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INTRODUCTION

This report is an analysis of the effects of the proposed Rosemont Copper Project (project) on U.S. Forest Service (Forest Service) Management Indicator Species (MIS). Forest Service land use plans, policies, and regulations have the primary jurisdiction over land use activities within the project area. The Coronado National Forest Land and Resource Management Plan (forest plan), as amended (Forest Service 1986) guides the long-term management of National Forest System lands on the Coronado National Forest. The forest plan provides for integrated multiple use and sustained yield of goods and services from the Coronado National Forest in a way that maximizes long-term net public benefits in an environmentally sound manner (Forest Service 1986:1).

The role of MIS in National Forest planning is described in the 1982 implementation regulations for the National Forest Management Act of 1976 (36 Code of Federal Regulations [CFR] 219.19(a)(1)). Forest Service Manual 2620.5 defines MIS as “plant and animal species, communities or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent” (Forest Service 1991:6). These regulations require that certain vertebrate and/or invertebrate species present in the area be identified as MIS within the planning area (Coronado National Forest) and that these species be monitored, as “their population changes are believed to indicate the effects of management activities” (36 CFR 219.19(a)(1)).

Standard and Guideline No. 1 for Wildlife and Fish within the forest plan (Forest Service 1986:31-1) directs the Coronado National Forest (the Coronado) to “maintain or improve occupied habitat of . . . listed threatened and endangered species, and Management Indicator Species through mitigation of Forest activities.” Standard and Guideline No. 11 for Wildlife and Fish within the forest plan (Forest Service 1986:32) further states that it is necessary to conduct an “evaluation through consultation with Arizona Game and Fish Department [AGFD], New Mexico Department of Game and Fish and Natural Resources, along with other wildlife and plant-oriented groups where appropriate, [of the] population viability of Management Indicator Species through determination of: 1) amount of suitable habitat; 2) distribution of suitable habitat; 3) number of individuals that support regional population goals; and 4) likelihood of continued existence.” Population and habitat trends of MIS are documented as part of forest plan monitoring.

In order to meet the intent of planning regulations, 33 MIS in eight groups (Cavity Nesters, Riparian Species, Species Needing Diversity, Species Needing Herbaceous Cover, Species Needing Dense Canopy, Game Species, Special Interest Species, and Threatened and Endangered Species) were identified in Appendix G of the forest plan (Forest Service 1986:128–129). All 33 MIS and cavity-nesting birds identified for the Coronado National Forest are listed by group in Table 1. Forest-wide trends for all MIS have been assessed and are reported in the latest Coronado National Forest–wide status report for MIS (Forest Service 2011a).
Table 1. Coronado National Forest Management Indicator Species Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Species Validity as Recognized by Integrated Taxonomic Information System</th>
</tr>
</thead>
</table>
| Cavity Nesters                     | Elegant Trogon (*Trogon elegans*)  
Sulphur-bellied Flycatcher (*Myiodynastes luteiventris*)  
Other primary and secondary cavity nesters*                                                                 |
| Riparian Species                   | Gray Hawk (*Buteo nitidus*)  
Blue-throated Hummingbird (*Lampornis clemenciae*)  
Elegant Trogon  
Rose-throated Becard (*Pachyramphus aglaiae*)  
Thick-billed Kingbird (*Tyrannus crassirostris*)  
Sulphur-bellied Flycatcher  
Northern Beardless-Tyrannulet (*Camptostoma imberbe*)  
Bell's Vireo (*Vireo bellii*)  
Black Bear (*Ursus americanus*)                                                                 |
| Species Needing Diversity          | White-tailed Deer (*Odocoileus virginianus*)  
Merriam’s Turkey (*Meleagris gallopavo merriami*)  
Elegant Trogon  
Sulphur-bellied Flycatcher  
Buff-breasted Flycatcher (*Empidonax fulvifrons*)  
Black Bear                                                                 |
| Species Needing Herbaceous Cover   | White-tailed Deer  
Montezuma Quail (*Cyrtonyx montezumae*)  
Pronghorn (*Antilocapra americana*)  
Desert Massasauga (*Sistrurus catenatus edwardsii*)  
Baird’s Sparrow (*Ammodramus bairdii*)                                                                 |
| Species Needing Dense Canopy       | Bell’s Vireo  
Northern Beardless-Tyrannulet  
Gray Hawk                                                                 |
| Game Species                       | White-tailed Deer  
Montezuma Quail  
Pronghorn  
Bighorn Sheep (*Ovis canadensis*)  
Merriam’s Turkey  
Black Bear                                                                 |
| Special Interest Species           | Montezuma Quail  
Gray Hawk  
Blue-throated Hummingbird  
Elegant Trogon  
Rose-throated Becard  
Thick-billed Kingbird  
Sulphur-bellied Flycatcher  
Buff-breasted Flycatcher  
Northern Beardless-Tyrannulet  
Five-striped Sparrow (*Aimophila quinquestriata*)                                                                 |
### Table 1. Coronado National Forest Management Indicator Species Groups (Continued)

<table>
<thead>
<tr>
<th>Group</th>
<th>Species Validity as Recognized by Integrated Taxonomic Information System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened and Endangered Species*</td>
<td>Bighorn Sheep</td>
</tr>
<tr>
<td></td>
<td>Gray Hawk</td>
</tr>
<tr>
<td></td>
<td>American Peregrine Falcon (<em>Falco peregrinus anatum</em>)</td>
</tr>
<tr>
<td></td>
<td>Blue-throated Hummingbird</td>
</tr>
<tr>
<td></td>
<td>Elegant Trogon</td>
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<tr>
<td></td>
<td>Rose-throated Becard</td>
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<td>Thick-billed Kingbird</td>
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<tr>
<td></td>
<td>Sulphur-bellied Flycatcher</td>
</tr>
<tr>
<td></td>
<td>Buff-breasted Flycatcher</td>
</tr>
<tr>
<td></td>
<td>Northern Beardless-Tyrannelet</td>
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<tr>
<td></td>
<td>Bell's Vireo</td>
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<tr>
<td></td>
<td>Baird's Sparrow</td>
</tr>
<tr>
<td></td>
<td>Five-striped Sparrow</td>
</tr>
<tr>
<td></td>
<td>Mexican Stoneroller (<em>Campostoma ornatum</em>)</td>
</tr>
<tr>
<td></td>
<td>Apache Trout (<em>Oncorhynchus gilae apache</em>)</td>
</tr>
<tr>
<td></td>
<td>Gila Topminnow (<em>Poeciliopsis occidentalis</em>)</td>
</tr>
<tr>
<td></td>
<td>Gila Chub (<em>Gila intermedia</em>)</td>
</tr>
<tr>
<td></td>
<td>Sonora Chub (<em>Gila ditaenia</em>)</td>
</tr>
<tr>
<td></td>
<td>Desert Massasauga</td>
</tr>
<tr>
<td></td>
<td>Twin-spotted Rattlesnake (<em>Crotalus pricei</em>)</td>
</tr>
<tr>
<td></td>
<td>Ridge-nosed Rattlesnake (<em>Crotalus willardi willardi</em>)</td>
</tr>
<tr>
<td></td>
<td>Sonoran Tiger Salamander (<em>Ambystoma mavortium stebbinsi</em>)</td>
</tr>
<tr>
<td></td>
<td>Tarahumara Frog (<em>Lithobates tarahumarae</em>)</td>
</tr>
<tr>
<td></td>
<td>Western Barking Frog (<em>Craugastor augusti cactorum</em>)</td>
</tr>
<tr>
<td></td>
<td>Spikedace (<em>Meda fulgida</em>)</td>
</tr>
<tr>
<td></td>
<td>Arizona Treefrog (<em>Hyla wrightorum</em>)</td>
</tr>
<tr>
<td></td>
<td>Mount Graham Red Squirrel (<em>Tamiasciurus Hudsonicus grahamensis</em>)</td>
</tr>
<tr>
<td></td>
<td>Gould's Turkey (<em>Meleagris gallopavo mexicana</em>)</td>
</tr>
</tbody>
</table>

Source: Forest Service (2011a).

**Notes:**

* Primary Cavity Nesters
- Ladder-backed Woodpecker, Arizona Woodpecker, Northern Flicker, Gila Woodpecker, Acorn Woodpecker, Hairy Woodpecker

* Secondary Cavity Nesters

* Threatened and endangered species in the context of MIS is a term applied by the Forest Service to species that are either rare or not well distributed in the United States. There is no relationship to the terms “threatened” and “endangered” under the Endangered Species Act, although three MIS are also federally listed.

**PROPOSED PROJECT AREA**

The proposed Rosemont Copper Project area (project area) is located on the east side of the Santa Rita Mountains, approximately 30 miles southeast of Tucson. It is located west of State Route (SR) 83, south of Interstate (I-) 10, and north of Box Canyon Road (Forest Road 62) (Figure 1). The project area encompasses portions of Townships 18 and 19, Ranges 15 and 16, Gila and Salt River Meridian, Pima County, Arizona. A complete description of the proposed project is found in the preliminary Mine Plan of Operations (MPO) (WestLand Resources, Inc. [WestLand] 2007) and in numerous technical documents, plans, and memoranda prepared by Rosemont Copper Company (Rosemont Copper) and its consultants in support of the preliminary MPO. Mine construction, including preproduction stripping to expose the ore
Figure 1. Analysis area for biological resources.
in preparation for mining, is proposed to occur over an 18-month period. Following preproduction, mine production would occur over a 19-year period.

The **project area** is defined as all areas in which any ground disturbance would take place as a result of this proposed project in the vicinity of the mine, including the mine pit, waste rock piles, tailings, leach-pad, access roads, utility corridors, and on-site facilities (i.e., the mine “footprint”). The project area acreage resulting in direct impacts varies slightly by alternative, ranging from 6,278 acres for the Phased Tailings Alternative with TEP Alternative 1 to 7,444 acres for the Scholefield-McCleary Alternative with TEP Alternative 4.

The **analysis area** is defined as the project area plus the area of potential effects for each species discussed in subsequent sections of this report. Temporally, the potential on-site and off-site impacts resulting from the project encompass construction, operation, reclamation, and postclosure. The analysis area for this report is based on 1) the area of the mine footprint; 2) areas outside the mine footprint that may be affected by noise, dust, light pollution, and other mining activities; 3) all areas for which mining activity may affect ground and surface water; 4) other areas outside the footprint that are related to mining activity, such as road modifications, power lines, and pipelines (i.e., connected actions); and 5) downstream areas potentially affected by the action alternatives. A total of 42,144 acres within the analysis area is on Forest Service lands.

**Land Ownership and Administration**

Land ownership of the proposed project area consists of a combination of federal, state, county, and private lands, including Coronado National Forest, BLM lands, Arizona State Trust lands, Pima County–administered lands, and private lands owned by Rosemont Copper. The majority of the project area consists of federal lands administered by the Nogales Ranger District of the Coronado National Forest and private lands owned by Rosemont Copper. Extraction of ore from an approximately 2,900-foot-deep open-pit mine would be conducted primarily on private land. Processing, waste management, and other support facilities are proposed to be located on the Coronado National Forest surface; project infrastructure, such as utilities, would be located on BLM and Arizona State Trust land. Access to the site would originate on SR 83 east of the property; however, a new access road is also proposed west of the property.

