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3. Existing Environment

This section briefly describes the physical and biological environments of the project area. It focuses on those factors most likely to influence essential habitat components of the species considered in this BA. The descriptions established in this baseline are for the impacts analysis provided in Section 5—some alteration of these environmental elements could result if the Proposed Project is approved.

3.1 Land Status and Use

3.1.1 Within the Project Area

Land management and/or ownership within the project area include the Army, the State of California, and private holdings as discussed in Section 2 and depicted in Figure 1-1.

Additional land uses in the project area include:

- One operational mine in the Southern Avawatz Mountains (the Silver Lake Mine), and numerous inactive and abandoned mines scattered throughout the project area;
- Dispersed recreation use (e.g., rock hounding, sightseeing, camping, and on-trail off-highway vehicle (OHV), mostly in the Superior Valley portion of the project area. The withdrawn lands will remain open to public use until the Army is allowed to begin military training activity;
- State of California lands present in the Superior Valley and Eastgate parcels. These lands comprise approximately 2,262 acres (915 ha; 2 percent) within the withdrawn area;
- The State of California lands also include one small parcel (312 acres [126 ha]) in the extreme southwest corner of the Superior Valley. This parcel is managed by California Fish and Game and is designated as a "wildlife preserve;"
- Private lands are scattered throughout the Superior and Eastgate portions of the project area. There are two unpatented mining claims, seven patented mining claims, and one operating mine in the area. Only one occupied residence is present in the project area in the Superior Valley near the southern boundary of NAWS China Lake. The remaining private lands are vacant or have abandoned structures and/or ruins that indicate past use for ranching and/or mining operations;
- The Fort Irwin Study Site (FISS), a research station and desert tortoise hatchery operated by the Fort Irwin DPW through Cal State Dominguez Hills, is in the southeast corner of the project area.

3.1.2 Adjacent Land Use

A major utility transmission corridor (Boulder Corridor, or Utility Corridor "D") containing four high capacity electric transmission lines, two buried fiber optic lines and two high pressure underground gas lines, runs along the eastern and southeastern boundary of the project area. The project area's eastern boundary runs roughly parallel with the western most utility in the corridor, that being a buried high pressure gas line that was constructed in 2002 and early 2003. At no point does the project area extend to the east of the utility corridor.

Two Wilderness Study Areas (WSAs) immediately adjacent to the Eastgate parcel are currently being proposed to Congress for permanent Wilderness designation pursuant to the Wilderness Act of 1964 (P.L. 88-577, 78 Stat 890; 16 U.S.C. 1121 (note), 1131-1136). To the north and northeast is the Death Valley WSA, to the north is the Avawatz Mountains WSA, and to the east is the Soda Mountains WSA.

The project area is primarily surrounded by vacant land administered by the BLM and managed pursuant to the 1980 California Desert Conservation Area (CDCA) Plan, as amended (BLM 1999).

Most residential land in the immediate vicinity of Fort Irwin is south of the UTM 90 Area. In 1998, there were 18 improved residential parcels including houses and mobile homes (Montgomery Watson 1998). One operating business, a concrete factory, the Daily Transit Mix, is located off Fort Irwin Road, south of the UTM 90 Area.

Dispersed recreation such as rock hounding, sightseeing, camping, and on-trail OHV use occurs primarily to the west and southwest of the project area in the Superior Valley area, although all areas are open for public access.

Several Areas of Critical Environmental Concern (ACEC) are outside and adjacent to the project area. The Cronese Basin ACEC is 3 miles southeast of the project area. It encompasses approximately 10,226 acres (4,138 ha) and was established to preserve cultural resources and wildlife habitat. The Afton Canyon ACEC is south of the Cronese Basin ACEC and I-15. It encompasses approximately 4,726 acres (1,913 ha) and was established to preserve riparian vegetation and habitat, wildlife habitat, and scenery. The Black Mountain ACEC is southwest of the western portion of the project area and the Superior Valley. It includes approximately 61,806 acres (25,012 ha) and was set aside to protect prehistoric and Native American resources. The Rainbow Basin ACEC is 10 miles south of the western portion of the project area and southwest of the Black Mountain ACEC. The Rainbow Basin/Owl Canyon ACEC includes approximately 4,087 acres (1,654 ha) and was established to protect scenery, unique geology and paleontology, and prehistoric resources (BLM 1999).

