCIENCES

CSU COOPERATIVE EXTENSION SERVICE
GUNNISON CITY MANAGER
GUNNISON COUNTY PUBLIC WORKS DEPT
SAGUACHE COUNTY
USDA NRCS
USDI NATIONAL PARK SERVICE
WSC DEPT OF ENVIRONMENTAL STUDIES

AMERICAN LANDS ALLIANCE
CENTER FOR NATIVE ECOSYSTEMS
COLORADO ENVIRONMENTAL COALITION
COLORADO NATIVE PLANT SOCIETY
COLORADO OUTFITTERS ASSOCIATION
COLORADO TRAIL RIDERS
CU SCIENCE DISCOVERY
ENVIRONMENTAL DEFENSE FUND
FLINT GEOTHERMAL
GRAND VALLEY AUDUBON SOCIETY
GUNNISON COUNTRY TIMES
GUNNISON COUNTY STOCKGROWERS ASSOC, INC
GUNNISON COUNTY TRAILS COMMISSION
LAKE CITY SNOWMOBILE CLUB
LOBO OUTFITTERS
NATURAL RESOURCES DEFENSE COUNCIL
OFFICE FOR RESOURCE EFFICIENCY
WILLIAM M PARKER
QUIET USE COALITION
ROCKY MOUNTAIN BIOLOGICAL LAB
SIERRA CLUB - UNCOMPAHGRE GROUP
SIERRA CLUB - ROCKY MTN CHAPTER
SISK-A-DEE
THEODORE ROOSEVELT CONSERVATION PARTNERSHIP
TROUT UNLIMITED

BLUE MESA 4-WHEELERS
COLORADO CATTLEMAN'S ASSOCIATION
COLORADO MOUNTAIN CLUB
COLORADO OFF-HWY VEHICLE COALITION
COLORADO TRAIL FOUNDATION
COLORADO WILD
DEFENDERS OF WILDLIFE
ENVIRONMENT COLORADO
FOSSIL RIDGE TRAILRIDERS
GREAT OLD BROADS FOR WILDERNESS
GUNNISON COUNTY ELECTRIC ASSOC, INC
HIGH COUNTRY CITIZEN'S ALLIANCE
LAND AND WATER FUND
NATIONAL WILDLIFE FEDERATION
NEEDLE CREEK OUTFITTERS
PACIFIC LEGAL FOUNDATION
QWEST CORPORATION
RED MOUNTAIN PROJECT
ROCKY MTN RESOURCE MGMT SERVICES
SIERRA CLUB - COLORADO FIELD OFFICE
SIERRA CLUB - PIKE'S PEAK GROUP
THE NATURE CONSERVANCY
WESTERN COLORADO CONGRESS

WESTERN LAND EXCHANGE PROJECT
WILDEARTH GUARDIANS

O.A. PESNELL JR
IRBY RANCHES LLC
OWSLEY RANCH LLLP
DOUBLE HEART LODGE LLC
WAUNITA HOT SPRINGS RANCH INC
SUPERIOR OIL COMPANY
MICHAEL WILLIAM FANELLI ET AL
MICHAEL W BRENDLE ET AL
MEREDITH ANN FARMER TRUST
CHARLES E WILLIS
ROBERT M DRAKE ET AL
JACK AND JERRALYNN STEVENSON
WILEY COYOTE LAND MINING & EXPLORATION INC
CHRISTOPHER R NASH ET AL
CHARLES F HILL ET AL
RUSSELL W BARR ET AL
CONNIE AND ROGER CHESHIRE
DUANE AND IMBRA TARAMARCAZ
GREGORY KRUTHAAPT ET AL
TEM PROPERTIES LLC
CRAIG AND ALYSHA JACKSON
DAVID M NESBIT ET AL
ROBERT M RAINS ET AL
DANIEL AND JEANIE WOODBURY
RONALD LEE MCCUTCHIN
MICHAEL L WEIDLER

WESTERN WATERSHEDS PROJECT

TARAMARCAZ FAMILY TRUSTS
DAVID AND JAN NELSON
DOUBLE HEART LLC
MILE 200 LLC
DANNY J DYKSTRA, ET AL
WLM EXCHANGE INC
VERNIER CREDIT SHELTER TRUST
MARK M MATTHEWS ET AL
ALBERT O SINGLETON III
ANDREW HAGERTY ESTATE
JOY K CHRISTENSEN ET AL
JOHN ROBERT LARKEY ET AL
RIVER BROTHERS LLC
JOSEPH W WAKEFIELD ET AL
JACK W COFFEEN SR, ET AL
JACQUELINE R BARKER
JAMES R MENDONCA ET AL
JACKI OVERTON DEVOS
MARTHA E GRANTHAM
TAD J PUCKETT
GERALDINE N CAMERA
DAVID AND PAULINE OBEROSLER
PATRICIA A HOSTETLER REVOCABLE TRUST
CHARLES R WEIDLER ET AL

5 LIST OF PREPARERS:

<u>Name</u>	<u>Title</u>	<u>Area(s) of Responsibility</u>
Kristi Murphy	Recreation Planner	Wild and Scenic Rivers Wilderness Access and Transportation Recreation Visual Resources
Andrew Breibart	Hydrologist	Floodplains Water Quality Wetlands and Riparian Areas Aquatic Wildlife Hydrology and Water Rights Soils
Brian Brown	Forester	Forest Vegetation/Management
Tara deValois	Rangeland Management Specialist	Invasive, Non-Native Species Upland Vegetation Rangeland Management
Russell Japuntich	Wildlife Biologist	Migratory Birds

Dave Kinateder	Wildlife Biologist	Threatened, Endangered and Sensitive Species Terrestrial Wildlife Fire and Fuels Management Migratory Birds Threatened, Endangered and Sensitive Species
David Lazorchak Marnie Medina	Geologist Realty Specialist/NEPA Coordinator (IDT Leader)	Terrestrial Wildlife Geology and Minerals Lands Authorizations NEPA Hazardous Materials Environmental Justice Prime and Unique Farmlands
Elizabeth Francisco	Archaeologist	Cultural Resources Native American Religious Concerns Geology and Minerals Paleontology
Jake Schmalz	Rangeland Management Specialist	Invasive, Non-Native Species Upland Vegetation Rangeland Management
Brian Stevens	Prescribed Fire Specialist	Fire and Fuels Management

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APPENDIX A
INTERDISCIPLINARY TEAM ANALYSIS RECORD CHECKLIST

NUMBER: DOI-BLM-COS060-2010-OO30- EA

PROJECT NAME: Geothermal Lease Nomination, Gunnison County, CO

DETERMINATION OF STAFF: (Choose one of the following abbreviated options)

NP = not present in the area impacted by the proposed or alternative actions

NA = present, but not affected to a degree that detailed analysis is required

PA = present and requires further analysis because 1) analysis of the issue is necessary to make a reasoned choice between alternatives, or 2) analysis of the issue is necessary to determine the significance of impacts.

PHYSICAL RESOURCES			
Air Quality (Clean Air Act)	Determination	Signature	Date
	NA	Andrew Breibart	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.10 of the EA.		
Geology/Minerals	Determination	Signature	Date
	NA/PA	David Lazorchak	8/31/10
	Rationale for Determination: See the discussion under section 3.5 of the EA of geology, particularly areas of geologic hazard. Leasing geothermal rights would not have any effect on mineral resources in the analysis area. Any potential subsequent geothermal development activities would have little or no effect on mineral resources other than the geothermal resource.		
Paleontology	Determination	Signature	Date
	NA	Elizabeth Francisco	8/31/10
	Rationale for Determination: The analysis is not known to have a high potential for paleontological resources.		
Soils (includes Public Land Health Standard 1)	Determination	Signature	Date
	PA	Andrew Breibart	8/31/10
	Rationale for Determination: See the discussion under section 3.4 of the EA.		
Floodplains (EO11988)	Determination	Signature	Date
	NP	Andrew Breibart	8/31/10
	Rationale for Determination: There are no floodplains in the analysis area.		
Water Quality (drinking/ground) (Clean Water Act and others) (includes Public Land Health Standard 5)	Determination	Signature	Date
	PA	Andrew Breibart	8/31/10
	Rationale for Determination: See the discussion under section 3.3 of the EA.		

BIOLOGICAL RESOURCES			
Fire and Fuels Management	Determination	Signature	Date
	NA	Brian Stevens	8/31/10
	Rationale for Determination: Leasing geothermal rights would not have any effect on fire or fuels management in the analysis area. Any potential subsequent geothermal development activities would have little or no effect.		
Invasive, Non-native Species (Federal Noxious Weed Act and EO 13112)	Determination	Signature	Date
	NA	Gay Austin	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.5 of the EA and the lease notice under section 2.2.4.		
Forest Vegetation (includes Public Land Health Standard 3)	Determination	Signature	Date
	NA	Brian Brown	8/31/10
	Rationale for Determination: Leasing geothermal rights would not have any effect on forest vegetation in the analysis area. Any potential subsequent geothermal development activities would have little or no effect on forest vegetation in the analysis area. Most of the forested areas are within areas that would have a NSO lease stipulation applied.		
Upland Vegetation (includes Public Land Health Standard 3)	Determination	Signature	Date
	NA	Tara de Valois	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.4 of the EA.		
Threatened, Endangered, Candidate (ESA), and/or Sensitive Plant Species (includes Public Land Health Standard 4)	Determination	Signature	Date
	NA	Russell Japuntich	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.3 of the EA.		
Riparian Zones and Wetlands (EO 11990) (includes Public Land Health Standard 2)	Determination	Signature	Date
	PA	Andrew Breibart	8/31/10
	Rationale for Determination: See the discussion under section 3.3 of the EA.		
Wildlife (includes Public Land Health Standard 3)	Determination	Signature	Date
	NA	Russell Japuntich	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.2 of the EA of wildlife issues that were not analyzed in detail. See the lease notice under section 2.2.4 of the EA and the affected environment and environmental effects discussion under section 3.1 of big game winter range.		

Migratory Birds (EO 13186 and Migratory Bird Treaty Act)	Determination	Signature	Date
	NA	Russell Japuntich	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.1 of the EA.		
Threatened, Endangered, Candidate (ESA), and/or Sensitive Animal Species (includes Public Land Health Standard 4)	Determination	Signature	Date
	NA/PA	Russell Japuntich	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.3 of the EA of Canada lynx, Gunnison's prairie dog, and bald eagle, issues that were not analyzed in detail. See the affected environment and environmental effects discussion under section 3.2 of the EA of Gunnison sage-grouse and habitat.		
HERITAGE RESOURCES and HUMAN ENVIRONMENT			
Cultural Resources (National Historic Preservation Act)	Determination	Signature	Date
	PA	Elizabeth Francisco	8/31/10
	Rationale for Determination: See the lease notice under section 2.2.4 of the EA and the discussion under section 3.6.		
Environmental Justice (EO 12898)	Determination	Signature	Date
	NA	Marnie Medina	8/31/10
	Rationale for Determination: The proposed action has no disproportionate impact on any racial, ethnic, or socioeconomic group.		
Native American Religious Concerns (American Indian Religious Freedom Act)	Determination	Signature	Date
	PA	Elizabeth Francisco	8/31/10
	Rationale for Determination: See the lease notice under section 2.2.4 of the EA and the discussion under section 3.6.		
Socio-economics	Determination	Signature	Date
	NA	Marnie Medina	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.12 of the EA.		
Visual Resources	Determination	Signature	Date
	NA	Kristi Murphy	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.6 of the EA.		
Wastes (hazardous or solid) (RCRA and CERCLA)	Determination	Signature	Date
	NP	<i>David Lazorchak</i>	6/25/2010
	Rationale for Determination: There are no known wastes in the project area.		
LAND USES and SPECIAL DESIGNATIONS			
Areas of Critical Environmental Concern (FLPMA)	Determination	Signature	Date
	NP	Marnie Medina	8/31/10
	Rationale for Determination: There are no ACECs' in or adjacent to the analysis area.		

