Proposed Tomichi Dome Geothermal Lease Nomination
Biological Assessment\(^1\)
Grand Mesa, Uncompahgre and Gunnison National Forests
Gunnison Ranger District
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\(^1\) Meets the standards for both a Biological Evaluation (FSM 2672.42) and Biological Assessment (50 CFR 402.12(f)).
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I. INTRODUCTION

The purpose of this document is to present the analysis and determination of effects of the Tomichi Dome Geothermal Lease Nomination proposed action on federally listed species (endangered, threatened, and proposed).

This biological assessment (BA) conforms to legal requirements set forth under section 7 of the Endangered Species Act (ESA) (16 U.S.C. 1536 (c), 50 CFR 402.12 (f) and 402.14). Section 7(a) (1) of the ESA requires federal agencies to use their authorities to further the conservation of listed species. Section 7(a) (2) requires that federal agencies ensure any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of federally-listed species, or destroy or adversely modify designated critical habitat.

Forest Service policy requires that a review of programs and activities, through an effects analysis document (referred to in current Forest Service policy as a biological evaluation or BE), be conducted to determine their potential effect on threatened and endangered species, species proposed for listing, and Regional Forester-designated sensitive species (FSM 2670.3). Under the ESA, the effects analysis report is called a biological assessment (BA) and must be prepared for federal actions that are “major construction activities” to evaluate the potential effects of the proposal on listed or proposed species and critical habitats. The contents of the BA are at the discretion of the federal agency, and will depend on the nature of the federal action (50 CFR 402.12(f)). In addition to meeting ESA compliance, preparation of a BA as part of the NEPA process ensures that threatened, endangered, and proposed species receive full consideration in the decision-making process.

This document includes information specific to analyzing projects under the Southern Rockies Lynx Amendment management direction (SRLA). This helps ensure that the appropriate information is used in the effects analysis and provided to the U.S. Fish and Wildlife Service that leads to streamlined consultations on SRLA projects.

II. DESCRIPTION OF THE PROPOSAL

Background

This analysis describes the effects of leasing about 3,748 acres of National Forest System lands within the Gunnison Ranger District of the Grand Mesa Uncompahgre-Gunnison National Forests to private industry for the development of geothermal resources.

This analysis examines the competitive lease application, describes the Reasonably Foreseeable Development scenario for this application area, examines the existing environmental setting, and describes the potential direct, indirect and cumulative effects that issuing the lease would have on Federally threatened, endangered, and proposed species under the ESA.

On federal lands, a geothermal lease is for the heat resource of the earth where the mineral estate is Federally-administered. A competitive geothermal lease nomination was submitted to the Bureau of Land Management (BLM) – Colorado State Office for approximately 3,748 acres of National Forest System lands with potential for geothermal resources. The
nomination is for lands generally located in Sections 9, 20, 21, 22, 27, 28, 33 and 34, T 49 N, R 4 E, NMPM; in Gunnison County, Colorado about 22 miles southeast of the town of Gunnison (Figure 1). The land surface is National Forest System (NFS) lands administered by the Grand Mesa, Uncompahgre and Gunnison National Forests (GMUG), and the subsurface geothermal resource is administered by the BLM. The lease nomination on NFS lands is in 2 parcels, referred to in this document as the Tomichi Dome and the north parcel.

Adjacent BLM public lands to the west have also been nominated for geothermal lease. The State Land Board also had interest in accessing geothermal resources on State-administered lands in the vicinity.

The NFS lands in this nomination were acknowledged in the Final Programmatic EIS for Geothermal Leasing in the Western United States (Programmatic EIS) completed by the BLM and Forest Service (FS) in 2008 (USDI-BLM and USDA-FS, 2008) as having commercially viable geothermal capacity for electrical generation. Information from the Programmatic EIS and Record of Decision were used in this analysis. The Programmatic EIS may be found at: http://www.blm.gov/wo/st/en/prog/energy/geothermal/geothermal_nationwide/Documents/Final_PEIS.html.

Location Description

The two NFS land parcels nominated for geothermal leasing are located in Gunnison County, approximately 22 miles southeast of Gunnison, CO, north of U.S. Highway 50 (Figure 1). The north parcel is located north of Tomichi Dome and Hot Springs Creek. The Tomichi Dome parcel includes NFS lands on and surrounding Tomichi Dome. The legal location is described as Sections 9, 20, 21, 22, 27, 28, 33 and 34, T 49 N, R 4 E; New Mexico Principal Meridian. The Tomichi Dome parcel is within the Mid Tomichi Creek Comp (1402000389010100 HUC), Spring Creek (1402000389020500 HUC), Horn Gulch (1402000389010800 HUC), Hot Spring Creek (1402000389020100 HUC), and Monson Gulch (1402000389010900 HUC) watersheds. The north parcel is within the Hot Spring Creek (1402000389020100 HUC) watershed.
Figure 1. Project Area Vicinity Map

Geothermal Leasing Process

Leasing geothermal resources on Federal lands is authorized under the Geothermal Steam Act of 1970, as amended by the Energy Policy Act of 2005. The BLM is the federal government’s minerals manager and is responsible for issuing leases on NFS lands, but can only do so if the Forest Service determines that the NFS lands are available, and consents to leasing.

This geothermal lease nomination will be processed according to administrative procedures outlined in the Memorandum of Understanding between the United States Department of the Interior and United States Department of Agriculture for Implementation of Section 225 Of The Energy Policy Act of 2005 Regarding Geothermal Leasing And Permitting, hereafter referred to as the National-level MOU. Under the terms of the National-level MOU, the Forest Service and the BLM committed to jointly prepare NEPA documents that will meet the requirements of both agencies in reaching their independent leasing decisions. The Energy Policy Act of 2005 further requires federal agencies to respond in a timely fashion to applications for energy resources.

According to the procedures for geothermal leasing in 43 CFR 3200, the BLM grants access to geothermal resources through a formalized leasing process based on end use. Uses such as electrical generation are known as “indirect uses”, and are leased under a competitive process. Other uses, known as direct uses (such as heating pools, spas, greenhouses, other buildings etc.) also require a lease, however are leased non-competitively. In general, areas
are nominated for lease by the public. The geothermal lease nomination subject to this analysis is for indirect uses, and thus would be let competitively.

With respect to geothermal leasing, when the BLM receives nominations from applicants that involve NFS lands, the proposal is forwarded to the Forest Service (FS). The FS is responsible for consenting (or not consenting) to the leasing of NFS lands, for conducting NEPA analysis for leasing, for developing appropriate terms and conditions under which the lease may be developed, and to ensure that doing so is consistent with the Land and Resource Management Plan developed under the National Forest Management Act.

If FS consent is given, the BLM is responsible for conducting geothermal lease sales and issuing the leases. Although the BLM cannot issue a lease without the consent of the FS, the BLM can add any additional terms, conditions or stipulations that it deems necessary and appropriate, and must make an independent decision whether to issue the lease after review of the decision and documentation presented by the FS, and any other relevant factors.

Leasing geothermal resources by 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. Lease issuance alone does not authorize any ground-disturbing activities to explore for or develop geothermal resources without additional site-specific analysis and approval for the intended operation.

If leased, geothermal resource development would occur in the following four phases:

1) exploration
2) drilling operations
3) utilization
4) reclamation/ abandonment

Decisions pertaining to surface use and disturbance associated with these development phases are not made at the leasing stage. Rather, decisions for permit-related surface activities are made when and if site-specific surface uses are proposed. Each phase requires a permit from the BLM, each of which would require an application, environmental review, and approval by the BLM. Also at each stage, the BLM (in consultation with the Forest Service on NFS lands) can issue site-specific conditions of approval to protect resource values. In the case facilities are proposed off-lease then the Forest Service would review such a proposal and evaluate it on its own merits, including consultation with USFWS and conducting a NEPA analysis if needed.

**Purpose and Need for Action**

The purpose of this Federal action is to determine if 3,748 acres of the GMUG national forest are available for geothermal leasing (by the BLM) to facilitate environmentally responsible exploration and economic development of public resources; and if so under what reasonable and justifiable terms, i.e., the conditions under which the geothermal resources might be recovered. The conditions would provide protection for surface resources while allowing optimum subsurface geothermal resource recovery. Conditions, also known as lease stipulations, are considered for areas where there would be reasons to preclude or restrict surface use.
The need for the action is to facilitate geothermal resource leasing in an environmentally responsible manner to help meet the increasing interest in geothermal development on Federal lands (Energy Policy Act of 2005, Section 211) and to further respond to policy directives calling for clean and renewable energy to meet the nation’s increasing demand for energy. The need is also linked to the GMUG Land and Resource Management Plan (LRMP) Plan which emphasizes environmentally sound mineral and energy development (LRMP, page II-61).

The Gunnison Resource Area Approved Resource Management Plan (RMP), as amended by the Record of Decision and Resource Plan Amendments for Geothermal Leasing in the Western United States (ROD), designates 614,233 acres of federal mineral estate as open to geothermal leasing, subject to compliance with applicable laws and regulations, and 164,408 acres closed to leasing (ROD, pg. A-3). The RMP (Appendix K) and ROD (pgs. 2-4 to 2-9) specify stipulations and conditions for leasing to protect other resource values and uses.

