

Wildlife Report

Newberry Volcano Enhanced Geothermal System (EGS) Demonstration Project

US Department of the Interior, Bureau of Land Management (BLM)
DOI-BLM-OR-P000-2011-0003-EA DOE/EA-1897

ENVIRONMENTAL ASSESSMENT DECEMBER 2011

Location: Federal Geothermal Leases on the West Flank of Newberry Volcano,
Deschutes County, 22 miles south of Bend, Oregon

Applicant: Davenport Newberry Holdings LLC and
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INTRODUCTION

The purpose of this wildlife report is to evaluate the potential effects from the proposed Newberry Volcano Enhanced Geothermal System (EGS) Demonstration Project on Deschutes National Forest Management Indicator Species (MIS) and migratory birds with habitat on the Deschutes National Forest.

The following three documents provide guidance for managing MIS and migratory birds on federal lands: the Deschutes National Forest Land and Resource Plan (LRMP)[1990], the US Fish and Wildlife Service (USFWS) Birds of Conservation Concern, and a Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington (Altman 2000). Some species listed in these documents overlap with each other as well as the federal threatened, endangered and sensitive species lists (addressed in the Biological Evaluation).

Executive Order (13186) provides for enhanced cooperation between the Forest Service and USFWS to address impacts to neotropical migratory birds in conjunction with the Migratory Bird Treaty Act (MBTA). Specific activities are identified where cooperation between the parties will substantially contribute to conservation and management of migratory birds, their habitat, and associated values, and thereby advances many of the purposes of the Executive Order.

In response to this Executive Order and subsequent compliance with the MBTA, the Deschutes National Forest is currently following guidelines from the “Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington”. This document addresses key habitat types as well as biological objectives and conservation strategies for these habitat types and the focal species that are associated with these habitats found in the East Slope of the Cascades. The key habitats are: 1) Ponderosa Pine 2) Mixed Conifer (Late Successional) 3) Oak-Pine Woodland 4) Unique Habitats (Lodgepole Pine, White Bark Pine, Meadows, Aspen, and Subalpine Fir). There is no Oak-Pine Woodland, White Bark Pine, Aspen, Meadows, or Subalpine Fir habitat within the proposed treatment areas.

In 2002 the USFWS released “Birds of Conservation Concern 2002” (BCC) which identifies species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973. Bird species listed in this report include nongame birds, gamebirds without hunting seasons, subsistence-hunted nongame species in Alaska, and federally listed candidate, proposed endangered or threatened, including recently delisted species. While all of the bird species included in BCC 2002 are priorities for conservation, the list makes no finding with regard to whether they warrant ESA listing. The goal is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservations actions (USFWS 2002). From this publication, Bird Conservation Regions (BCRs) were developed based on similar geographic parameters. Species on these lists are discussed within this document if they were known to or potentially could occur within the proposed treatment areas.

This report has considered the best available science; including papers, reports, literature reviews, review citations, peer reviews, and science consistency reviews. The best available science coupled with goshawk surveys, general field reconnaissance, District and Forest data,

and local knowledge of the area was used to determine species or habitat presence and effects.

The proposed project is located in central Oregon on Deschutes National Forest lands along the western flank of Newberry Volcano. Except for three seismic monitoring stations (Figure 1), the project is located outside the Newberry National Volcanic Monument (Monument or NNVM), on federal geothermal leases administered by the BLM that were issued between 1982 and 2003. Davenport Newberry LLC is currently the holder of all geothermal leases identified in the NOI.

The BLM is the lead agency for this project because the majority of the project activity would occur on leases issued and administered by the BLM. The proposed project is located entirely on National Forest system lands as part of the USDA Forest Service, Deschutes National Forest. Nine (9) of the monitoring stations necessary to implement the Seismic Mitigation Plan are within lands where surface disturbance is under the authority of the Forest Service. Therefore, the Forest Service is a cooperating agency for the preparation of this Environmental Assessment (EA). The Energy Policy Act of 2005 gives the Secretary of Energy the authority to conduct a program of research, development, demonstration, and commercial application for geothermal energy. The U.S. Department of Energy (DOE) is funding a portion of the project; therefore DOE is also a cooperating agency in this EA.

SUMMARY OF THE ALTERNATIVES

The following are summaries of the three alternatives, therefore this report incorporates the detailed purpose and need, the three alternatives, and mitigation measures/project design criteria as described in Chapters 1, 2, 3, and 4 of the EA.

Alternative A (Proposed Action)

Davenport and AltaRock (Proponents) propose to create an EGS Demonstration Project involving new technology, techniques, and advanced monitoring protocols for the purpose of testing the feasibility and viability of enhanced geothermal systems for renewable energy production.

The project would utilize an existing well pad and an existing deep geothermal well on federal geothermal lease OR40497 held by Davenport Newberry Holdings LLC. Nearby there would be 20 microseismic monitoring stations. All of these sites are on national forest system lands. Eleven of the sites would be on federal geothermal leases administered by the BLM, and 9 would be on lands that are administered by USFS. If approved, drilling and installation of the downhole microseismic monitoring stations for the project would begin in early 2012.

Alternative B

Alternative B is identical to Alternative A except for the long-term circulation test, which uses different equipment. This alternative was derived from public comments received during the scoping process expressing concerns over water usage and the visual impact from the

steam plume. In this alternative, closed, pressurized vessels would be used to separate steam at a higher pressure and temperature thereby reducing water lost through evaporation and reducing the amount of water vapor in the steam plume. This alternative would require diesel engines in addition to those in Alternative A to power air-cooled heat exchangers to cool the separated liquid.