Farmlands (Prime or Unique) (SMCRA and Farmland Protection Policy Act)	Determination	Signature	Date
	NP	Marnie Medina	8/31/10
	Rationale for Determination: There are no prime or unique farmlands in the analysis area. The District Conservationist for the NRCS has determined that in Gunnison County there are only “Farmlands of Statewide Importance”, and only lands that are under irrigation fall into that category within the Important Farmland Inventory for the State of Colorado. There are no irrigated lands on public land in the analysis area.		
Lands/Realty Authorizations	Determination	Signature	Date
	NA	Marnie Medina	8/31/10
	Rationale for Determination: There are 7 rights-of-way authorized on BLM lands in the analysis area. Leasing geothermal rights would not have any effect on the existing authorized uses. BMP’s and permit conditions of approval, and coordination with the potentially affected ROW holder, would be implemented to ensure that any permitted geothermal activities would not unduly interfere with the existing authorized uses.		
Rangeland Management	Determination	Signature	Date
	NA	Tara de Valois	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.14 of the EA of livestock grazing.		
Recreation	Determination	Signature	Date
	NA	Kristi Murphy	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.8 of the EA.		
Access and Transportation	Determination	Signature	Date
	NA	Kristi Murphy	8/31/10
	Rationale for Determination: See the discussion under section 1.5.2.13 of the EA.		
Wild and Scenic Rivers (Wild and Scenic Rivers Act)	Determination	Signature	Date
	NP	Kristi Murphy	8/31/10
	Rationale for Determination: There are no Wild or Scenic rivers in the Gunnison Field Office.		
Wilderness (FLPMA and Wilderness Act)	Determination	Signature	Date
	NP	Kristi Murphy	8/31/10
	Rationale for Determination: There are no Wilderness Areas in or adjacent to the analysis area.		

FINAL REVIEW:

Reviewer Title	Signature	Date	Comments
NEPA Coordinator	Marnie Medina	10/12/10	
Field Manager	Brian St. George	10/13/10	

Appendix B: Best Management Practices (BLM, 2008b)

Best Management Practices are state-of-the-art mitigation measures applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse environmental or social impacts. They are applied to management actions to aid in achieving desired outcomes for safe, environmentally responsible resource development, by preventing, minimizing, or mitigating adverse impacts and reducing conflicts.

This appendix provides a list of sample BMPs that have been collected from various BLM and FS documents addressing geothermal and fluid mineral leasing and development, including resource management plans, forest plans, and environmental reports for geothermal leasing and development. The purpose of this appendix is to provide a list of recommended BMPs that would be incorporated as appropriate into the permit application by the lessee or would be included in the approved use authorization by the BLM as conditions of approval should a geothermal lease be issued. When implementing new BMPs, offices are encouraged to work with an affected lessee early in the process, to explain how BMPs may fit into their development proposals and how BMPs can be implemented with the least economic impact to the lessee. Offices should discuss potential resource impacts with the lessee and seek the operator's recommended solutions. The office should also encourage the lessee to incorporate necessary and effective BMPs into their project proposal. BMPs not incorporated into the permit application by the lessee may be considered and evaluated through the environmental review process and incorporated into the use authorization as conditions of approval or rights-of-way stipulations.

All offices will incorporate appropriate environmental BMPs into proposed use authorizations after appropriate environmental review. Environmental BMPs to be considered in nearly all circumstances include the following:

- Interim reclamation of well locations and access roads soon after the well is put into production;
- Painting of all new facilities a color that best allows the facility to blend with the background, typically a vegetated background;
- Design and construction of all new roads to a safe and appropriate standard, "no higher than necessary" to accommodate their intended use; and
- Final reclamation recontouring of all disturbed areas, including access roads, to the original contour or a contour that blends with the surrounding topography.

Other environmental BMPs are more suitable for consideration by an administrative unit on a case-by-case basis, (1) depending on their effectiveness, (2) the balancing of increased operating costs vs. the benefit to the public and resource values, (3) the availability of less restrictive mitigation alternatives that accomplish the same objective, and (4) other site-specific factors. Examples of typical, case-by-case BMPs are identified below.

Guidelines for applying and selecting project-specific requirements include determining whether the measure would (1) ensure compliance with relevant statutory or administrative requirements, (2) minimize local impacts associated with siting and design decisions, (3) promote post construction stabilization of impacts, (4) maximize restoration of previous habitat conditions, (5) minimize cumulative impacts, or (6) promote economically feasible development of geothermal energy on BLM-administered or FS-administered land.

The following typical BMPs provide the BLM, FS, industry, and stakeholders a menu of improved practices for developing geothermal energy and minimize impacts to the biophysical and cultural landscape. The list is extensive but is not meant to be all inclusive given the constant development of improved practices, diversity of the western states, and potential for unique site-specific conditions. Local land use plans may contain other BMPs that better address such unique situations. Where the BMPs presented here are inconsistent with or incompatible with those developed under a specific land use plan, the staff will conduct an environmental review to determine the appropriate practices.

Only those individual mitigation measures reasonably necessary to ensure environmentally responsible geothermal development should be selected from the list below. Not all of the individual mitigation measures below will apply in most situations and selection of appropriated BMPs and mitigation measures should be dependent on factors such as the project size, location, site-specific characteristics, and potential resource impacts. Prior to inclusion into a permit, the measures may be further modified to meet site-specific situations and agency requirements.

A menu of typical BMPs can also be found on the BLM Washington Office Fluid Minerals Web site at: www.blm.gov/bmp.

Note: The BMPs and mitigation measures are arranged from Information Collection and Monitoring to Final Reclamation and have been further subcategorized. While many of the BMPs and mitigation measures will apply to all phases of geophysical exploration and development; to avoid duplication, the measures are listed only once.

B.1 INFORMATION COLLECTION & MONITORING

B.1.1 General

- Prior to geothermal exploration and development, a complete subsurface geotechnical investigation will be conducted to analyze the soil and geologic conditions. The investigation will evaluate and identify potential geologic hazards and would provide remedial grading recommendations, foundation and slab design criteria, and soil parameters for the design of geothermal power infrastructure.
- The operator will collect available information describing the environmental and socio-cultural conditions in the vicinity of the proposed project and will provide the information to the agency.

- A monitoring program will be developed by the operator to ensure that environmental conditions are monitored during the exploration and well drilling, testing, construction, and utilization and reclamation phases. The monitoring program requirements, including adaptive management strategies, will be established at the project level to ensure that potential adverse impacts of geothermal development are mitigated. The monitoring program will identify the monitoring requirements for each major environmental resource present at the site, establish metrics against which monitoring observations can be measured, identify potential mitigation measures, and establish protocols for incorporating monitoring observations and additional mitigation measures into ongoing activities. The operator will provide results of the monitoring program to the agency in an annual report.
- The operator will comply with the Secretary of Agriculture's rules and regulations for all use and occupancy of the NFS lands prior to approval of an exploration plan by the Secretary of Interior and for uses of all existing improvements, such as forest development roads, within and outside the area permitted by the Secretary of Interior; and use and occupancy of the NFS lands not authorized by an exploration plan approved by the Secretary of Interior.

B.1.2 Paleontological and Cultural Resources

- Before any specific permits are issued under leases, treatment of cultural resources will follow the procedures established by the Advisory Council on Historic Preservation for compliance with Section 106 of the National Historic Preservation Act. A pedestrian inventory will be undertaken of all portions that have not been previously surveyed or are identified by BLM as requiring inventory to identify properties that are eligible for the National Register of Historic Places (NRHP). Those sites not already evaluated for NRHP eligibility will be evaluated based on surface remains, subsurface testing, archival, and/or ethnographic sources. Subsurface testing will be kept to a minimum whenever possible if sufficient information is available to evaluate the site or if avoidance is an expected mitigation outcome. Recommendations regarding the eligibility of sites will be submitted to the BLM, and a treatment plan will be prepared to detail methods for avoidance of impacts or mitigation of effects. The BLM will make determinations of eligibility and effect and consult with SHPO as necessary based on each proposed lease application and project plans. 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. Avoidance of impacts through project design will be given priority over data recovery as the preferred mitigation measure. Avoidance measures include moving project elements away from site locations or to areas of previous impacts, restricting travel to existing roads, and maintaining barriers and signs in areas of cultural sensitivity. Any data recovery will be preceded by approval of a detailed research design, Native American Consultation, and other requirements for BLM issuance of a permit under the Archaeological Resources Protection Act (BLM 2007a).

- If cultural resources are present at the site, or if areas with a high potential to contain cultural material have been identified, a cultural resources management plan (CRMP) will be developed. This plan will address mitigation activities to be taken for cultural resources found at the site. Avoidance of the area is always the preferred mitigation option. Other mitigation options include archaeological survey and excavation (as warranted) and monitoring. If an area exhibits a high potential, but no artifacts were observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area. A report will be prepared documenting these activities. The CRMP also will (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land (BLM 2005).
- Operators will determine whether paleontological resources exist in a project area on the basis of the sedimentary context of the area, a records search for past paleontological finds in the area, and/or, depending on the extent of existing information, a paleontological survey.
- If paleontological resources are present at the site, or if areas with a high potential to contain paleontological material have been identified, a paleontological resources management plan will be developed. This plan will include a mitigation plan for avoidance, removal of fossils, or monitoring. If an area exhibits a high potential but no fossils were observed during survey, monitoring by a qualified paleontologist may be required during excavation and earthmoving in the sensitive area. The operator will submit a report to the agency documenting these activities. The paleontological resources management plan also will (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of fossils on public land.

B.1.3 Water Resources

- In coordination with State regulatory agencies the operator will comply with all State and Federal surface and ground water rules and regulations for all phases of geothermal exploration, development, and reclamation.
- Operators will develop a storm water management plan for the site to ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion.
- Operators will gain a clear understanding of the local hydrogeology. Areas of groundwater discharge and recharge and their potential relationships with surface water bodies will be identified.

- Operators will avoid creating hydrologic conduits between discrete aquifers during foundation excavation and other activities.
- Freshwater-bearing and other usable water aquifers will be protected from contamination by assuring all well casing (excluding the liner) is required to be cemented from the casing shoe to the surface.
- Periodic testing and monitoring via observation wells will be conducted in a manner to assure maximum protection of water resources from geothermal fluids or alterations in reservoir pressure.

B.1.4 Vegetation and Fish and Wildlife

- The operator will conduct surveys for plant and animal species that are listed or proposed for listing as threatened or endangered and their habitats in areas proposed for development where these species could potentially occur, following accepted protocols and in consultation with the USFWS or NMFS, as appropriate. Particular care should be taken to avoid disturbing listed species during surveys in any designated critical habitat. The operator will monitor activities and their effects on ESA-listed species throughout the duration of the project.
- The operator will identify important, sensitive, or unique habitat and biota in the project vicinity and site and should design the project to avoid (if possible), minimize, or mitigate potential impacts on these resources. The design and siting of the facilities will follow appropriate guidance and requirements from the BLM, FS, and other resource agencies, as available and applicable.

B.1.5 National Scenic and Historic Trails

- When any right-of-way application includes remnants of a National Historic Trail, is located within the viewshed of a National Historic Trail's designated centerline, or includes or is within the viewshed of a trail eligible for listing on the NRHP, the operator will evaluate the potential visual impacts to the trail associated with the proposed project and identify appropriate mitigation measures for inclusion in the operation plan.

B.1.6 Air Quality and Climate

- The operator will coordinate with the [State Air Quality Division] to develop and implement an air quality monitoring plan.

B.2 PLANNING, LOCATION, AND DESIGN

B.2.1 Traffic Planning

- Operators will consult with local planning authorities regarding increased traffic prior to the construction phase, including an assessment of the number of vehicles per day, their

size, and type. Specific issues of concern (e.g., location of school bus routes and stops) will be identified and addressed in the traffic management plan.