**Proposed Action**

The FS proposed action is to consent to the BLM leasing the subject lands by competitive bid for subsequent geothermal resource development, with terms and conditions under which the lease can be developed for the protection of surface resources. Conditions, also known as stipulations for the lease, are designed to be consistent with Forest Plan standards, wildlife conservation agreements, FS policy and direction and applicable laws. Part of the Proposed Action includes adopting the geothermal lease stipulation framework established in the Programmatic EIS for the GMUG National Forests.

The BLM proposed action is to: 1) offer the nominated lands for lease with existing and additional stipulations; and 2) amend the RMP to include the additional stipulations necessary for resource protection. These additional stipulations include No Surface Occupancy (NSO) for protection of gullies and steep slopes, geologic hazards, and riparian areas.

The Proposed Action is related to leasing the subject lands only, and does not contemplate or allow any surface disturbing activities.

Lease stipulations are major or moderate constraints applied to a new 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, and is attached to and made part of the lease. BLM can add additional stipulations to the lease during their review. Stipulations may be more restrictive than those in the Programmatic EIS if supported by LRMP, conservation plans, or other direction. The Proposed Action includes adopting the stipulation framework brought forward in the Programmatic EIS for geothermal leasing on the GMUG NFs.

Stipulations proposed for this geothermal lease are consistent with Forest Plan standards, wildlife conservation agreements, FS policy and direction and applicable laws. The lease stipulations are only as restrictive as necessary to protect the resources for which they are applied.
The following descriptions are necessary to understand how stipulations are applied in this analysis.

**No Surface Occupancy** stipulations are considered a major constraint as they do not allow for development. They are used when standard lease terms and conditions, other less restrictive stipulations, and best management practices are insufficient to achieve resource protection objectives.

**Controlled Surface Use** stipulations allow BLM to require future activities or development to be modified or relocated from the proposed location if necessary to achieve resource protection. The lessee will be required to submit a plan to meet resource management plan objectives through special design, operation, mitigation, relocation or reclamation measures. Plan must be approved by BLM to allow surface occupancy in these areas.

**Timing Limitation** stipulations are used to protect resources that are sensitive to disturbance during certain periods. These stipulations are generally applicable to specific areas, seasons and resources. They generally apply to items such as wildlife activities and habitats.

To ensure leasing decisions remain appropriate in the light of continually changing circumstances and new information, the BLM develops and applies lease stipulation waiver, exception or modification (WEM) criteria. A WEM must be specifically approved by the agency if the record shows that circumstances or relative resources values have changed, or that the lessee can demonstrate that operations can be conducted without causing unacceptable effects. Descriptions of WEMs are given below.

**Waivers** make permanent exceptions from a lease stipulation and it no longer applies anywhere on the lease.

**Exceptions** are a one-time exception for a particular site within the leasehold; exceptions are determined on a case-by-case basis; stipulation continues to apply to the rest of the leasehold.

**Modifications** are a change in the provisions of a stipulation either temporarily or for the term of the lease. Depending on the modification, the stipulation may or may not apply to all sites within the leasehold to which the restrictive criteria are applied.

**Reasonably Foreseeable Development Scenario**

Because leasing itself does not involve any surface disturbance, it is necessary to project the amount of surface use or activity that may result during lease development in order to disclose potential effects and inform decision-making. This projection of activity is done in the Reasonable Foreseeable Development Scenario, or RFD. The RFD serves as a basis for analyzing environmental effects that could result from leasing and developing geothermal resources. There are a variety of factors (e.g., economic, social and political) that are beyond the control of the federal agencies that will influence the demand for and development of geothermal resources. Therefore, RFD scenarios are a best professional estimate of what may occur if leasing occurs. RFDs are not intended to be maximum-development scenarios, nor should it be interpreted that the RFD sets a limit or threshold on development. Rather it should be viewed as a reasonable projection of activities that could occur for the purposes of analyzing environmental effects. It should be noted that an RFD provides a general
projection of the types of activity and effects that may occur, but cannot accurately predict the magnitude and extent of the effects due to uncertainty about the timing, location distribution of the geothermal resource, and the likely types of development.

Geothermal RFDs look at the four sequential phases of geothermal development; exploration, drilling, utilization and reclamation/abandonment. The success or failure of each phase affects the implementation of the subsequent phases, and thus the associated environmental effects. More detailed discussion on the individual phases is in the Programmatic EIS, Section 2.5. The RFD also contains an assessment of the potential for geothermal resources to occur.

For this proposed lease area, BLM specialists prepared an RFD for the specific lands involved in the lease nomination (USDI-BLM 2010). The following section presents a summary of the geothermal resource potential and development potential by phase in geothermal development. The RFD assumed one geothermal development project that could culminate in a working commercial binary-cycle geothermal power plant of between 5 and 30 megawatts. Once operational, the project as a whole would likely occur in a two-section area with a small area of actual disturbance in that area. It was assumed that due to the average annual temperatures in the area, that the plant would operate using the dry cooling method which does not generate water vapor; therefore no plumes would be visible. The RFD also projected that geothermal fluids (i.e. water) would be developed in a closed system, and would be re-injected into the geothermal reservoir; hence no water loss would be expected.

Because of the nature of geothermal resource exploration and development, the lack of data regarding the area’s geothermal system, and the areal extent of the geothermal system, predicting precisely where within the RFDS Study Area (Figure 2) surface disturbance will occur is almost impossible. Unless otherwise stated, the activities discussed below 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. Even though the effects of the Forest Service lease nomination area may be greatly exaggerated, it must be assumed that all future activity may occur on NFS lands in the lease nomination; all activity would occur outside of areas that have a No Surface Occupancy stipulation proposed for the resource being analyzed; and may be subject to other lease terms and best management practices/mitigation proposed which further limit placement of facilities.
Geothermal Resource Occurrence and Development Potential

The RFD projects that all the nominated lands within the national forest have high potential for geothermal resources to occur, except a small portion on the northeastern-most corner of the northern parcel. The potential for geothermal resources to occur is linked to the presence of the Dakota Sandstone.
For the NFS lands, the RFD projects that development potential is high around the Tomichi Dome and eastern third of the north parcel, and moderate for the western two thirds of the northern parcel. The areas of high development potential are those most likely to see exploratory efforts. Table 1 shows the projected amount of activity by phase.

Table 1. Projected Activity and Disturbance for Geothermal Lease Nomination COC-75384

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
<th>Projected short term disturbance</th>
<th>Projected long term disturbance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exploration</td>
<td>Geologic mapping, geophysical surveys</td>
<td>Negligible</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Temperature gradient holes</td>
<td>Four temperature-gradient boreholes per section, 0.17 acres disturbance per section on about 6 sections of NFS lands = 1 acre disturbance.</td>
<td>Negligible</td>
</tr>
<tr>
<td>2. Drilling</td>
<td>Test Wells</td>
<td>2 test wells at 4 acres each = 8 acres temporary (short term) disturbance</td>
<td>Negligible, unless test wells converted to production wells, then 1.6 acres long term.</td>
</tr>
<tr>
<td></td>
<td>Production and injection wells</td>
<td>3 production and 2 injection wells on 4 pads at 4 acres each = 16 acres</td>
<td>Reclaim to 0.8 acres per pad = 3.2 acres long term disturbance</td>
</tr>
<tr>
<td></td>
<td>Roads (estimate also includes temp. roads from exploration)</td>
<td>10 miles at 3.6 acres per mile = 36 acres</td>
<td>4 miles at 3.6 acres per mile = 14 acres</td>
</tr>
<tr>
<td></td>
<td>Drill holes – water depletion</td>
<td>11 wells at 1 ac-ft per well = 11 ac-ft of water</td>
<td>11 ac-ft of water</td>
</tr>
<tr>
<td>3. Utilization</td>
<td>Power plant</td>
<td>5 to 30 megawatt plant = 10 acres</td>
<td>10 acres</td>
</tr>
<tr>
<td></td>
<td>Pipelines</td>
<td>6 miles at 3 acres per mile = 18 acres</td>
<td>18 acres</td>
</tr>
<tr>
<td></td>
<td>Electrical transmission lines</td>
<td>5 miles at 6.1 acres per mile = 30.5 acres</td>
<td>Minimal, re-vegetation would occur after installation</td>
</tr>
<tr>
<td>Total estimated disturbance</td>
<td>119 acres</td>
<td>45 to 47 acres</td>
<td></td>
</tr>
<tr>
<td>4. Reclamation/Abandonment</td>
<td>All</td>
<td>Reclamation and abandonment, the fourth phase of a geothermal project, is expected to result in temporary disturbance of all originally disturbed acres, after which, the site would graded and vegetated to pre-disturbance conditions.</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

**Exploration**

Exploration will likely involve on-the-ground surveys (detailed mapping, ground resistivity, microseismic, etc.), which would likely entail foot traffic, all terrain vehicle use, and limited
vehicular disturbance (e.g., that associated with seismic studies). These activities would be followed by the drilling of a number of geothermal temperature gradient boreholes.

Temperature gradient boreholes are usually drilled with a truck-mounted rig. Rigs of this size typically do not require construction of a drill pad, except for vegetation clearing and leveling if needed. Access would be afforded on existing roads, or could require construction of new temporary roads. The estimate of roads shown for the drilling activities includes any roads that would be constructed during the exploration phase. Support vehicles would travel to the site on a daily basis. This drilling may last for several weeks.