NASA Goldstone - Deep Space Communications Complex operates under permit from the Army and lies between the Superior Valley parcel and Fort Irwin's cantonment area.

NAWS China Lake lies directly to the west of Fort Irwin and to the north and northwest of the Superior Valley parcel of the project area.

The Death Valley National Park boundary lies to the north of Fort Irwin and the project area.

Two BLM permitted grazing allotments are immediately adjacent to the project area. The Cronese Lake allotment is an active cattle grazing allotment to the southeast of the project area and the Superior Valley Allotment is an inactive sheep grazing allotment south of the Superior Valley parcel. BLM permitted grazing allotments, or portions of grazing allotments that were within the legislated withdrawal area, were voided by virtue of the congressional land withdrawal to the Army.

3.2 Geomorphology

The project area is in San Bernardino County in southeastern California, approximately 40 miles (64 km) northeast of Barstow, within the central Mojave Desert physiographic province. This region is characterized by rugged block-faulted mountain ranges separated by alluvium filled basins mostly of internal or closed drainage. The basins consist of broad valley plains, gentle sloping bajadas, and rolling hills with low relief. The lowest basins form floors of ephemeral lakes (playas), with either clay or saline beds. The eroding mountains produce talus slopes, boulder fields, and rocky or gravelly alluvial fans that merge into the sandy soils and fine gravels of bajadas and plains. Although none of the basins presently contain permanent water, groundwater exists at relatively shallow depths of 100 – 150 ft (30-50 m) below ground surface (BGS).

Elevations in the project area range from 854 ft (260 m) above mean sea level (AMSL) in Silurian Valley in the east, to 4,534 ft (1,382 m) AMSL at Montana Peak in the west, resulting in total relief of nearly 3,680 ft (1,122 m) AMSL. Three mountain ranges (or portions of them) are within the boundaries of the project area: Paradise, Alvord, and Avawatz. The western portion of the project area intersects Superior Valley to the north and straddles the northwestern slope of Paradise Mountain. The Superior Valley drainage terminates at several playa lakebeds and is separated from the Paradise Valley drainage by a gradual rise. The central portion of the project area (UTM 90 Area) includes foothills of the Alvord Range. The Paradise Valley drains Lane Mountain and the Paradise Range east to the Coyote dry lakebed and south from the Alvord Mountains. The lowest point in the central portion drains from Bitter Springs south towards Afton Canyon. The eastern portion of the project area includes segments of two valleys that drain east and south into Silver Dry Lake north of Baker. This eastern area is also drained by several unnamed sandy washes that become a series of braided washes before emptying into Silurian Valley. Drainages east of the Soda Mountains terminate in a sandy valley floor that drains into Red Pass Dry Lake.

3.3 Soils

Soils develop and are distributed according to differences in parent material, elevation, deposition, and topographic slope and position. The coarsest depositional materials derived from mountainous parent rock are generally found on upper regions of high plains and slopes, while the finest materials are along valley floors. Soils of upper bajadas consist of coarse gravels grading into loamy gravels toward the toe of alluvial fans. Soils of lower bajadas grade from sandy loams to finer loamy materials. Playas at the bottom of basins accumulate silts and clays and generally develop salt pans. Higher mountain soils in the project area are excessively drained, very stony or

rocky, sandy loams to sands that are derived from nearby parent material. These soils develop on strongly sloping to very steep upland slopes of 9–75 percent. Where present, soil depth is seldom more than 10 inches (in) (25 centimeters [cm]).

Desert soils that develop on alluvium in the project area are generally light in color, deficient in nutrients such as phosphorous and nitrogen, and lack organic matter. Except for Pleistocene river terraces and other old alluvial landforms, soils have little profile development.

The predominant soil units are the Kimberlina series and the Calvista series, which comprise 40 percent and 25 percent, respectively of the project area respectively. The Kimberlina series consists of very deep, well drained soils formed in mixed alluvium, derived primarily from granitic or sedimentary bedrock. Kimberlina soils are coarse-loamy mixed superactive calcareous soils formed on slopes below 9 percent between 1,800 and 4,100 ft (549-1,250 m) AMSL. Calvista soils are shallow, well drained, and derived from granitic rock with seams of calcite on mountain slopes between 2–30 percent.