Alternative C (No Action)

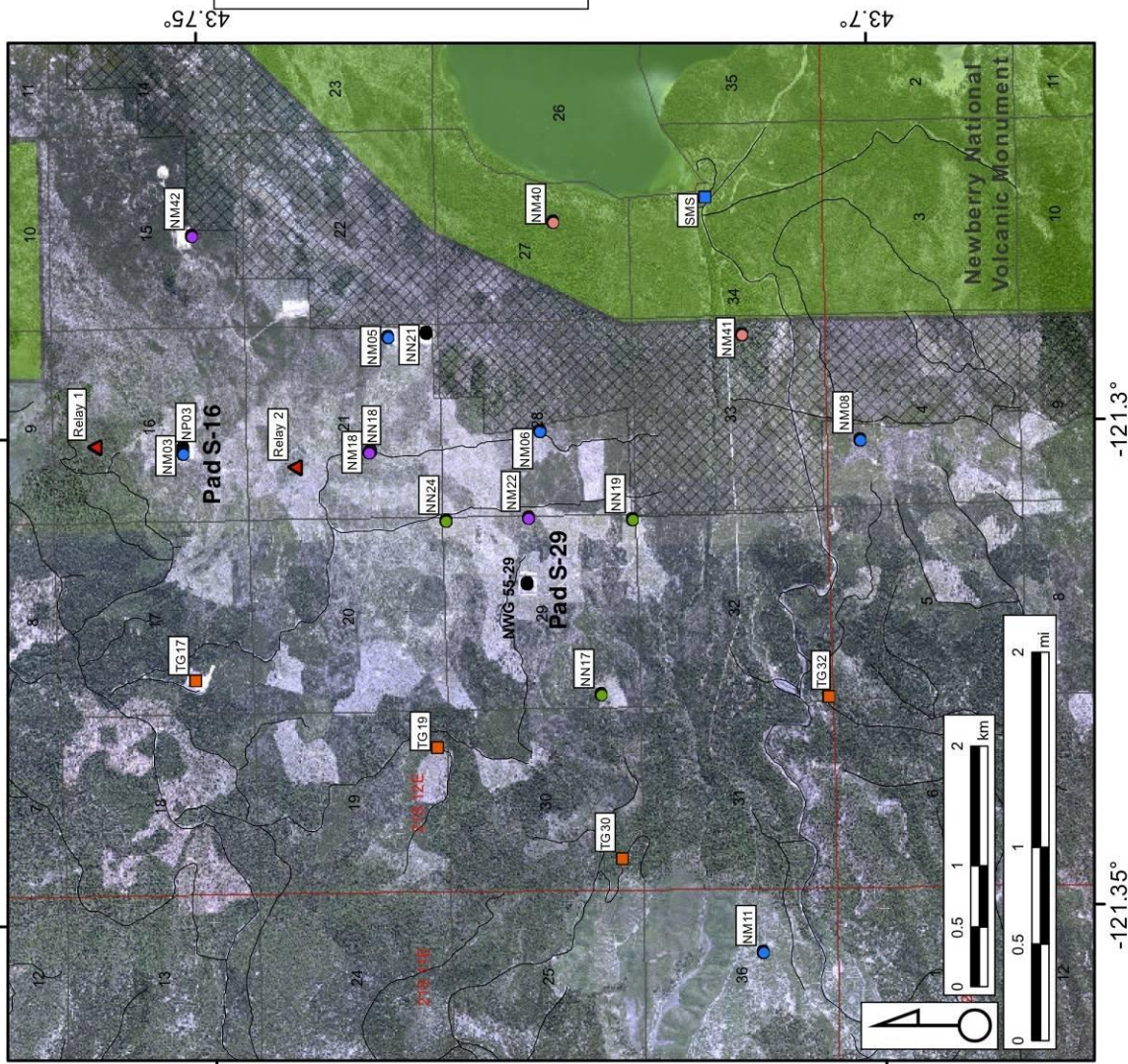
Under this alternative, the EGS demonstration project would not be approved. Analysis of this alternative is required by NEPA to establish a baseline from which to evaluate the relative impact to the environment of implementing other alternatives.

Figure 1 below shows the proposed monitoring stations and the existing well pad (S-29), where the bulk of the activity would occur.

Newberry Microseismic Array Station Locations (11/01/2011)

- Legend**
- SMS
 - ▲ Relay Station
 - MSA and Related Station Locations**
 - Existing Holes or Conductor Pipe
 - Current - Remain as Surface
 - Current Surface Station - BH to be drilled
 - Exploration Holes
 - New Surface Location - no Solar/Telemetry
 - New Surface Location
 - Newberry National Volcanic Monument
 - Special Management and Transfer Areas

Label	Alt/Labels	Type
NN19	NBM07	Down hole
NN21	CE 88-21	Down hole
NN24		Down hole
TG19	TG 19N	Down hole
NN18	Water Well #2	Down hole
NN17	NBM17	Down hole
TG32	TG 32S	Down hole
NP03	NWCA46-16	Down hole
TG17	TG 17N	Down hole
TG30	TG30N, MSA12	Down hole
NM08	NBM08	Surface
NM22		Surface
NM03	NBM03	Surface
NM05	NBM05, MSA05	Surface
NM06	MSA06	Surface
NM18	Water Well #2	Surface
NM40	USGS P19	Surface
NM42	TCH 76-15	Surface
NM41		Surface
NM11	MSA11	Surface



ANALYSIS METHODS

A Forest Service biologist conducted field reconnaissance of the project area, including the broader area outside the project area for the purposes of potential cumulative effects. The Forest Service conducted surveys specifically for the Temperature Gradient sites (Figure 1) in the 2010 and 2011 breeding seasons, but no raptors were detected. In the 2011 breeding season, the Forest Service also conducted goshawk surveys for all the surface stations and the three new borehole MSA stations (NN 17, NN 24, and NN19), but no raptors or raptor nests of any kind were detected.

Since the ongoing Ogden EA project area overlaps the entire EGS project area, the field surveys that were conducted were also utilized, including other data where applicable. The Forest Service conducted surveys for the northern goshawk in the Ogden EA project area between July 2nd and July 24th 2009 and again in the 2010 and 2011 breeding seasons in an attempt to locate the presence of a nesting pair (the Ogden wildlife survey area overlaps the entire EGS Project area). Two northern goshawk nest sites with a total of three nests were detected as a result of these surveys. In addition, while there are no known active eagle or osprey nests, there is a historical osprey nest located within the riparian area along Paulina creek.

The detailed findings from these surveys are on file at the Bend-Fort Rock Ranger District Office.

Some wildlife habitats required a more detailed analysis and discussion. The level of analysis depends on the existing habitat conditions, such as limited habitat availability versus widespread habitat availability, including habitat components (travel corridors, late/old structural habitat, snags, fragmentation, water sources), the magnitude and intensity of the effects of the proposed actions (i.e. would the proposed actions cause a loss, no change, or increase in habitat), the risk to the resources (sustainability and availability of the habitat), and the issues identified during the formulation of the alternatives in the EA. These factors were used to form conclusions as to how the information, in regards to the effects would be useful and relevant in the process of making an informed decision.

There have been a considerable number of past National Forest projects and activities in and around the 32,000 acre geothermal lease area in which the EGS Demonstration Project is proposed. Table 1 lists the past actions that have contributed to the existing conditions within the project area and cumulative effects area. Table 2 lists ongoing or reasonably foreseeable future actions in the project area and cumulative effects area.