Temperature gradient wells are not intended to directly contact the geothermal reservoir, and therefore produce no geothermal fluids.

**Drilling Operations**

If exploration shows favorable results for a geothermal resource, drilling test, production wells may occur. Drilling is an intense activity that requires large equipment (e.g., drill rig) and can take place 24 hours. Bringing the rig and ancillary equipment to the site may require 15 to 20 trips by full-sized tractor-trailers; with a similar amount for de-mobilizing the rig. There could be 10 to 40 daily trips for commuting and hauling in equipment (BLM 2007b).

If a reservoir is discovered, characteristics of the well and the reservoir are determined by flow testing the well. If the well and reservoir were sufficient for development, a wellhead, with valves and control equipment, would be installed on top of the well casing. Excess geothermal fluids are stored in temporary pits or sumps, generally lined with plastic (small sumps) or clay (large sumps).

**Utilization**

Utilization and production is the next phase after a viable reservoir is determined and includes the infrastructure needed for commercial operations, including access roads, construction of facility structures, building electrical generation facilities, drilling and developing production and injection wells, and installing pipelines, meters, substations, and transmission lines. The utilization phase could last from 10 to 50 years and involves the operation and maintenance of the geothermal field(s) and generation of electricity.

Geothermal production wells are usually deep (several thousand feet). The size of the well pad is dependent upon site conditions and on the number of wells for the pad. In order to drill these deep holes, a large drilling rig or derrick would be erected. Various temporary support facilities may be located on-site, including generators, mud tanks, cement tanks, trailers for the drillers and mud loggers, housing trailers, and storage sheds. Drilling operations can occur 24 hours a day.

Utilization operations would include geothermal power plant, which is typically supported by pipeline systems in the plant’s vicinity. The pipeline systems include a gathering system for produced geothermal fluids, and an injection system for the reinjection of geothermal fluids after heat extraction takes place at the plant. Pipelines transporting hot fluids or steam to the plant are covered with insulation, whereas injection pipelines are generally not. When feasible, they would parallel the access roads and existing roads to the destination of the
geothermal resource’s water. Pipelines are typically constructed on supports above ground, resulting in little if any impact to the surrounding area once construction is complete and the corridor has been re-vegetated. The pipelines typically have a few feet of clearance underneath them. The pipelines are typically painted to blend in with the surrounding environment.

Electric transmission lines would also be needed to convey generated electricity to the end user.

**Reclamation and Abandonment**

This phase involves abandoning the well after production ceases and reclaiming all disturbed areas in conformance with BLM and FS standards. Abandonment includes plugging, capping, and reclaiming the well site. Reclamation includes removing the power plant and all surface equipment and structures (including pipelines and transmission lines specific to the facility), regarding the site and access roads to pre-disturbance contours, and replanting native or appropriate vegetation to facilitate natural restoration.

**Lease Stipulations**

Stipulations for this project which are relevant for this analysis are described below. Stipulations developed for lynx include direction from the 2008 Southern Rockies Lynx Management Direction. Stipulations developed for other wildlife species (Gunnison Sage-Grouse and big game) or for other resource concerns also result in protection for lynx due to overlap with lynx habitat.

To comply with the 2008 Southern Rockies Lynx Management Direction, the following stipulations will apply if surface use on the lease is proposed in lynx habitat:

- **Timing Limitation** – In suitable lynx habitat, activities that would increase snow compaction will be prohibited between December 1 and April 15.
- **Controlled Surface Use** – In suitable lynx habitat, surface uses must be designed to accommodate the following:
  - Winter access will be limited to designated routes
  - Avoid facility construction in primary lynx habitat
  - Tree cutting will be avoided in snowshoe hare habitat
  - Remote monitoring of development sites
  - New roads will be closed to public motorized use
  - Avoid constructing new roads in lynx habitat
  - New roads will not be built on ridge tops, saddles, or in areas important for lynx habitat connectivity
  - Situate new roads away from forested stringers
  - Reclamation plans will include measures to promote lynx habitat and provide for effective road closure and decommissioning

Stipulations developed for other resources result in protections for lynx due to overlap with lynx habitat. No Surface Occupancy stipulations comprise 398 acres of lynx habitat; Controlled Surface Use comprises all lynx habitat (1,456.7 acres); and timing limitations, when combined with the lynx habitat timing limitation above, also comprise all lynx habitat.
• No Surface Occupancy – Geothermal activities will be prohibited within areas identified as earth flows or unstable slopes, which are considered geological hazards.
• No Surface Occupancy - Geothermal activities will be prohibited in areas containing slopes greater than 50%.
• No Surface Occupancy - Gunnison Sage-Grouse habitat.
• No Surface Occupancy – 100-ft buffer of riparian areas, seeps, and springs.
• Controlled Surface Use – Geological hazards identified as potentially unstable slopes, stabilized earth flow, or high ground water.
• Controlled Surface Use – Areas identified with a Recreation Opportunity Spectrum of semi-primitive non-motorized. No new roads would be allowed within this area, which comprises nearly all lynx habitat in the lease parcels.
• Controlled Surface Use – Slopes between 40 and 50%.
• Timing Limitation – Bald eagle winter concentration area (11/15 – 04/15); elk winter concentration and mule deer critical winter range (12/1 – 04/15).

If there is reason to believe that Threatened or Endangered species are present, or become present in the lease area, or if surface disturbing operations are proposed in habitat for any Threatened or Endangered species, the Lessee/Operator may be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall include species or groups of species identified by the FS, and will be conducted by a qualified specialist. A report of findings will be prepared and provided to the FS. A plan will be made that recommends protection for these species or action necessary to mitigate the disturbance consistent with the Forest Plan, wildlife conservation agreements, FS policy and with direction and applicable laws including ESA compliance.

In accordance with BLM Instruction Memorandum No. 2002-174, the BLM would apply the following stipulation on any leases where threatened, endangered, or other special status species or critical habitat is known or strongly suspected:

1. 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 the lease terms 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 would 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.

In addition to lease stipulations, during any subsequent exploration, drilling, utilization, or reclamation and abandonment of geothermal activities, the BLM and FS would require project-specific mitigation measures on permits. Best Management Practices (BMPs) are state-of-the-art mitigation measures that may be incorporated into a site-specific permit.
application by the lessee/operator, or included in the approved use authorization by the BLM as conditions of approval. Because there are no surface disturbing activities involved at the leasing stage, site-specific BMPs or mitigations to further protect surface resources are not included in the Decision Framework. However, the following list of items may be considered in more detail if or when surface disturbing activities are proposed. This list is not all inclusive, but is intended to disclose additional resources the federal and state agencies consider if the area is leased and also represents some of considerations in the Record of Decision for the Programmatic EIS (http://www.blm.gov/wo/st/en/prog/energy/geothermal/geothermal_nationwide/Documents/Final_PEIS.html).

- Geotechnical investigations
- Stormwater management
- Groundwater discharge and recharge
- Additional plant and animal surveys such as raptors, sensitive plants, etc. with subsequent avoidance
- Air quality monitoring plan and emissions control
- Noise
- Traffic plans and road design
- Visual resource mitigation or design (colors, lighting, siting features, etc)
- Vegetation removal/ incidental timber harvest
- Construction techniques for roads, pads, pipelines, utility lines
- Noxious weed prevention and control
- Hazardous materials
- Waste management
- Protection of workers and public
- Coordination with grazing permitees
- Interim and final reclamation techniques including recontouring, vegetation management, topsoil management, seeding, erosion control, mulching

III. ACTION AREA

The action area is not limited to the project footprint, but rather encompasses the full geographic area potentially affected by the proposed project, including the extent of all direct and indirect effects, as well as interdependent or interrelated activities. The action area serves to establish baseline conditions from which to evaluate potential effects from the project. For this biological assessment, the 39,848-acre Tomichi Dome Lynx Analysis Unit (LAU) will be considered the action area for the analysis of effects on lynx (Figure 3). Other scales of analysis may be used for other species (please see the biological evaluation and management indicator species analyses, available in the project record at the Gunnison Ranger District Office).
In October, 2009, a list of threatened, endangered, and proposed species present in Gunnison County was accessed from the U.S. Fish and Wildlife Service Colorado County Species list (http://www.fws.gov/mountain-prairie/endspp/countylists/colorado.pdf). On July 14, 2010, this list was accessed and reviewed a second time due to recent updates to the list (updated March 2010) and to ensure that the most updated species list was used for this analysis. The following list includes threatened, endangered, and proposed species, and/or designated critical habitat that are located within Gunnison County. These species were reviewed to determine their potential for occurrence within the project area. A pre-field review was conducted of available information to assemble occurrence records, describe habitat needs and ecological requirements, and to plan field reconnaissance. Sources of information included Forest Service records and files, the State Natural Heritage Program database, state wildlife agency (CDOW) information, and published research (please see literature cited section).
Candidate species have sufficient information on their biological status and threats to warrant a proposal to list as Endangered or Threatened, but development of a listing regulation is precluded by other higher priority listing activities. Species that are candidates for listing under the ESA are automatically placed on the Region 2 Regional Forester’s sensitive species list. The analysis and determination of effects for candidate species are included as part of the biological evaluation for sensitive species.