Major geologic surface composition in the project area is depicted in Figure 3-1. Rocks form from minerals and their physical appearance is determined by composition and rate of formation. Rocks that cool quickly (extrusive) near the earth's surface are fine-grained and those that cool slowly (intrusive) deep beneath the earth's crust are course-grained. Maphic rocks are dark in color because they were formed from large amounts of metallic dark colored minerals. Silicic rocks are light in color. Maphic and silicic rocks may be fine or coarse grained. Parent material within the project area is classified as either basaltic, dacite-like, dioritic, granitic, or rhyolitic. Basaltoid is a term including all "basalt like" parent material. Basalt is fine-grained, dark, primarily extrusive igneous rock that is relatively rich in calcium, iron and magnesium and relatively poor in silicon. Granitoid rocks are intrusive igneous rocks with relatively high silica content, and include granite, granodiorite, and tonalite. Granitic rocks are made up of relatively large crystals of quartz, feldspar, and ferro-magnesian metals. There are two type of feldspar: one is primarily pink in color, while the other is cream to gray in color. Rhyolitoid rocks are extrusive high silica content volcanic rocks, high in orthoclase feldspar. Dacitoid rocks are extrusive volcanic rock with silica content intermediate between diorite (andesite) and rhyolite. Dioritoid rocks are intrusive igneous rock, similar in appearance to granite, but with a more intermediate (acidic) silica content and high in plagioclase feldspar.

3.4 Hydrology

3.4.1 Groundwater

The western portion of the project area lies partially within the Superior, Goldstone, and Coyote watershed basins. The UTM 90 Area is within the Coyote and Mojave basins. The eastern portion of the project area lies entirely within the Amargosa basin. The Mojave River is the primary subsurface water source for the region.

The Bicycle, Irwin, and Langford basins contain aquifers that are currently used to supply the water needs of Fort Irwin. Three producing wells have been drilled in Bicycle Basin, three in Langford Basin, and five in Irwin Basin to meet Fort Irwin's current water needs. Depth to groundwater in each of these basins is between 200 and 500 ft (70–152 m) BGS. The Army owns two connected 640-acre sections of land in Coyote Basin south of Fort Irwin that are reserved for drawing water if needed.

3.4.2 Surface Water

Surface water resources in the project area and vicinity are scarce. There are no perennial watercourses within the region. Washes descending from mountains and other elevated landforms provide channels for ephemeral (occurring only during and immediately after heavy rains or thunderstorms) and intermittent (occurring on a regular, but highly seasonal basis) flows of surface runoff into topographical depressions or playas where ephemeral lakes are formed. Water accumulates in these areas during times of greater-than-average precipitation and can be expected to occur on average at least once every 10 years.

During heavy runoff events, water in washes carries sand, gravel, cobbles, and even boulder-sized rocks as part of the bedload transport. Deposition of this bedload material across areas of less steep terrain has formed alluvial fans, which are common in portions of the project area. Substantial subsurface flows may occur in the unconsolidated sand and gravel deposits found in washes and alluvial fans, even after surface flows have ceased. Local groundwater recharge may occur along washes because of this subsurface water movement. Without a drainage outlet, and owing to very slow percolation through clay soils, the surface water that accumulates in shallow ephemeral lakes or playas, such as Superior Dry Lake, is lost through evaporation.

There are several springs adjacent to the project area. Jack Spring is at the southern boundary of Fort Irwin near Fort Irwin Road. The Paradise Springs are in the Paradise Mountains adjacent to the western portion of the project area. Bitter Spring is just north of the portion of the project area that runs along the southwestern serrated boundary of Fort Irwin. The springs contain riparian vegetation as well as non-native invasive species and provide habitat for a variety of wildlife species.

3.5 Climate

Mojave Desert climate is characterized by dry air masses, high summer temperatures, infrequent precipitation, extremely high evaporation, and large diurnal temperature changes. Temperatures vary mostly with elevation, and to a lesser extent, local microclimate. Monthly mean temperatures within the project area, as determined from long-range climatic data at the Barstow/Daggett Airport and Bicycle Lake Army Air Field within Fort Irwin, range from 40-89°F (9-32°C) with a maximum mean of 104°F (40°C) and minimum mean of 36°F (2°C).

Precipitation at Fort Irwin and the surrounding region is highly variable and averages approximately 3.9 in (7.4 cm) annually. Most of the precipitation falls between November and April, originating from large-scale Pacific storm systems, while the rest is generated by high-intensity thunderstorms

that result from incursions of moist air from the Gulf of California or Gulf of Mexico during the summer months.