**Vegetation Communities**

As shown in Figure 2, the proposed project is located in two upland vegetation communities: semidesert grassland and Madrean evergreen woodland (Brown 1994). The vegetation of the project area has not been described recently; however, it is known that semidesert grassland, characterized by open grasslands with widely scattered shrubs and cacti, covers the lower elevations of the project area. Madrean evergreen woodland covers the higher elevations of the property, generally in the western and southern areas, and is characterized by open woodlands or savanna, consisting of trees interspersed with grasses and forbs. There are also two xeroriparian (riparian areas not associated with perennial waters) vegetation communities present in the project area recognized by the Forest Service: interior riparian deciduous woodland (Brown 1994) and ephemeral fluvial systems supporting upland vegetation (personal communication, Wayne Robbie, Forest Service Regional Office 2009). There are some springs and other wetlands associated with standing water scattered in the proposed project area. For a more detailed evaluation of these features, please see the Biologists’ Report (SWCA Environmental Consultants [SWCA] 2011a).
Figure 2. Vegetation types within the analysis area.
Uplands

There are two upland vegetation communities on Forest Service lands within the analysis area: semidesert grassland and Madrean evergreen woodland (Brown 1994). Semidesert grassland, characterized by open grasslands with widely scattered shrubs and cacti, generally covers the lower elevations of the analysis area. Madrean evergreen woodland mostly covers the higher elevations of the analysis area, generally in the western and southern areas, and is characterized by open woodlands or savanna, consisting of trees interspersed with grasses and forbs.

Semidesert Grassland

There is a total of approximately 17,195 acres of the semidesert grassland vegetation community on Forest Service lands within the analysis area. In the semidesert grassland vegetation type, composition and density will vary with geographic location, precipitation, and topography. Some areas within this vegetation community may be barren, with an abundance of sand, rock, gravel, scree, or talus, while other areas may have sparse to dense vegetation cover that includes succulent species, grasses, shrubs, scattered trees, and some herbaceous cover (Forest Service 2009). In the project area, the semidesert grassland vegetation type is described in accordance with the definitions of this community and a landscape map of the Southwest in Brown (1994).

Most areas are characterized by short grasses interspersed with a variety of low-growing trees, shrubs, and cacti. Prominent grasses in the semidesert grasslands include three-awn (Aristida spp.), tobosa (Hilaria spp.), and grama grasses (Bouteloua spp.), which at present dominate this community. Grass species include black (B. eriopoda), blue (B. gracilis), side oats (B. curtipendula), and hairy (B. hirsuta) gramas; buffalo grass (B. dactyloides); Plains lovegrass (Eragrostis intermedia); little bluestem (Schizachyrium cirratum); Plains bristlegrass (Setaria machrostachya); fluff grass (Dasyochloa pulchella); burrograss (Scleropogon brevifolius); Lehmann lovegrass (Eragrostis lehmanniana); green sprangletop (Leptochloa dubia); and slim tridens (Tridens muticus). Annual and perennial forbs are abundant; conspicuous non-grass species include whitethorn acacia (Acacia constricta), catclaw acacia (A. greggii), prickly-pear cactus (Opuntia sp.), agaves (Agave spp.), cholla (Cylindropuntia sp.), beargrass (Nolina microcarpa); desert spoon (Dasylirion wheeleri); and various yuccas (Yucca spp.).

Madrean Evergreen Woodland

There is a total of approximately 24,631 acres of the Madrean evergreen woodland vegetation community on Forest Service lands within the analysis area. A general description of Madrean evergreen woodland in southeastern Arizona is given by Brown (1994). Predominantly found in southeastern Arizona, evergreen oaks are the majority species in Madrean evergreen woodland communities, with junipers and pines (typically pinyons) often present. Open savannas are common in some areas, with numerous grasses growing beneath the oaks. Madrean evergreen woodland is typically dominated by evergreen oaks mixed with juniper and pines; open savannas are common in some areas, with numerous grasses growing beneath the oaks. Common and dominant tree species include Emory oak (Quercus emoryi), Mexican blue oak (Q. oblongifolia), Arizona white oak (Q. arizonica), silverleaf oak (Q. hypoleucoides), alligator bark juniper (Juniperus deppeana), one-seed juniper (J. monosperma), velvet mesquite (Prosopis velutina), and Mexican pinyon pine (Pinus cembroides). Common shrub species in this community include whitethorn acacia, catclaw acacia, Wright’s silk sassel (Garrya wrightii), evergreen sumac (Rhus virens var. choriophylla), and skunkbush sumac (R. trilobata). Several of the slopes are dominated by mountain mahogany (Cercocarpus montanus). Agaves, beargrass, banana yucca (Yucca baccata), soaptree yucca (Y. elata), desert spoon, several species of cactus, and a variety of grasses and forbs are also present in this community. Although trees dominate most of this habitat, the understory grasses are diverse and abundant and include green sprangletop, several species of muhly (Muhlenbergia spp.),
dropseed (*Sporobolus* sp.), wolfgrass (*Lycurus phleoides*), plains and Lehman lovegrass, cane beardgrass (*Bothriochloa barbinodis*), and slim tridens.

**Riparian**

There is a total of approximately 318 acres of riparian vegetation\(^1\) on Forest Service lands in the analysis area. The word “riparian” is used to describe plant communities associated with natural washes, rivers, ponds, and springs. Riparian plant associations occur along a continuum of available soil moisture, and regulatory agencies and researchers have consequently developed numerous and varied definitions of riparian (WestLand 2010). Some definitions relate directly to the nature of the water supply (e.g., perennial streams only), others relate to the condition and nature of the habitats associated with the watercourse (e.g., vegetation location, density, and composition), and still others use definitions that incorporate varied combinations of these factors (WestLand 2010). The Forest Service recognizes two riparian vegetation communities within the analysis area: interior riparian deciduous woodland and ephemeral fluvial systems, which support upland vegetation (Robbie 2009). These vegetation communities are present in drainages within the analysis area and along downstream portions of Box, McCleary, Sycamore, Scholefield, Wasp, Barrel, Davidson, and Gardner canyons; Empire Gulch; and Cienega Creek. While some limited riparian vegetation exists at other springs, only two springs had large, mappable areas of riparian vegetation: Scholefield No. 1 spring supports about 0.3 acre of wetland, and Fig Tree spring supports about 0.5 acre of riparian habitat, with a very limited wetland area. These water sources provide habitat for aquatic species within the analysis area.

**Interior Riparian Deciduous Woodland**

Interior riparian deciduous woodland vegetation is found along rivers and streams at elevations ranging from approximately 4,000 feet to approximately 9,000 feet above mean sea level (amsl) within southeastern Arizona (Brown 1994). The vegetation is a mix of riparian woodland tree and shrub species, with a variety of vegetation associations. The dominant vegetation is likely to depend on a suite of site-specific characteristics, including elevation, substrate, stream gradient, and depth to groundwater. In the area of the mine footprint, interior riparian deciduous woodland vegetation is found in portions of Barrel, McCleary, Wasp, and Scholefield canyons. Vegetation consists of a variety of trees and shrubs, including Arizona black walnut (*Juglans major*), Goodding’s willow (*Salix gooddingii*), netleaf hackberry (*Celtis reticulata*), desert willow (*Chilopsis linearis*), desert broom (*Baccharis sarothroides*), and seep willow (*B. glutinosa*). Also present are Fremont cottonwood (*Populus fremontii*), velvet ash (*Fraxinus velutina*), desert false indigo (*Amorpha fruticosa*), canyon grape (*Vitis arizonica*), American brooklime (*Veronica americana*), and southern cattail (*Typha domingensis*). For purposes of evaluating impacts, interior riparian deciduous woodland vegetation extends down Davidson Canyon and the lower Cienega Creek.

**Ephemeral Fluvial Systems Supporting Upland Vegetation**

This type of riparian vegetation community is found along major ephemeral washes. This vegetation type is associated with an ephemeral or intermittent water supply and typically contains plant species also found in neighboring uplands, although riparian plants are typically larger and often occur in higher densities than those in the uplands. In the project area, this vegetation community is found in portions of Barrel, McCleary, and Scholefield canyons (and numerous smaller named and unnamed washes within the project area), where the dominant plant species include Mexican blue oak, Arizona white oak, velvet mesquite, whitethorn and catclaw acacia, and wait-a-minute bush (*Mimosa biuncifera*).
Topographic Features

Forest Service lands within the analysis area range in elevation from approximately 4,340 to 6,610 feet amsl. Topography is dominated by rolling to steep hills, drainages, and canyons. The Santa Rita range includes numerous drainages containing riparian habitat, but few are perennial. Barrel Canyon is the principal drainage system for Forest Service lands on the east side of the proposed project footprint. Wasp, McCleary, and Scholefield canyons discharge to Barrel Canyon, which discharges to Davidson Canyon (and eventually to Cienega Creek) east of the proposed project footprint. The northwest side of the project area is drained by a series of unnamed headwater tributaries of Sycamore Canyon. Broadleaf riparian vegetation is present along some of the major washes and at some of the more reliable springs. The project area, depending on the alternative, may include the following topographic features: Barrel, Wasp, McCleary, Scholefield, and Sycamore canyons, Gunsight Pass, and slopes below the ridgeline.

There are other topographical features important to MIS present within the analysis area on Forest Service lands, including springs and other wetland features associated with standing water. For a more detailed evaluation of these features, please see the Onsite Riparian Habitat Assessment (WestLand 2010). For the locations of all springs, seeps, and stock tanks within and adjacent to the proposed project footprint, see Figure 3.

ALTERNATIVES

There are six alternatives currently being analyzed for this project, including the no action alternative, the proposed action (preliminary MPO), and four action alternatives that modify the location, phasing, and/or design of the waste rock and tailings piles. For a detailed description of the alternatives, please refer to Chapter 2 of the Environmental Impact Statement (EIS).

No Action Alternative

The National Environmental Policy Act (NEPA) requires consideration of a “no action” alternative. Under this alternative, Rosemont Copper would not develop the Rosemont mineral deposit at this time. Environmental conditions would not be affected by the construction, operation, reclamation, or closure of the mine. Any existing exploration-related or baseline collection disturbances on National Forest System lands by Rosemont Copper would be reclaimed in accordance with existing laws and permits.

Proposed Action

The proposed action is Rosemont Copper’s preliminary MPO, which has been accepted as sufficient to be analyzed under NEPA by the Coronado. The proposed action contains all the elements listed below as being common to all action alternatives.