No further analysis is needed for species that are not known or suspected to occur in the project area, and for which no suitable habitat is present. Table 2 documents the rationale for excluding a species. If suitable but unoccupied habitat is present, then additional survey is needed, or presence is assumed and potential effects evaluated.

**Table 2. Federally listed species in Gunnison County**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
<th>Known/ suspected to be present?</th>
<th>Suitable habitat present?</th>
<th>Designated Critical Habitat present or could be affected?</th>
<th>Rationale if not carried forward for analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonytail</td>
<td><em>Gila elegans</em></td>
<td>Endangered</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not occur in the action area but water depletions associated with the project may affect this species.</td>
</tr>
<tr>
<td>Canada lynx</td>
<td><em>Lynx canadensis</em></td>
<td>Threatened</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Colorado pikeminnow</td>
<td><em>Ptychocheilus lucius</em></td>
<td>Endangered</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not occur in the action area but water depletions associated with the project may affect this species.</td>
</tr>
<tr>
<td>Greenback cutthroat trout</td>
<td><em>Oncorhynchus clarki stomias</em></td>
<td>Threatened</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not occur in the action area and water depletions associated with the project will not affect this species.</td>
</tr>
<tr>
<td>Gunnison’s prairie dog</td>
<td><em>Cynomys gunnisoni</em></td>
<td>Candidate</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Analyzed in the Biological Evaluation for sensitive species.</td>
</tr>
<tr>
<td>Humpback chub</td>
<td><em>Gila cypha</em></td>
<td>Endangered</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not occur in the action area but water depletions associated with the project may affect this species.</td>
</tr>
<tr>
<td>Razorback sucker</td>
<td><em>Xyrauchen texanus</em></td>
<td>Endangered</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not occur in the action area but water depletions associated with the project may affect this species.</td>
</tr>
<tr>
<td>Uncompahgre frillar butterfly</td>
<td><em>Boloria acrocnema</em></td>
<td>Endangered</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not occur within lease area. Lease area is below the elevation range of this species occurrence. Known populations occur in the San Juan Mountains in Southwest CO.</td>
</tr>
<tr>
<td>Yellow-billed cuckoo</td>
<td><em>Coccyzus americana</em></td>
<td>Candidate</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not occur within lease area.</td>
</tr>
<tr>
<td>Mexican spotted owl</td>
<td><em>Strix occidentalis lucida</em></td>
<td>Threatened</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not occur within lease area.</td>
</tr>
<tr>
<td>Ute ladies’-tresses orchid</td>
<td><em>Spiranthes diluvialis</em></td>
<td>Threatened</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not occur within lease area.</td>
</tr>
</tbody>
</table>
V. CONSULTATION TO DATE

No previous consultation has been conducted for this project. This project represents a tiered consultation from that conducted under the SRLA decision and tiers to the SRLA biological opinion (http://www.fs.fed.us/r2/projects/lynx/documents/index.shtml), because the anticipated effects from the proposed action are consistent with those anticipated and analyzed in the programmatic biological opinion. The biological opinion discusses effects in a general way at a broad-scale, programmatic level. As such, site specific effects of the proposed action are discussed and analyzed in the Effects section below.

The Fish and Wildlife Service issued a biological opinion (BO) ES/GJ-6-CO-F-033-CP062 (as amended April 27, 2007) establishing programmatic consultation procedures (PBO) for Forest Service projects that may affect the four endangered Colorado River fishes (Colorado pikeminnow, razorback sucker, humpback chub, and bonytail chub). Forest Service projects that result in one-time depletions occurring on the Gunnison River (among other rivers) are limited to 50 acre-feet per project and 100 acre-feet per year cumulatively. Under these circumstances the Forest is required to provide an annual report to authorize depletions occurring under the PBO. Species information for the four endangered fish are presented in the PBO is hereby incorporated by reference.

VI. SPECIES INFORMATION

Canada lynx

The Canada lynx was listed as threatened in March 2000. On February 3, 1999, the Colorado Division of Wildlife (CDOW) released 51 lynx in an attempt to reintroduce wild lynx back into the state of Colorado. Lynx were released in the San Juan Mountains near Creede, Colorado. Additional lynx were released in the spring of 2000, 2003, 2004, 2005 and 2006. A total of 218 lynx have been released in Colorado as part of this reintroduction program to reestablish a viable, self-sustaining lynx population in the Southern Rocky Mountain Ecosystem. The CDOW does not plan any additional releases of lynx in the near future (Shenk 2009A). The majority of surviving lynx from the entire reintroduction effort use high elevation (>2,900 m) forested areas from New Mexico north to Independence Pass, west as far as Taylor Mesa and east to Monarch Pass (Shenk 2009A). CDOW aerial and satellite lynx tracking data indicates two primary areas of use: 1) the core release area in southwest Colorado, and 2) an established core use area centered in the Collegiate Peaks and Taylor Park area in central Colorado (Shenk 2009B). The CDOW has also documented high use for the area north of Highway 50 around Gunnison and north to Crested Butte (Shenk 2009B).

As of May 25, 2009, CDOW researchers were tracking 42 out of 103 lynx that are possibly still alive (Shenk 2009A). From 2003 – 2009, a total of 38 dens and 116 kittens were found (Shenk 2009A). Through radio-telemetry CDOW researchers have confirmed lynx presence, dispersal and reproduction on the Grand Mesa, Uncompahgre and Gunnison National Forests. From February 4, 1999 through February 1, 2005, 121 individual lynx were located within the Grand Mesa, Uncompahgre and Gunnison National Forests using aerial and satellite tracking (Shenk 2005). Lynx were also located on Tomichi Dome during this time period, but there were very few aerial and satellite locations of lynx in the Tomichi Dome area (see Figure 4 from Shenk 2005). CDOW monitoring of radio-collared lynx from April
2000 to April 2009 (Shenk 2009B) indicates that the proposed project is not located within or near a lynx high-use area. The 2006 Amended Lynx Conservation Agreement considers all lynx habitat on a National Forest as occupied when there are at least two verified lynx observations or records since 1999 unless they are verified to be transient individuals, or there is evidence of lynx reproduction on the Forest (USFS and USFWS 2006). The SRLA identifies all lynx habitat for the National Forests in the Southern Rocky Mountains as occupied.

Shenk (2009A; 2009B) describes daytime lynx habitat use at the landscape scale based on 10,935 aerial locations of lynx from February 1999 – August 2008. Engelmann spruce/subalpine fir was the dominant cover used by lynx year-round, followed by a mix of Engelmann spruce, subalpine fir and aspen as the second most common cover type and various riparian and riparian-mix areas as the third most common cover type used. Use of riparian areas increased in July, peaked in November, and dropped off December through June. Site-scale habitat plots also indicated that Engelmann spruce and subalpine fir were the most common forest stands used by lynx for all activities during winter. While Engelmann spruce and subalpine fir occurred in similar densities at kill sites, long beds and travel sites, den sites contained twice the density of subalpine firs found at all other sites (Shenk 2009A; 2009B). Most den sites occurred at high elevations (mean elevation of 11,001 ft), and typically on north-facing slopes in spruce/fir forests with abundant dense course woody debris (Shenk 2009B). For more detailed information on the life history, biology and ecology of the Canada lynx please see the biological assessment and biological opinion for the SRLA, available online at: [http://www.fs.fed.us/r2/projects/lynx/documents/index.shtml](http://www.fs.fed.us/r2/projects/lynx/documents/index.shtml).

Project activities include consenting to lease the proposed FS lease area, with leasing potentially leading to subsequent phases of geothermal development (exploration, drilling, utilization and reclamation/abandonment). There is approximately 1,457 acres of lynx habitat within the FS lease area. Lynx using this habitat for denning, hunting, resting, or travel could potentially be directly affected from future surface use activities in terms of disturbance/displacement from development activities, human presence, and associated noise effects, which may disrupt hunting, breeding and dispersal patterns of lynx. Lynx could be indirectly affected from habitat alteration that reduces or decreases the quality of winter foraging or denning habitat, or that results in changes to lynx primary or secondary prey distribution and abundance. Due to small patch size of lynx habitat on Tomichi Dome, lack of dense course woody debris (based on October 2009 field verification) and lack of connectivity of habitat in the lease area with larger contiguous blocks of lynx habitat elsewhere within the LAU, lynx use of the lease area most likely consists of traveling/foraging animals.

**Critical Habitat**

Critical habitat has not been designated for Canada lynx in the southern Rocky Mountains. Critical habitat does not occur within or near the action area for any other species.
VII. ENVIRONMENTAL BASELINE

Site Description
The Gunnison Ranger District wildlife biologist and a GMUG natural resource specialist conducted field visits to verify lynx habitat within the FS proposed lease area during the month of October, 2009. Elevations range from 8,600 ft to 11,465 ft within the NFS proposed lease boundaries. Forest vegetation and structure within the FS lease area include early, mid, and late seral stages of Engelmann spruce-subalpine fir, lodgepole pine, Douglas fir, ponderosa pine, bristlecone pine, aspen, grassland meadows, willow riparian, big sagebrush (Artemisia tridentata vaseyana and Artemisia tridentata wyomingensis), black sagebrush (Artemisia nova), and scree and talus fields (Table 3).