Regional winds are primarily influenced by the Sierra Nevada and Transverse mountain ranges, the distance inland from coastal northwest winds, and inland winds that flow out across the high desert plains from the Los Angeles Basin. Upper-level winds predominate from the southwest

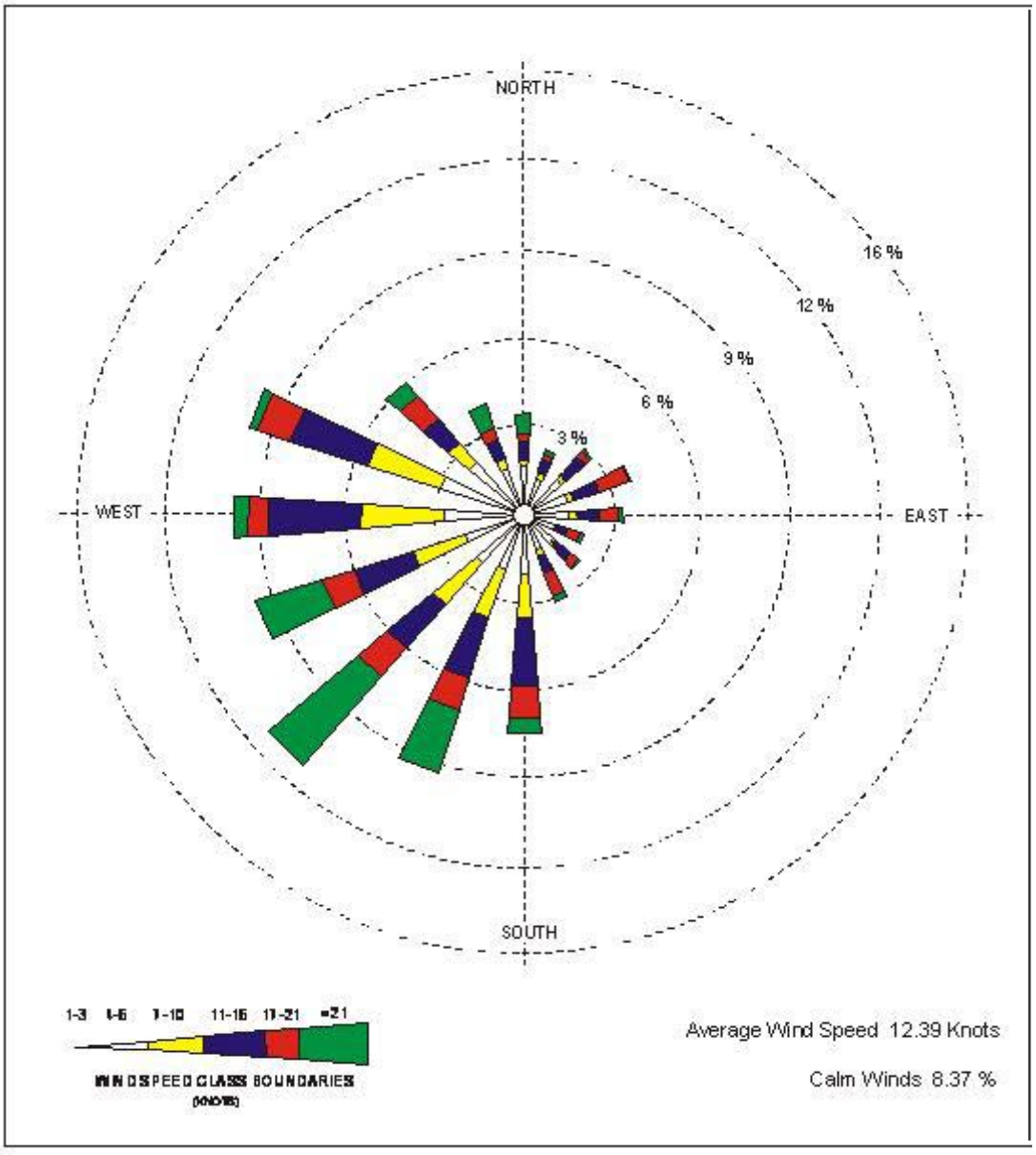

Figure 3-2: Wind Rose Derived From 2001 Data Collected at Four Corners, Fort Irwin, CA

with an annual average speed of approximately 15 miles per hour (mph) (16 kilometers per hour [km/h]) as monitored at Four Corners meteorological station near the center of Fort Irwin. Figure 3-2 shows wind roses generated for 2001 at the Four Corners station. Winds are predominately from the southwest.