Phased Tailings

This alternative was developed to respond to the significant issues regarding the potential short-term impacts on water resources and visual resources and contains a number of features in common with the proposed action. However, several features were modified and designed to better respond to the issues mentioned. These include the following:

---

2 This is the Sycamore Canyon on the west side of the ridgeline, not the Sycamore Canyon just to the south of the proposed mine.
Figure 3. Springs, seeps, and stock tanks within the analysis area.
• Reversing the phased placement of the dry-stack tailings to leave the McCleary Canyon drainage open for approximately an additional 10 years. This would reduce the short-term impact on surface water flow by allowing the McCleary Canyon drainage to remain open approximately 10 years longer than it would under the proposed action.
• Replacing the central drain with a series of flow-through drains and drainage basins located beneath or adjacent to the dry-stack tailings facility to improve overall stormwater drainage capacity and reduce the possibility that stormwater that has contacted tailings could comingle with stormwater discharged off-site.
• Redesigning the diversion and stormwater management plan and including more conservative storm design criteria for surface water control structures to increase the capacity of stormwater control structures.
• Modifying the process water temporary storage pond and adding a double liner with a leak collection and removal system to the process water containment to improve the containment of process water and separate stormwater from process water.
• Realigning the primary access road to reduce its visibility, decrease stormwater runoff into the Barrel Canyon drainage system, and reduce impacts to riparian vegetation.
• Modifying the locations of facilities at the plant site to reduce geotechnical concerns regarding differential settlement.
• Providing secondary containment opportunities where possible for process solutions, process interruptions, or ponds by changing facility locations.

**Barrel**

This alternative was developed to respond to the significant issues regarding potential impacts on biological resources, cultural resources, recreation, and the surface water component of water resources. The Barrel Alternative places all of the tailings and waste rock in upper Barrel Canyon and the lower portion of Wasp Canyon. Prohibiting mine tailings or waste in McCleary Canyon permanently maintains its contribution of surface water flow to the Barrel Canyon drainage system, albeit in a somewhat decreased capacity during operations by the requirement to retain runoff from the plant site, and increases the drainage area that may be diverted through the McCleary Canyon channel, in contrast to that of the proposed action and the Phased Tailings Alternative.

**Barrel Trail**

This alternative was developed to respond to the significant issues regarding potential impacts on visual resources and the surface water component of water resources. The Barrel Trail Alternative places all tailings and waste rock in upper Barrel, Trail, and Wasp canyons. This alternative is similar to the Barrel Alternative in that it also permanently avoids placement of mine waste in McCleary Canyon to reduce impacts to surface water flows into Barrel Canyon. However, this alternative incorporates a more varied topography to more closely replicate a natural landform than the other alternatives. The incorporation of a more varied topography resulted in an expanded footprint of the tailings and waste rock facilities. The topography of the Barrel Alternative includes two ridges with varying elevation and an intervening valley that drains to Barrel Canyon.

**Scholefield-McCleary**

This alternative was developed to respond to the issues regarding potential impacts on cultural resources, riparian habitat resources, and the surface water component of water resources, which would arise from
placing the tailings and waste rock in the McCleary and/or Barrel canyon drainages. The Scholefield-McCleary Alternative would place all tailings and the majority of waste rock north of the McCleary Canyon drainage channel. The dry-stack tailings would occupy Scholefield Canyon and an unnamed tributary drainage, and waste rock would be placed on the northern slope of McCleary Canyon above the drainage bottom and extend to the north atop the tailings. The general facility layout within the plant site would be similar to the Barrel and Barrel Trail alternatives.

Components of All Action Alternatives

The proposed mine would be located about 30 miles southeast of Tucson, Arizona. Primary highway access would be from SR 83, which is a north-south two-lane paved road that connects to I-10 approximately 12 miles north of the mine site. A new two-lane gravel road referred to as the primary access road would be constructed to provide primary access between SR 83 and the mine. The primary access road would provide the primary access and would leave SR 83 in the project vicinity along a straight section of the state highway. At the intersection, SR 83 would be widened and provided with additional lanes. The primary access road would be open for the public from SR 83 to the mine entrance. A newly constructed segment of road would connect the primary access road to a secondary road over the Santa Rita Mountains via a new road over Lopez Pass.

Mine construction, including removing the overlying rock to expose the ore in preparation for mining, is proposed to occur over an 18-month period. The mine contains two types of ore, sulfide and oxide, each requiring a different process to recover the metals. The metal concentrate and the copper cathodes are the products to be sold by the proposed operation; further refining and metal recovery would be done off-site by other companies. Ore would be produced over a 20-year period at an approximate rate of 75,000 tons per day and waste rock at a rate of 195,000 to 267,000 tons per day. Oxide ore would be mined out in the first 6 to 7 years of the project, while sulfide ore would be produced throughout the mine life.

Facilities and Designs Common to the Proposed Action and Action Alternatives

All of the action alternatives represent differing facility layouts and designs that allow Rosemont Copper to mine and process their identified mineral resource. The alternatives were developed in response to the significant issues to reduce the potential environmental impacts and primarily involve different locations and shapes for the tailings and waste rock facilities, phasing the construction of the tailings, different locations for the access roads, and modification to process facility locations as required by the different tailings facility sites. In addition, the alternatives also include modification of other elements of the plan such as timing of the tailings placement, storm events used to design stormwater control facilities, and layout of stormwater diversion channels.

A list of operation facilities and activities common to all the action alternatives (excluding the no action alternative) is presented below. Project facilities listed below would be constructed for all action alternatives; however, the location and detailed design may vary among the alternatives. The exceptions are the mine pit and processing facilities, which would have the same locations. The pit would remain the same shape and depth for all alternatives.

Below is a list of the major facilities and a brief description of each. Additional details can be found in the preliminary MPO (WestLand 2007). The major facilities include the following:

- Pit. Open-pit mining would be used to excavate ore to recover copper, molybdenum, silver, and gold. The roughly circular open-pit mine would measure, at end of mine life, between 6,000 and 6,500 feet in diameter, with a final depth of 1,800 to 2,900 feet, depending on the elevation of the pit rim. The pit would disturb 955 acres, of which 590 acres would be on private land and 365 acres would be on National Forest System lands.
• **Plant Site Facilities.** Facilities necessary to support the Rosemont Copper mining and ore processing operations include buildings and structures, such as administration buildings, change house, warehouse with laydown yards, analytical laboratory, light-vehicle and process maintenance building, mine truck shop, mine truck wash and lube facility, powder magazines and ammonium nitrate storage, main guard shack with truck scale, and fuel and lubricant storage and dispensing facilities.

• **Waste Rock and Tailings.** Waste rock, which consists largely of chemically basic limestone and other largely non-acid-generating rocks, would be disposed of in areas located outside the proposed open pit. Tailings would be disposed of using the “dry-stack” method. In dry-stack disposal, the tailings slurry would be processed to remove most of the remaining water, resulting in a material that has the consistency of moist, fine-grained sand. The preliminary MPO states that 92% of the water would be removed from the tailings slurry and recycled to the process circuit. The dewatered tailings would be sent via conveyor belt to the unlined dry-stack tailings disposal area.

• **Heap Leach.** The heap leach facility used to process the oxide ore during the first 6 to 7 years of project would be located in the waste rock disposal area.

• **Diversion Channels.** Stormwater diversion channels would be constructed to route surface water runoff around the project area and from undisturbed areas within the project to natural drainages downhill from the mine site. Stormwater from the mine pit, ore processing facilities, and mine maintenance plant areas would be prohibited from surface discharge by the stormwater permit. Stormwater from the waste rock facilities, including the waste rock buttresses, would be routed to sediment control ponds, where any pond overflow discharging off-site would be monitored for chemical and sediment content in accordance with the stormwater permit. Active stormwater control would continue after the mine closes, as required by the stormwater discharge permit and the erosion control provisions of the mine land reclamation plan, administered by the Arizona State Mine Inspector.

• **Access Roads.** A primary access road would be constructed to exit SR 83 between Mileposts 46 and 47 and would run approximately 3.7 miles to the mine entrance. A secondary access road would be constructed that would pass through Lopez Pass.

• **Perimeter Fence.** A perimeter fence would be constructed for each of the action alternatives and would include a varying amount of National Forest System lands. The fencing would consist of a standard five-strand barbed-wire fence (with the bottom wire bare in accordance with BLM and Arizona Game and Fish Department [AGFD] fencing standards).

• **Transmission Lines.** Construction of this line would require a Certificate of Environmental Compatibility from the Arizona Corporation Commission. The Certificate of Environmental Compatibility process is currently being conducted. Under all alternatives, the proposed 138-kilovolt main power line would be supported on single 90 to 100-foot-tall single-steel poles with a minimum of 75 feet of ground clearance. Pole spacing would be about 800 feet on level ground or less where required to maintain ground clearance over the mountains. In addition, a power line supported on wooden poles would be constructed to supply electricity to the water supply wells and booster stations.
Activities Common to the Proposed Action and Action Alternatives

There are several mining activities common to the proposed action and all action alternatives. These activities have the potential to impact native biological plant communities, wildlife habitat, and wildlife species resources and are briefly described below.

Blasting and Drilling

Blasting would be required prior to excavation of the ore and waste rock. Blasting operations would be conducted daily and would be limited to daylight hours, typically between 9 a.m. and 4 p.m. All explosives management would be done in accordance with applicable rules, regulations, and safety standards.

Ore, Waste Rock, and Tailings Transport

Transportation of ore, waste rock, and tailings would occur only in the mine area, which is off-limits to the public for safety reasons. Ore and waste rock would be moved in large, off-highway haul trucks. Sulfide ore would be transported from the pit to a crusher in mine haul trucks; following crushing, the sulfide ore would be transported via conveyors to the flotation unit. Dewatered tailings would be transported using a conveyor system from the dewatering plant to the tailings facility for final placement. The tailings facility consists of perimeter buttresses that would be constructed using waste rock that is placed using haul trucks traveling on haul roads. Oxide ore would be transported in mine haul trucks from the pit and placed directly on the lined heap leach pad for processing. Processing would include the placement of a system similar to drip irrigation for the delivery of a weak acid to leach the metals out of the ore.

Roads for the haul trucks would be constructed both within the open pit and between the pit and the plant, heap leach, and waste rock disposal sites. Haul roads would be approximately 125 feet wide, including safety berms and drainage ditches, and no steeper than 10% to 12%. Maximum truck speed would be 35 miles per hour. Haul roads are temporary and would not be paved but would be routinely watered for dust suppression.

Transportation on State Route 83

Mine-related traffic on SR 83 during operations would primarily consist of trucks carrying supplies to the project, trucks carrying concentrate and copper cathodes from the project, and employee traffic. Copper concentrate shipments would form the largest number of routine truck shipments, with approximately 56 round trips per day, 7 days a week. The largest concentrated volume of mine traffic during a 24-hour period would occur during workforce shift change. Shift changes vary between 6 a.m.–8 a.m. and 4 p.m.–6 p.m. Equipment and construction material deliveries are estimated to total approximately 1,000 truck shipments to the site. Major equipment arriving by rail would be received at the Port of Tucson, which is located near Vail, Arizona.