Since the effects deal with forest development which inherently involve multiple decades, short-term impacts are addressed over a < 20-30 year time span while long-term impacts are addressed for over a time span > 30 years. Similarly, the timeframes used to address cumulative effects may vary by species but would generally include a time span of 20 years, which would roughly equate to more than one generation of the species. The spatial boundary for cumulative effects is dependent on the species and potential additive effects with the proposed action(s). Spatially, cumulative effects would generally start at the general project area boundary and then depending on the species criteria, may include adjacent subwatersheds.

The cumulative effects area was the 32,000-acre lease area and the Lower Little Deschutes River Watershed. This watershed includes the Lower and Upper Paulina Creek 12th field subwatersheds (formerly 6th field) and is the two subwatersheds that are mostly within or adjacent to the project area. Lower Paulina Creek subwatershed is slightly northwest of Paulina Lake and extends west of the project to Highway 97. Upper Paulina Creek encompasses both Paulina and East Lake, extending to the north, east, south, and west of the two lakes. The cumulative effects boundaries would provide for a range of habitat conditions that occur on the landscape that generally encompass at least a few home ranges of a species needs.

Table 1: Past Actions and Events that Contribute to the Current Conditions in the Project Area and Cumulative Effects Area.

Past Actions	Timing	Description	Residual Effects
Road Access			
Forest System Roads	1920s to Present	Road system developed 175.1 miles of open road; 6.1 miles of closed road (maintenance level 1).	Current transportation system road density is 4.22 miles per square mile; access, habitat fragmentation
Wildfires			
	1918	Paulina Prairie wildfire 2,827 acres	Contributed to current tree size/structure and species composition.
	1918	Paulina Creek wildfire 169 acres	
	1994	Ogden wildfire 13 acres	
	1998	McKay wildfire 1,150 acres	
	1999	Black Bark wildfire 79 acres	
	2000	Newberry 2 wildfire 548 acres	
Vegetation Management / Fuels Reduction Projects			
Industrial Timber Operations	1920s-1930s	Extensive railroad logging, primarily clearcutting.	Extensive areas of single-story ponderosa pine. Lodgepole pine in extensive plantations has expanded its stocking substantially.

Past Actions	Timing	Description	Residual Effects
Thinning and other harvest	1970s 1980s 1990s	Thinning, regeneration harvest, and other management has occurred throughout the planning area since it was added to the Deschutes NF.	Past harvest has contributed to the current vegetative structure in the area and is reflected in the current condition assessment for forested vegetation and fuels.
Lava Cast Project	DN signed 2007 Alternative 3	Commercial thinning and fuels reduction analyzed for 9,515 acres north of project area. Harvest complete. Commercial and small tree thinning. Fuels Treatments ongoing. Prescribed burning including pile and underburning. Two of the three sales (Bon and Dice Timber Sales) have completed fuels treatments	More open stands of ponderosa pine with substantial reduction of stand density. Basal area at lower management zone. Stand density reduction with 1) reduced risk of tree mortality as a result of beetle attack and 2) reduced risk of stand replacement wildfire.
Crossings	Decision Memo signed 7/2006.	Fuels reduction within the LaPine Wildland Urban Interface (WUI) Community Wildfire Protection Plan (CWPP) – the western edge of project area. 1,000 acres of ladder fuel reduction, low thinning, hand piling and mowing. All project work completed in 2010.	Fuel treatments in this area will be effective for approximately 7-10 years. Surface fire after this time would be fast moving with some torching of trees.
Range			
Sugarpine Allotment Sand Flat Allotment	SP - Closed 2007 SF - Vacant	Two range allotments have had activity within the project area. The Sugarpine Allotment has been closed. The Sand Flat Allotment is vacant.	All Sugarpine Allotment fences have been removed; risk to wildlife and humans reduced. Two cattle guards have been removed and others are planned for removal, reducing maintenance costs.
Geothermal Exploration and Other Misc.			
Newberry Geothermal Pilot Project FEIS/ROD	ROD signed 6/30/1994	Authorized exploration and development on CalEnergy leases (currently owned by Ormat) Three drill pads were constructed and two pads were partially constructed for surface disturbance of 31 acres. One water well, three production wells, and two temperature gradient exploration wells were	Resource not developed; Sites undergoing reclamation. Two pads have been re-contoured and prepped for natural regeneration; three pads anticipated for re-contouring and prepped for natural regeneration in 2011. Three of the wells have been plugged and abandoned. One well and the water well have

Past Actions	Timing	Description	Residual Effects
		drilled.	not been plugged or abandoned.
USGS Permanent Volcanic Monitoring Stations	Categorical Exclusion completed Aug. 2011; stations installed.	Monitoring stations to track seismic activity. Stations located in areas not obvious to the general public. One station to be located at NNVM visitor center or Newberry Crater.	Structures minimize detracton of the surrounding area. Ground disturbing area does not exceed 100-200 feet.

Table 2: Ongoing or Reasonably Foreseeable Future Actions, in the Project Area and Lower Little Deschutes Watershed that may Contribute to Cumulative Effects.

Project Name / Activity	Status/Timing	Description	Predicted or Ongoing Effects
Geothermal Exploration			
Newberry Geothermal Exploration Project	Decision Record signed by BLM in 2007	The improvement of required Forest Service access roads; construction of three well pad sites, including drilling pads and a reserve pit for the storage of waste drilling mud and fluid; the drilling (and re-drilling, as may be necessary) of up to nine geothermal resource exploration wells; testing of each drilled well; and the continued monitoring of well pressure and other data in each well.	Three well pads, each 5 acres in size. All three currently in exploration; one well pad has geothermal exploration ongoing and is being considered for use in the Newberry Volcano EGS Demonstration Project. Continued access needed. Existence of temporary road. Potential short-term disruption of recreation or management activities on access roads for road maintenance and equipment moving.
Drilling, Testing, and Monitoring of up to 12 Temperature Gradient / Passive Seismic Geothermal Exploratory Wells	Decision Record signed by BLM in April 2010;	Drill up to 12 temperature gradient / passive seismic monitoring wells, each to depths of approximately 2,500 to 3,500 feet. Relatively shallow wells; small diameter (4.5" or less).	Small clearings in vegetation totaling about 2.5 acres; Work to be completed summer 2011; wells maintained and monitored through 2012. See road access discussion above.
Micro-Seismic Testing	Forest Service CE signed Jan. 2010 for Special Use Permit Testing ongoing	12 stations each 2 feet wide by 1 to 4 feet in depth; data collection at each site.	Currently collecting data. Stations are to be removed 4 to 10 months following installation and will become holes instead of surface sites. See road access discussion above.
Forest Service Consent to Lease	Planning EA expected to be signed 2011	Forest Service assessing which parcels to consent to leasing for geothermal exploration and identifying mitigations measures if developed. All	No ground-disturbing actions will be authorized. Programmatic decision. Future development would undergo