During winter, strong turbulent winds sometimes occur, often accompanying frontal systems, and can reach speeds of 25 to 60 mph (40 to 60 km/h). Local winds in the valleys among the Alvord, Avawatz, Calico, Granite, and Soda mountains will occur when regional winds are low to calm. These surface wind patterns depend almost entirely on local terrain and ground cover. Persistent winds with little directional modification are found in open areas, but winds in valleys show strong drainage influences.

Synoptic (pressure gradient) winds may be forced around hills or channeled through valleys, but if there are no strong gradient flows, diurnal upslope/downslope winds dominate.

3.6 Vegetation

The project area lies within the central Mojave Desert region of the desert floristic province (Hickman 1993). This region mixes an array of geographic substrates, topographic features, climatic regimes, soil types, and other physical factors, which combine to produce a mosaic of floristic components and associated natural habitats. Low, widely spaced shrubs dominate Mojave Desert vegetation. The species composition of the Mojave Desert has common elements with the Great Basin to the north and includes many succulent species common to the Sonoran Desert to the south and east. The most widely distributed plant is the creosote bush *(Larrea tridentata),* which covers extensive areas in nearly pure stands, often in close association with burrobush *(Ambrosia dumosa).*

3.6.1 Vegetation Communities

The vegetation communities in a given region are largely determined by prevailing environmental variation and disturbance history. Individual plant communities can generally be separated along environmental gradients (Whittaker 1967). Gradients in soil moisture, soil fertility, temperature, slope, and other physical parameters affect the distribution of individual species, and this affects the type of plant community that develops at a given location. Since plant species generally respond individually to environmental gradients (Sawyer and Keeler-Wolf 1995), it is often difficult to differentiate recurrent and ecologically meaningful combinations of species as plant communities. Plant community classification, despite these limitations, serves an important function in organizing vegetation data into relatively distinct units, which occur with some consistency in the landscape and are amenable to study and management.

Previous vegetation community surveys were conducted in the region by Chambers Group (1995). In 2001, Charis Corporation initiated a study to map and quantify vegetation within the project area at a more detailed level than had been done previously. In this effort, botanists classified vegetation based on a hierarchical system of plant community, alliance, and association. The upper hierarchical level (community) was based on vegetation structure, height and leaf form. The lower levels (alliance and association) were based on floristic composition of the uppermost strata

(alliance) and total floristic composition (association). Unless otherwise noted, the information presented in this section is adapted from this study and discussed in the context of the community classification level.

Within the project area, seven major vegetation communities were identified:

- Mojave creosote bush scrub
- Saltbush scrub
- Mojave desert wash scrub
- Mojave mixed woody scrub
- Joshua tree woodland
- Saltbush creosote bush transition
- Desert sink scrub

Creosote bush is the predominant vegetation community and represents the largest area at 73 percent, followed by saltbush scrub at about 12 percent, and desert wash scrub at 5 percent. Mojave mixed woody scrub and Joshua tree woodland communities contribute to another 7 percent of the total, while saltbush creosote bush transition and desert sink scrub communities account for approximately 2 percent. The remaining 1 percent of the project area includes unvegetated features such as washes, alluvial fans, valley floor, ridges, dunes, and playas. The seven plant community types identified in the project area are described further below and depicted in Figure 3-3.

3.6.1.1 Mojave Creosote Bush Scrub

Mojave creosote bush scrub is the most common vegetation type in the region, occurring on alluvial slopes, valley floors, and mountain slopes below 3,600 ft (1,100 m) AMSL. It is usually found on well-drained soils, often on bajadas and low hills, and is conspicuously absent around playas because of high salinity (Wallace and Romney 1972) and/or dense fine-textured basin soils low in oxygen (Lunt et al. 1973**)**. Areas without significant concentrations of this habitat are the steepest and rockiest slopes, washes, saltbush flats, and dry lakebeds. A sub-association of this vegetation type is described as the creosote-burrobush association based on the widespread dominance of creosote bush and burrobush. Creosote bush and burrobush size and vigor are strongly influenced by water availability, and the largest individuals are characteristically found along edges of washes and roads.