Reclamation and Closure

Reclamation of the Rosemont Copper project would be administered and regulated by the Coronado (36 Code of Federal Regulations [CFR] 228) on National Forest System lands; administered and regulated by the Arizona State Mine Inspector (Arizona Revised Statutes [ARS] 27-901 et seq., as amended) on private land; and regulated by the Arizona Department of Environmental Quality (ARS 49-241 through 49-252; and Arizona Administrative Code 18-9-101 through 403). The reclamation concept plan, which will be completed prior to the publication of the final EIS, would focus on design of the facilities with closure goals in mind and would include the following:
• Designing the facilities with closure goals in mind;
• Managing operations to minimize environmental impacts;
• Implementing concurrent reclamation practices (36 CFR 228 Subpart A);
• Constraining disturbances to a minimum number of drainages and minimizing downstream hydrologic disturbances;
• Preparing a comprehensive drainage plan;
• Using appropriate technology to minimize the generation of impacted water;
• Reclaiming the facilities to blend in with surrounding topography;
• Constructing an outer facility shell to reduce visual impacts of mining operations;
• Salvaging soil resources;
• Performing selective vegetation removal;
• Revegetating reclaimed surfaces; and
• Preparing an estimated closure cost for a variety of closure scenarios.

At closure, the open pit would be berm'd and/or fenced to restrict access. Operating facilities at the project site would be demolished and removed and building foundations would also be removed. All areas would be investigated for contaminants, and any contaminated soils, reagents, or fuels would be disposed of off-site at licensed facilities.

Post-mine land use on National Forest System lands would follow the forest plan that is in place at that time. Post-mining/closure reclamation objectives for Rosemont Copper’s private property could include dispersed recreation, wildlife habitat, and ranching.

Design Elements and Mitigation Measures Common to the Proposed Action and Action Alternatives for Plants and Animals

The following elements were designed to avoid or reduce impacts on native biological plant communities, wildlife habitat, and wildlife species from the mine and related actions.

Rosemont Copper will revegetate disturbed areas with native vegetation, excluding the pit area. This includes linear features such as utilities and pipe lines, which will be reclaimed to avoid fragmentation of native biological communities. Specifications will be included in the reclamation plan.

Process water ponds, such as raffinate ponds, pregnant leach solution collection ponds, or chemical or fuel storage areas, will be enclosed, covered, or otherwise managed to protect wildlife, livestock, and public safety. Location and construction criteria for project facilities will prevent deleterious exposure of livestock, wildlife, or birds to toxic chemicals or hazardous conditions created by, used in, or resulting from processing operations. Further details are contained in the preliminary MPO.

In order to protect wildlife breeding habitat, Rosemont Copper will fence selected exclusion areas of highest-value riparian habitat to restrict livestock access from breeding areas for sensitive wildlife species within the Rosemont Ranch land system. The Rosemont, Thurber, DeBaud, and Greaterville grazing allotment permits will be modified to reflect fence locations and livestock exclusion periods.

Rosemont Copper will monitor disturbed and revegetated areas associated with mine activities for noxious and invasive weeds and will take action to prevent, eliminate, or control weeds should they
occur. Methods of control may include removal by hand, spray, mechanical, or other approved methods. An invasive species control plan will be developed that contains specific measures to prevent, control, and reduce noxious weed introduction and control weeds throughout the project area and that will acknowledge that noxious and invasive weed prevention is preferable to remedial action. This plan will also address invasive species such as American Bullfrogs (*Lithobates catesbeiana*).

Upon indication or discovery of a cave, sinkhole, underground drainage into a solution cavern or similar karst features, Rosemont Copper will suspend work at that site and contact the designated Forest Service representative to investigate the discovery before work is reinitiated. The designated Forest Service representative will promptly coordinate the investigation with appropriate agency resource specialists. Any natural void in rock that is large enough for a human to enter constitutes a cave. Any collapse feature in or over carbonate rock constitutes a sinkhole.

In order to reduce or avoid impacts to habitat specific to rocky slopes on the east side of the Santa Rita Mountains, including talus slopes, the west side pit operations power loop will be located within the disturbance perimeter of the ultimate pit and diversion structures.

**GENERAL POTENTIAL EFFECTS OF ALL ACTION ALTERNATIVES**

All of the action alternatives are similar. For example, they have the same pit specifications, the facilities are in the same area, they occupy approximately the same acreage, the duration and hours of operation will be the same, and most of the Forest Service lands involved will be disposal sites for waste rock and tailings. The general effects on plants and animals are inherent for a project of this magnitude. The following bulleted list summarizes the major influences that will likely affect the area’s biota. These factors were taken into consideration for effects determinations of all species.

- **Magnitude:** The proposed project is of a large scale, with at least 6,200 acres being directly lost or altered. Some of the areas will be irreversibly lost.
- **Beyond the footprint,** the affected area could be much larger (e.g., light, noise, and vibration; congestion on SR 83 and increased animal-vehicle collisions; the physiological and chemical effects of dust; surface and groundwater drawdown, contamination, and decreased flow; etc.).
- **Duration:** This project is expected to last at least 20 or more years.
- **Disturbance:** There will be additional noise and vibrations for 20 years, day and night.
- **Light pollution:** The effects of lighting at night for 20 years in an otherwise dark area could be significant (see, for example, Longcore and Rich 2004).
- **Altered hydrologic flows.**

Unfortunately, it is not always possible to predict the consequences of these actions. For example, it cannot be predicted with certainty whether the loss of agaves, disturbance from noise and vibrations, and light pollution will cause bats to abandon roosting sites. Also, it is not possible to predict with certainty whether certain populations of plants and animals can persist within the mine footprint if not directly crushed, even with mitigation; however, the environment will be significantly altered in the vicinity of the mine. In the two previous examples, monitoring seems prudent, so that adaptive management may help the Forest Service to determine how to maintain viable populations of MIS.

This part of the section discusses common impacts related to the five action alternatives (proposed action, Phased Tailings, Barrel, Barrel Trail, and Scholefield-McCleary) on all evaluated biological resources.
SPECIES IDENTIFICATION

Of the 33 total MIS and one group of cavity-nesting birds on the Coronado National Forest, nine species and the group of cavity nesters (indicated by shaded rows in Table 2) were selected for further detailed analysis within this report at the project level based on their known occurrence or presence of suitable habitat within or near the project area (see Table 2). The remaining 24 species were eliminated from consideration in this analysis because either their known distributions are well outside the project area on Forest Service lands or the project area on Forest Service lands does not contain suitable habitats for those species, as explained in Table 2.

It is important to note that some of the 24 species excluded from further detailed analysis in this report may still be indirectly impacted by project activities, but these impacts are expected to occur off Forest Service lands, downstream or within utility or road corridors; therefore, these impacts are not discussed within the context of this report, which only discusses population-level impacts to MIS on Forest Service lands. Because of this, some of the 24 species are evaluated in greater detail in the Biologists’ Report (SWCA 2011a), Biological Assessment (to be drafted and submitted to the USFWS at a later date), Biological Evaluation (SWCA 2011b), and/or Migratory Bird Analysis (SWCA 2011c).

Table 2. Coronado National Forest MIS and Occurrence in the Proposed Project Area

<table>
<thead>
<tr>
<th>Species</th>
<th>Evaluation for Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Peregrine Falcon</td>
<td>No aeries known from the project area on Forest Service lands; potential use by wintering or migrating birds may occur. Foraging habitat is present within the project area on Forest Service lands for birds from nearby aeries. This species was not observed by Russell et al. (n.d. [1977]), a comprehensive survey of birds in the Rosemont area.</td>
</tr>
<tr>
<td>Apache Trout (Oncorhynchus gilae apache)</td>
<td>Does not occur within the analysis area on Forest Service lands, as no suitable aquatic habitat occurs on Forest Service lands potentially impacted by this project (WestLand 2010).</td>
</tr>
<tr>
<td>Arizona Ridge-nosed Rattlesnake (Crotalus willardi willardi)</td>
<td>The ridge-nosed rattlesnake typically occurs in oak woodland to pine-fir forests near rock crevices on forest and woodland floors in extreme southeastern Arizona in the Huachuca, Santa Rita, Patagonia, and Whetstone mountains and the Canelo Hills at elevations ranging between 4,800 and 9,000 feet amsl (AGFD 2001d). Suitable habitat occurs within the project area on Forest Service lands.</td>
</tr>
<tr>
<td>Arizona Treefrog (Hyla wrightorum)</td>
<td>Not thought to occur within the project area on Forest Service lands, as this species is only known from the Huachuca Mountains and Canelo Hills in southeastern Arizona (Brennan and Holycross 2006).</td>
</tr>
<tr>
<td>Baird’s Sparrow (Ammodramus bairdii)</td>
<td>Occurrences are considered unlikely as this species is known to winter in tall, dense grassland patches with sufficient herbaceous cover, which is lacking within the proposed project footprint. Additionally, it is thought that this species avoids grazed rangelands This species was not observed by Russell et al. (n.d. [1977]) in their comprehensive survey of birds in the Rosemont area.</td>
</tr>
<tr>
<td>Bell’s Vireo (Vireo bellii)</td>
<td>This species inhabits lowland riparian areas containing willows, mesquite, and seepwillows, preferring dense, low, shubby vegetation below 3,500 feet amsl in the lower Sonoran zone within desert riparian communities (AGFD 2002a). This species may be impacted within downstream portions of the analysis area off of Forest Service lands, and possibly within lower Barrel Canyon on Forest Service lands. This species was observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Bighorn Sheep (Ovis Canadensis)</td>
<td>This species does not occur within the analysis area. This species is not known from the Santa Rita Mountains. The Silver Bell Mountains near Tucson maintain the last endemic Bighorn Sheep population from what was likely a population complex that included the Santa Rita, Santa Catalina, and Rincon mountains (AGFD 2009a).</td>
</tr>
<tr>
<td>Black Bear (Ursus americanus)</td>
<td>Occurs within the project area on Forest Service lands; suitable foraging habitat is present in the analysis area (AGFD 2010). Scat and paw prints have been observed during at least one visit to the project site by a trained SWCA biologist.</td>
</tr>
</tbody>
</table>
Table 2. Coronado National Forest MIS and Occurrence in the Proposed Project Area (Continued)