Project Name / Activity	Status/Timing	Description	Predicted or Ongoing Effects
		parcels outside NNVM.	further NEPA.
Ogden Vegetation Management Project	FS DEIS in progress. Decision expected Jan. 2012	Proposal includes commercial and precommercial thinning, shrub mowing, and prescribed burning across approx. 14,600 acres of the 26,500-acre project area to reduce tree densities, encourage late and old structure pine development, break up fuel continuity; 2 plan amendments minimize surface disturbance.	The goal of the project is to reduce forest density and fuels in the project area. Vegetation clearing and prescribed burns would occur throughout the project area.
Ormat Temperature Gradient Well Proposal	BLM and FS NEPA document expected to be completed in 2012.	A special use authorization is proposed to be issued to Ormat Technologies, Inc. to drill up to seven temperature gradient wells for the purpose of geothermal resource exploration. Well sites (about 100 X 100 feet) have experienced previous disturbance and are mostly clear of vegetation, and do not require any site grading or conditioning to perform drilling operations.	Project effects are within the Upper Paulina subwatershed wildlife cumulative effects analysis area.
Recreation			
Lava Rock OHV Trail Project	Planning	41.9 miles of motorized trail to be designated within project area; 101.5 miles of motorized trail to be designated within the Little Lower Deschutes watershed. 58.5 miles of level 2 FS roads would become level 1 roads.	Potential increase of user-created trails in areas that are thinned and/or underburned, with potential for increased motorized use into RHCA. Less overall cross-country use throughout project area because of trail designation and travel mgmt. restrictions.
Developed Recreation	Seasonal, Ongoing	McKay Campground Ogden Group Camp Paulina Plunge	Recreational use by public, primarily during Spring through Fall. Soil compaction of immediate areas. When campgrounds are full, use is spread to other areas, particularly on user created roads, often into riparian habitat.

Project Name / Activity	Status/Timing	Description	Predicted or Ongoing Effects
Dispersed Recreation	Seasonal, Ongoing	Peter Skene Ogden trail; 7.08 miles of non- motorized trails; OHV use occurring in area; User created dispersed campsites, including along Paulina Creek	Areas possibly more accessible as result of thinning: 1) user created trails; 2) campsites etc. This could result in disturbance to wildlife, soils, RHCA, other resources.
	Seasonal, Ongoing – Winter use only	6 Mile Sno Park 10 Mile Sno Park 29.39 miles of winter trail 3.13 of Nordic Trails 26.26 miles of snowmobile trail grooming	None. Sno parks adjacent to Forest Road 21. Snowmobile trails over snow do not add to soil compaction.
Roads			
Road Closures	Planning	58.5 miles of maintenance level 2 roads would become level 1 roads under the Lava Rock OHV Project EIS, currently in the planning stages.	Reduction in road density. Reduces habitat fragmentation.
Deschutes-Ochoco Travel Management Project	Draft EIS; Implementation expected in 2011	Implementation of the Travel Rule.	Motorized travel in Central Oregon would be restricted to designated roads and trails only. Access to dispersed camping would have special provisions to limit access to sensitive areas.

IDENTIFICATION OF ISSUES

BLM received nine comment letters from the public in response to the Scoping Notice and considered these as well as comments made during the public meetings. All comments were considered, and substantive and relevant comments and concerns are addressed in the EA. The letters and the scoping analysis report are on file and publically available at the Prineville BLM office.

Concerns and topics raised by the public, as well as those raised by specialists from the three cooperating agencies, were reviewed and used to develop “key issues” and help guide the EA. A decision instrument was used to identify the key issues by evaluating the comments and accessing how the issues and concerns can be met by customary and usual methods. For example, some issues are dealt with by following the Deschutes LRMP Standards and Guidelines; other issues are resolved by following best management practices (BMPs); and others are resolved through project design features or mitigations. Any issue or concerns not

already met by these methods that are within the scope of the project become key issues. A copy of this decision instrument is on file at the Prineville district office. Key issues describe potential effects on a specific resource that may be relevant to the environmental analysis and will therefore be analyzed and discussed in detail in the EA.

Following review, BLM determined that other concerns submitted were beyond the scope of analysis and would not be considered. The following issue is only for the wildlife resource.

Wildlife Key Issue:

Preparing and clearing the vegetation for the three borehole MSA stations have the potential to remove habitat on these sites for some species. Drilling activities, testing and stimulation activities, and an increase in human disturbance also have the potential to disturb nesting sites up to ¼ mile during the breeding season or temporarily displace some wildlife species.

The Deschutes LRMP Wildlife Standards and Guidelines that support these issue statements include: WL-1 --5, 11, 12, 19, 20, 28, 29, 31, 33, 34, 56, 72, and 73.

Units of Measure:

- Distance between drill sites and nesting sites.
- Area of habitat removed.

PROJECT DESIGN FEATURES

The following design features of the Project are incorporated to minimize environmental impacts. A discussion of these specific features is presented below. These project design features are common to all action alternatives and therefore would be implemented for both Alternatives A and B.

As previously discussed, general field reconnaissance of the project area and goshawk surveys were conducted. There are no known active nests within or adjacent to the proposed sites, and the surveys did not detect any raptors. Since human disturbance has been known to potentially cause nest abandonment, the following seasonal disturbance restrictions would be applied if applicable. The proposed drilling activities would produce noise that is expected to be heard at ½ mile and the LRMP direction is ¼ mile, and depicts that disturbing activities would vary site specifically. Therefore, if nesting raptors are located within ½ mile of any of the new borehole MSA sites, a wildlife biologist would make a determination if drilling would be timed to not occur during the breeding season for the following species:

- | | |
|--------------------|---------------------------|
| • Bald eagle | January 1st – August 31st |
| • Osprey | April 1st – August 31st |
| • Redtail hawk | March 1st – August 31st |
| • Northern goshawk | March 1st – August 31st |
| • Cooper’s hawk | April 1st – August 31st |

- Sharp-shinned Hawk April 1st – August 31st
- Great gray owl March 1st – June 30th

DISCUSSION OF EFFECTS ON WILDLIFE FROM SEISMIC INDUCED EVENTS

This section is intended for those wildlife species brought forward for analysis and to put in context the unknown effects or potential effects from the proposed seismic events that would occur under Alternatives A and/or B. The remaining sections disclose the logical or potential effects from known activities that would occur under both alternatives. Although the referenced papers below focuses on grizzly bear and takin (an ungulate in China), there is suitable habitat interspersed throughout the project area for black bears and other big game animals, such as deer, elk, and mountain lions.