B.2.2 Roads & Pads

- To plan for efficient use of the land, necessary infrastructure will be consolidated wherever possible.
- Existing roads and pad sites will be used to the maximum extent feasible, but only if located in a safe and environmentally sound location. No new roads and pad sites will be constructed without agency authorization. If new roads and pad sites have been authorized, they will be designed and constructed by the operator to the appropriate agency standard, no higher than necessary to accommodate their intended function. Roads and pad sites will be routinely maintained by the operator maintain public safety and to minimize impacts to the environment such as erosion, sedimentation, fugitive dust, loss of vegetation.
- An access road siting and management plan will be prepared incorporating existing Agency standards regarding road design, construction, and maintenance such as those described in the
- A traffic management plan will be prepared for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan will incorporate measures such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configuration.
- Where possible, access roads will be located to follow natural contours and minimize side hill cuts and fills. Excessive grades on roads, road embankments, ditches, and drainages will be avoided, especially in areas with erodible soils.
- Roads will be designed so that changes to surface water runoff are minimized and new erosion is not initiated.
- Access roads will be located to minimize stream crossings. All structures crossing streams will be located and constructed so that they do not decrease channel stability or increase water velocity. Operators will obtain all applicable federal and state water crossing permits.
- Roads will be located away from drainage bottoms and avoid wetlands, if practicable.

B.2.3 Geotechnical Analysis

- The operator will perform a detailed geotechnical analysis prior to the construction of any structures; so they will be sited to avoid any hazards from subsidence or liquefaction (i.e.,

the changing of a saturated soil from a relatively stable solid state to a liquid during earthquakes or nearby blasting).

B.2.4 Visual Mitigation

- The operator will incorporate visual design considerations into the planning and design of the project to minimize potential visual impacts of the proposal and to meet the Visual Resource Management objectives of the area and the agency.

B.2.5 Visual Design Considerations

- Construct low-profile structures whenever possible to reduce structure visibility.
- Select and design materials and surface treatments to repeat or blend with landscape elements.
- Site projects outside of the viewsheds of publically accessible vantage points, or if this cannot be avoided, as far away as possible;
- Site projects to take advantage of both topography and vegetation as screening devices to restrict views of projects from visually sensitive areas;
- Site facilities away from and not adjacent to prominent landscape features (e.g., knobs and water features);
- Avoid placing facilities on ridgelines, summits, or other locations such that they will be silhouetted against the sky from important viewing locations;
- Collocate facilities to the extent possible to use existing and shared rights-of-way, existing and shared access and maintenance roads, and other infrastructure to reduce visual they do not bisect ridge tops or run down the center of valley bottoms.
- Site linear features (aboveground pipelines, rights-of-way, and roads) to follow natural land contours rather than straight lines (particularly up slopes) when possible. Fall-line cuts should be avoided.
- Site facilities, especially linear facilities, to take advantage of natural topographic breaks (i.e., pronounced changes in slope) to avoid siting facilities on steep side slopes.
- Where available, site linear features such as rights-of-ways and roads to follow the edges of clearings (where they will be less conspicuous) rather than passing through the centers of clearings.
- Site facilities to take advantage of existing clearings to reduce vegetation clearing and ground disturbance, where possible.

- Site linear features (e.g., trails, roads, rivers) to cross other linear features at right angles whenever possible to minimize viewing area and duration.
- Site and design structures and roads to minimize and balance cuts and fills and to preserve existing rocks, vegetation, and drainage patterns to the maximum extent possible.
- Use appropriately colored materials for structures or appropriate stains and coatings to blend with the project's backdrop. Refer to the Standard Environmental Colors chart available from the BLM.
- Use non-reflective or low-reflectivity materials, coatings, or paints whenever possible.
- Paint grouped structures the same color to reduce visual complexity and color contrast.
- Design and install efficient facility lighting so that the minimum amount of lighting required for safety and security is provided but not exceeded and so that upward light scattering (light pollution) is minimized. This may include, for example, installing shrouds to minimize light from straying off-site, properly directing light to only illuminate necessary areas, and installing motion sensors to only illuminate areas when necessary.
- Site construction staging areas and laydown areas outside of the viewsheds of publically accessible vantage points and visually sensitive areas, where possible, including siting in swales, around bends, and behind ridges and vegetative screens.
- Discuss visual impact mitigation objectives and activities with equipment operators prior to commencement of construction activities.
- Mulch or scatter slash from vegetation removal and spread it to cover fresh soil disturbances or, if not possible, bury or compost slash.
- If slash piles are necessary, stage them out of sight of sensitive viewing areas.
- Avoid installing gravel and pavement where possible to reduce color and texture contrasts with existing landscape.
- Use excess fill to fill uphill-side swales resulting from road construction in order to reduce unnatural-appearing slope interruption and to reduce fill piles.
- Avoid downslope wasting of excess fill material.
- Round road-cut slopes, vary cut and fill pitch to reduce contrasts in form and line, and vary slope to preserve specimen trees and nonhazardous rock outcroppings.
- Leave planting pockets on slopes where feasible.

- Combine methods of re-establishing native vegetation through seeding, planting of nursery stock, transplanting of local vegetation within the proposed disturbance areas and staging of construction enabling direct transplanting.
- Revegetate with native vegetation establishing a composition consistent with the form, line, color, and texture of the surrounding undisturbed landscape.”
- Provide benches in rock cuts to accent natural strata.
- Use split-face rock blasting to minimize unnatural form and texture resulting from blasting.
- Segregate topsoil from cut and fill activities and spread it on freshly disturbed areas to reduce color contrast and to aid rapid revegetation.
- Bury utility cables in or adjacent to the road where feasible.
- Minimize signage and paint or coat reverse sides of signs and mounts to reduce color contrast with existing landscape.
- Prohibit trash burning; store trash in containers to be hauled off-site for disposal.
- Undertake interim restoration during the operating life of the project as soon as possible after disturbances. During road maintenance activities, avoid blading existing forbs and grasses in ditches and along roads.
- Randomly scarify cut slopes to reduce texture contrast with existing landscape and to aid in revegetation.
- Cover disturbed areas with stockpiled topsoil or mulch, and revegetate with a mix of native species selected for visual compatibility with existing vegetation.
- Restore rocks, brush, and natural debris whenever possible to approximate preexisting visual conditions.

B.2.6 Air Quality and Climate

- The operator will prepare and submit to the agency an Equipment Emissions Mitigation Plan for managing diesel exhaust, An Equipment Emissions Mitigation Plan will identify actions to reduce diesel particulate, carbon monoxide, hydrocarbons, and nitrogen oxides associated with construction and drilling activities. The Equipment Emissions Mitigation Plan will require that all drilling/construction-related engines are maintained and operated as follows:

- Are tuned to the engine manufacturer's specification in accordance with an appropriate time frame.
- Do not idle for more than five minutes (unless, in the case of certain drilling engines, it is necessary for the operating scope).
- Are not tampered with in order to increase engine horsepower.
- Include particulate traps, oxidation catalysts, and other suitable control devices on all drilling/construction equipment used at the project site.
- Use diesel fuel having a sulfur content of 15 parts per million or less, or other suitable alternative diesel fuel, unless such fuel cannot be reasonably procured in the market area.
- Include control devices to reduce air emissions. The determination of which equipment is suitable for control devices should be made by an independent Licensed Mechanical Engineer. Equipment suitable for control devices may include drilling equipment, work over and service rigs, mud pumps, generators, compressors, graders, bulldozers, and dump trucks.

B.2.7 Health and Safety

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

safe work practices, security, heavy equipment transportation, traffic management, emergency procedures, and fire control.

- A health and safety program will be developed to protect both workers and the general public during construction and operation of geothermal projects.
- Regarding occupational health and safety, the program will identify all applicable federal and state occupational safety standards; establish safe work practices for each task (e.g., requirements for personal protective equipment and safety harnesses; Occupational Safety and Health Administration standard practices for safe use of explosives and blasting agents; and measures for reducing occupational electric and magnetic fields exposures); establish fire safety evacuation procedures; and define safety performance standards (e.g., electrical system standards and lightning protection standards). The program will include a training program to identify hazard training requirements for workers for each task and establish procedures for providing required training to all workers. Documentation of training and a mechanism for reporting serious accidents to appropriate agencies will be established.
- Regarding public health and safety, the health and safety program will establish a safety zone or setback for generators from residences and occupied buildings, roads, right-of-ways, and other public access areas that is sufficient to prevent accidents resulting from the operation of generators. It will identify requirements for temporary fencing around staging areas, storage yards, and excavations during construction or rehabilitation activities. It will also identify measures to be taken during the operation phase to limit public access to hazardous facilities (e.g., permanent fencing would be installed only around electrical substations, and facility access doors would be locked).
- Operators will consult with local planning authorities regarding increased traffic during the construction phase, including an assessment of the number of vehicles per day, their size, and type. Specific issues of concern (e.g., location of school bus routes and stops) will be identified and addressed in the traffic management plan.
- Operators will develop a fire management strategy to implement measures to minimize the potential for a human-caused fire.

B.2.8 Livestock Grazing

- The operator will coordinate with livestock operators to minimize impacts to livestock operations.

B.2.9 Noxious Weeds and Pesticides

- Operators will develop a plan for control of noxious weeds and invasive species, which could occur as a result of new surface disturbance activities at the site. The most recent recommendations at the state and local level should be incorporated into any operating plan for the geothermal exploration and development. The plan will address monitoring,

education of personnel on weed identification, the manner in which weeds spread, and methods for treating infestations. The use of certified weed-free mulching will be required. If trucks and construction equipment are arriving from locations with known invasive vegetation problems, a controlled inspection and cleaning area will be established to visually inspect construction equipment arriving at the project area and to remove and collect seeds that may be adhering to tires and other equipment surfaces.

- If pesticides are used on the site, an integrated pest management plan will be developed to ensure that applications would be conducted within the framework of all Federal, State, and local laws and regulations and entail only the use of EPA-registered pesticides.

B.2.10 Vegetation and Fish and Wildlife

- The operator will prepare a habitat restoration plan to avoid (if possible), minimize, or mitigate negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. The plan will identify revegetation, soil stabilization, and erosion reduction measures that will be implemented to ensure that all temporary use areas are restored. The plan will require that restoration occur as soon as possible after completion of activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.

B.3 CONSTRUCTION

B.3.1 Traffic Management

- Traffic will be restricted to the roads developed for the project. Use of other unimproved roads will be restricted to emergency situations.
- Signs will be placed along roads to identify speed limits, travel restrictions, and other standard traffic control information. Signs directing vehicles to alternative park access and parking will be posted in the event construction temporarily obstructs recreational parking areas near trailheads. Whenever active work is being performed, the area will be posted with “construction ahead” signs on any adjacent access roads or trails that might be affected.
- Project personnel and contractors will be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure safe and efficient traffic flow and to reduce wildlife collisions and disturbance and fugitive dust.
- When practical, construction activities will be avoided during high recreational use periods.

B.3.2 Roads & Pads

- The operator will obtain agency authorization prior to borrowing soil or rock material from agency lands.
- Road use will be restricted during the wet season if road surfacing is not adequate to prevent soil displacement, rutting, etc., and resultant stream sedimentation.
- Access roads and on-site roads will be surfaced with aggregate materials where necessary to provide a stable road surface, support anticipated traffic, reduce fugitive dust, and prevent erosion.
- Dust abatement techniques will be used before and during surface clearing, excavation, or blasting activities. Dust abatement techniques will be used on unpaved, unvegetated surfaces to minimize fugitive dust. Speed limits (e.g., 25 mph [40 kph]) will be posted and enforced to reduce fugitive dust. Construction materials and stockpiled soils will be covered if they are a source of fugitive dust.
- Culvert outlets will be rip-rapped to dissipate water energy at the outlet and reduce erosion. Catch basins, roadway ditches, and culverts will be cleaned and maintained regularly.

B.3.3 Pipelines

- Pipelines constructed above ground due to thermal gradient induced expansion and contraction will rest on cradles above ground level, allowing small animals to pass underneath. Projects should be analyzed to ensure adequate passage for all wildlife species. The pipeline will be raised higher to allow wildlife passage where needed. Because pipeline corridors through certain habitat types can alter local predator-prey dynamics by providing predators with lines of sight and travel corridors, large projects should be analyzed to ensure there will be no significant changes to predator-prey balance.

B.3.4 Utilities

- Underground utilities will be installed to minimize the amount of open trenches at any given time, keeping trenching and backfilling crews close together. Avoid leaving trenches open overnight. Where trenches cannot be back-filled immediately, escape ramps should be constructed at least every 100 feet.