<table>
<thead>
<tr>
<th>Species</th>
<th>Evaluation for Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue-throated Hummingbird (Lampornis clemenciae)</td>
<td>Not thought to occur within the project area on Forest Service lands. Corman and Wise-Gervais (2005) report that this species has only been observed within Madera and Florida canyons (and possibly in upper Gardner and Cave canyons as well) in the Santa Rita Mountains, areas that would not be impacted by this project. This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Buff-breasted Flycatcher (Empidonax fulvifrons)</td>
<td>Not thought to occur within the analysis area, as no suitable pine forest habitat above 6,000 feet amsl is present in the project area on Forest Service lands (AGFD 2003b). This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Desert Massasauga (Sistrurus catenatus edwardsii)</td>
<td>Not thought to occur within the project area on Forest Service lands. The desert massasauga is currently known from only two localized populations in extreme southeastern Arizona in San Bernardino and Sulphur Springs valleys (Brennan and Holycross 2006).</td>
</tr>
<tr>
<td>Elegant Trogon (Trogon elegans)</td>
<td>Not thought to occur within the project area on Forest Service lands, as there is no suitable habitat. In riparian areas of 11 canyons in the Huachuca and Santa Rita mountains, individuals selectively used oak-pine and pine-oak vegetation (AGFD 2001a), vegetation types that would not be impacted by this project. This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Five-striped Sparrow (Aimophila quinquestriata)</td>
<td>Not thought to occur within the project area on Forest Service lands, as this species is typically observed in thornscrub associations near permanent water and has only been recently reported in Madera Canyon within the Santa Rita Mountains (Corman and Wise-Gervais 2005). This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Gila Chub (Gila intermedia)</td>
<td>Not thought to occur within the analysis area on Forest Service lands, as no suitable aquatic habitat occurs on Forest Service lands potentially impacted by this project (WestLand 2010).</td>
</tr>
<tr>
<td>Gila Topminnow (Poeciliopsis occidentalis)</td>
<td>Not thought to occur within the analysis area on Forest Service lands, as no suitable aquatic habitat occurs on Forest Service lands potentially impacted by this project (WestLand 2010).</td>
</tr>
<tr>
<td>Gould’s Turkey (Meleagris gallopavo mexicana)</td>
<td>Historic occurrences in the Santa Rita Mountains, along with re-established populations adjacent to the project area. Suitable oak-grassland-riparian habitat exists on Forest Service lands within the project area. This species was not observed by Russell et al. (n.d. [1977]); however, several populations have been released into the Santa Rita Mountains since that survey effort was conducted.</td>
</tr>
<tr>
<td>Gray Hawk (Buteo nitidus)</td>
<td>This species typically occurs in riparian woodlands with large trees (cottonwoods), usually near mesquite forests (AGFD 2000), and so is not expected to occur within the analysis area on Forest Service lands. It may be impacted downstream on non-Forest Service lands within portions of Cienega Creek included in the analysis area (see the Biological Evaluation [SWCA 2011b]). This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Merriam’s Turkey (Meleagris gallopavo merriami)</td>
<td>Historic occurrence records exist in the Santa Rita Mountains, but the species has not been recently documented from project area on Forest Service lands (Corman and Wise-Gervais 2005). Thought to be extirpated from the Santa Rita Mountains. This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Mexican Stoneroller (Campostoma ornatum)</td>
<td>Not thought to occur within the analysis area on Forest Service lands, as no suitable aquatic habitat occurs on Forest Service lands potentially impacted by this project (WestLand 2010).</td>
</tr>
<tr>
<td>Montezuma Quail (Cyrtonyx montezumae)</td>
<td>Known to occur within the project area on Forest Service lands; suitable grassland and Madrean evergreen woodland habitats are present in the project area on Forest Service lands. This species was observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Mount Graham Red Squirrel (Tamiasciurus hudsonicus grahamsensis)</td>
<td>Does not occur within the project area; endemic to the Pinaleño Mountains. No suitable habitat is present, as this species is only found in mixed-conifer and subalpine forests at elevations above 8,700 feet amsl in the Pinaleño Mountains (AGFD 2003a).</td>
</tr>
<tr>
<td>Northern Beardless-Tyranulet (Campstoma imberbe)</td>
<td>May occur within the project area on Forest Service lands. This species has been observed fairly regularly in wooded foothill drainages of the Santa Rita Mountains (Corman and Wise-Gervais 2005). This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Primary and secondary cavity nesters</td>
<td>Occur within the project area on Forest Service lands; suitable habitat (cavities in trees) is available. Numerous owls, woodpeckers, and flycatchers known to nest in cavities may be present in the project area on Forest Service lands. Many of these species were observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Pronghorn (Antilocapra americana)</td>
<td>Not thought to occur within the project area on Forest Service lands. This species is primarily found in treeless grasslands, sage scrub or chaparral, and desert; requires open cover to avoid predation (AGFD 2002c; AGFD 2002d).</td>
</tr>
</tbody>
</table>
Table 2. Coronado National Forest MIS and Occurrence in the Proposed Project Area (Continued)

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Rose-throated Becard (Pachyramphus aglaiae)</td>
<td>Not thought to occur within the project area on Forest Service lands. Suitable habitat for this species, low-elevation sycamore riparian habitats in extreme southern Arizona near flowing water (AGFD 2001b), would not be impacted by this project on Forest Service lands. This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Sonora Chub (Gila ditaenia)</td>
<td>Not thought to occur within the analysis area on Forest Service lands, as no suitable aquatic habitat occurs on Forest Service lands potentially impacted by this project (WestLand 2010).</td>
</tr>
<tr>
<td>Sonoran Tiger Salamander (Ambystoma mavortium stebbinsi)</td>
<td>Not thought to occur within the analysis area on Forest Service lands, as no suitable aquatic habitat occurs on Forest Service lands potentially impacted by this project (WestLand 2010).</td>
</tr>
<tr>
<td>Spikedace (Meda fulgida)</td>
<td>Not thought to occur within the analysis area on Forest Service lands, as no suitable aquatic habitat occurs on Forest Service lands potentially impacted by this project (WestLand 2010).</td>
</tr>
<tr>
<td>Sulphur-bellied Flycatcher (Myiodynastes luteiventris)</td>
<td>Not thought to occur on Forest Service lands within the project area, as this species typically occurs in riparian canyons in association with sycamores for nest tree and walnuts for nest material or pine-oak communities (Corman and Wise-Gervais 2005; Lowther and Stotz 1999). This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Tarahumara Frog (Lithobates tarahumarae)</td>
<td>Extirpated from the United States, but former range is outside the project area, as this species requires perennial lotic waters with plunge pools in rugged canyons (Brennan and Holycross 2006). Reintroduced into the Santa Rita Mountains approximately 10 to 15 miles south of the project area starting in 2004 (Brennan and Holycross 2006).</td>
</tr>
<tr>
<td>Thick-billed Kingbird (Tyrannus crassirostris)</td>
<td>Not thought to occur within the project area on Forest Service lands. Suitable habitat for this species, sycamore riparian habitats dominated by cottonwood, willow, and mesquite (AGFD 2001c), would not be impacted by this project on Forest Service lands, and this species is not known from the Cienega Creek watershed. This species was not observed by Russell et al. (n.d. [1977]).</td>
</tr>
<tr>
<td>Twin-spotted Rattlesnake (Crotalus pricei)</td>
<td>Not thought to occur within the project area on Forest Service lands. This snake is found in the Chiricahua, Pinaleño, Huachuca, and Santa Rita mountain ranges of southeastern Arizona at elevations ranging from 6,000 to 11,000 feet amsl in Petran Subalpine Conifer Forest and Petran montane conifer forest communities (Brennan and Holycross 2006).</td>
</tr>
<tr>
<td>Western Barking Frog (Craugastor augusti cactorum)</td>
<td>May occur within the project area on Forest Service lands. Limited suitable habitat, rock crevices on hillsides within Madrean evergreen woodland (AGFD 2009b), occurs in the project area on Forest Service lands.</td>
</tr>
<tr>
<td>White-tailed Deer (Odocoileus virginianus)</td>
<td>Known to occur within the project area on Forest Service lands; widespread suitable habitat (oak woodland and oak woodland/grassland) is present in the project area (AGFD 2010) on Forest Service lands.</td>
</tr>
</tbody>
</table>

ANALYSIS OF EFFECTS

In order to determine the level of impact that each of these MIS may incur on a forest-wide level, analysis was completed to determine the percentage of each species’ occupied habitat across the Coronado National Forest that may be impacted (lost or disturbed) by implementation of any of the action alternatives. Please note that for each of these species for which an estimate was made of the percent of occupied habitat potentially impacted by this project, the numbers are expected to be higher than actual, as all “suitable habitat” was considered to be equivalent to “occupied habitat” in this analysis since species-specific surveys were not conducted for any MIS.

American Peregrine Falcon (Falco peregrinus anatum)

Habitat and Population Trends across the Coronado National Forest

The American Peregrine Falcon is included in the “Threatened and Endangered Species” MIS group for the Coronado National Forest. This falcon breeds in Arizona wherever sufficient prey is available near cliffs, such as those associated with the Mogollon Rim, Grand Canyon, and Colorado Plateau. Optimum
nesting habitat is generally considered to be steep, sheer cliffs overlooking woodlands, riparian areas, or other areas that support an abundance of avian prey species; the presence of an open expanse is critical (Glinski 1998). However, these falcons have been observed breeding in less optimal habitats (small broken cliffs in ponderosa pine forest or large, sheer cliffs in very xeric areas) as human development expands in Arizona (AGFD 2002b). In Arizona, these falcons return to breeding areas from mid-February to mid-March, although year-round resident birds are not uncommon. Nesting sites (also called aeries) usually consist of a shallow depression scraped into a ledge on the side of a cliff (AGFD 2002b). Peregrine Falcons feed almost exclusively on birds, but bats are also taken (AGFD 2002b). In Arizona, these birds use areas of Sonoran, Mohave, and Great Basin deserts scrub up through areas of Rocky Mountain and Madrean montane conifer forest from around 400 feet amsl along the lower Colorado River to 9,000 feet amsl along the Mogollon Rim (AGFD 2002b).

The forest plan gives no data for acres of occupied habitat on the Coronado National Forest (Forest Service 1986:130), nor does it identify desired habitat conditions for this species. However, Peregrine Falcons are capable of rapid, long-distance flight, and it is unlikely that the entire forest, including the project area, could provide suitable hunting habitat. For the purposes of this analysis, occupied habitat is defined as a combination of suitable nesting habitat and adjacent hunting areas. No specific monitoring method is identified in the forest plan for this species other than “measurements of appropriate habitat components” (Forest Service 1986:94). This species was not observed by Russell et al. (n.d. [1977]) in their comprehensive survey of birds in the Rosemont area. There are no known active aeries in the project area and optimal nesting habitat is limited; however, Peregrine Falcons nest elsewhere in the Santa Rita Mountains (at least three sites are known), and the project area may be used by peregrines from nearby active aeries throughout the year. Although the forest plan does not specifically require monitoring for this species, known aeries have been identified and monitored periodically for many years by Forest Service personnel. Twenty-nine Peregrine Falcon territories have been identified on the Coronado National Forest, and 14 of these have been identified for continued long-term monitoring as a condition of delisting the species (Abbate 2006; USFWS 2003). In 2006, 12 of the 14 sites on the Coronado National Forest were occupied, producing a total of 11 young (Abbate 2006). No forest-wide trends are discernible. Nationwide, the Peregrine Falcon population is considered secure and has been increasing for the past 30 years (USFWS 2003). Forest-wide habitats are considered secure and sufficient to allow the species to be well distributed across the forest (Forest Service 2011a).

**Evaluation of Effects**

Since the species is not known to nest in the proposed project footprint, no direct effects are anticipated. However, the removal or burial of vegetation would result in indirect effects in the form of reductions in avian prey species abundance. The proposed project is unlikely to cause a detectable change in Peregrine Falcon populations, as this species is not known to breed in the project area. Although there are no data on the acres of currently occupied habitat for this species on the Coronado National Forest (Forest Service 1986), the project is expected to result in a loss of suitable foraging habitat for this species. All action alternatives would result in the removal of vegetation of all sizes and age classes and would change the rate of recruitment of trees, shrubs, and other vegetation. Changes in vegetation would result in corresponding reductions in food species diversity and abundance (i.e., songbirds). Furthermore, groundwater drawdown could impact local prey population through the elimination of springs and seeps in and adjacent to the project area. Thus, all action alternatives are anticipated to result in potential direct and indirect impacts to individual Peregrine Falcons.