A search of scientific literature was conducted by URS Corporation on the potential effects of induced seismic events on bird or mammal species. Based on this review, no documented specific effects were identified for general wildlife species. One study looked at the effects of seismic surveys on denning bears in northern Alaska (Reynolds et. al. 1986). Three radio-collared denning grizzly bears were monitored for heart rate changes before and after detonation of seismic shots 1.4-1.8 km away. The study found that the limited number of observations and the fact that bears show increased heart rates during undisturbed conditions limited the conclusions that could be drawn. The authors concluded that even if animals responded to noises associated with seismic exploration activities, effects on the bears were probably minimal. None of the radio-collared bears deserted their dens in response to seismic activities and all emerged in the spring with no observed deaths of accompanying offspring. In a memorandum to AltaRock (Bettelheim 2011), URS concluded that the magnitude and intensity of the induced seismic events are anticipated to cause minimal temporary disturbance or displacement to nesting bird or large mammal species. Nest abandonment/failure or bird mortality is considered unlikely. In addition, the measures outlined in the ISMP (Appendix A in the EA), are designed to mitigate induced seismic events.

The Forest Service also conducted a search on impacts from seismic events to wildlife, but most of the studies were conducted on large mammals throughout the world due to the oil and gas industry. These studies are also not applicable due to different types of industrial activities or at a larger scale (i.e. creating and blasting seismic transect lines). The most relevant research found was a study of behavioral effects of earthquakes on takin (an ungulate in China), but the study focused on a powerful earthquake of 8.0. Bao-Ming Ge et. al. (2010) found that there was no detectable effect of the earthquake on takin spatial behavior (i.e. migration).

While a magnitude 3.5 induced seismic event could result in acoustic, visual, and tactile stimuli that would be detectable by wildlife in the area in the form of short-duration, low-to-high frequencies of sound, and physical shaking, these stimuli may be masked by or mistaken for natural, ambient environmental conditions and may not induce a response in wildlife species. Depending on the timing and frequency of induced seismic events, their impact on large mammal species could vary from temporary disturbance to temporary displacement. The impact of induced seismic events on nesting birds could vary from stress abandonment

or failure and mortality of eggs, fledglings and adults. However, it is unknown whether the magnitude of disturbance birds might experience following an induced seismic event would be substantially different from the natural, ambient stimuli and, thus whether nest abandonment/failure or bird mortality is likely to occur.

MANAGEMENT INDICATOR SPECIES AND MIGRATORY BIRDS

The interspersed areas between the proposed sites or adjacent to (i.e. Paulina Creek and East and Paulina Lakes) provides suitable or potential habitat for a number of MIS and migratory bird species such as: ospreys, great blue heron, a few water fowl species, great gray owl, American marten, olive-sided flycatcher, chipping sparrow, brown creeper, Cooper's hawk, northern goshawk, sharp-shinned hawk, red-tailed hawk, several woodpeckers (i.e. northern flicker, three-toed, black-backed, pileated and hairy woodpeckers), mule deer and elk (these areas are used by deer and elk mostly during spring, summer, and fall). Table 3 starting on page 18 shows the full list of MIS and migratory birds, their listing status, a brief habitat description and whether Alternatives A or B would have an impact to species with habitat. Those with no comments in the last column have no habitat and/or there would be no impact because habitat or known nests are beyond the ½ mile threshold for noise disturbance.

Field surveys were conducted by the Forest Service for the northern goshawk in the Ogden EA project area between July 2nd and July 24th 2009 and again in the 2010 and 2011 breeding seasons in an attempt to locate the presence of a nesting pair (the Ogden wildlife survey area overlaps the entire EGS Project area). Two northern goshawk nest sites with a total of three nests were detected as a result of these surveys. In addition, while there are no known active eagle or osprey nests, there is a historical osprey nest located within the riparian area along Paulina creek.

The approximate distance from any known nest site, and the historical osprey nest site, to the nearest proposed EGS EA site is provided below:

- Osprey nest (S 31, Paulina Creek): NN17 = 0.6 miles
- Goshawk nest (T22S, R11E, Sec. 10): NM11 = 3.2 miles
- Goshawk nest (T22S, R11E, Sec. 25): TG17 = 1.2 miles

In addition to utilizing the Ogden EA wildlife surveys, the Forest Service conducted surveys specifically for the Temperature Gradient sites (see Figure 1) in the 2010 and 2011 breeding seasons, but no raptors were detected. In the 2011 breeding season, the Forest Service also conducted goshawk surveys for all the surface stations and the three new borehole MSA stations (NN 17, NN 24, and NN19), but no raptors or raptor nests of any kind were detected.

Direct and Indirect Effects to Management Indicator Species

Alternative C (no action) would have no direct or indirect effects to MIS species or their habitat. The high degree of human recreation use, high road density, and an increase in

traffic from ongoing projects could potentially continue to have some form of disturbance on MIS species in the project area.

Alternative B is identical to Alternative A, except for requiring the long-term circulation test which requires additional diesel engines and air-cooled heat exchangers to cool the separated liquid. Therefore, under this alternative, noise would be louder due to additional diesel engines needed and longer duration of noise disturbance (60 days) in the project area (note that this activity would only occur at the concentration of activities of the project—at the 55-29 pad). In summary, Alternative B could potentially have a slightly higher impact on some MIS species due to the extra road traffic that would be required to supply equipment and diesel fuel for the air-cooled condensers.

The total 2/3 acre removal of vegetation of early seral lodgepole pine at the three borehole sites under either alternative does not provide nesting habitat for most raptors, except for potentially sharp-shinned hawks. This early seral habitat may also provide nesting or foraging habitat for migratory birds and dispersal cover for deer or elk. Given the amount of lodgepole pine habitats throughout the project area, the total area of temporary habitat removal at each proposed site would have a minimal impact on overall habitat for MIS species, therefore the focus of this analysis is on disturbance.