B.4 SPECIFIC RESOURCES

B.4.1 Cultural and Paleontological Resources

- Unexpected discovery of cultural or paleontological resources during construction will be brought to the attention of the responsible BLM authorized officer immediately. Work will be halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation measures are being developed.

B.4.2 Noise

- The operator will take measurements to assess the existing background noise levels at a given site and compare them with the anticipated noise levels associated with the proposed project.
- Within [2] miles of existing, occupied residences, geothermal well drilling or major facility construction operations will be restricted to non-sleeping hours (7:00 am to 10:00 pm).
- All equipment will have sound-control devices no less effective than those provided on the original equipment. All construction equipment used will be adequately muffled and maintained.
- All stationary construction equipment (i.e., compressors and generators) will be located as far as practicable from nearby residences.
- If blasting or other noisy activities are required during the construction period, nearby residents will be notified by the operator at least 1 hour in advance.
- Explosives will be used only within specified times and at specified distances from sensitive wildlife or streams and lakes, as established by the federal and state agencies.

B.4.3 Noxious Weeds and Pesticides

- The use of certified, weed-free mulch will be required when stabilizing areas of disturbed soil.
- If trucks and construction equipment are arriving from locations with known invasive vegetation problems, a controlled inspection and cleaning area will be established to visually inspect construction equipment arriving at the project area and to remove and collect seeds that may be adhering to tires and other equipment surfaces.
- Fill materials and road surfacing materials that originate from areas with known invasive vegetation problems will not be used.
- Revegetation, habitat restoration and weed control activities will be initiated as soon as possible after construction activities are completed.
- Use of pesticides must be approved by the agency. Pesticide use will be limited agency approved pesticides and will only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.

B.4.4 Waste Management

- All refueling will occur in a designated fueling area that includes a temporary berm to limit the spread of any spill.
- Drip pans will be used during refueling to contain accidental releases.
- Drip pans will be used under fuel pump and valve mechanisms of any bulk fueling vehicles parked at the construction site.
- Any containers used to collect liquids will be enclosed or screened to prevent access to contaminants by wildlife, livestock, and migratory birds.
- Spills will be immediately addressed per the spill management plan, and soil cleanup and removal initiated as soon as feasible.

B.4.5 Wild Horses and Burros

- The operator will ensure employees, contractors, and site visitors avoid harassment and disturbance of wild horses and burros, especially during reproductive (e.g., breeding and birthing) seasons. In addition, any pets will be controlled to avoid harassment and disturbance of wild horses and burros.
- Observations of potential problems regarding wild horses or burros, including animal mortality, will be immediately reported to the agency.

B.4.6 Wildlife

- The operator will ensure that employees, contractors, and site visitors avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. In addition, pets will be controlled or excluded to avoid harassment and disturbance of wildlife.
- Ponds, tanks and impoundments (including but not limited to drill pits) containing liquids can present hazards to wildlife. Any liquids contaminated by substances which may be harmful due to toxicity, or fouling of the fur or feathers (detergents, oils), should be excluded from wildlife access by fencing, netting or covering at all times when not in active use. Liquids at excessive temperature should likewise be excluded. If exclusion is not feasible, such as a large pond, a hazing program based on radar or visual detection, in conjunction with formal monitoring, should be implemented. Clean water impoundments can also present a trapping hazard if they are steep-sided or lined with smooth material. All pits, ponds and tanks should have escape ramps functional at any reasonably anticipated water level, down to almost empty. Escape ramps can take various forms depending on the configuration of the impoundment. Earthen pits may be constructed with one side sloped 3:1 or greater lined ponds can use textured material; straight-sided tanks can be fitted with expanded metal escape ladders.

B.5 OPERATIONS/UTILIZATION

- “Good housekeeping” procedures will be developed by the operator to ensure that during all phases of exploration and operation the site will be kept clean of noxious weeds, debris, litter, garbage, fugitive trash or waste, and graffiti. Scrap heaps and dumps are prohibited. Storage yards are to be minimized to that which is absolutely necessary.

B.6 RECLAMATION

The following objectives, performance standards, and recommended reclamation BMPs and mitigation measures are based on the standards and guidelines found in the BLM and Forest Service Gold Book, 4th Edition, updated in 2007.

NOTE: [] Indicates site-specific values to be filled in by the authorized officer.

B.6.1 Reclamation Objectives

- The objective of interim reclamation is to restore vegetative cover and a portion of the landform sufficient to maintain healthy, biologically active topsoil; control erosion; and minimize habitat, visual, and forage loss during the life of the well or facilities.
- The long-term objective of final reclamation is to return the land to a condition approximating that which existed prior to disturbance. This includes restoration of the landform and natural vegetative community, hydrologic systems, visual resources, and wildlife habitats. To ensure that the long-term objective will be reached through human and natural processes, actions will be taken to ensure standards are met for site stability, visual quality, hydrological functioning, and vegetative productivity.

B.6.2 Reclamation Performance Standards

The following reclamation performance standards will be met:

Interim Reclamation

Includes disturbed areas that may be redisturbed during operations and will be redisturbed at final reclamation to achieve restoration of the original landform and a natural vegetative community.

- Disturbed areas not needed for active, long-term production operations or vehicle travel have been recontoured, protected from erosion, and revegetated with a self-sustaining, vigorous, diverse, native (or as otherwise approved) plant community sufficient to minimize visual impacts, provide forage, stabilize soils, and impede the invasion of noxious, invasive, and non-native weeds.

Final Reclamation

Includes disturbed areas where the original landform and a natural vegetative community have been restored.

- The original landform has been restored for all disturbed areas including well pads, production facilities, roads, pipelines, and utility corridors.
- General: A self-sustaining, vigorous, diverse, native (or otherwise approved) plant community is established on the site, with a density sufficient to control erosion and invasion by non-native plants and to reestablish wildlife habitat or forage production. At a minimum, the established plant community will consist of species included in the seed mix and/or desirable species occurring in the surrounding natural vegetation.
- Specific: No single species will account for more than [30]% total vegetative composition unless it is evident at higher levels in the adjacent landscape. Permanent vegetative cover will be determined successful when the basal cover of desirable perennial species is at least [80]% of the basal cover on adjacent or nearby undisturbed areas where vegetation is in a healthy condition; or [80]% of the potential basal cover as defined in the National Resource Conservation Service Ecological Site(s) for the area. Plants must be resilient as evidenced by well-developed root systems and flowers. [Shrubs, will be well established and in a “young” age class at a minimum (therefore, not comprised mainly of seedlings that may not survive until the following year).]
- In agricultural areas, irrigation systems and soil conditions are reestablished in such a way as to ensure successful cultivation and harvesting of crops.
- Erosion features are equal to or less than surrounding area and erosion control is sufficient so that water naturally infiltrates into the soil and gulying, headcutting, slumping, and deep or excessive rills (greater than 3 inches) are not observed.
- The site is free of State- or county-listed noxious weeds, oil field debris and equipment, and contaminated soil. Invasive and non-native weeds are controlled.

B.6.3 Reclamation Actions

- During initial well pad, production facility, road, pipeline, and utility corridor construction and prior to completion of the final well on the well pad, pre-interim reclamation stormwater management actions will be taken to ensure disturbed areas are quickly stabilized to control surface water flow and to protect both the disturbed and adjacent areas from erosion and siltation. This may involve construction and maintenance of temporary silt ponds, silt fences, berms, ditches, and mulching.
- When the last well on the pad has been completed, some portions of the well location will undergo interim reclamation and some portions of the well pad will usually undergo final reclamation. Most well locations will have limited areas of bare ground, such as a small area around production facilities or the surface of a rocked road. Other areas will have interim reclamation where workover rigs and fracturing tanks may need a level area to set up in the future. Some areas will undergo final reclamation where portions of the well pad will no longer be needed for production operations and can be recontoured to restore the original landform.

- The following minimum reclamation actions will be taken to ensure that the reclamation objectives and standards are met. It may be necessary to take additional reclamation actions beyond the minimum in order to achieve the Reclamation Standards.

B.6.4 Reclamation - General

Procedure:

- The agency will be notified 24 hours prior to commencement of any reclamation operations.

Housekeeping:

- Immediately upon well completion, the well location and surrounding areas(s) will be cleared of, and maintained free of, all debris, materials, trash, and equipment not required for production.
- No hazardous substances, trash, or litter will be buried or placed in pits. Upon well completion, any hydrocarbons in the pit will be remediated or removed.

Vegetation Clearing:

- Vegetation removal and the degree of surface disturbance will be minimized wherever possible.
- *[Example of site-specific requirement: During vegetation clearing activities, trees and woody vegetation removed from the well pad and access road will be moved aside prior to any soil disturbing activities. Care will be taken to avoid mixing soil with the trees and woody vegetation. Trees left for wood gathering will be cut [twelve inches or less from the ground], delimbed, and the trunks, six (6) inches or more in diameter will be removed and placed either by the uphill side of the access road, or moved to the end of the road, or to a road junction for easy access for wood gatherers and to reduce vehicle traffic on the well pad. Trees with a trunk diameter less than six (6) inches and woody vegetation will be used to trap sediment, slow runoff, or scattered on reclaimed areas to stabilize slopes, control erosion, and improve visual resources.]*

Topsoil Management:

- Operations will disturb the minimum amount of surface area necessary to conduct safe and efficient operations. When possible, equipment will be stored and operated on top of vegetated ground to minimize surface disturbance.
- In areas to be heavily disturbed, the top [eight (8)] inches of soil material, will be stripped and stockpiled around the perimeter of the well location to control run-on and run-off, and to make redistribution of topsoil more efficient during interim reclamation. Stockpiled topsoil may include vegetative material. Topsoil will be clearly segregated and stored separately from subsoils.

- Earthwork for interim and final reclamation will be completed within 6 months of well completion or plugging unless a delay is approved in writing by the BLM authorized officer.
- Salvaging and spreading topsoil will not be performed when the ground or topsoil is frozen or too wet to adequately support construction equipment. If such equipment creates ruts in excess of four (4) inches deep, the soil will be deemed too wet.
- No major depressions will be left that would trap water and cause ponding.

Seeding:

- Seedbed Preparation. Initial seedbed preparation will consist of recontouring to the appropriate interim or final reclamation standard. All compacted areas to be seeded will be ripped to a minimum depth of 18 inches with a minimum furrow spacing of 2 feet, followed by recontouring the surface and then evenly spreading the stockpiled topsoil. Prior to seeding, the seedbed will be scarified and left with a rough surface.

If broadcast seeding is to be used and is delayed, final seedbed preparation will consist of contour cultivating to a depth of 4 to 6 inches within 24 hours prior to seeding, dozer tracking, or other imprinting in order to loosen up the soil and create seed germination micro-sites.

- Seed Application. Seeding will be conducted no more than 24 hours following completion of final seedbed preparation. A certified weed-free seed mix designed by BLM to meet reclamation standards will be used.

No seeding will occur from [May 15 to September 15]. Fall seeding is preferred and will be conducted after [September 15] and prior to ground freezing. [Shrub species will be seeded separately and will be seeded during the winter.] Spring seeding will be conducted after the frost leaves the ground and no later than [May 15].

Erosion Control and Mulching:

- Mulch, silt fencing, waddles, hay bales, and other erosion control devices will be used on areas at risk of soil movement from wind and water erosion.
- Mulch will be used if necessary to control erosion, create vegetation micro-sites, and retain soil moisture and may include hay, small-grain straw, wood fiber, live mulch, cotton, jute, or synthetic netting. Mulch will be free from mold, fungi, and certified free of noxious or invasive weed seeds.
- If straw mulch is used, it will contain fibers long enough to facilitate crimping and provide the greatest cover.

Pit Closure:

- Reserve pits will be closed and backfilled within **sixty (60)** days of release of the rig. All reserve pits remaining open after **sixty (60)** days will require written authorization of the

authorized officer. Immediately upon well completion, any hydrocarbons or trash in the pit will be removed. Pits will be allowed to dry, be pumped dry, or solidified in-situ prior to backfilling.