No direct effects on Peregrine Falcons are anticipated to result from this project as this species is not known to nest in the proposed project footprint; however, birds from nearby territories are likely to hunt over the project area. *Thus, all action alternatives are not expected to result in detectable changes in the Coronado National Forest–wide population of American Peregrine Falcon or to result in a loss of occupied habitat for this species.*
Arizona Ridge-nosed Rattlesnake (Crotalus willardi willardi)

Habitat and Population Trends across the Coronado National Forest

The Ridge-nosed Rattlesnake is in the “Threatened and Endangered” MIS group in the forest plan. The Ridge-nosed Rattlesnake occurs in oak woodland to pine-fir forests, typically thought to be a pine-oak specialist, near rock crevices on forest and woodland floors in extreme southeastern Arizona in the Huachuca, Santa Rita, Patagonia, and Whetstone mountains and the Canelo Hills at elevations ranging between 4,800 and 9,000 feet amsl (AGFD 2001d). It is also found in mesic canyon bottoms with canopies of alder, box elder, maple, oak, and other broadleaf deciduous trees and is infrequently found in high grassland bordering the woodlands (AGFD 2001d). This rattlesnake preys on various rodents, lizards, snakes, birds, and arthropods, including centipedes (AGFD 2001d).

On a global scale, the Arizona Ridge-nosed Rattlesnake is considered demonstrably secure, with more than 100 occurrences. On a state scale, the species is apparently uncommon or restricted with 21 to 50 occurrences (AGFD 2001d). Regional trend information for the Arizona Ridge-nosed Rattlesnake is not available, and no systematic surveys are conducted for the species. A “general feeling” exists that it may be less common locally in the Huachuca Mountains than 25 years ago (AGFD 2001d). No systematic surveys are conducted for Arizona Ridge-nosed Rattlesnake; thus, the population trend for this species on the Coronado National Forest is unknown (Forest Service 2011a).

Evaluation of Effects

Although it is very unlikely that this species occurs in the analysis area, as it is typically thought to be a pine-oak specialist, distribution data are unclear for this species because it is hard to detect through surveys, so it is still evaluated here. It is estimated that this species occupies 28,175 acres within the Coronado National Forest (Forest Service 1986), and there is a total of 24,949 acres of suitable habitat for this species (i.e., Madrean evergreen woodland, interior riparian deciduous woodland, and ephemeral fluvial systems that support upland vegetation) on Forest Service lands within the analysis area. The proposed project would result in direct impacts to this species through the removal of approximately 2,195 to 2,637 acres of suitable habitat above 4,800 feet (depending on which action alternative is selected). Therefore, the proposed project has the potential to impact up to 8% to 9% of this species’ occupied habitat across the Coronado National Forest.

All action alternatives would result in the removal of vegetation of all sizes and age classes and would change the rate of recruitment of trees, shrubs, and other vegetation, resulting in corresponding reductions in prey species diversity and abundance. Any individuals present within the footprint of the mine infrastructure (including the pit, buildings, roads, tailings or waste piles, etc.) or in the path of either the water or transmission lines would be expected to be crushed or trampled as a result of project activities. Any individuals present in the analysis area outside of the mine footprint may experience indirect effects from noise, vibrations, and light to suitable habitat, including a decrease in their prey base and habitat conversion. It is expected that this project will impact no more than 9% of the suitable habitat present for this species across the Coronado National Forest; thus, all action alternatives are not expected to result in detectable changes in the Coronado National Forest–wide population of Arizona Ridge-nosed Rattlesnake.
Bell’s Vireo (Vireo bellii)

**Habitat and Population Trends across the Coronado National Forest**

Bell’s Vireo is included in the “Riparian Species,” “Species Needing Dense Cover,” and “Threatened and Endangered” MIS groups for the Coronado National Forest. This species builds nests in low, dense vegetation usually less than 5 feet above the ground, often located near openings within thickets and near water (AGFD 2002a). Cowbird nest parasitism affects up to 70% of all nests (the vireo abandons the nest if parasitized, and reproductive success is lowered) and severe weather and predation also affect productivity (AGFD 2002a). Bell’s Vireo is an insectivore (also known to occasionally eat fruit), feeding on caterpillars, beetles, bees, wasps, and small spiders, moving about slowly as it takes food from branches and leaves in dense underbrush and shrubs (AGFD 2002a). This species inhabits lowland riparian areas that contain willows, mesquite, and seepwillows, preferring dense, low, shrubby vegetation below 3,500 feet amsl in the lower Sonoran zone in desert riparian communities (AGFD 2002a). In Arizona, Bell’s Vireo is associated with dense, shrubby vegetation and woodland edges, especially those with a mesquite component (Corman and Wise-Gervais 2005).

Bell’s Vireo occurs in Arizona, California, Nevada, and New Mexico, and south into Mexico (NatureServe 2010); it is ranked by NatureServe as G5T4 (Globally Apparently Secure), N4B (Nationally Apparently Secure), and S4 (Apparently Secure) in the State of Arizona. This bird occurs across central, southeastern, and southwestern Arizona (NatureServe 2010). Bell’s Vireo is threatened by the loss and degradation of riparian habitat through human and human-induced activities, nest parasitism by the Brown-headed Cowbird, water projects, severe flooding as a result of water releases from dams, clearing of land for development and agriculture, pesticides, human disturbance, fire in riparian habitat, off-highway vehicles, livestock impacts to tree saplings, and invasion of nonnative plants (AGFD 2002a).

This species inhabits lowland riparian areas containing willows, mesquite, and seepwillows, preferring dense, low, shrubby vegetation below 3,500 feet amsl in the lower Sonoran zone within desert riparian communities (AGFD 2002a). This species may be impacted within downstream portions of the analysis area. This species was detected by the University of Arizona/ANAMAX surveys of the 1970s as being “uncommon in summer in lower wash (i.e., near the confluence of Barrel Canyon wash with State Route 83) where it may breed” (Russell et al. n.d. [1977]:184).

No systematic surveys are conducted specifically for Bell’s Vireos on the Coronado National Forest; however, a high relative abundance for the species was noted where it was breeding in Florida Canyon in 1994 (Forest Service 2011a). This species is regularly detected during breeding bird surveys in southeastern Arizona, and populations in Arizona and northern Mexico are considered stable overall based on North American Breeding Bird Survey data. According to Sauer et al. (2008), population trend data for this species show a decline in Arizona for the period 1997 to 2007. Overall, the habitat and population trend for this species on the Coronado National Forest appears to be stable, even though this species is expected to rarely use Forest Service lands because of the lack of suitable lower-elevation mesquite thickets available.

**Evaluation of Effects**

There are no data on the acres of currently occupied habitat for this species on the Coronado National Forest (Forest Service 1986); however, all action alternatives would result in the removal of vegetation of all sizes and age classes and would change the rate of recruitment of trees, shrubs, and other vegetation. Changes in vegetation would result in corresponding reductions in food species’ diversity and abundance, resulting in direct and indirect impacts to Bell’s Vireo. Potential nesting habitat may be removed, and groundwater drawdown could indirectly impact Bell’s Vireos through the elimination of springs and seeps in and adjacent to the project area, which in turn could negatively impact food resource diversity.
and abundance. However, this species is expected to rarely use the project area because of the lack of suitable lowland riparian areas containing willows, mesquite, and seepwillows. It is unknown whether this project will impact occupied habitat for this species on the Coronado National Forest because of a lack of data; thus, all action alternatives are not expected to result in detectable changes in the Coronado National Forest–wide population of Bell’s Vireo.

Black Bear (Ursus americanus)

**Habitat and Population Trends across the Coronado National Forest**

Black Bears are included in the “Riparian Species,” “Species Needing Diversity,” and “Game Species” MIS groups in the forest plan. Black Bears are wide-ranging habitat generalists that prefer areas of dense cover and high vegetative diversity. They will use riparian areas for cover and as travel corridors. In Arizona, Black Bears are found in a variety of habitats, including subalpine and montane conifer forests, riparian forests, evergreen woodlands, and chaparral (AGFD 2010). Individuals establish home ranges but are capable of moving great distances (100 miles) in response to climatic conditions or food availability. They often return long distances after being moved (AGFD 2010).

Most Arizona Black Bears hibernate from November through March, during which time they reduce their body temperature, heart rate, and metabolic function while still remaining somewhat conscious in the den (AGFD 2010). They are normally solitary animals, the exception being family groups (mother and cubs), breeding pairs, and congregations at feeding sites (AGFD 2010). Bears will establish and defend territories, a behavior that tends to limit population densities in any given area. They feed on a variety of items, including berries, acorns, grass, insects, mesquite beans, and carrion. Grass has been shown to be a very important component of the diet in the spring. Prickly-pear cactus fruits are seasonally important in some years. In general, the diet consists of approximately 90% plant material and only 10% animal matter, primarily in the form of insects. They can be effective predators and have been known to take livestock, especially calves, on occasion. Black Bears may attempt to exploit sources of food at the mine site, potentially becoming a nuisance wherever mine employees eat, discard, or store food.

Normal reproductive cycles in Arizona Black Bears may be adversely affected by drought and/or poor physiological condition (AGFD 2010). Although bears are generally most active in the early morning and late evening, they may alter their activity pattern to exploit sources of artificial food, becoming nocturnal nuisances at campgrounds and dumpsites (AGFD 2010). AGFD data from Game Management Unit 34A show a small increase in the number of Black Bears taken in the area recently (only one taken in 2003 and 2004; two harvested in 2005; four harvested in 2006; and five in 2007) (AGFD 2010).

Black Bears are both wide-ranging and secretive and thus are difficult to census with any degree of accuracy (Forest Service 2011a). As a result, no attempts are made to survey for bears on the Coronado National Forest. Across the forest, habitat is of sufficient quality and abundance to allow the species to be well distributed across federal lands. Historic habitats remain occupied, although the population fluctuates within occupied habitats based on the availability of forage. No population trends can be detected, although it is generally believed that poor mast crops over the past several years have led to a decrease in the carrying capacity for bears on the Coronado National Forest. A current forest-wide population estimate is not available, but the range of the species on the Coronado National Forest has not changed significantly since 1986, and the population trend for this species on the forest appears to be stable.

**Evaluation of Effects**

The project is expected to result in a loss of suitable foraging habitat for Black Bear, as this species is known to use lands in and adjacent to the project area. The mine could be expected to impact movement routes commonly used by Black Bear. The project area falls in or adjacent to three different linkages
identified by the Arizona Wildlife Linkages Assessment Workgroup (2006): 1) Linkage 92: San Xavier-Sierrita-Santa Rita, 2) Linkage 94: Rincon-Whetstone-Santa Rita, and 3) Linkage 95: Santa Rita-Empire Complex. Black Bear is identified as a species using all three of these linkage zones, and as reported in Beier et al. (2006), was one of the focal species selected for this detailed analysis. Groundwater drawdown could indirectly impact local populations through the elimination of springs and seeps in and adjacent to the project area. Noise and light also could reduce use of areas adjacent to the mine.