Scattered individuals of ponderosa pine and bristlecone pine were often found in Douglas fir and lodgepole pine dominated stands on the south side of Tomichi Dome. Pure aspen and aspen-Douglas fir mixed stands were found primarily on the south and east sides of Tomichi Dome. Sagebrush plant communities occur in the south 1/3 of the Tomichi Dome parcel. Smaller sagebrush patches overlap into the FS lease area and connect to larger patches on adjacent BLM and private lands on the west and east side of Tomichi Dome. Engelmann spruce-subalpine fir and lodgepole pine was found on the north side of Tomichi Dome. The north parcel consisted of sagebrush, Douglas fir, ponderosa pine and willow riparian vegetation. The FS vegetation database (R2Veg, last updated April 14, 2010) was used in this analysis to describe existing vegetation within the project area. Existing vegetation at two potential analysis scales (FS proposed lease area and LAU) is shown in Tables 3 and 4.

Table 3. Acres of vegetation cover types and habitat structural stages within the FS lease area, based on R2Veg.

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>No Veg. Structure</th>
<th>1M</th>
<th>2S</th>
<th>3A</th>
<th>3B</th>
<th>3C</th>
<th>4A</th>
<th>4B</th>
<th>4C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grasslands</td>
<td>370</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>370</td>
</tr>
<tr>
<td>Bare Soil/Rock</td>
<td>196</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>244</td>
</tr>
<tr>
<td>Sagebrush</td>
<td>868</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>868</td>
</tr>
<tr>
<td>Willow</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Aspen</td>
<td>13</td>
<td>84</td>
<td>262</td>
<td>53</td>
<td>303</td>
<td>716</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Douglas fir</td>
<td>64</td>
<td>33</td>
<td>61</td>
<td>418</td>
<td>79</td>
<td>655</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bristlecone pine</td>
<td>31</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Lodgepole pine</td>
<td>74</td>
<td>39</td>
<td>152</td>
<td>391</td>
<td>656</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spruce-fir</td>
<td>101</td>
<td>11</td>
<td>5</td>
<td>73</td>
<td>189</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>197</td>
<td>418</td>
<td>887</td>
<td>44</td>
<td>323</td>
<td>307</td>
<td>99</td>
<td>628</td>
<td>845</td>
<td>3,748</td>
</tr>
</tbody>
</table>

*No Veg. Structure – open water or predominantly barren; little to no vegetation; 1M - Grass-forb, not previously trees (Natural meadow); 2S - Shrub-seedling, not previously trees; 2T - Shrub-seedling, previously trees; 3A - Sapling-Pole, Crown cover percent < 40; 3B - Sapling-Pole, Crown cover percent ≥ 40 and < 70; 3C - Sapling-Pole, Crown cover percent ≥ 70; 4A - Mature and over mature, crown cover percent < 40; 4B - Mature and over mature, crown cover percent ≥ 40 and < 70; 4C - Mature and over mature, crown cover percent ≥ 70.*
Table 4. Acres of vegetation cover types and habitat structural stages within the Tomichi Dome LAU, based on R2Veg.

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>No Veg. Structure</th>
<th>1M</th>
<th>1T</th>
<th>2S</th>
<th>2T</th>
<th>3A</th>
<th>3B</th>
<th>3C</th>
<th>4A</th>
<th>4B</th>
<th>4C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forblands</td>
<td>96</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>102</td>
</tr>
<tr>
<td>Grasslands</td>
<td>3,644</td>
<td>64</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3,713</td>
</tr>
<tr>
<td>Bare Soil/Rock</td>
<td>222</td>
<td>48</td>
<td>11</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>314</td>
</tr>
<tr>
<td>Shrublands</td>
<td>115</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>128</td>
</tr>
<tr>
<td>Sagebrush</td>
<td>10,255</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10,261</td>
</tr>
<tr>
<td>Willow</td>
<td>575</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>575</td>
</tr>
<tr>
<td>Aspen</td>
<td>215</td>
<td>1,146</td>
<td>2,650</td>
<td>132</td>
<td>840</td>
<td>3,216</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8,469</td>
</tr>
<tr>
<td>Douglas fir</td>
<td>123</td>
<td>181</td>
<td>111</td>
<td>297</td>
<td>1,054</td>
<td>786</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,551</td>
</tr>
<tr>
<td>Bristlecone Pine</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Lodgepole Pine</td>
<td>80</td>
<td>107</td>
<td>4,065</td>
<td>3,666</td>
<td>267</td>
<td>2,925</td>
<td>2,022</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13,131</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Spruce-fir</td>
<td>4</td>
<td>101</td>
<td>11</td>
<td>10</td>
<td>95</td>
<td>294</td>
<td></td>
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<td></td>
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<td>515</td>
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<tr>
<td>Water</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>28</td>
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<tr>
<td><strong>Total</strong></td>
<td>250</td>
<td>3,788</td>
<td>197</td>
<td>10,875</td>
<td>80</td>
<td>485</td>
<td>5,763</td>
<td>6,437</td>
<td>711</td>
<td>4,922</td>
<td>6,318</td>
<td>39,825</td>
</tr>
</tbody>
</table>

No Veg. Structure – open water or predominantly barren; little to no vegetation; 1M - Grass-forb, not previously trees (Natural meadow); 1T - Grass-forb, previously trees; 2S - Shrub-seedling, not previously trees; 2T - Shrub-seedling, previously trees; 3A - Sapling-Pole, Crown cover percent < 40; 3B - Sapling-Pole, Crown cover percent ≥ 40 and < 70; 3C - Sapling-Pole, Crown cover percent ≥ 70; 4A - Mature and over mature, crown cover percent < 40; 4B - Mature and over mature, crown cover percent ≥ 40 and < 70; 4C - Mature and over mature, crown cover percent ≥ 70.

Environmental Baseline Status of Lynx Habitat

The 3,748-acre lease area is entirely within the Tomichi Dome LAU. Lynx habitat mapping within the lease area was field verified in October 2009 with net field validation results shown in Table 5. Approximately 38.9% (1,456.7 ac) of the lease area’s overall area is considered suitable habitat for lynx with lynx denning (659.3 ac), winter foraging (417.9 ac), and “other” lynx habitat (379.5 ac). “Other” lynx habitat is defined as capable lynx habitat but currently not winter foraging or denning habitat. Stands mapped as other lynx habitat offer additional foraging opportunities during non-snow seasons and are within a matrix of higher-quality habitat but lack the structural attributes necessary to sustain year-round snowshoe hare populations. Other lynx habitat often consists of stands that are in close proximity to high quality snowshoe hare habitat. The remaining 61.1% of the action area is non-habitat (2,291 ac). There is no unsuitable habitat within the lease area.

Lynx habitat mapping within the Tomichi Dome LAU identifies lynx denning, winter foraging, other (i.e. capable but currently not denning or winter foraging habitat), and unsuitable habitat (Table 5; Figure 4). Unsuitable habitat is defined as clear-cuts and recent burns that currently do not meet lynx habitat requirements. Currently, 0.6% of lynx habitat within the LAU is unsuitable.
Potential impacts of the project to lynx are limited to the Tomichi Dome LAU. To date, lynx habitat within this LAU has not been affected by any SRLA exceptions and exemptions. Existing conditions of the Tomichi Dome LAU are summarized in Table 6 and include estimated lynx habitat that could potentially be affected by geothermal development if leasing occurs, based on the Reasonably Foreseeable Development Scenario. Since site-specific locations of surface activities are unknown at this time, an assumption is made that all surface activities could potentially occur in suitable lynx habitat. Within this LAU, there is 6,872 acres of non-federal land. Lynx habitat on non-federal lands is described in Table 7.

Table 5. Environmental Baseline Status of lynx habitat in the Tomichi Dome LAU.