3.6.1.2 Desert Saltbush Scrub

Desert saltbush scrub is dominated by one or more species of saltbush (*Atriplex* spp.). Saltbush scrub is associated with moderately alkaline soils toxic enough to inhibit most desert shrubs that occur in the creosote bush scrub. It commonly occurs on lower bajada slopes and plains and

around playas throughout most of the desert (Holland 1986). Typically, one strongly dominant species of saltbush is found in association with several additional species in a particular area (possibly including other species of saltbush). It tolerates colder temperatures and more finely textured soils with higher salinity and/or alkalinity than does Mojave creosote bush scrub (Vasek and Barbour 1977).

3.6.1.3 Mojave Desert Wash Scrub

Mojave desert wash scrub is a low, shrubby, diverse community occurring in open washes, arroyos, and canyons throughout the project area. Periodic flooding in these areas maintains the open character of this community. Representative shrub species for this community include spiny sena (*Senna armata*), rayless encelia (*Encelia frutescens*), cheesebush (*Hymenoclea salsola*), desert almond (*Prunus faciculata*), indigo bush (*Psorothamnus aborescens*), bladder sage (*Salazaria mexicana*), and sandpaper plant (*Petalonyx thurberi*). In some areas, this scrub community may have a scattered to locally dense overstory of small trees such as cat claw (*Acacia greggii*), desert willow (*Chilopsis linearis ssp. arcuata*), smoke tree (*Psorothamnus spinosus*), honey mesquite (*Prosopis glandulosa var. torreyana*), and screw-bean mesquite (*Prosopis pubescens*) (Holland 1986; Thorne et al. 1981).

Figure 3-3: Vegetation Communities

3.6.1.4 Mojave Mixed Woody Scrub

Mojave mixed woody scrub is a heterogeneous assemblage of shrubs that grow in steep, rocky, granitic, or volcanic slopes. The lack of a dominant shrub species makes it difficult to clearly categorize this scrub type into the more common communities. It is typically considered a scrub community comprised of a highly variable mixture of shrubs with several species sharing dominance.

Mojave mixed woody scrub occurs sparingly in areas above 3,000 ft (914 m) AMSL in the western portion of the project area on the midslopes of the bajadas, generally below Mojave creosote bush scrub and above desert saltbush scrub. The dominant species in this scrub varies from place to place, and the transitions to Mojave creosote bush scrub and desert saltbush scrub generally are indistinct. Species commonly found include cheesebush, burrobush, spiny hopsage (*Grayia spinosa*), winter fat (*Krascheninnikovia lanata*), Cooper goldenbush (*Acamptopappus sphaerocephalus*), desert tomato (*Lycium andersonii*), Nevada joint fir (*Ephedra nevadensis*), allscale (*Atriplex polycarpa*), desert needlegrass (*Stipa speciosa*), and big galleta grass (*Pleuraphis rigida*).

3.6.1.5 Joshua Tree Woodland

Joshua tree woodland is an open woodland that occurs on gentle alluvial slopes with well-drained sandy, loamy, or gravelly soils. The Joshua tree (*Yucca brevifolia*) is usually the only native arborescent species and, when it occurs in higher densities, constitutes a woodland setting. The woodland consists of a low, open, scrubby understory of various shrubs and perennial herbs with a Joshua tree overstory. The understory shrubs in the project area typically consist of representative species of Mojave creosote bush scrub and Mojave mixed woody scrub. Joshua tree woodland occurs at approximately 3,000–5,500 ft (914–1,676 m) AMSL and usually on fairly gentle bajada slopes **(**Vasek and Barbour 1977). This plant community usually intergrades at lower elevations with Mojave creosote bush scrub and at higher elevations with pinyon-juniper woodland **(**Holland 1986**)**, although within the project area, Mojave creosote and mixed woody scrub occur both above and below areas that support Joshua trees.

3.6.1.6 Saltbush-Creosote Bush Transition

This ecotone occurs on carbonate rich hillsides on upper bajadas at elevations much higher than normal saltbush associations. It is located near Goldstone and on the divide between Superior and Paradise Valleys. Shadscale generally dominates and to a lesser extent creosote bush. Other species present in this community are California buckwheat (*Eriogonum fasciulatum*), desert needle grass, desert tomato, winterfat, burrobush, spiny hopsage, felthorn (*Tetradymia spp*.), and Nevada joint fir.

3.6.1.7 Desert Sink Scrub

Desert sink scrub occurs where soil salinities are very high and, as such, supports only the growth of halophytic plants such as Torrey inkweed (*Suaeda fruiticosa*), picklebush (*Allenrolfea occidentalis*), Mojave red sage (*Kochia californica*), and alkali pink (*Nitrophila occidentalis*).