It is estimated that this species occupies 641,113 acres within the Coronado National Forest (Forest Service 1986), and there is a total of 24,949 acres of habitat (Madrean evergreen woodland, interior riparian deciduous woodland, and ephemeral fluvial systems that support upland vegetation) on Forest Service lands within the analysis area. All action alternatives would result in the removal of vegetation of all sizes and age classes and would change the rate of recruitment of trees, shrubs, and other vegetation. Changes in vegetation would result in corresponding reductions in food species’ diversity and abundance for Black Bears, and so all action alternatives could result in potential direct and indirect impacts to this species. The proposed project would result in the removal of approximately 2,912 to 3,315 acres of habitat for this species (depending on which action alternative is selected). Therefore, the proposed project has the potential to impact approximately 0.5% of this species’ occupied habitat across the Coronado National Forest, and it is expected that there is sufficient suitable habitat available for this species outside the area of impact. *It is expected that this project will impact less than 1% of the suitable habitat present for this species across the Coronado National Forest; thus, all action alternatives are not expected to result in detectable changes in the Coronado National Forest–wide population of Black Bear.*

**Gould’s Turkey (Meleagris gallopavo mexicana)**

*Habitat and Population Trends across the Coronado National Forest*

This MIS is also a Forest Sensitive species; it is included in the “Threatened and Endangered Species” MIS group and was selected as such within the forest plan because it inhabits oak-grassland-riparian associations with trees of sufficient size for roosting, free water, and herbaceous material and insects during the breeding season.

Gould’s Turkey is distributed throughout northern Mexico and into the southwestern United States. In Mexico, populations appear to be stable and well distributed (Heffelfinger et al. 2000), but in Arizona the species occurs only in isolated pockets in the Chiricahua, Galiuro, Santa Catalina, Huachuca, Peloncillo, Santa Rita, and Pinaleño mountains because of the re-establishment of populations in those ranges. The native turkey population on the Coronado National Forest is believed to have been extirpated during the early 1900s (with the possible exception of a small population within the Peloncillo Mountains). While no taxonomic records exist, it is likely that these birds were the Gould’s subspecies (*M. g. mexicana*), based on the proximity to and connectivity between existing Gould’s Turkey habitats in northern Mexico and mountain ranges on the Coronado National Forest. A small but apparently stable population of Gould’s Turkeys has persisted in the Peloncillo, Animas, and San Luis mountains in southeastern New Mexico. In the 1980s, agency efforts focused on the establishment of the Gould’s subspecies into suitable habitats on the Coronado National Forest throughout southeastern Arizona.

This species was not observed by Russell et al. (n.d. [1977]). In 1983 and 1987, 21 turkeys were released into the Huachuca Mountains. After some initial mortality, this population has increased in numbers and distribution to the point that it appears to be self-sustaining. In 1994 and 1997, 67 turkeys trapped in Mexico were released in the Galiuro Mountains, but the released birds suffered high mortality. In March 2000, these efforts to re-establish Gould’s Turkeys were formalized under the auspices of the Southeastern Arizona Turkey Management Plan, a cooperative effort between the Coronado, AGFD, BLM, Fort Huachuca, and the National Wild Turkey Federation. The goal of this plan is to establish self-
sustaining populations of Gould’s Turkeys throughout southeast Arizona (Heffelfinger et al. 2000). Recent releases include 38 turkeys in the Santa Rita Mountains and 15 turkeys in the Pinaleño Mountains (National Wild Turkey Federation 2006).

Beginning in 2005 and again in 2008, Gould’s Turkeys were released into the Santa Rita Mountains, and these birds appear to be surviving well (Forest Service 2011a). Gould’s Turkey populations on the Coronado National Forest have increased since 1986, and increases since 1990 have been the result of natural reproduction and ongoing transplant efforts. Habitat on the Coronado National Forest is of sufficient quality and distribution to allow the population to increase. According to Sauer et al. (2008), population trend data are not available for the period from 1997 to 2007 for this species in Arizona. The population trend for this species on the Coronado National Forest appears to be upward due to recent release efforts (Forest Service 2011a).

**Evaluation of Effects**

There are no data on the acres of currently occupied habitat for this species on the Coronado National Forest (Forest Service 1986); however, all action alternatives would result in the removal of vegetation of all sizes and age classes and would change the rate of recruitment of trees, shrubs, and other vegetation. Changes in vegetation (particularly to the oak-grassland and riparian communities) would result in corresponding reductions in food species diversity and abundance. Furthermore, groundwater drawdown could indirectly impact the re-established local population of Gould’s Turkey through the elimination of springs and seeps in and adjacent to the project area, which in turn could negatively impact reproductive success. *It is unknown whether this project will impact occupied habitat for this species on the Coronado National Forest because of a lack of data; thus, all action alternatives are not expected to result in detectable changes in the Coronado National Forest–wide population of Gould’s Turkey.*

**Montezuma Quail (Cyrtonyx montezumae)**

**Habitat and Population Trends across the Coronado National Forest**

Montezuma Quail are an indicator for the “Species Needing Herbaceous Cover” and “Game Species” MIS groups in the forest plan. Montezuma Quail are the largest and most secretive of Arizona’s quail species (AGFD 2010). It forms fall and winter coveys that are likely to remain in the same general area where they were raised (AGFD 2010). Montezuma Quail prefer oak woodlands and oak savannas in the southeastern portions of the state, where grass cover is abundant (AGFD 2010). The maintenance of grass height over 6 inches is necessary to provide sufficient cover for the birds to hide from predators. Although Montezuma Quail populations are considered to be highly correlated with the amount and timing of summer precipitation, high levels of grazing or other activities that decrease herbaceous production, especially during the growing season, have also been shown to have negative impacts to the Montezuma Quail as a result of the decrease in cover (Brown 1982).

Montezuma Quail nest only after the monsoon and often postpone breeding until after the summer solstice, when the days start getting shorter (AGFD 2010). They generally demonstrate high hatching success, and their highly fluctuating numbers are determined largely by how many birds survive the winter, as this species typically experiences relatively high winter mortality (AGFD 2010). Since 1979, harvested quail numbers and hunter interest have decreased, causing some hunters and wildlife managers to wonder whether a long-term decline in quail numbers may have occurred (AGFD 2010). This species was observed by Russell et al. (n.d. [1977]:184), who described this species as a “common resident of oak-juniper woodland; breeds. Usually encountered in flocks of 10-12, apparently family groups. One flock of young birds . . . in oak-juniper woodland. Census data do not accurately reflect abundance or
presence of this species due to secretive habits (tendency to flush only when approached within several meters, and flocking behavior).”

Effective techniques for measuring Montezuma Quail abundance are lacking, and unlike Gambel’s, Scaled, and Masked Bobwhite Quail, Montezuma Quail cannot be reliably censused using breeding season call counts (Forest Service 2011a). AGFD has collected harvest data from quail hunters in selected canyons since approximately 1980, and since 1987, harvest data have been collected annually by AGFD via a small-game mail questionnaire. Harvests have fluctuated widely, with no discernible long-term trend. According to Sauer et al. (2008), population trend data are not available for the period from 1997 to 2007 for this species in Arizona. The population trend for this species on the Coronado National Forest appears to be stable (Forest Service 2011a).

**Evaluation of Effects**

The project is likely to cause a detectable change in the local Montezuma Quail population. It is estimated that this species occupies 225,410 acres within the Coronado National Forest (Forest Service 1986), and there is a total of 44,671 acres of habitat (Madrean evergreen woodland, semidesert grassland, interior riparian deciduous woodland, and ephemeral fluvial systems that support upland vegetation) on Forest Service lands within the analysis area. All action alternatives would result in the removal of vegetation of all sizes and age classes and would change the rate of recruitment of trees, shrubs, and other vegetation. The proposed project would result in the removal of approximately 4,937 to 6,007 acres of habitat for this species (depending on which action alternative is selected). Therefore, the proposed project has the potential to impact approximately 2.2% to 2.7% of this species’ occupied habitat across the Coronado National Forest. Changes in vegetation would result in corresponding reductions in food species’ diversity and abundance. Further, groundwater drawdown could indirectly impact the local population of Montezuma Quail through the elimination of springs and seeps in and adjacent to the project area, which in turn could negatively impact reproductive success. All action alternatives could result in potential direct and indirect impacts to individual Montezuma Quail; however, it is expected that there is sufficient suitable habitat available for this species outside the area of impact. *It is expected that this project will impact no more than 2.7% of the suitable habitat present for this species across the Coronado National Forest; thus, all action alternatives are not expected to result in detectable changes in the Coronado National Forest–wide population of Montezuma Quail.*

**Northern Beardless-Tyrannulet (Camptostoma imberbe)**

*Habitat and Population Trends across the Coronado National Forest*

This species is included in the “Riparian Species,” “Species Needing Dense Canopy,” “Special Interest Species,” and “Threatened and Endangered Species” MIS groups for the Coronado National Forest. Northern Beardless-Tyrannulet inhabits relatively open riparian woodland and heavily wooded dry washes in southeastern Arizona (Corman and Wise-Gervais 2005). During the research period for the *Arizona Breeding Bird Atlas*, they were reported primarily from lowland riparian woodlands with Fremont cottonwood and Goodding’s willow stands, but they also were found fairly regularly in intermittent foothill drainages and dry washes with stands of tall netleaf hackberry (Corman and Wise-Gervais 2005). Most tyrannulets are migratory and return to breeding areas in early to mid-March, with the earliest nest building reported on April 12. Peak nesting for this species is early May through late June. *Arizona Breeding Bird Atlas* data indicate that they nest at elevations from 1,920 to 4,600 feet. They were found nesting along the San Pedro River and its tributaries, Arivaca Creek, Sonopa Creek, upper Santa Cruz River, and in wooded foothill drainages of the Baboquivari, Atascosa, Santa Rita, and Santa Catalina mountains (Corman and Wise-Gervais 2005). This species was not observed by Russell et al. (n.d. [1977]).
On a global scale and state scale, the Northern Beardless-Tyrannulet is considered demonstrably secure, with more than 100 occurrences, although it could be considered quite rare in some areas (Forest Service 2001b). Population trend data are not displayed for this species in the North American Breeding Bird Survey database. The general breeding distribution has changed little since the 1990s (Corman and Wise-Gervais 2005). According to Sauer et al. (2008), population trend data are not available for the period from 1997 to 2007 for this species in Arizona. There are not sufficient data to determine population trends on the Coronado National Forest, but optimal habitats are very limited, primarily because much of the forest is above the elevational range of the species (Forest Service 2011a).