<table>
<thead>
<tr>
<th>Habitat Description</th>
<th>Acres Habitat in LAU</th>
<th>Net Field Validation Results (acres)</th>
<th>Updated Acres of Habitat in LAU</th>
<th>Updated % of Lynx habitat in LAU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter Foraging</td>
<td>10,030</td>
<td>-327</td>
<td>9,703</td>
<td>39.7</td>
</tr>
<tr>
<td>Denning</td>
<td>6,366</td>
<td>-49</td>
<td>6,317</td>
<td>25.84</td>
</tr>
<tr>
<td>Other</td>
<td>8,671</td>
<td>-402</td>
<td>8,269</td>
<td>33.83</td>
</tr>
<tr>
<td>Suitable (sum of above)</td>
<td>25,067</td>
<td>-778</td>
<td>24,289</td>
<td>99.4</td>
</tr>
<tr>
<td>Unsuitable/Stand Initiation Structural Stage</td>
<td>155</td>
<td>0</td>
<td>155</td>
<td>0.6</td>
</tr>
<tr>
<td>Total Lynx Habitat</td>
<td>25,222</td>
<td>-778</td>
<td>24,444</td>
<td>100</td>
</tr>
<tr>
<td>Non-habitat</td>
<td>14,603</td>
<td>+778</td>
<td>15,381</td>
<td>38.6% of LAU</td>
</tr>
</tbody>
</table>

Table 6. Tomichi Dome LAU Summary of Existing Condition

<table>
<thead>
<tr>
<th></th>
<th>Total Acreage</th>
<th>Suitable Habitat</th>
<th>Acres Currently Unsuitable Habitat (% of lynx habitat)</th>
<th>Acres Non Habitat (% of LAU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomichi Dome LAU</td>
<td>39,825</td>
<td>24,289</td>
<td>155 (0.6)</td>
<td>15,381 (38.6)</td>
</tr>
<tr>
<td>Lease Area</td>
<td>3,748</td>
<td>1,457</td>
<td>0 (0)</td>
<td>2,291 (5.8)</td>
</tr>
<tr>
<td>Reasonably Foreseeable Actions (surface acres affected)</td>
<td>119</td>
<td>≤119</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 4. Lynx habitat within the Tomichi Dome LAU

Table 7. Lynx Habitat by Land Ownership, Tomichi Dome LAU

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>USFS - GMUG</th>
<th>BLM</th>
<th>SLB</th>
<th>Private</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-habitat</td>
<td>11,633</td>
<td>5</td>
<td>355</td>
<td>3,388</td>
<td>15,381</td>
</tr>
<tr>
<td>Other</td>
<td>7,052</td>
<td>1</td>
<td>287</td>
<td>930</td>
<td>8,269</td>
</tr>
<tr>
<td>Winter Foraging</td>
<td>8,818</td>
<td>0</td>
<td>384</td>
<td>502</td>
<td>9,703</td>
</tr>
<tr>
<td>Denning</td>
<td>5,296</td>
<td>0</td>
<td>259</td>
<td>762</td>
<td>6,317</td>
</tr>
<tr>
<td>Unsuitable</td>
<td>149</td>
<td></td>
<td></td>
<td>6</td>
<td>155</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32,947</strong></td>
<td><strong>6</strong></td>
<td><strong>1,284</strong></td>
<td><strong>5,588</strong></td>
<td><strong>39,825</strong></td>
</tr>
</tbody>
</table>

SLB = State Land Board

Environmental Baseline for Cumulative Effects

The lynx is a boreal forest predator with individual lynx maintaining very large territories (Mean for a reproductive female and attending male = 29,824 and 40,768 ac, Shenk 2009B; generally ranging between 7,680 ac – 53,120 ac, Koehler 1990, Koehler and Aubry 1994, Aubry et al. 2000, Squires and Laurion 2000; mean for non-reproductive animals = 259,840 ac, Shenk 2009B) of mature, old growth, and early successional forest, and may be influenced by the cumulative effects of multiple use vegetation management objectives, open road density, recreation, and other human activities. The action area for lynx (LAU) has a
history of such activities. It is likely that such cumulative actions influence lynx habitat use throughout the Tomichi Dome LAU.

Federal actions which have occurred in the past and are expected to occur in the future include additional vegetation management treatments (prescribed burns, which are not lynx habitat, and timber harvest), permitted livestock (currently cattle) grazing, permitted outfitter guides (horseback rides, but not within the nominated FS parcels, and hunting), permitted firewood cutting, and disbursed recreation (including hunting). Several easements are currently being administered, including the Western Area Power Administration (230 kv powerline that passes through the lease parcel in T49N, R4E, Sec. 9, with a ROW 125 ft in width), several road easements accessing private land inholdings, and a Ditch Bill easement (Greathouse Ditch, 1,500 ft length by 30 ft width located in Sec. 8, 9, T49N, R43E, NMPM). The Hot Springs Reservoir, totaling 32 acres, occurs on state land adjacent to and south of the north parcel. Road and trail maintenance is expected to continue within the LAU. The Gunnison Basin Federal Lands Travel Management FEIS was completed in April 2010, and the Record of Decision was signed on June 28, 2010. Future travel management activities include closing existing roads and trails identified in the ROD and FEIS. Non-federal actions occurring in the area include recreational hunting, mountain biking, ATV and dirt bike use on existing roads and trails, dispersed camping primarily associated with hunting, and nonspecific dispersed recreation. On private lands, single family homes, ranching, and livestock grazing are the primary uses within the LAU.

VIII. EFFECTS OF THE PROPOSED ACTION

Canada Lynx

Lynx Management Direction and Project Compliance with the Southern Rockies Lynx Amendment

The Canada lynx was listed as threatened on March 24, 2000 ([http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2000_register&docid=00-7145-filed.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2000_register&docid=00-7145-filed.pdf)). In August 2004, the Second Edition of the Canada Lynx Conservation Assessment and Strategy (LCAS) was released, to provide a consistent and effective approach to conserve Canada lynx on federal lands. The Canada lynx Conservation agreement (USDA 2005) identifies the Science Report (Ruggiero et al. 2000) and the LCAS (Ruediger et al. 2000) as including the best available science on habitat and identifies conservation measures. Both of these documents, along with local information are to be used for project analysis. In 2008, the Southern Rockies Lynx Management Direction Record of Decision on the Southern Rockies Lynx Amendment (SRLA) was published, which supersedes the LCAS.

The following direction (Table 7) from the SRLA ([http://www.fs.fed.us/r2/projects/lynx/documents/index.shtml](http://www.fs.fed.us/r2/projects/lynx/documents/index.shtml)) applies to human use (HU) projects (i.e., mineral and energy development). If leasing occurs, these objectives, standards, and guidelines will be applicable when and if geothermal resource development occurs and would apply to each of the four stages of development: exploration, drilling
operations, utilization, and reclamation/abandonment. Lease stipulations were developed to ensure compliance with the SRLA.

Table 7. Project compliance with the SRLA objectives, standards and guidelines.

<table>
<thead>
<tr>
<th>SRLA Direction</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conservation Measures Applicable to all Programs and Activities</strong></td>
<td></td>
</tr>
<tr>
<td>Objective ALL O1. Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.</td>
<td>Not Applicable. Project is not at a scale or at a location which precludes habitat linkage.</td>
</tr>
<tr>
<td>Standard ALL S1. New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in a LAU and/or linkage area.</td>
<td>Not Applicable. Development will not be at a scale or in a location which precludes habitat linkage.</td>
</tr>
<tr>
<td><strong>Conservation Measures Applicable to this Project</strong></td>
<td></td>
</tr>
<tr>
<td>Objective HU O1. Maintain the lynx’s natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat.</td>
<td>The Recreation Opportunity Spectrum for most of the area is classified as Semi-primitive Non-motorized, and is not open to over-the-snow motorized travel. A small portion of the area is open to semi-primitive motorized travel which allows for over-the-snow motorized travel. The area is open to unregulated over-the-snow non-motorized travel. Project activities will not change this, although they may increase such travel over current levels.</td>
</tr>
<tr>
<td>Objective HU O2. Manage recreational activities to maintain lynx habitat and connectivity.</td>
<td>Project does not alter recreational opportunities in the area. Roads developed for this project will not be open to public motorized use.</td>
</tr>
<tr>
<td>Objective HU O3. Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.</td>
<td>Project purpose and need does not allow for this. Project driven by resource extraction needs.</td>
</tr>
<tr>
<td>Objective HU O5. Manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat.</td>
<td>As site-specific locations for surface activities are not yet proposed, opportunity exists to minimize impacts to habitat at the surface development stage. However, terrain and project needs may limit ability to minimize impacts.</td>
</tr>
<tr>
<td>Guideline HU G4. Remote monitoring of mineral and energy development sites and facilities should be encouraged to reduce snow compaction.</td>
<td>Included in lease stipulations for this project.</td>
</tr>
<tr>
<td>Guideline HU G5. A reclamation plan should be developed (e.g., road reclamation and vegetation rehabilitation) for closed mineral and energy development sites and facilities that promote the restoration of lynx habitat.</td>
<td>Included in lease stipulations for this project.</td>
</tr>
<tr>
<td>Guideline HU G7. New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.</td>
<td>As site-specific locations for surface activities are not yet proposed, opportunity exists to minimize impacts to habitat at the surface development stage. However, terrain and project needs may limit ability to minimize impacts. This guideline is included in lease stipulations for this project.</td>
</tr>
</tbody>
</table>
### Table 7. Project compliance with the SRLA objectives, standards and guidelines.

<table>
<thead>
<tr>
<th>SRLA Direction</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline HU G9. If project level analysis determines that new roads adversely affect lynx, then public motorized use should be restricted. Upon project completion, these roads should be reclaimed or decommissioned, if not needed for other management activities.</td>
<td>Included in lease stipulations for this project.</td>
</tr>
<tr>
<td>Guideline HU G12. Winter access for non-recreation special uses and mineral and energy exploration and development should be limited to designated routes or designated over-the-snow routes.</td>
<td>Included in lease stipulations for this project.</td>
</tr>
</tbody>
</table>

### Exemptions/Exceptions Used & Acres Counted Toward Forest Caps on Habitat Change

The proposed project will not result in effects to lynx or lynx habitat because lease issuance alone does not authorize any ground-disturbing activities to explore for or develop geothermal resources without site specific environmental review and approval for the intended operation. As such, no exemptions and exceptions apply to this project. Exemptions and exceptions may apply during each of the four phases of geothermal development following lease issuance.