Desert sink scrub is found on poorly drained, usually clayey soils that have a high water table and a high salinity and/or alkalinity.

3.7 Wildlife

3.7.1 Wildlife Habitats

The project area has a variety of natural vegetation communities and landscape features that offer diverse types of wildlife habitat. While these habitat types correspond with the vegetation community types discussed in Section 3.6, they are also defined by a number of distinct landscape features such as springs and seeps, washes and gullies, rock outcrops, cliffs and taluses, and cave entrances. All contribute to the diversity and abundance of wildlife in the area as they generally provide a microhabitat for wildlife uniquely adapted to or dependent on, these features.

Most wildlife species within the project area are adapted to extreme drought conditions, including sparse vegetative cover and limited sources of permanent water. However, in areas adjacent to the project area, seeps and springs provide perennial water sources and a high concentration of vegetation and cover that contribute to increased wildlife diversity. Large mammals, such as Nelson's bighorn sheep (*Ovis canadensis nelsoni*), coyote (*Canis latrans*), and desert kit fox (*Vulpes macrotis*), use these water sources and return to them regularly. Bats typically forage over these areas because of increased abundance of invertebrate prey. More common bird species may nest and forage in these areas year-round, while migratory bird species may forage and rest in these areas during migration.

A number of unnamed washes and drainages occur throughout the project area. These areas generally have more structured and complex vegetative assemblages, and higher wildlife diversity than the surrounding bajadas. Washes function as movement corridors for mammals and serve as congregation and feeding areas for a variety of bird species.

Rocky terrain in the Avawatz, Alvord, and Paradise Mountains provide habitat for many species of small mammals, birds, and reptiles. Along with different vegetation communities that normally occur with increasing elevation in these ranges, differences in slope and aspect result in a variety of microhabitats that support a number of wildlife species. Notable groups of species that occur in these areas include bats, which rely on rocky outcrops for roosting sites, and raptors, which use cliff faces and rocky ledges for roosting or nesting.

The dry lakes or playas in the western portion of the project area are dry for much of the time and provide little intrinsic value to wildlife. However, in some years during periods of heavy rainfall, these areas may accumulate water, which provides a limited habitat for small numbers of migratory waterfowl and shorebirds.

3.7.2 General Wildlife

Some 250 wildlife species have been recorded on or near Fort Irwin either as residents or as migrants. These include 187 bird species, 31 mammal species, and 32 reptile species. An

additional 92 vertebrate species are suspected to live or migrate through the region, 73 of which are birds. The presence and distribution of these species were primarily determined from previous studies conducted on Fort Irwin and the surrounding region, including portions of the Alvord, Soda, Avawatz, and Paradise Mountains, Silurian and Valjean Hills, and Silurian Valley (Karl 2001; Brown and Nagy 1997; Recht 1997; RDN, Inc. 1995; Brown 1994; Morafka 1993; MBA Inc. 1991).

3.7.2.1 Mammals

Most desert mammals are nocturnal, but occasionally a few may be seen during the day. Small mammals, most frequently observed within the project area and surrounding region, include the blacktail jackrabbit (*Lepus californicus*), Mohave ground squirrel (*Spermophilus mohavensis*), whitetail antelope squirrel (*Ammospermophilus leucurus*), desert kangaroo rat (*Dipodomys deserti*), Merriam's kangaroo rat (*D. merriami*), Panamint kangaroo rat (*D. panamintinus*), Great Basin kangaroo rat (*D. microps*), long-tailed pocket mouse (*Perognathus formosus*), little pocket mouse (*P. longimembris*), deer mouse (*Peromyscus maniculatus*), cactus mouse (*P. eremicus*), canyon mouse (*P. crinitus*), grasshopper mouse (*Onychomys torridus*), and desert woodrat (*Neotoma lepida*) (RDN Inc. 1995; USFWS 1994a; Recht 1997).

Larger mammal species likely to occur in the project area include the badger (*Taxidea taxus*), kit fox, grey fox (*Urocyon cinereoargenteus*), coyote, bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), and Nelson's bighorn sheep. The kit fox and coyote are expected to have wide distributions throughout the project area, whereas the others occur in highly localized areas and are uncommon.