The total presence from the activities under Alternatives A or B would occur up to approximately two years. A logical assumption could be made that the proposed activities may cause or has the potential to cause some form of noise disturbance to certain MIS (if present in the area) from the increased traffic, drilling noise, or human presence. The sound levels from the proposed drilling are estimated to be up to 45 dBA at a distance of 0.5 miles. As previously stated, all three known raptor nests are over ½ mile away from any project site requiring drilling. Drilling would be temporary, approximately 180 days at NWG 55-29, and 14 days at each of the 3 new borehole MSA sites (the habitats adjacent to these 3 borehole MSA sites do not provide nesting habitat for most raptors, nor are there known nests).

The vegetation, including various buttes interspersed throughout all 20 proposed sites would act as a natural barrier to reduce noise disturbance to habitats during drilling or from traffic noise, therefore noise levels would vary from area to area. The following direction is provided by the Deschutes National Forest Land and Resources Management Plan (USDA 1990) to minimize any potential impacts to nesting raptors:

“Disturbing” activities will vary site specifically. Active raptor nest sites should be protected from disturbing activities within a ¼ mile (one mile for the use of explosives) of nests by restricting operations during the nesting periods. If the specified restriction period must be compromised, project activity at the end of the period (e.g. the last month or two) is least likely to cause nest abandonment.

Since the proposed noise is expected to be heard at ½ mile and the LRMP direction is ¼ mile, and depicts that disturbing activities will vary site specifically if nesting raptors are located within ½ mile of any of the activity sites, a wildlife biologist will make a determination if drilling would be timed to not occur during the breeding season for the following species:

• Bald eagle	January 1st – August 31st
• Osprey	April 1st – August 31st
• Redtail hawk	March 1st – August 31st
• Northern goshawk	March 1st – August 31st
• Cooper’s hawk	April 1st – August 31st
• Sharp-shinned Hawk	April 1st – August 31st
• Great gray owl	March 1st – June 30th

In view of the direct and indirect effects, and by applying the project design feature above, the proposed activities may have a slight impact on some MIS species (i.e. unknown nests) from human disturbance and noise traffic, but it is expected to be short-term (2 years) and localized.

Direct and Indirect Effects to Migratory Birds

One of the consequences of industrial activity in forested environments is increased anthropogenic noise due to vehicles, machinery, and infrastructure (Bayne et. al 2008). Industrial noise can take many forms. Forestry and energy-sector operations can generate intense noise for periods of days to weeks in a relatively small area. It seems logical because of the importance of acoustic information to forest songbirds and the myriad number of ways anthropogenic noise can affect avian communication, that birds might avoid chronically noisy locations (Bayne et. al 2008). Bayne et. al 2008 compared the density and occupancy rate of forest passerines from noise-generating compressor stations and noiseless well pads in the boreal forest of Alberta, Canada. They found that one-third of the species examined showed patterns that supported the hypothesis that abundance is influenced by anthropogenic noise.

This study was conducted at compressor stations that are part of the gas pipeline network and sites > 3km away from each other were selected to ensure noise from one site to another could not be heard. A compressor consists of 1-3 motors cooled by an equal number of large fan units housed in an insulated metal shed in a small clearing of about 2 – 4 ha, producing between 75 and 90 dB at the source, but can reach 105 dB at large facilities (MacDonald et al. 1996 in Bayne et. al 2008). Non-passerines (i.e. woodpeckers) were counted but excluded from all analyses.

Unlike the already established industry in Alberta, Canada, including continuous running compressor stations and the louder decibel output, the total presence from the activities under Alternatives A or B would occur for approximately up to two years. A logical assumption could be made that the proposed activities may cause or have the potential to cause some form of disturbance to some migratory birds (if present in the area) from the increased traffic and drilling noise. The sound levels from the proposed drilling are estimated to be up to 45 dBA at a distance of 0.5 miles. As described above, drilling would be temporary and vegetation and terrain changes would act as a natural barrier to reduce disturbance. Alternative B could potentially have slightly higher impacts versus Alternative A due to the need for increased machinery and vehicles.

Alternative C (no action) would have no direct or indirect effects to migratory birds or their habitat. The high degree of human recreation use, high road density, and an increase in traffic from ongoing projects could potentially continue to have some form of disturbance on migratory birds in the project area.

In view of the direct and indirect effects, the proposed activities under Alternatives A or B may have a slight impact on nesting or foraging on some migratory bird species from noise disturbance, but it is expected to be short-term (2 years) and localized.

Cumulative Effects to MIS and Migratory Birds

Cumulative effects result from collective past, present, and reasonably foreseeable future actions, regardless of what agency or entity undertakes such actions. Both alternatives have been evaluated for its potential effects to resources to be cumulative with other actions that are occurring or might occur within the cumulative effects area. The past, present, and reasonably foreseeable future projects in Tables 1 and 2 have been considered.

The analysis found that the three most likely influential activities to MIS and migratory bird habitats within the last 100 years or so within the cumulative effect areas have been from: 1.) road development, 2.) timber management (both harvest and fuels reductions), and 3.) recreational use.

Past road development has had the most influence on habitat fragmentation in the cumulative effects areas due to the amount of road density, impacting some species more so than others. Habitat fragmentation from roads has not only reduced the number of acres of habitat, it likely caused an impact to species that require isolation and/or those species that are sensitive to human disturbance.

The earlier years of timber harvest (1920's – 1930's) has had a major influence on habitats (i.e. old growth ponderosa pine stands) due to the more extensive areas or acres of harvest than in more recent years (1970's – 1990's), therefore impacting those species dependent on old growth stands, those that require a more closed canopy stand and those that require more isolation. The more recent years of timber harvest included thinning and regeneration, but were not as extensive. Fuels treatments have impacted some wildlife species (i.e. decrease in shrub habitats or early to mid-seral trees), while benefitting other species, especially the areas that received prescribed burning.

Recreation has also likely had an influence on acres of habitat fragmentation due to developed trails and through dispersed public use. Recreational use occurs year-round and use is considered high in the area, but with most use occurring around the Paulina and East Lake areas, and camping, fishing, and hiking along Paulina Creek. These activities may cause some species of wildlife to change movement patterns, and either to move from the area or cause a temporary disturbance. Other recreational uses in these areas include snowmobiling, ATVs, hunting, sight-seeing, and/or joy riding.

It could be assumed that the future actions that may cumulatively impact MIS and migratory bird species in relation to past and present actions are as follow: other geothermal activities, vegetation management, recreation use, and continued use of roads.