- Following completion activities, pit liners will be completely removed or removed down to the solids level and disposed of at an approved landfill, or treated to prevent their reemergence to the surface and interference with long-term successful revegetation. If it was necessary to line the pit with a synthetic liner, the pit will not be trenched (cut) or filled (squeezed) while containing fluids. When dry, the pit will be backfilled with a minimum of 5 feet of soil material. In relatively flat areas the pit area will be slightly mounded above the surrounding grade to allow for settling and to promote surface drainage away from the backfilled pit.

Management of Invasive, Noxious, and Non-Native Species:

- All reclamation equipment will be cleaned prior to use to reduce the potential for introduction of noxious weeds or other undesirable non-native species.
- An intensive weed monitoring and control program will be implemented prior to site preparation for planting and will continue until interim or final reclamation is approved by the authorized officer.
- Monitoring will be conducted at least annually during the growing season to determine the presence of any invasive, noxious, and non-native species. Invasive, noxious, and non-native species that have been identified during monitoring will be promptly treated and controlled. A Pesticide Use Proposal will be submitted to the BLM for approval prior to the use of herbicides.

B.6.5 Interim Reclamation Procedures - Additional

Recontouring:

- Interim reclamation actions will be completed no later than 6 months from when the final well on the location has been completed, weather permitting. The portions of the cleared well site not needed for active operational and safety purposes will be recontoured to the original contour if feasible, or if not feasible, to an interim contour that blends with the surrounding topography as much as possible. Sufficient semi-level area will remain for setup of a workover rig and to park equipment. In some cases, rig anchors may need to be pulled and reset after recontouring to allow for maximum interim reclamation.
- If the well is a producer, the interim cut and fill slopes prior to re-seeding will not be steeper than a 3:1 ratio, unless the adjacent native topography is steeper. Note: Constructed slopes may be much steeper during drilling, but will be recontoured to the above ratios during interim reclamation.
- Roads and well production equipment will be placed on location so as to permit maximum interim reclamation of disturbed areas. If equipment is found to interfere with

the proper interim reclamation of disturbed areas, the equipment will be moved so proper recontouring and revegetation can occur.

Application of Topsoil & Revegetation:

- Topsoil will be evenly respread and aggressively revegetated over the entire disturbed area not needed for all-weather operations including road cuts & fills and to within a few feet of the production facilities, unless an all-weather, surfaced, access route or small “teardrop” turnaround is needed on the well pad.
- In order to inspect and operate the well or complete workover operations, it may be necessary to drive, park, and operate equipment on restored, interim vegetation within the previously disturbed area. Damage to soils and interim vegetation will be repaired and reclaimed following use. To prevent soil compaction, under some situations, such as the presence of moist, clay soils, the vegetation and topsoil will be removed prior to workover operations and restored and reclaimed following workover operations.

Visual Resources Mitigation for Reclamation:

- Trees, if present, and vegetation will be left along the edges of the pads whenever feasible to provide screening.
- To help mitigate the contrast of recontoured slopes, reclamation will include measures to feather cleared lines of vegetation and to save and redistribute cleared trees, debris, and rock over recontoured cut and fill slopes.
- To reduce the view of production facilities from visibility corridors and private residences, facilities will not be placed in visually exposed locations (such as ridgelines and hilltops).
- Production facilities will be clustered and placed away from cut slopes and fill slopes to allow the maximum recontouring of the cut and fill slopes.
- All long-term above ground structures will be painted [Covert Green] (from the “Standard Environmental Colors” chart) to blend with the natural color of the late summer landscape background.

B.6.6 Final Reclamation Procedures - Additional

- Final reclamation actions will be completed within 6 months of well plugging, weather permitting.
- All disturbed areas, including roads, pipelines, pads, production facilities, and interim reclaimed areas will be recontoured to the contour existing prior to initial construction or a contour that blends indistinguishably with the surrounding landscape. Resalvaged topsoil will be respread evenly over the entire disturbed site to ensure successful revegetation. To help mitigate the contrast of recontoured slopes, reclamation will

include measures to feather cleared lines of vegetation and to save and redistribute cleared trees, woody debris, and large rocks over recontoured cut and fill slopes.

- Water breaks and terracing will only be installed when absolutely necessary to prevent erosion of fill material. Water breaks and terracing are not permanent features and will be removed and reseeded when the rest of the site is successfully revegetated and stabilized.
- If necessary to ensure timely revegetation, the pad will be fenced to BLM standards to exclude livestock grazing for the first two growing seasons or until seeded species become firmly established, whichever comes later. Fencing will meet standards found on page 18 of the BLM/FS Gold Book, 4th Edition, or will be fenced with operational electric fencing.
- Final abandonment of pipelines and flowlines will involve flushing and properly disposing of any fluids in the lines. All surface lines and any lines that are buried close to the surface that may become exposed in the foreseeable future due to water or wind erosion, soil movement, or anticipated subsequent use, must be removed. Deeply buried lines may remain in place unless otherwise directed by the authorized officer.

B.6.7 Reclamation Monitoring and Final Abandonment Approval

- Reclaimed areas will be monitored annually. Actions will be taken to ensure that reclamation standards are met as quickly as reasonably practical.
- Reclamation monitoring will be documented in an annual reclamation report submitted to the authorized officer by [March 1]. The report will document compliance with all aspects of the reclamation objectives and standards, identify whether the reclamation objectives and standards are likely to be achieved in the near future without additional actions, and identify actions that have been or will be taken to meet the objectives and standards. The report will also include acreage figures for: Initial Disturbed Acres; Successful Interim Reclaimed Acres; Successful Final Reclaimed Acres. Annual reports will not be submitted for sites approved by the authorized officer in writing as having met interim or final reclamation standards. Monitoring and reporting continues annually until interim or final reclamation is approved. Any time 30% or more of a reclaimed area is redisturbed, monitoring will be reinitiated.
- The authorized officer will be informed when reclamation has been completed, appears to be successful, and the site is ready for final inspection.

Appendix C: Geothermal Lease Stipulations by Alternative

The following is a listing of which geothermal lease stipulations and notices would apply under each of the five alternatives analyzed in this EA.

Alternative 1: Proposed Action

All lands would be subject to the following lease stipulations and lease notices:

Number	Type	Purpose
G-9	NSO	To protect active Gunnison sage-grouse leks
G-11	NSO	To protect cultural resources – designated or eligible
G-12	NSO	To protect cultural and archaeological resources
G-13	NSO	To protect water and riparian resources
G-14	NSO	To protect steep slopes and erosive soils
G-15	NSO	To protect mapped elk winter concentration areas
G-16	NSO	To protect gullies and other chronic erosion areas
G-17	NSO	To protect areas of geologic hazard
G-20	TL	To protect Gunnison sage-grouse lekking
G-21	TL	To protect Gunnison sage-grouse lekking
G-22	CSU	To protect riparian and wetland habitat
G-23	CSU	To protect visual resources
G-24	CSU	To protect steep slopes
G-25	CSU	To protect mapped Gunnison sage-grouse summer-fall habitat
G-26	CSU	To protect water and geothermal rights and geothermal features
CO-52	CSU	To protect water and geothermal rights and geothermal features
CO-34	Notice	To protect threatened, endangered, or other special status species
CO-39	Notice	To protect cultural resources
G-27	Notice	To protect Gunnison sage-grouse habitat
G-28	Notice	To protect cultural resources - inventory
G-29	Notice	To protect cultural resources - traditional cultural places
G-30	Notice	To protect big game winter range
G-31	Notice	To manage noxious weeds
CO-53	Notice	To comply with state and local statutes, rules, and regulations

Alternative 2: No Action

All lands would be subject to the following lease stipulations and lease notices:

Number	Type	Purpose
G-9	NSO	To protect active Gunnison sage-grouse leks
G-11	NSO	To protect cultural resources – designated or eligible
G-12	NSO	To protect cultural and archaeological resources
G-13	NSO	To protect water and riparian resources
G-14	NSO	To protect steep slopes and erosive soils
G-20	TL	To protect Gunnison sage-grouse lekking
G-21	TL	To protect Gunnison sage-grouse lekking
G-22	CSU	To protect riparian and wetland habitat
G-23	CSU	To protect visual resources

G-24	CSU	To protect steep slopes
CO-34	Notice	To protect threatened, endangered, or other special status species
CO-39	Notice	To protect cultural resources
G-27	Notice	To protect Gunnison sage-grouse habitat
G-28	Notice	To protect cultural resources - inventory
G-29	Notice	To protect cultural resources - traditional cultural places
G-30	Notice	To protect big game winter range
G-31	Notice	To manage noxious weeds
CO-53	Notice	To comply with state and local statutes, rules, and regulations

Alternative 3: Additional Protections for GUSG Habitat

All lands would be subject to the following lease stipulations and lease notices:

Number	Type	Purpose
G-10	NSO	To protect all Gunnison sage-grouse leks
G-11	NSO	To protect cultural resources – designated or eligible
G-12	NSO	To protect cultural and archaeological resources
G-13	NSO	To protect water and riparian resources
G-14	NSO	To protect steep slopes and erosive soils
G-15	NSO	To protect mapped elk winter concentration areas
G-16	NSO	To protect gullies and other chronic erosion areas
G-17	NSO	To protect areas of geologic hazard
G-18	NSO	To protect mapped Gunnison sage-grouse summer-fall habitat
G-20	TL	To protect Gunnison sage-grouse lekking
G-21	TL	To protect Gunnison sage-grouse lekking
G-22	CSU	To protect riparian and wetland habitat
G-23	CSU	To protect visual resources
G-24	CSU	To protect steep slopes
G-26	CSU	To protect water and geothermal rights and geothermal features
CO-52	CSU	To protect water and geothermal rights and geothermal features
CO-34	Notice	To protect threatened, endangered, or other special status species
CO-39	Notice	To protect cultural resources
G-27	Notice	To protect Gunnison sage-grouse habitat
G-28	Notice	To protect cultural resources - inventory
G-29	Notice	To protect cultural resources - traditional cultural places
G-30	Notice	To protect big game winter range
G-31	Notice	To manage noxious weeds
CO-53	Notice	To comply with state and local statutes, rules, and regulations

Alternative 4: NSO Protections for Occupied GUSG Habitat

All lands would be subject to the following lease stipulations and lease notices:

Number	Type	Purpose
G-10	NSO	To protect all Gunnison sage-grouse leks
G-11	NSO	To protect cultural resources – designated or eligible
G-12	NSO	To protect cultural and archaeological resources
G-13	NSO	To protect water and riparian resources

G-14	NSO	To protect steep slopes and erosive soils
G-15	NSO	To protect mapped elk winter concentration areas
G-16	NSO	To protect gullies and other chronic erosion areas
G-17	NSO	To protect areas of geologic hazard
G-18	NSO	To protect mapped Gunnison sage-grouse summer-fall habitat
G-19	NSO	To protect all occupied Gunnison sage-grouse habitat
G-20	TL	To protect Gunnison sage-grouse lekking
G-21	TL	To protect Gunnison sage-grouse lekking
G-22	CSU	To protect riparian and wetland habitat
G-23	CSU	To protect visual resources
G-24	CSU	To protect steep slopes
G-26	CSU	To protect water and geothermal rights and geothermal features
CO-52	CSU	To protect water and geothermal rights and geothermal features
CO-34	Notice	To protect threatened, endangered, or other special status species
CO-39	Notice	To protect cultural resources
G-27	Notice	To protect Gunnison sage-grouse habitat
G-28	Notice	To protect cultural resources - inventory
G-29	Notice	To protect cultural resources - traditional cultural places
G-30	Notice	To protect big game winter range
G-31	Notice	To manage noxious weeds
CO-53	Notice	To comply with state and local statutes, rules, and regulations

Alternative 5: Close to Leasing

Under this alternative the BLM would amend the RMP to close the analysis area to geothermal leasing. No lease would be offered, therefore no lease stipulations would apply.