Mines and natural caves throughout the project area provide potential roosting habitat for bats. Bats also use the many cliff faces and rocky ledges of mountains as roost sites, and they have the potential to use Joshua trees as night roosts. Seven bat species were detected on and adjacent to Fort Irwin during surveys by Brown (1994). The western pipistelle (*Pipistrellus hesperus*) and California myotis (*Myotis californicus*) were the two most commonly observed species.

3.7.2.2 Birds

Brydolf (1997) confirmed a total of 182 species, including 41 families representing 16 orders, on Fort Irwin and in the surrounding region. Most bird species in the project area and surrounding region are associated with creosote scrub habitat. Some common bird species include the black-throated sparrow (*Amphispiza bilineata*), rock wren (*Salpinctes obsoletus*), horned lark (*Eremophila alpestris*), common raven (*Corvus corax*), and greater roadrunner (*Geococcyx californianus*). The verdin (*Auriparus flaviceps*) and black-tailed gnatcatcher (*Polioptila melanura*) are more common in desert wash systems.

The greatest bird activity is concentrated in the immediate vicinity of water. Springs and seeps adjacent to the project area and in the surrounding region are a valuable resource to most resident and migratory bird species. Not only is there increased structural diversity of the vegetation and habitat, but invertebrates that become abundant in the vicinity of springs during spring and

summer provide an important food source to resident species. Representative birds include the house finch (*Carpodacus mexicanus*), phainopepla (*Phainopepla nitens*), northern mockingbird (*Mimus polyglottos*), and song sparrow (*Melospiza melodia*). Numerous birds occur as winter or summer residents, or migrants that occur only during brief periods in the spring and fall. Some common species include the yellow-rumped warbler (*Dendroica coronata*), Hutton's vireo (*Vireo huttoni*), cliff swallow (*Hirundo pyrrhonata*), ruby-crowned kinglet (*Regulus calendula*), and white-crowned sparrow (*Zonotrichia leucophrys*).

Red-tailed hawks (*Buteo jamaicensis*), northern harriers (*Circus cyaneus*), golden eagles (*Aguila chrysaetos*), and prairie falcons (*Falco mexicanus*) are some raptors that occur in the project area. Many raptor species use cliff faces and rocky ledges of mountain ranges as sites to roost or nest. Owl species observed in the area include burrowing owl (*Speotyto cunicularia*), barn owl (*Tyto alba*), and short-eared owl (*Asio flammeus*).

3.7.2.3 Reptiles

Reptiles are especially adapted to drought conditions and extreme temperatures and are therefore well represented in the project area and surrounding region. Some 13 lizard species, 15 snake species, and one tortoise species are known to occur in or near the project area. Many diurnal lizards are widespread, while others are habitat specialists. Widespread species include zebra-tailed lizards (*Callisaurus draconoides*), side blotched lizards (*Uta stansburiana*), desert spiny lizard (*Sceloporus magister*), and western whiptails (*Cnemidophorus tigris*). Other lizard species that are widespread but less abundant include the desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislezenii*), and desert iguana (*Dipsosaurus dorsalis*). Habitat specialists include the Mojave fringe-toed lizard (*Uma scoparia*), collard lizard (*Crotophytis insularis*), chuckwalla (*Sauromalus obesus*), long-tailed brush lizard (*Urosaurus graciosus*), and common (desert) night lizard (*Xantusia vigilis*) (Morafka 1993; Morafka 1997; Brown and Nagy 1997).

The desert tortoise (*Gopherus agassizii*) occurs in varying densities throughout the project area (MBA Inc. 1991; Chambers Group 1992a and 1992b; Karl 2001). This species is listed as threatened by the USFWS and requires special management considerations. Detailed information on this species is presented in Section 4.1.

Common snake species include the coachwhip (*Masticophis flagellum*), gopher snake (*Pituophis melanoleucus*), western patch-nosed snake (*Salvadora hexalepis*), western shovel-nosed snake (*Chionactis occipitalis*), and sidewinder (*Crotalus cerastes*) (MBA, Inc. 1991; Chambers 1992b; Brown and Nagy 1997). Less common species include the blind snake (*Leptotyphlops humulis*) and ground snake (*Sonora semiannulata*). Unlike lizards, most of which are primarily diurnal, most snake species on the installation are nocturnal.

3.7.2.4 Amphibians and Fish

Although the introduced mosquitofish (*Gambusia affinis*) occurs in some ponds on Fort Irwin, there is no documentation of any amphibian or fish species occurring in any of the springs or drainages in or adjacent to the project area.