### Assumptions

For this analysis, all lease stipulations as described in section II are considered to be in effect. This analysis assumes that all future activities may occur within the FS lease area, and that all activity would occur outside areas that have a No Surface Occupancy stipulation and may also be subject to other lease terms (including controlled surface use stipulations and timing restrictions described in section II) and best management practices/mitigation which further limit placement of facilities.

The duration of Lynx habitat loss is described as either short-term or long-term. For the purpose of this analysis, “short-term” is defined as those temporary habitat impacts that would be reclaimed during one of the first three phases of geothermal development. Habitat would be expected to partially recover prior to completion of the project, but could take 20 years or longer, depending on the site. Although described as short-term, for lynx habitat recovery the impacts are really long-term because the duration of “short-term” habitat impacts and habitat loss would likely exceed several life-times of individual lynx and their prey. Long-term is defined as those habitat impacts, or habitat loss, that will not be reclaimed during or subsequent to the phases of development. Long-term habitat loss will be realized for the full duration of all geothermal phases, which will depend on the geothermal resource which is projected to be 30-50 years. Lynx habitat would not recover to a suitable condition until 20 years post-reclamation which is 50 to 70 years in the future.

### Direct and Indirect Effects

Consenting to the BLM to lease FS lands for geothermal resources is an administrative action that, in and of itself, would not cause any effects to listed species because lease issuance
alone does not authorize any ground-disturbing activities to explore for or develop geothermal resources without additional site-specific analysis and approval for the intended operation. However, lease issuance does grant 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 included in the lease. Stipulations include ESA compliance and FS consultation with the U.S. Fish and Wildlife Service if any listed species would be affected by ground-disturbing activities. The Reasonably Forseeable Development Scenario (RFD) described in section II projects the amount of surface use and activities that could potentially occur if a lease is issued, in terms of four sequential phases of development: exploration, drilling, operations, utilization and reclamation/abandonment.

**Exploration**

The RFD predicts that exploration would likely involve on-the-ground geologic mapping and geophysical surveys that would entail foot traffic, all terrain vehicle use, and limited vehicular disturbance. These activities would occur primarily along the existing transportation system within the lease area. Survey activities are not anticipated to impact habitat. Following these on-the-ground surveys, geothermal temperature gradient boreholes would be drilled with a truck-mounted rig. Access would utilize existing roads, or could require construction of new temporary roads. The RFD predicts that four temperature gradient boreholes per section would be drilled, on about six sections of FS lands, comprising 0.17 acres of disturbance per section for a total of one acre of disturbance. Therefore, out of the total 1,456.7 acres of suitable lynx habitat within the FS lease area and the total 24,444 acres of suitable lynx habitat within the Tomichi Dome LAU, the area of impact from exploration could potentially include one acre of suitable lynx habitat that could be converted to an unsuitable condition. At this stage of development, unsuitable lynx habitat within the Tomichi Dome LAU would increase from 155 acres to 156 acres. This would be a negligible increase in unsuitable habitat and the percent unsuitable would remain at 0.6 percent of lynx habitat in the LAU.

If present, lynx could potentially be displaced when exploration activities occur due to human presence. However, due to the relatively small amount of suitable lynx habitat within the lease area, the large amount of non-habitat surrounding the lease parcels (due to adjacent non-forested BLM, private and FS lands), and a lack of habitat connectivity to other suitable lynx habitat within the LAU, lynx are more likely to use larger blocks of suitable habitat within the LAU outside the lease area and unlikely to be present except as dispersing animals traveling through the area.

**Drilling Operations**

Drilling operations include test wells, production and injection wells, and road construction. The RFD projects two test wells, each comprising four acres, for a total disturbance of eight acres. The RFD anticipates three production and two injection wells on four pads (one pad for each of the three production wells and one pad for both injection wells). Each pad would comprise four acres, for a total disturbance of 16 acres. After they are constructed and the production and injection wells are in place, pads would be reclaimed from four acres down to 0.8 acres each. Once the reclaimed area has recovered to pre-disturbance conditions, the anticipated long-term disturbance from well pads would total 3.2 acres. The RFD projects 10
miles of road construction, with 3.6 acres of disturbance per mile for a total disturbance of 36 acres. Once the infrastructure is established, roads would be reclaimed from 10 miles down to four miles, for a total long-term disturbance of 14 acres.

Total short-term acres of disturbance for all drilling activities combined would be 60 acres, and total long-term disturbance would be 18.8 acres. Therefore, out of the total 1,456.7 acres of suitable lynx habitat within the FS lease area and the total 24,444 acres of suitable lynx habitat within the Tomichi Dome LAU, and assuming that all activities will occur in lynx habitat, drilling could potentially impact 60 acres of suitable lynx habitat. Of these 60 acres, the RFD projects that 41.2 acres may be reclaimed and 18.8 acres would be impacted over the long-term (life of geothermal production and operation). However, it is reasonable to assume that 60 acres of suitable lynx habitat would be converted to an unsuitable condition over the life of the project (30 to 50 years). The roads are not expected to result in increased snow compaction within lynx habitat in the LAU due to the stipulations described in section II. The exploration and drilling operations phases, when combined, could increase unsuitable lynx habitat within the Tomichi Dome LAU from 155 acres to 215 acres. This would likely be a negligible increase in unsuitable habitat as the percent unsuitable would increase from 0.6 percent to 0.9 percent of lynx habitat in the LAU.

As described above in the Exploration section, lynx are not anticipated to be present except as dispersers traveling and hunting through the area. However, in addition to temporary and potential long-term habitat loss, noise and human activity associated with construction and drilling activities may result in area avoidance of the area by lynx and prevent lynx from using otherwise suitable habitat in terms of travel, resting, and hunting.

Utilization
Utilization activities include the power plant, pipelines (surface), and electrical transmission lines. The RFD assumes a commercial binary-cycle geothermal power plant of between five to 30 megawatts and 10 acres of disturbance. The RFD also assumes that due to the average annual temperatures in the Upper Gunnison Basin area, the power plant would operate using the dry cooling method which does not generate water vapor. The RFD projects six miles of surface pipelines impacting three acres per mile, for a total disturbance of 18 acres. Five miles of electrical transmission lines are anticipated, impacting 6.1 acres per mile, for a total disturbance of 30.5 acres.

If all utilization activities occur in lynx habitat, there would be a total direct loss of 58.5 acres of habitat for the life of the project. When combined with the exploration and drilling operations phases, unsuitable lynx habitat within the LAU would increase from 155 acres to 274 acres. This would likely be a negligible increase in unsuitable habitat as the percent unsuitable would increase from 0.6 percent to 1.1 percent of lynx habitat in the LAU.

Reclamation/Abandonment
Reclamation and abandonment is expected to result in temporary disturbance of all originally disturbed acres described above, after which, the site would be graded and re-vegetated. The site is anticipated to re-vegetate to types consistent with their pre-disturbance condition over the long-term. Impacts to lynx and lynx habitat would be the same as described above.
Summary of Impacts from Geothermal Activities

Since it is possible that all surface disturbances could occur in lynx habitat, the total estimated loss of lynx habitat over the life of the project would be 119 acres (Table 8). Unsuitable lynx habitat in the Tomichi Dome LAU would increase from 155 acres to 274 acres, and the percent unsuitable within the LAU would increase from 0.6 percent to 1.1 percent. After the project is complete, all impacted areas would be graded and re-vegetated and expected to recover to pre-disturbance conditions (50-70 years). The duration that lynx habitat would be affected would exceed multiple lifetimes of both lynx and their prey. Twenty to 30 years post-reclamation, habitat could be suitable as winter foraging habitat depending on site-specific conditions, or might function as “other” lynx habitat. Depending on site-specific conditions, after 30 years the habitat would likely be suitable as “other” lynx habitat, and it could take 150 years or likely longer to provide old growth characteristics and habitat components suitable for denning.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
<th>Projected disturbance converting lynx habitat from suitable to unsuitable</th>
<th>% habitat in leasing analysis area (1456.7 acres habitat in lease area)</th>
<th>% habitat in the Tomichi Dome LAU (24,444 acres in LAU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>Geologic mapping, geophysical surveys</td>
<td>None</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td></td>
<td>Temperature gradient holes</td>
<td>1 acre</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Drilling</td>
<td>Test Wells</td>
<td>8 acres</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td></td>
<td>Production and injection wells</td>
<td>16 acres</td>
<td>1.1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td></td>
<td>Roads (estimate also includes temp. roads from exploration)</td>
<td>36 acres</td>
<td>2.5%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Utilization</td>
<td>Power plant</td>
<td>10 acres</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td></td>
<td>Pipelines</td>
<td>18 acres</td>
<td>1.2%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td></td>
<td>Electrical transmission lines</td>
<td>30.5</td>
<td>2.1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td><strong>Total estimated disturbance</strong></td>
<td></td>
<td><strong>119 acres</strong></td>
<td><strong>8.2%</strong></td>
<td><strong>0.5%</strong></td>
</tr>
</tbody>
</table>