EXHIBIT G-9

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description):

<ALL LANDS>

For the purpose of:

To protect Gunnison sage-grouse lekking sites within a six-tenths (0.6) mile radius from any active sage-grouse lek.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria:

The authorized officer may grant an exception if an environmental review in coordination with appropriate local, state, and federal agencies determines that the action, as proposed or conditioned, would not impair the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities. An exception may also be granted by the authorized officer if the proponent, BLM, State wildlife agency, and where necessary, other affected interests, develop non-monetary compensation or mitigation that satisfactorily offsets anticipated impacts to Gunnison sage-grouse habitats and/or breeding activities.

Modification Criteria:

The authorized officer may modify the area subject to the stipulation if an environmental analysis in coordination with appropriate local, state, and federal agencies finds that a portion of the NSO area is nonessential, or that the proposed action could be conditioned so as not to impair, the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities.

Waiver Criteria:

This stipulation may be waived, if after consulting with the State wildlife agency, it is determined that the site has been permanently abandoned or unoccupied for a minimum of 10 years; site conditions have changed such that there is no reasonable likelihood of future site occupation, or Gunnison sage-grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS and it is determined that habitat protection is no longer necessary or desired.

EXHIBIT G-10

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description):

<ALL LANDS>

For the purpose of:

To protect Gunnison sage-grouse lekking sites within a six-tenths (0.6) mile radius from any status (active, inactive, historic, or unknown) sage-grouse lek.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria:

The authorized officer may grant an exception if an environmental review in coordination with appropriate local, state, and federal agencies determines that the action, as proposed or conditioned, would not impair the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities. An exception may also be granted by the authorized officer if the proponent, BLM, State wildlife agency, and where necessary, other affected interests, develop non-monetary compensation or mitigation that satisfactorily offsets anticipated impacts to Gunnison sage-grouse habitats and/or breeding activities.

Modification Criteria:

The authorized officer may modify the area subject to the stipulation if an environmental analysis in coordination with appropriate local, state, and federal agencies finds that a portion of the NSO area is nonessential, or that the proposed action could be conditioned so as not to impair, the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities.

Waiver Criteria:

This stipulation may be waived, if after consulting with the State wildlife agency, it is determined that the site has been permanently abandoned or unoccupied for a minimum of 10 years; site conditions have changed such that there is no reasonable likelihood of future site occupation, or Gunnison sage-grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS and it is determined that habitat protection is no longer necessary or desired.

EXHIBIT G-11

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description):

<ALL LANDS>

For the purpose of:

To protect cultural resources within the boundary of properties designated or eligible for the National Register of Historic Places, including National Landmarks and National Register Districts and Sites, and additional lands outside the designated boundaries to the extent necessary to protect values where the setting and integrity is critical to their designation or eligibility.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria:

Modification Criteria:

Waiver Criteria:

EXHIBIT G-12

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description):

<ALL LANDS>

For the purpose of:

To protect cultural resources within areas with important cultural and archaeological resources, such as traditional cultural properties and Native American sacred sites, as identified through consultation.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria:

Modification Criteria:

Waiver Criteria:

EXHIBIT G-13

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description):

<ALL LANDS>

For the purpose of:

To protect water bodies, riparian areas, wetlands, playas, and 100-year floodplains.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria:

Modification Criteria:

Waiver Criteria:

EXHIBIT G-14

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description).

On the lands described below:

<ALL LANDS>

For the purpose of:

Protecting soils on surfaces greater than 40 percent slope and/or soils with severe to very severe erosion hazard.

Exception Criteria:

In the event the lessee demonstrates that operations can be conducted without causing unacceptable impacts and that less restrictive measures will protect the public interest, an exception may be approved by the Authorized Officer. A request for an exception must include an engineering and reclamation plan which provides a high level of certainty that such operations can be conducted consistent with BLM's surface operating standards and guidelines for Oil and Gas Exploration and Development. All elements of the Steep Slopes CSU would apply (Exhibit G-xx). In addition, the operator must provide sufficient on-site analysis of soil types, vegetation types, aspect, depth to bedrock, nature of subsurface materials and potential for below ground seeps or springs. The lessee must also provide an evaluation of past practices on similar terrain and be able to demonstrate success under similar conditions. Previous success under similar conditions would be a critical element in the Authorized Officer's determination.

Modification Criteria:

Waiver Criteria:

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

EXHIBIT G-15

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description).

On the lands described below:

<ALL LANDS>

For the purpose of:

To protect mapped elk winter concentration areas and limit disturbance to wintering elk in mapped elk winter concentration areas.

Exception Criteria:

The Field Manager may grant an exception if an environmental analysis indicates that the proposed action can be conditioned so as not to interfere with the habitat function or compromise animal condition or security within the project vicinity. An exception may also be granted for actions intended to enhance the long-term utility or availability of suitable habitat.

Modification Criteria:

Waiver Criteria:

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

EXHIBIT G-16

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description).

On the lands described below:

<ALL LANDS>

For the purpose of:

To protect within 50 feet of a gully or other area of chronic erosion if adjacent and surrounding slopes are less than 30% or within 100 feet of a gully or other area of chronic erosion if adjacent and surrounding slopes are in excess of 30%.

Exception Criteria:

In the event the lessee demonstrates that operations can be conducted without causing unacceptable impacts and that less restrictive measures will protect the public interest, an exception may be approved by the Authorized Officer. A request for an exception must include an engineering and reclamation plan which provides a high level of certainty that such operations can be conducted consistent with BLM's surface operating standards and guidelines for Oil and Gas Exploration and Development. All elements of the Steep Slopes CSU would apply (Exhibit G-xx). In addition, the operator must provide sufficient on-site analysis of soil types, vegetation types, aspect, depth to bedrock, nature of subsurface materials and potential for below ground seeps or springs. The lessee must also provide an evaluation of past practices on similar terrain and be able to demonstrate success under similar conditions. Previous success under similar conditions would be a critical element in the Authorized Officer's determination.

Modification Criteria:

Waiver Criteria:

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

EXHIBIT G-17

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description).

On the lands described below:

<ALL LANDS>

For the purpose of:

To protect areas of geologic hazard, which consist of landslide deposits from Tomichi Dome.

Exception Criteria:

In the event the lessee demonstrates that operations can be conducted without causing unacceptable impacts and that less restrictive measures will protect the public interest, an exception may be approved by the Authorized Officer. A request for an exception must include an engineering and reclamation plan which provides a high level of certainty that such operations can be conducted consistent with BLM's surface operating standards and guidelines for Oil and Gas Exploration and Development. All elements of the Steep Slopes CSU would apply (Exhibit G-xx). In addition, the operator must provide sufficient on-site analysis of soil types, vegetation types, aspect, depth to bedrock, nature of subsurface materials and potential for below ground seeps or springs. The lessee must also provide an evaluation of past practices on similar terrain and be able to demonstrate success under similar conditions. Previous success under similar conditions would be a critical element in the Authorized Officer's determination.

Modification Criteria:

Waiver Criteria:

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

EXHIBIT G-18

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description).

On the lands described below:

<ALL LANDS>

For the purpose of:

To protect mapped Gunnison sage-grouse summer-fall habitat.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria:

The authorized officer may grant an exception if an environmental review in coordination with appropriate local, state, and federal agencies determines that the action, as proposed or conditioned, would not impair the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities. An exception may also be granted by the authorized officer if the proponent, BLM, State wildlife agency, and where necessary, other affected interests, develop non-monetary compensation or mitigation that satisfactorily offsets anticipated impacts to Gunnison sage-grouse habitats and/or breeding activities.

Modification Criteria:

The authorized officer may modify the area subject to the stipulation if an environmental analysis in coordination with appropriate local, state, and federal agencies finds that a portion of the NSO area is nonessential, or that the proposed action could be conditioned so as not to impair, the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities.

Waiver Criteria:

This stipulation may be waived, if after consulting with the State wildlife agency, it is determined that the site has been permanently abandoned or unoccupied for a minimum of 10 years; site conditions have changed such that there is no reasonable likelihood of future site occupation, or Gunnison sage-grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS and it is determined that habitat protection is no longer necessary or desired.

EXHIBIT G-19

Lease Number: COC-73585

NO SURFACE OCCUPANCY STIPULATION

No surface occupancy or use is allowed on the lands described below (legal description or other description).

On the lands described below:

<ALL LANDS>

For the purpose of:

To protect occupied Gunnison sage-grouse habitat.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria:

The authorized officer may grant an exception if an environmental review in coordination with appropriate local, state, and federal agencies determines that the action, as proposed or conditioned, would not impair the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities. An exception may also be granted by the authorized officer if the proponent, BLM, State wildlife agency, and where necessary, other affected interests, develop non-monetary compensation or mitigation that satisfactorily offsets anticipated impacts to Gunnison sage-grouse habitats and/or breeding activities.

Modification Criteria:

The authorized officer may modify the area subject to the stipulation if an environmental analysis in coordination with appropriate local, state, and federal agencies finds that a portion of the NSO area is nonessential, or that the proposed action could be conditioned so as not to impair, the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities.

Waiver Criteria:

This stipulation may be waived, if after consulting with the State wildlife agency, it is determined that the site has been permanently abandoned or unoccupied for a minimum of 10 years; site conditions have changed such that there is no reasonable likelihood of future site occupation, or Gunnison sage-grouse are no longer a BLM sensitive or special status species and are not listed by the USFWS and it is determined that habitat protection is no longer necessary or desired.

EXHIBIT G-20

Lease Number: COC-73585

TIMING LIMITATION STIPULATION

No construction or drilling activities are allowed during the following time period(s). This stipulation does not apply to routine operations, maintenance, and other activities.

March 15 through May 15

On the lands described below:

<ALL LANDS>

For the purpose of (reasons):

To protect Gunnison sage-grouse lekking habitat and Gunnison sage-grouse during lekking season.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of the stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

EXCEPTION: The authorized officer may grant an exception if an environmental review in coordination with appropriate local, state, and federal agencies determines that the action, as proposed or conditioned will not affect nest attendance, egg or chick survival, nesting/brood-rearing success. An exception could also be granted by the Authorized Officer if the proponent, BLM, and State wildlife agency and where necessary, other affected interests, develop non-monetary compensation or mitigation that would satisfactorily offset the anticipated losses of nesting habitat or nesting activities. Actions designed to enhance the long-term utility or availability of suitable Gunnison sage-grouse habitat may be exempted from the timing limitations.

MODIFICATION: The authorized officer may modify the size and shape of the timing limitation area if an environmental analysis in coordination with appropriate local, state, and federal agencies indicates the actual habitat suitability for nesting/ brood-rearing is greater or less than the 4-mile radius. Timeframes may be modified based on studies documenting local periods of actual use.

WAIVER: This stipulation may be waived, if after consulting with the State wildlife agency, it is determined that the described lands are incapable of serving the long-term requirements of Gunnison sage-grouse nesting habitat and that these ranges no longer warrant consideration as components of Gunnison sage-grouse nesting/brood-rearing habitat.

EXHIBIT G-21

Lease Number: COC-73585

TIMING LIMITATION STIPULATION

No routine operations, maintenance, and other activities in occupied Gunnison sage-grouse habitat will be allowed during the following night-time hours. This restriction applies to human activity, and not to continuing operation of equipment and facilities, such as well pumps, power plant, and cooling equipment.

4:00 p.m. and 9:00 a.m. during the period between March 15 and May 15.

On the lands described below:

<ALL LANDS>

For the purpose of (reasons):

To protect Gunnison sage-grouse lekking habitat and Gunnison sage-grouse during lekking season.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of the stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

EXCEPTION: The authorized officer may grant an exception if an environmental review in coordination with appropriate local, state, and federal agencies determines that the action, as proposed or conditioned will not affect nest attendance, egg or chick survival, nesting/brood-rearing success. An exception could also be granted by the Authorized Officer if the proponent, BLM, and State wildlife agency and where necessary, other affected interests, develop non-monetary compensation or mitigation that would satisfactorily offset the anticipated losses of nesting habitat or nesting activities. Actions designed to enhance the long-term utility or availability of suitable Gunnison sage-grouse habitat may be exempted from the timing limitations.

MODIFICATION: The authorized officer may modify the size and shape of the timing limitation area if an environmental analysis in coordination with appropriate local, state, and federal agencies indicates the actual habitat suitability for nesting/ brood-rearing is greater or less than the 4-mile radius. Timeframes may be modified based on studies documenting local periods of actual use.