**Evaluation of Effects**

The project may cause a detectable change in the local populations of Northern Beardless-Tyrannulet. It is estimated that this species occupies 1,270 acres within the Coronado National Forest (Forest Service 1986), and there is a total of 318 acres of riparian habitat (interior riparian deciduous woodlands) on Forest Service lands within the analysis area. All action alternatives would result in the removal of vegetation of all sizes and age classes within riparian areas and would change the rate of recruitment of trees and large shrubs in riparian areas. The proposed project would result in the removal of between 71 and 119 acres of habitat for this species (depending on which action alternative is selected); therefore, the proposed project has the potential to impact between 5.6% and 9.4% of this species’ occupied habitat across the Coronado National Forest. *It is expected that this project will impact less than 10% of the suitable habitat present for this species across the Coronado National Forest; thus, all action alternatives are not expected to result in detectable changes in the Coronado National Forest–wide population of Northern Beardless-Tyrannulet.*

**Primary and Secondary Cavity Nesters**

**Habitat and Population Trends across the Coronado National Forest**

Primary and secondary cavity nesters may potentially occupy oak trees in the project area. In general, cavity nesters require large, older age class trees and snags (and columnar cacti where they occur). Activities that affect cavity nesters are those that change the rate of regeneration of cavity-forming trees. Mining would result in a decrease in the density and numbers of oaks and other large, woody plants in the project area and would affect the future recruitment of trees, although much of the project area contains few trees of sufficient size to provide potentially suitable cavities. Numerous owls, woodpeckers, flycatchers, and other birds known to nest in cavities may be present in the project area on Forest Service lands. Many of these species (including the Western Screech Owl, Elf Owl, Flicker, Gila Woodpecker, American Kestrel, and Ash-throated Flycatcher) were observed by Russell et al. (n.d. [1977]).

No monitoring of cavity nesting birds as a group occurs on the Coronado National Forest (Forest Service 2011a). North American Breeding Bird Survey information for the Cavity Nester group show slight but statistically insignificant declines for Ash-throated Flycatcher and Bewick’s Wren; a slight, but statistically insignificant increase for the Ladder-back Woodpecker; and significant downward trends for Northern Flicker and American Kestrel. For all other primary or secondary cavity nesters, either trends were not significant or no data were available. There has also been a substantial, but unquantified, increase noted in potential habitats (snags) for high-elevation cavity-nesters across the Coronado National Forest.

**Evaluation of Effects**

There are no data on the acres of currently occupied habitat for this group on the Coronado National Forest (Forest Service 1986). However, all action alternatives would result in the removal of vegetation of
all sizes and age classes containing snags and other cavities and would change the rate of recruitment of
trees and large shrubs, resulting in potential direct and indirect impacts to any cavity-nesting species that
may occur in the analysis area. Although the mining plan calls for mitigation and reclamation options,
none of these would provide cavity-bearing trees for at least 20 years. The acreage of occupied habitat for
these species on the Coronado National Forest is unknown because of a lack of data; thus, it is difficult to
determine whether the action alternatives are expected to result in detectable changes in the Coronado
National Forest–wide populations of any cavity-nesting species.

Western Barking Frog (Craugastor augusti cactorum)

Habitat and Population Trends across the Coronado National Forest

This species is included in the “Threatened and Endangered” MIS group in the forest plan. In Arizona, the
Western Barking Frog is typically found on limestone, rhyolite, granite, and other rock outcrops or caves
on the hillsides of canyons within Madrean evergreen woodland and woodland-grassland ecotones
(AGFD 2009b). It is sometimes also found in yucca-covered hills, brushy woodlands, open pine forests,
juniper-live oak woodland, and low, dense clumps of cactus (Stebbins 2003). It occurs in Cochise and
extreme southern Pima and Santa Cruz counties (Quinlan, Santa Rita, Patagonia, Huachuca, and Pajarito
mountains) at elevations between 4,200 and 6,200 feet (AGFD 2009b). It is not known whether any
recent surveys have been conducted within or adjacent to the project area. These secretive, terrestrial
frogs are nocturnal, spending the day under rocks or in mines, wells, caves, or fissures (Stebbins 2003).
Permanent water is not necessary, even for breeding, as the species lacks an aquatic larva (Stebbins
2003). In Arizona, they call from their hiding spots (e.g., crevices) for only two to four weeks on rainy
nights after the start of the summer monsoons in late June or July (AGFD 2009b). Their diet consists of a
variety of invertebrates, including crickets, scorpions, silverfish, centipedes, kissing bugs, grasshoppers,
spiders, ant lions, and katydids (AGFD 2009b).

On a global scale, the Western Barking Frog is considered apparently secure, with more than 100
occurrences, although it could be quite rare in some areas (Forest Service 2011a). On a state scale,
the species is very rare, with one to five occurrences in Arizona (Forest Service2011b). Limestone and
rhyolite rock outcrops are common and well distributed throughout the Coronado National Forest,
although no attempts have been made to quantify their extent (Forest Service 2011a). These habitats are
not affected to any degree by management activities and are assumed to be present in the same amount as
in 1986. The few known populations appear to be persisting, although small and isolated, so stochastic
events could threaten their persistence (Forest Service 2011a).

Evaluation of Effects

The proposed project may impact the Western Barking Frog as a result of destruction or alteration of
rocky outcrop habitat. It is estimated that this species occupies 891 acres within the Coronado National
Forest (Forest Service 1986), and there is a total of approximately 29 acres of talus slopes and rock
outcrops within the analysis area. Therefore, the proposed project has the potential to impact up to 3% of
this species’ occupied habitat across the Coronado National Forest. All action alternatives could result in
potential direct and indirect impacts to Western Barking Frogs. Individual frogs may be crushed during
mine construction and operations, especially in the area proposed for the open pit or on roadways.
All action alternatives would result in the removal and disturbance of rock outcrops, and these changes
would result in corresponding reductions in food species’ diversity and abundance (i.e., invertebrates).
It is expected that this project will impact no more than 3% of the suitable habitat present for this species
across the Coronado National Forest; thus, all action alternatives are not expected to result in detectable
changes in the Coronado National Forest–wide population of Western Barking Frog.
White-tailed Deer (Odocoileus virginianus)

Habitat and Population Trends across the Coronado National Forest

White-tailed Deer are included in the “Species Needing Diversity” and “Game Species” MIS groups in the forest plan. White-tailed Deer are most common in the state’s southeastern mountains. They require areas of predictable summer precipitation and are most abundant in oak woodlands and chaparral-covered hillsides with oaks and pines (AGFD 2010). While more resilient than Mule Deer to hunting pressure, White-tailed Deer is less drought tolerant (AGFD 2010). In Arizona’s southern mountain ranges, they are generally found at higher elevations and in rougher country than Mule Deer (AGFD 2010). White-tailed Deer will use a variety of habitats but prefer areas of thicker cover with freestanding water; thus, they likely benefit from the current presence of stock tanks and springs in the project area. Large-scale vegetation removal prior to and during the fawning period reduces hiding cover and may reduce fawn survival and recruitment (Ockenfels et al. 1991). Unlike Mule Deer, White-tailed Deer rarely form herds, and most observations are of fewer than six animals (AGFD 2010). Shrubs constitute the majority of the diet, although forbs are seasonally important.

The project area falls within AGFD Game Management Unit 34A, which includes all of the Forest Service lands within the Santa Rita Mountains and surrounding lands from Sahuarita Road south to Nogales and west to I-19 and east to SRs 82 and 83. AGFD (2010) data from Game Management Unit 34A show an increase in the number of White-tailed Deer taken in the area for 2007, compared with data from 2003 through 2006 (43 bucks, does, and fawns taken in 2003; 22 total in 2004; 31 total harvested in 2005; 5 in 2006; and 62 total in 2007).

The data are collected on the basis of a game management unit, but the majority of White-tailed Deer habitat in southeastern Arizona is found on the Coronado National Forest (Forest Service 2011a). The forest plan identifies 1,430,071 acres of occupied habitat for White-tailed Deer. The amount of occupied habitat has not changed significantly since 1986. The White-tailed Deer statewide population trended slightly downward through the mid-1990s but has recovered somewhat since then. This trend is thought to be related primarily to changes in the amount and timing of precipitation since the mid-1990s and the subsequent effects on fawn survival. White-tailed Deer on the Coronado National Forest have followed this trend. Harvest levels (a rough surrogate for population levels) have trended upward since approximately 2001.

Evaluation of Effects

All action alternatives could result in potential direct and indirect impacts to White-tailed Deer. The project may result in a loss of important foraging and fawning habitat for this species. It is possible that groundwater drawdown could indirectly impact the local population of White-tailed Deer through the elimination of springs and seeps in and adjacent to the project area, which in turn could negatively impact reproductive success. Noise and light also could reduce this species’ use of areas adjacent to the mine. The mine could be expected to impact movement routes commonly used by White-tailed Deer. The project area falls in or adjacent to three different linkages identified by the Arizona Wildlife Linkages Assessment Workgroup (2006): 1) Linkage 92: San Xavier-Sierrita-Santa Rita, 2) Linkage 94: Rincon-Whetstone-Santa Rita, and 3) Linkage 95: Santa Rita-Empire Complex. White-tailed Deer is identified as a species using Linkages 94 and 95, and as reported in Beier et al. (2006), White-tailed Deer was one of the focal species selected.

It is estimated that this species occupies 1,430,071 acres within the Coronado National Forest (Forest Service 1986), and there is a total of 42,144 acres of habitat within the analysis area. Therefore, the proposed project has the potential to impact approximately 3% of this species’ occupied habitat across the Coronado National Forest. All action alternatives would result in the removal of vegetation of all sizes
and age classes and would change the rate of recruitment of trees, shrubs, and other vegetation. Changes in vegetation would result in corresponding reductions in food species’ diversity and abundance. *It is expected that this project will impact no more than 3% of the suitable habitat present for this species across the Coronado National Forest; thus, all action alternatives are not expected to result in detectable changes in the Coronado National Forest–wide population of White-tailed Deer.*

**CUMULATIVE EFFECTS**

A cumulative effect, as defined by the Council on Environmental Quality (40 CFR 1508.7), is the impact to the environment that results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts are interdisciplinary and multijurisdictional and usually do not conform to political boundaries. To determine the cumulative effects, past, present, and future actions were evaluated within the same geographic extent as the proposed action.

Past, present, and reasonably foreseeable future projects or actions that have affected or will affect resources on the Coronado National Forest include historic grazing activities, historic mining, natural fires and wildfire suppression, invasive plants, recreation, and water diversions. Livestock grazing has occurred within the analysis area for more than 100 years (Bahre 1985). Grazing-related losses of herbaceous cover and litter have resulted in increased erosion, surface runoff, flooding, and downcutting in the Southwest, and there is considerable evidence that widespread unregulated livestock grazing after about 1880 resulted in the removal of much of the herbaceous fine fuels necessary to support fires (Bahre 1985). The reduction in fine fuels, combined with active fire suppression beginning in the early 1900s, contributed to decreased fire frequency and the subsequent invasion of many grasslands by woody plants.

Previous mineral exploration and production activities in the project area have resulted in numerous landscape disturbances, such as mine prospects and adits, mine-related access roads, and geotechnical drilling sites. These disturbances are scattered throughout the project area. Additional anthropogenic disturbances have resulted from livestock grazing and recreation, including all-terrain vehicle use, target shooting, and camping. In addition to hiking, camping, hunting, and off-highway vehicle use, there is evidence that the project area has been used by border crossers. The area also has seen a substantial but unquantifiable increase in vehicle traffic related to drug and immigration interdiction efforts on the part of the U.S. Border Patrol and other enforcement agencies. These activities have contributed incrementally to small-scale disturbances and changes in ecological conditions in the project area.

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LITERATURE CITED