Other geothermal activities include clearing small areas for drilling and exploration. These activities may contribute to noise disturbance and cause habitat fragmentation and/or cause temporarily displacement of species due to the increase in human presence and noise disturbance.

The ongoing Ogden vegetation management project would influence habitat changes for some species, while improving habitat for others, but would contribute to increased traffic and potential noise disturbance for the life of the project.

Recreation is going to continue and has potential to expand (see Table 2) within the cumulative effects area. The activities related to recreation (increased ATV's, snowmobiles, traffic) have the potential to have disturbance impacts on MIS and migratory birds.

In summary, in view of the direct and indirect effects the EGS Project including the ongoing and foreseeable activities (recreation, timber/fuels, continued road use, geothermal developments) would cumulatively contribute to a slight increase in traffic and potentially cause disturbance to some species. Although, the slight increase in traffic may be offset somewhat due to the proposed road closures via ongoing vegetation projects in the cumulative effects area. Potential impacts to nesting raptors from the proposed EGS project could be mitigated with application of the project design criteria (timing restrictions).

Summary of Determinations to Deschutes NF MIS and Migratory Birds

Table 3 shows the combined Deschutes National Forest MIS and migratory birds list, each species status, a brief habitat description, and whether Alternatives A or B would have a disturbance impact. The species bolded in black are species whom have potential habitat or within the matrix of habitat between the 20 proposed sites in the project area, including those who may be potentially impacted from noise disturbance due to traffic and human presence. Although there may be potential suitable habitat at Paulina or East Lake for many of the shorebirds or waterfowl species, there would be no impact to these species because the main site of project activity (NWG 55-29) and the three new borehole MSA drill sites would occur several miles away, west of the two lakes.

In view of the direct, indirect, and cumulative effects, the proposed EGS project may have potential impacts on some MIS and migratory birds from disturbance, but would not cause a species to decline in a downward trend.

This rationale is reached because:

- A high amount of disturbance already occurs due to recreation, traffic, & road density.

- Impacts would be short-term (up to two years).
- Total vegetation removal would be 2/3 acre, which does not provide habitat for most of these species.
- There are no known nesting sites within proximity of drilling sites or the other monitoring sites (¼ to ½ mile distance), and any new raptor nests would be mitigated.
- Impacts are predicted to be potential.

Table 3: Deschutes National Forest MIS and Migratory Birds.

Species	Status	Habitat	Alternatives A and B
Northern goshawk	MIS S3 Vulnerable	Mature and old-growth forests; especially high canopy closure and large trees	Potential noise disturbance
Cooper's hawk	MIS S4 Apparently secure	Similar to goshawk, can also use mature forests with high canopy closure/tree density	Potential noise disturbance
Sharp-shinned hawk	MIS S4 Apparently secure	Similar to goshawk in addition to young, dense, even-aged stands	Potential noise disturbance & slight decrease in habitat
Great gray owl	MIS S3 Vulnerable	Mature and old growth forests associated with openings and meadows	Potential noise disturbance
Great blue heron	MIS S4 Apparently secure	Riparian edge habitats including lakes, streams, marshes and estuaries	Potential noise disturbance
Golden eagle	MIS, BCC S4 Apparently secure	Large open areas with cliffs and rock outcrops	
Red-tailed hawk	MIS S5 Secure	Large snags, open country interspersed with forests	Potential noise disturbance
Osprey	MIS S4 Apparently secure	Large snags associated with fish bearing water bodies	Potential noise disturbance
Elk	MIS S5 Secure	Mixed habitats	Potential noise disturbance
American marten	MIS S3 Vulnerable	Mixed conifer or high elevation late-successional forests with abundant down woody material	Potential noise disturbance

Species	Status	Habitat	Alternatives A and B
Mule deer	MIS S5 Secure	Mixed habitats	Potential noise disturbance
Snags and Downed Wood associated species and habitat	MIS	Snags and down woody material	
Pygmy nuthatch	Landbird focal species S4 Apparently Secure	Mature ponderosa pine forests and snags	Potential noise disturbance
Chipping sparrow	Landbird focal species S4 Apparently Secure	Open understory ponderosa pine forests with regeneration	Potential noise disturbance
Brown creeper	Landbird focal species S4 Apparently Secure	Large trees in mixed conifer forests	Potential noise disturbance
Flammulated owl	Landbird focal species, BCC S3B Vulnerable - breeding	Interspersed grassy openings and dense thickets in mixed conifer forests	Potential noise disturbance
Hermit thrush	Landbird focal species S4 Apparently Secure	Multi-layered/dense canopy in mixed conifer forests	Potential noise disturbance
Olive-sided flycatcher	Landbird focal species S3B Vulnerable - breeding	Edges and openings created by wildfire in mixed conifer forests	Potential noise disturbance
Common loon	MIS SHB, S5N – Possibly Extirpated-Breeding, Secure Non-breeding	Edges of remote freshwater ponds and lakes	
Pied-billed grebe	MIS S5 Secure	Edge of open water in freshwater lakes, ponds, sluggish rivers and marshes	
Horned grebe	MIS S2B, S5N – Imperiled breeding, Secure – non-breeding	Open water with emergent vegetation	
Red-necked grebe	MIS S1B, S4N – Critically imperiled breeding, Apparently secure nonbreeding	Lakes and ponds in forested areas	
Eared grebe	MIS S4 Apparently secure	Open water with emergent vegetation	
Western grebe	MIS S3B, S2S3N – Vulnerable breeding, Imperiled/Vulnerable-nonbreeding	Marches with open water and lakes and reservoirs with emergent vegetation	

Species	Status	Habitat	Alternatives A and B
Canada goose	MIS S5 Secure	Variety of habitat: shores of lakes, rivers, and reservoirs especially with cattails and bulrushes	
Wood duck	MIS S4 Apparently secure	Cavity nester	
Gadwall	MIS S5 Secure	Concealed clumps of grasses in meadows and tall grasslands	
American widgeon	MIS S5 Secure	Clumps of grasses in meadows or tall grasslands	
Mallard	MIS S5 Secure	Open water with emergent vegetation	
Blue-winged teal	MIS S4 Apparently secure	Marshes, lakes, ponds, slow-moving streams	
Cinnamon teal	MIS S5 Secure	Cover of vegetation near shoreline	
Northern shoveler	MIS S5 Secure	Grassy areas near water	
Northern pintail	MIS S5 Secure	Open areas near water	
Green-winged teal	MIS S5 Secure	Freshwater marshes with emergent vegetation	
Canvasback	MIS S4 Apparently secure	Emergent vegetation	
Redhead	MIS S4 Apparently secure	Freshwater marshes and lakes concealed in vegetation	
Ring-necked duck	MIS S3 vulnerable	Thick emergent vegetation on shorelines	
Lesser scaup	MIS S3B, S4N - Vulnerable breeding, apparently Secure nonbreeding	Dry grassy areas near lakes at least 10 ft. deep	
Common goldeneye	MIS S4 Apparently Secure	Cavity nester	
Barrow's goldeneye	MIS S3B, S3N - Vulnerable breeding, Vulnerable-nonbreeding	Cavity nester	
Hooded merganser	MIS S4 Apparently Secure	Cavity nester	
Common merganser	MIS S4 Apparently Secure	Cavity nester	