WAIVER: This stipulation may be waived, if after consulting with the State wildlife agency, it is determined that the described lands are incapable of serving the long-term requirements of Gunnison sage-grouse nesting habitat and that these ranges no longer warrant consideration as components of Gunnison sage-grouse nesting/brood-rearing habitat.

EXHIBIT G-22

Lease Number: COC-73585

CONTROLLED SURFACE USE STIPULATION

Surface occupancy or use is subject to the following special operating constraints.

On the lands described below:

<ALL LANDS>

For the purpose of:

To protect the values and functions of perennial water impoundments and streams, and/or riparian/wetland vegetation, which include important Gunnison sage-grouse brood-rearing habitat, by moving geothermal exploration and development 500 feet beyond the riparian vegetation zone.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria:

This stipulation may be excepted subject to an on-site impact analysis with consideration given to the nature, extent, and value of the area potentially affected, as well as the degree of slope, soils, importance to the amount and type of wildlife and fish use, water quality, and other related resource values.

Modification Criteria:

Waiver Criteria:

EXHIBIT G-23

Lease Number: COC-73585

CONTROLLED SURFACE USE STIPULATION

Surface occupancy or use is subject to the following special operating constraints.

On the lands described below:

<ALL LANDS>

For the purpose of:

To protect BLM Visual Resource Management Class II areas; NFS lands with a Scenery Management System integrity level of High; and other sensitive viewsheds such as within the visual setting of National Scenic and Historic Trails or near residential areas.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria:

Exceptions may be granted if a visual assessment has been conducted and an on-site impact analysis shows no degradation of the visual resource values.

Modification Criteria:

Waiver Criteria:

EXHIBIT G-24

Lease Number: COC-73585

CONTROLLED SURFACE USE STIPULATION

Surface occupancy or use is subject to the following special operating constraints.

On the lands described below:

<ALL LANDS>

For the purpose of:

Protecting soils on surfaces greater than 30 percent slope. Prior to surface disturbance of steep (greater than 30 percent) a plan of development must be approved by the Authorized Officer. Such plans must demonstrate how the following performance objectives will be met:

Performance Objectives:

1. Maintain the soil productivity of the site.
2. Surface runoff will be adequately controlled.
3. Protect off-site areas by preventing accelerated soil erosion (such as drilling, gullying, piping, mass wasting, etc.) from occurring.
4. Protect water quality and quantity of adjacent surface and groundwater sources.
5. Select the best possible site for development in order to prevent impacts to the soil and water resources.
6. Surface-disturbing activities will not be conducted during extended wet periods.
7. Construction will not be allowed when soils are frozen.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

EXHIBIT G-25

Lease Number: COC-73585

CONTROLLED SURFACE USE STIPULATION

Surface occupancy or use is subject to the following special operating constraints.

On the lands described below:

<ALL LANDS>

For the purpose of:

To protect mapped Gunnison sage-grouse summer-fall habitat, the project applicant will be required to submit a plan to meet the resource management objectives through special design, construction, operation, mitigation, or reclamation measures, and/or relocation. Unless the plan is approved, no surface occupancy would be allowed in the mapped Gunnison sage-grouse summer-fall habitat.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

Exception Criteria: The authorized officer may grant an exception if an environmental review in coordination with appropriate local, state, and federal agencies determines that the action, as proposed or conditioned will not affect nest attendance, egg or chick survival, nesting/brood-rearing success. An exception could also be granted by the Authorized Officer if the proponent, BLM, and State wildlife agency and where necessary, other affected interests, develop non-monetary compensation or mitigation that would satisfactorily offset the anticipated losses of nesting habitat or nesting activities. Actions designed to enhance the long-term utility or availability of suitable Gunnison sage-grouse habitat may be exempted from the timing limitations.

Modification Criteria: The authorized officer may modify the size and shape of the timing limitation area if an environmental analysis in coordination with appropriate local, state, and federal agencies indicates the actual habitat suitability for nesting/ brood-rearing is greater or less than the 4-mile radius. Timeframes may be modified based on studies documenting local periods of actual use.

Waiver Criteria: This stipulation may be waived, if after consulting with the State wildlife agency, it is determined that the described lands are incapable of serving the long-term requirements of Gunnison sage-grouse nesting habitat and that these ranges no longer warrant consideration as components of Gunnison sage-grouse nesting/brood-rearing habitat.

EXHIBIT G-26

Lease Number: COC-73585

CONTROLLED SURFACE USE STIPULATION

Surface occupancy or use is subject to the following special operating constraints.

On the lands described below:

<ALL LANDS>

For the purpose of:

To prevent potential material injury to senior water or geothermal rights under Colorado state law, and to ensure that existing geothermal features are protected a comprehensive geologic and hydrogeologic study, and interpretation that assesses hydraulic relationships in the area, will be required prior to the lessee/operator being approved by the BLM to install any production or injection wells.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

EXHIBIT CO-52

Lease Number: COC-73585

CONTROLLED SURFACE USE STIPULATION

Surface occupancy or use is subject to the following special operating constraints.

On the lands described below:

<ALL LANDS>

For the purpose of:

To prevent potential material injury to senior water or geothermal rights under Colorado state law, and to ensure that existing geothermal features are protected under the terms of BLM's applicable Resource Management Plan, as amended by the Record of Decision and Resource Management Plan Amendments for Geothermal Leasing in the Western United States, 2008, as appropriate, this lease is restricted as follows.

Monitoring by the lessee prior to and during all lease operations, including development and utilization of a geothermal resource may be required as directed by the BLM in consultation with the Colorado State Engineer's Office, and the burden of proof shall be on the lessee, to ensure compliance with federal and state statutes, rules, and regulations.

Material injury may be determined by the relevant Colorado Water Court, and such an order from the Water Court may result in limitations on the use of the resource.

NOTE: If monitoring is required, the lessee/operator must also demonstrate to the BLM that they have made a good faith effort to work with the owners of the Upper and Lower Waunita Hot Springs to develop an effective monitoring program. The monitoring program would be designed to determine if there are any impacts to water quality, quantity, and/or temperature of the Waunita Hot Springs during any exploration, development, and production of the lease.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

EXHIBIT CO-34

Lease Number: COC-73585

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. 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. 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. 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.

On the lands described below:

<ALL LANDS>

EXHIBIT CO-39

Lease Number: COC-73585

CULTURAL RESOURCES 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, E.O.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 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.

Any changes to this stipulation will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the use of this stipulation, see BLM Manual 1624 and 3101 or FS Manual 1950 and 2820.)

On the lands described below:

<ALL LANDS>

EXHIBIT G-27

Lease Number: COC-73585

LEASE NOTICE

This lease may in part, or in total, contain important Gunnison sage-grouse habitats, as identified by the BLM, either currently or prospectively. The operator may be required to implement specific measures to avoid if possible, minimize, or mitigate impacts of geothermal operations on Gunnison sage-grouse populations and habitat quality. Such measures shall be developed during the Application for Permit to Drill (APD) on-site and environmental review process, or during the environmental review process for sundry notices and associated rights-of-way, and will be consistent with lease rights granted.

In addition to the lease stipulations described under the various alternatives, there are other resource protection concerns that will be addressed in any subsequent permitting of surface disturbing activities in GUSG habitat. These concerns include:

- Avoid, if possible, minimize, or mitigate impacts to nesting sage-grouse, particularly within a 4-mile buffer of active leks between May 15 and June 30.
- Avoid, if possible, minimize, or mitigate impacts to critical winter GUSG habitat.
- Attempts should be made to minimize continuous noise by reducing levels to 10 dBA or less at the edge of the 0.6-mile lek buffer (RCP, 2005) or to a maximum of 49dBA measured 30 feet from the source in areas between 0.6 and 4.0 mile radius from a lek buffer (DOW, 2010). Any equipment should produce minimal noise; all compressors, vehicles, and other sources of noise should be equipped with effective mufflers or noise suppression devices.
- Avoid, if possible, minimize, or mitigate additional fragmentation of GUSG habitat.
- Incorporate new scientific information as it becomes available.
- Incorporate additional management guidance in the event that the Gunnison sage-grouse is listed as a Threatened or Endangered species by the USFWS.

On the lands described below:

<ALL LANDS>

EXHIBIT G-28

Lease Number: COC-73585

LEASE NOTICE

This lease may contain cultural resources. Before any development begins, a cultural inventory of the remaining unsurveyed acres within the proposed development area is required. Survey prior to submitting development applications alleviates future delays in development activities in order for a required cultural inventory to be completed, a possible delay of up to six months.

On the lands described below:

<ALL LANDS>

EXHIBIT G-29

Lease Number: COC-73585

LEASE NOTICE

This lease may contain areas of traditional cultural importance, such as traditional cultural places. The lease area is within an archaeologically sensitive area that includes Tomichi Dome and its nearby hot springs. The BLM will continue tribal consultation specific to any potential subsequent geothermal exploration, drilling, utilization, and/or reclamation and abandonment activities in the analysis area.

On the lands described below:

<ALL LANDS>

EXHIBIT G-30

Lease Number: COC-73585

LEASE NOTICE

This lease may contain big game winter range. The Gunnison RMP (pg. 2-33) provides guidance that activities that will result in unnecessary disturbances to big game will be excluded from December 1 through April 30. This direction applies to Management Unit 12, which comprises most of the lease area.

On the lands described below:

<ALL LANDS>

EXHIBIT G-31

Lease Number: COC-73585

LEASE NOTICE

This lease may contain noxious weeds. The Gunnison Field Office has a newly approved Integrated Weed Management Plan (August 2010) that guides management of noxious weeds. The plan includes Standard Operating Procedures, Best Management Practices, design features, mitigation measures, monitoring measures, and conservation measures that need to be followed when managing noxious weeds on BLM lands in the Gunnison Field Office.

On the lands described below:

<ALL LANDS>

EXHIBIT CO-53

Lease Number: COC-73585

LEASE NOTICE

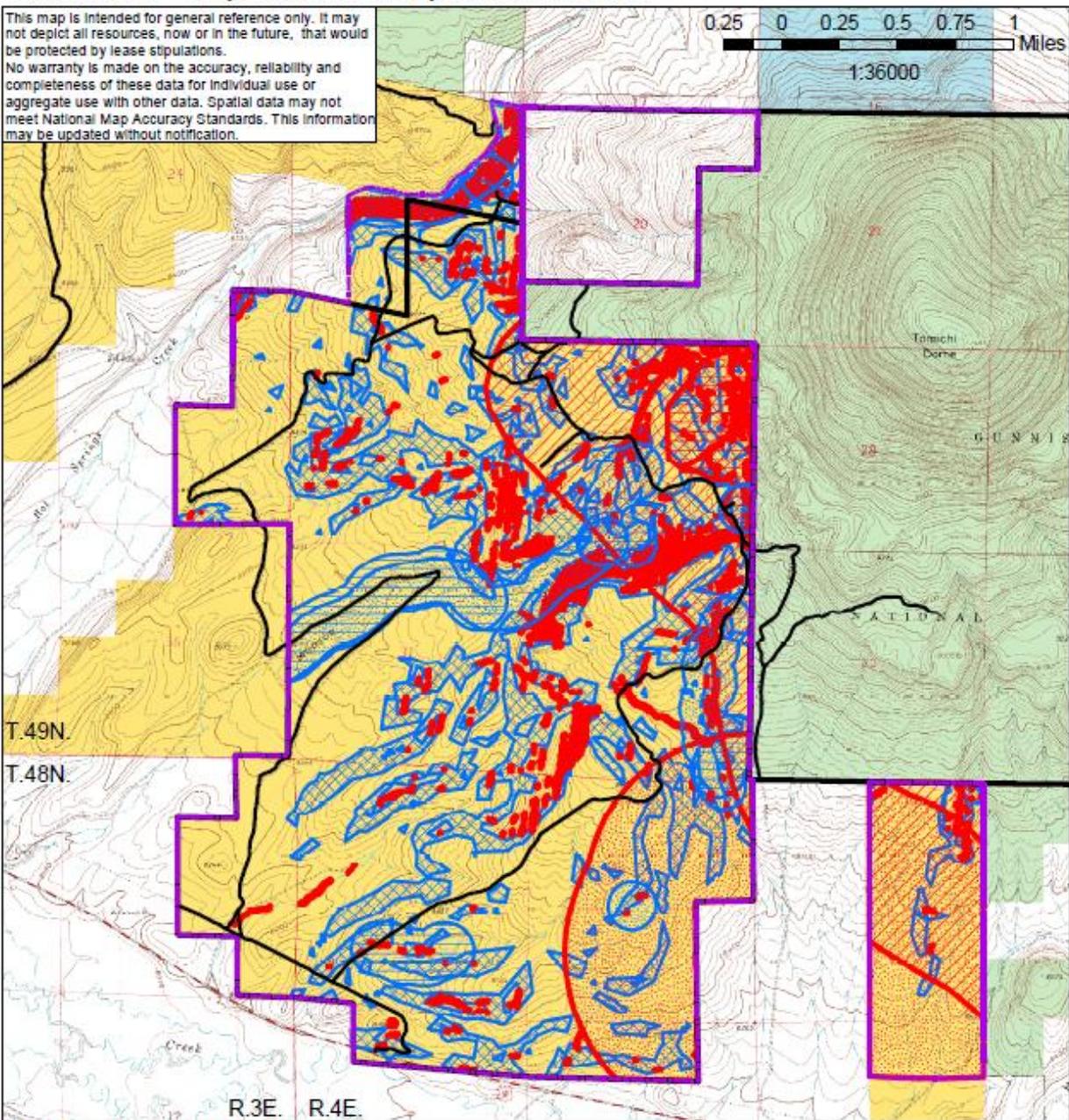
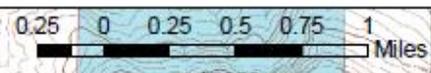
The lessee is hereby notified that prior to development of a geothermal resource, the lessee will have to comply with applicable provisions of the Colorado Geothermal Resources Act § 37-90.5-101-108, C.R.S., as amended by Colorado Senate Bill 10-174, other state and local statutes, and rules and regulations, now in existence or as may be modified in the future, consistent with lease rights.

On the lands described below:

<ALL LANDS>

Alternative 1 - Proposed Action Stipulations in Detail

This map is intended for general reference only. It may not depict all resources, now or in the future, that would be protected by lease stipulations. No warranty is made on the accuracy, reliability and completeness of these data for individual use or aggregate use with other data. Spatial data may not meet National Map Accuracy Standards. This information may be updated without notification.

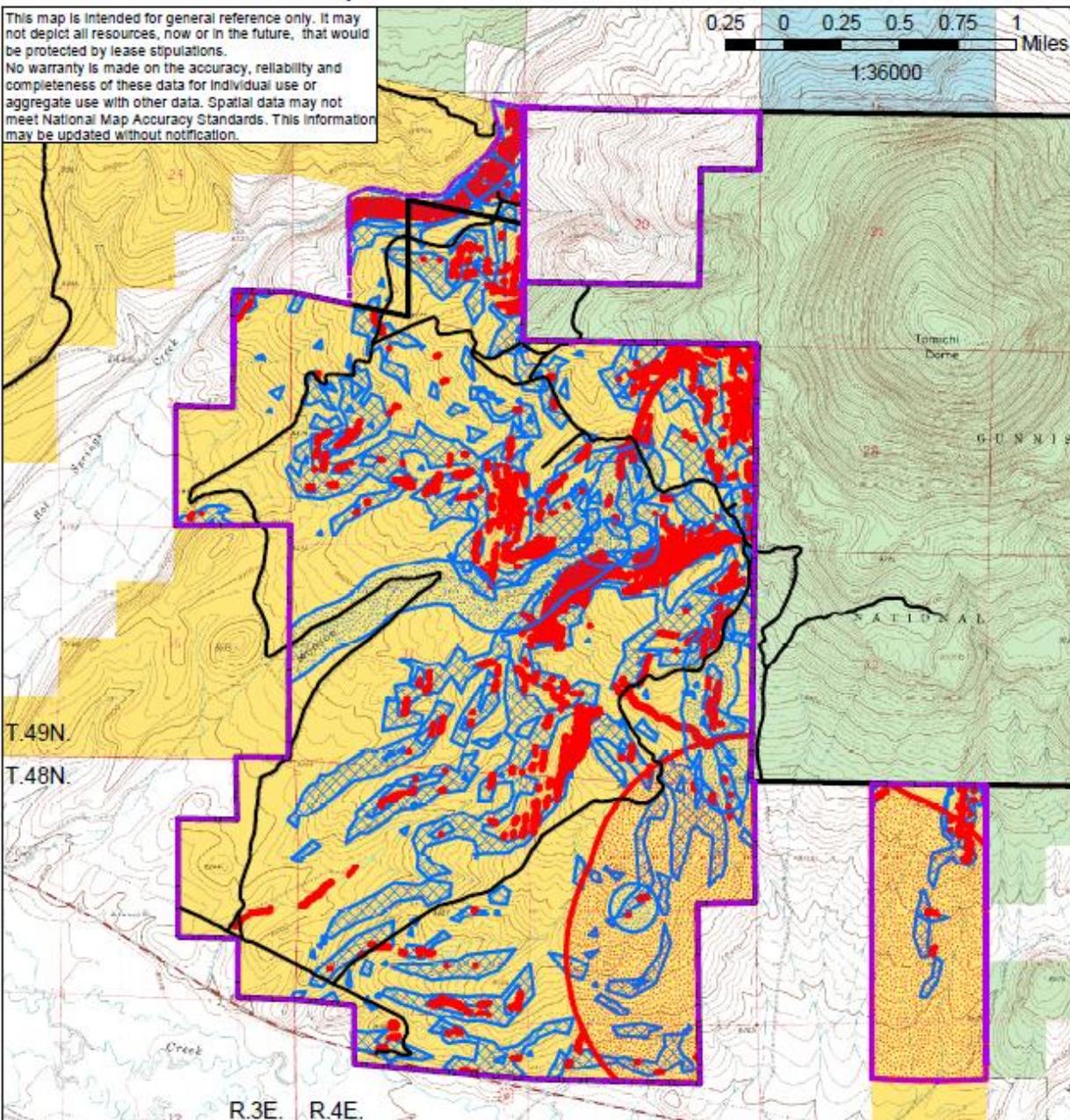


	NSO - Active GUSG Lek Buffer		Lease Nomination Area
	NSO - Geologic Hazards		Analysis Area
	NSO - Areas of Chronic Erosion: Gullies, Slopes Over 40%, and Erosive Soils		BLM
	NSO - Elk Winter Concentration Area		Forest Service
	CSU - GUSG Mapped Summer-Fall Habitat		Private
	CSU - Slopes Between 30 - 40%		State
	CSU - Riparian and Wetland Habitat		
			Roads

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Alternative 2 - No Action Stipulations in Detail

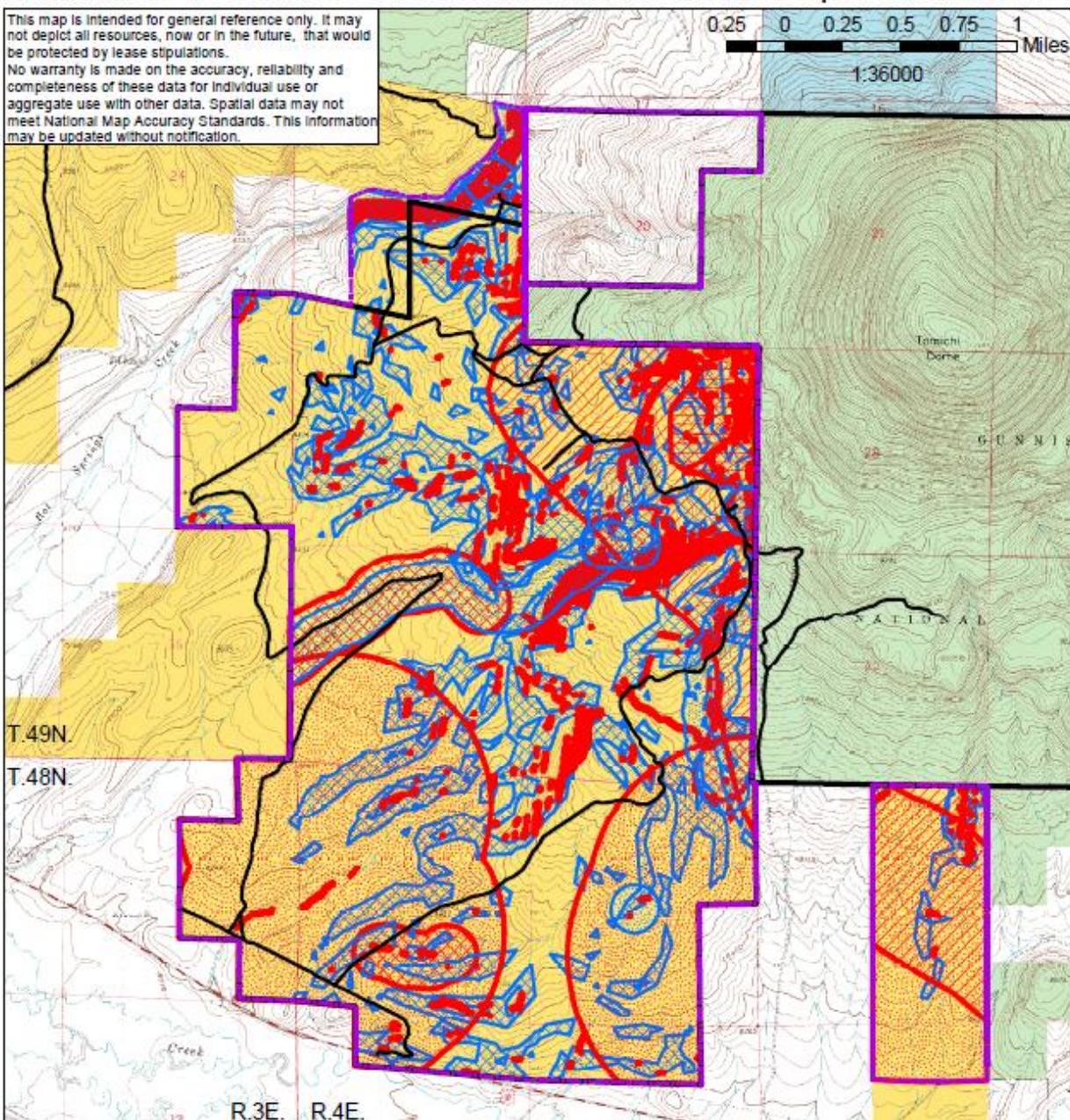
This map is intended for general reference only. It may not depict all resources, now or in the future, that would be protected by lease stipulations. No warranty is made on the accuracy, reliability and completeness of these data for individual use or aggregate use with other data. Spatial data may not meet National Map Accuracy Standards. This information may be updated without notification.



 NSO - Active GUSG Lek Buffer	 Lease Nomination Area
 NSO - Slopes Over 40% and Erosive Soils	 Analysis Area
 CSU - Slopes Between 30 - 40%	 Roads
 CSU - Riparian and Wetland Habitat	LAND OWNERSHIP
	 BLM
	 Forest Service
	 Private
	 State

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Alternative 3 - NSO for All GUSG Leks and Summer-Fall Habitat Stipulations in Detail



- | | | | |
|--|---|-----------------------|-----------------------|
| | NSO - All GUSG Lek Buffer | | Lease Nomination Area |
| | NSO - Geologic Hazards | | Analysis Area |
| | NSO - Areas of Chronic Erosion: Gullies, Slopes Over 40%, and Erosive Soils | | Roads |
| | NSO - Elk Winter Concentration Area | LAND OWNERSHIP | |
| | NSO - GUSG Summer-Fall Habitat | | BLM |
| | CSU - Slopes Between 30 - 40% | | Forest Service |
| | CSU - Riparian and Wetland Habitat | | State |
| | | | Private |
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