Lease stipulations will mitigate impacts due to the creation of roads, transmission lines, pads for production and injection wells, power plant facility, winter access, and vegetation changes. The stipulations are described in section II of this analysis and their application to specific Forest Plan/Lynx Management Direction objectives and guidelines for human use projects such as the proposed action are indicated in Table 7. Lease stipulations described in Section II result in No Surface Occupancy, Controlled Surface Use, and Timing Limitation protections. Figure 5 identifies the spatial overlap of these stipulations with lynx habitat. No Surface Occupancy stipulations would protect 398 acres of lynx habitat. Controlled Surface Use and Timing Limitations overlap all lynx habitat in the lease parcels.
Summary of Direct and Indirect Effects

The following potential effects to lynx may include:

- Direct effect of habitat loss/alteration
- Short and long-term direct effects from disturbance to lynx dispersing, hunting, or resting
- Short and long-term direct effects of mortality from traffic
- Impacts from changes in winter access (competition and disturbance)
- Long-term direct effects as a result of changes in vegetation, which provides denning and foraging habitat

This analysis examines a worst-case scenario for habitat loss due to the uncertainty of locations of future surface disturbance activities associated with the four phases of geothermal development. If the proposed action is implemented and the four phases of geothermal development occur as described in the RFD, and all associated activities occur within lynx habitat, 119 acres of suitable habitat could be directly lost (total loss throughout the life of the project) through the creation of roads, surface pipelines, electrical transmission lines, production and injection wells, and the powerplant within the LAU (0.5%). Some of the past and current activities may result in the loss of 155 acres of habitat within the LAU, for a total of 274 acres of habitat lost within the LAU (1.1% of lynx habitat within the LAU). None of the other past, present, or reasonably foreseeable future activities within the LAU are anticipated to result in lost habitat or habitat effectiveness.
Based on field verification of lynx habitat, the majority of the area mapped as denning habitat within the lease area does not provide adequate structure (root wads, jackstraw piles, large course woody debris) required for den sites. As such, lynx are unlikely to den within the lease area. However, lynx habitat on Tomichi Dome is important in terms of providing cover, refuge, and prey for traveling or dispersing lynx. A permanent loss of habitat and human disturbance associated with geothermal activities reduces this functionality of the Tomichi Dome area for lynx, thus reducing the overall effectiveness of the LAU. Traffic is not anticipated to be a substantial impact. Roads used for this project will be low-speed routes and public use would be restricted. Roads will also be decommissioned after they are no longer needed, as noted in the lease stipulations. Winter access is not anticipated to be substantially increased over current levels as the area receives little recreational over-the-snow use and maintenance activities should be minimal. In addition, lease stipulations should help to avoid or minimize snow compaction impacts.

**Cumulative Effects**

Cumulative effects under the Endangered Species Act include future non-federal actions which may impact this species. Past and ongoing actions are included and discussed above in the Environmental Baseline section. Although it is unknown during the lease phase if and/or how much future surface disturbance might occur in lynx habitat, a worst case analysis would assume that the proposed action would alter 119 acres of the 24,444 acres of lynx habitat within the LAU (0.5%). Added to the 155 acres (0.6%) of habitat impacted under previous and ongoing actions, this would result in 1.1% of the suitable habitat in the LAU being rendered unsuitable but would be expected to regenerate following reclamation.

The FACTS (Forest Service Activity Tracking System) database was used to determine past federal actions in the Tomichi Dome LAU which may have impacted lynx habitat. Within the past 10 years, a total of 6,239 acres of various overlapping vegetation treatments has occurred within the LAU, associated primarily with timber and prescribed fire vegetation management activities. Of these acres, 3,555 acres have occurred in lynx habitat. These acres reflect some re-treatment of areas due to multiple entries for a single project, so that less than 6,239 acres of the landscape have been actually treated. Past and ongoing treatments in lynx habitat have converted approximately 155 acres of habitat to an unsuitable condition over the past 40 years.

On private lands, ranching activities and grazing adjacent to the lease parcels may contribute to vegetation changes in the area. However, these private lands are already modified through long-term human use, and continued grazing is not likely to alter the suitability of lynx habitat in this area from current conditions. The potential exists for additional development on private land in terms of single family home development. If development should occur in previously undeveloped areas, lynx habitat and/or habitat quality may be reduced, but the amount that could be changed to an unsuitable condition is unlikely to impair lynx home range, disrupt habitat connectivity, or compromise the function of habitat within the affected LAU’s because suitable lynx habitat on adjacent federal public lands should function to meet lynx needs. Water developments in this area (Hot Springs Reservoir, ditches) already exist, and future actions will continue use of existing facilities. Impacts of past and current grazing, recreation, outfitting, and other permitted activities (easements) on federal lands are
the same as above. Other actions are insignificant and discountable to lynx or their habitat (road and trail maintenance) or occur on already disturbed sites (easements/special use permits). Recreation activities are not expected to be substantially altered by this project and impacts of recreation on lynx are expected to be similar to the current conditions.

When combining the direct and indirect effects of the project activities with the past, present, and reasonably foreseeable activities in the action area, it is likely that the proposed action would add cumulatively to existing impacts on the lynx to the point that an individual lynx or its home range (lynx analysis unit), would be adversely affected, due to the potential for permanent habitat loss that could result in reduced effectiveness of the Tomichi Dome LAU. However, abundant lynx habitat will remain within the LAU to provide potential lynx denning, winter foraging and travel habitat. The proposed action could potentially cause the percent unsuitable habitat in the LAU to increase to slightly above 1% of lynx habitat in the LAU. Habitat connectivity within the Tomichi Dome LAU and between adjacent LAUs is not expected to be significantly impacted because:

- The affected area is not close to adjacent LAU boundaries
- There is a relatively small patch size of suitable habitat on Tomichi Dome (1,456.7 acres).
- Based on the existing condition for lynx, there is a lack of habitat connectivity between suitable habitats in the project area with larger blocks of suitable lynx habitat elsewhere within the LAU due to non-forested BLM and private lands on the west, south and east sides of Tomichi Dome.
- There is an abundance of larger contiguous blocks of suitable lynx habitat outside the affected area within the LAU.
- The Tomichi Dome area and FS lease parcels occur outside lynx high use areas identified by Shenk (2009). Based on the use-density surface analysis for lynx satellite locations (Shenk 2009), the Tomichi Dome area appears to overlap a low density area for lynx occurrence.
- Lease stipulations for this project follow standards, guidelines and objectives identified in section II.

**Four Endangered Colorado River Fish (Bonytail, Colorado pikeminnow, Humpback chub, and Razorback sucker)**

**Direct, Indirect and Cumulative Effects**

The proposed action would result in a total of 11 wells drilled over the life of the lease (15 years). Consumptive use of water associated with a single well is 1 acre-feet for a total of 11 acre-feet for the life of the lease. Water depletions, as they occur, will be reported annually by February 1 following the year in which the depletion occurred in accordance with PBO # ES/GJ-6-CO-F-033-CP062.
IX. DETERMINATION

Canada lynx
Implementation of the project “may affect, and is likely to adversely affect” the Canada lynx. This is based primarily on the potential for permanent loss of suitable habitat within the lease area. Other impacts such as disturbance to dispersing, foraging, resting, denning, competition and disturbance from changes in winter access or increased mortality risk are insignificant and discountable due to the small patch size of lynx habitat, lack of connectivity of habitat within the lease area to larger contiguous blocks of higher quality lynx habitat elsewhere within the LAU, lack of adequate structure (abundant dense course woody debris) to provide den sites for lynx within the lease area as determined by field verification, and the low probability of incidental mortality due to new roads and increased traffic associated with geothermal development and operation. Lease stipulations should minimize impacts to lynx and lynx habitat, but the potential of permanent suitable lynx habitat loss that when combined with past, present, and reasonably foreseeable actions, leads to an adverse affect determination. As discussed above under direct, indirect, and cumulative effects, habitat in the lease area provides cover, refuge, and prey for traveling or dispersing lynx. Thus, a permanent loss of habitat could potentially reduce the effectiveness of the Tomichi Dome LAU.

Colorado pikeminnow, razorback sucker, humpback chub, and bonytail chub
Implementation of the project will result in a “may affect, and is likely to adversely affect” the endangered Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), and bonytail chub (*Gila elegans*), and their designated habitat. The adverse impact determination is based upon potential water depletion on 11 acre-feet of water over the life of the lease. Any water depletions associated with the project will be reported under the year they occur in accordance with the GMUGs programmatic water depletion consultation (ES/GJ-6-CO-F-033-CP062 (as amended April 27, 2007)).

X. RECOMMENDED CONSERVATION MEASURES TO AVOID, MINIMIZE, OR MITIGATE ADVERSE EFFECTS
Additional conservation measures are not necessary due to the lease stipulations that incorporate the lynx management direction from the SRLA.

XI. RESPONSIBILITY FOR A REVISED BIOLOGICAL ASSESSMENT
This Biological Assessment was prepared based on presently available information. If the action is modified in a manner that causes effects not considered, or if new information becomes available that reveals that the action may impact endangered, threatened, or proposed species that in a manner or to an extent not previously considered, a new or revised Biological Assessment will be required and consultation with U.S. Fish and Wildlife Service may need to be reinitiated.
XII. REFERENCES


basis for conserving forest carnivores American marten, fisher, lynx, and wolverine in the western United States. U.S. Department of Agriculture Forest Service General Technical Report RM-254, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.