Species	Status	Habitat	Alternatives A and B
Ruddy duck	MIS S4 Apparently Secure	Freshwater marshes, lakes, ponds in dense vegetation	
Woodpecker Species			
Williamson's sapsucker	MIS, Landbird Focal species, BCC	Mature or old growth conifer forests with open canopy cover; weak excavator	Potential noise disturbance
Red-naped sapsucker	MIS S4 Apparently Secure	Riparian hardwood forests	
Downy woodpecker	MIS S4 Apparently Secure	Riparian hardwood forest	
Hairy woodpecker	MIS S4 Apparently Secure	Mixed conifer and ponderosa pine forests	Potential noise disturbance
Three-toed woodpecker	MIS S3 Vulnerable	High elevation and lodgepole pine forests	Potential noise disturbance
Black-backed woodpecker	MIS, Landbird focal species S3 Vulnerable	Lodgepole pine forests, burned forests	Potential noise disturbance
Northern flicker	MIS S5 Secure	Variety of forest types but more associated with forest edges	Potential noise disturbance
Pileated woodpecker	MIS S4 Apparently Secure	Mature to old-growth mixed conifer forests	Potential noise disturbance
Swainson's hawk			
Swainson's hawk	BCC	Open country	
Ferruginous hawk			
Ferruginous hawk	BCC	Open sagebrush flats; open country	
Prairie falcon			
Prairie falcon	BCC	Rimrock, cliffs in open country	
Greater sage grouse			
Greater sage grouse	BCC	Sagebrush flats	
American golden plover			
American golden plover	BCC, Shorebird	Upland tundra, rare in OR in dry mudflats, fields and pastures	
Snowy plover			
Snowy plover	BCC, Shorebird	Sandy beaches	
American avocet			
American avocet	BCC	Shallow water	
Solitary sandpiper			
Solitary sandpiper	BCC, Shorebird	Small, freshwater mudflats	
Whimbrel			
Whimbrel	BCC, Shorebirds	Grassy marshes and tidal flats	

Species	Status	Habitat	Alternatives A and B
Long-billed curlew	BCC, Shorebird	Dry grasslands	
Marbled godwit	BCC	Expansive mudflats and sandflats on beaches	
Sanderling	BCC, Shorebird	Sandy beaches with wave action	
Wilson's phalarope	BCC, Shorebird	Shallow ponds within grassy marshes	
Yellow-billed cuckoo	BCC	Riparian hardwoods	
Burrowing owl	BCC	Open grassland or agricultural land	
Black swift	BCC	Damp coastal cliffs	
Loggerhead shrike	BCC	Open habitat with scattered trees and shrubs	Potential noise disturbance
Gray vireo	BCC	Rocky, dry hillsides with scattered trees	
Virginia's warbler	BCC	Mountain mahogany	
Brewer's sparrow	BCC	Sagebrush habitats	
Sage sparrow	BCC	Sagebrush habitats	
Piping plover	Shorebird	Rare in OR on sandy beaches	
Mountain plover	Shorebird	Shortgrass prairies	
Buff-breasted sandpiper	Shorebird	Nests in tundra, forages on shortgrass prairie	
Black oystercatcher	Shorebird	Coastal rocks	
Upland sandpiper	Shorebird	Grassy fields (4-8" tall) with open patches	
Bristle-thighed curlew	Shorebird	Rare in OR in marshes or beaches. Nests in Alaska tundra	
Hudsonian godwit	Shorebird	Mudflats and shallow water; nests around spruce woods	
Marbled godwit	Shorebird	Prairie ponds, mudflats and sandflats	

Species	Status	Habitat	Alternatives A and B
Black turnstone	Shorebird	Tundra, winters on rocky, coastal shores	
Surfbird	Shorebird	Nests on barren gravel hilltops, winters on rocky shorelines	
Western sandpiper	Shorebird	Mudflats and sandy beaches	
Rock sandpiper	Shorebird	Rocky shorelines	
Short-billed dowitcher	Shorebird	Mudflats and shallow muddy ponds along coast	
American woodcock	Shorebird	Damp, brushy woods	
Wilson's plover	Shorebird	Rare in OR on sandy beaches, sandflats or mudflats away from shoreline	
American oystercatcher	Shorebird	Rare in OR on rocky coasts	
Bar-tailed godwit	Shorebird	Low tundra in western Alaska	
Ruddy turnstone	Shorebird	Rocky and sandy shorelines	
Red Knot	Shorebird	Sandy beaches	
Dunlin	Shorebird	Sandy beaches and mudflats	
Calliope hummingbird	BCC	Open montane forest, mountain meadows, and willow thickets	Potential noise disturbance
Black swift	BCC	Waterfalls, wet cliffs, caves	
Sage thrasher	BCC	Juniper, sagebrush shrublands. Mt. mahogany and aspen	
Nashville warbler	BCC	Open deciduous and coniferous woodland, forest edge and undergrowth	Potential noise disturbance
Black-chinned sparrow	BCC	Desert, shrubland/chapparal	
Willow flycatcher	BCC	Brushy areas with willow and riparian shrubs	Potential noise disturbance
Pinyon jay	BCC	Pinyon/juniper woodland	
Green-tailed towhee	BCC	Sagebrush shrublands	

Species	Status	Habitat	Alternatives A and B
Black rosy-finch	BCC	Alpine rocky, grassy areas	

Landbird focal species come from the Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington (Altman 2000); **Management Indicator Species** come from the Deschutes National Forest Land and Resource Plan (LRMP)[1990]; **Birds of Conservation Concern (BCC)** come from the US Fish and Wildlife Service Birds of Conservation Concern – BCR 9 (Great Basin) [2008]; and **Shorebirds** come from the 2004 US Fish and Wildlife Service U. S. Shorebird Conservation Plan.

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