

Appendix A

Mine Features and Terminology

APPENDIX A

MINE TERMINOLOGY

For the purposes of this PEA, an abandoned hardrock mine is defined as a mine on or affecting public lands administered by the BLM, at which all mining operations have ceased as of January 1, 1981 (the effective date of the BLM's Surface Management regulations codified at 43 CFR 3809) with no evidence demonstrating that the miner intends to resume mining.

In order to assist the reader in understanding the terminology of mining as it applies to the proposed action in this PEA, an abbreviated glossary of mining terminology follows, accompanied by an illustration (Figure 1) demonstrating the particularly important terms.

Mining Definitions from American Geological Institute (AGI)
Dictionary of Mining, Mineral, and Related Terms, 2nd Edition. 1997.

Adit	A horizontal mine passage driven in from the surface.
Back/Roof	The ceiling of an underground mine working.
Collar	The surface opening to a shaft.
Collar set	The timber, rock, steel or cement stabilizer of a shaft collar.
Country rock	The ground material around an orebody; the ground material into which an orebody was deposited.
Crosscut	A horizontal underground mine passage driven perpendicular to the strike of an orebody, often to intersect an orebody from a drift.
Decline	A mine passage driven from the surface at an upward or downward angle from horizontal; often called an incline when driven at an upward angle; in hardrock usage a decline or incline can be driven from an underground level.
Drift	Usually a horizontal underground mine.
Dump	Waste rock removed by mining and deposited on the surface.
Face	The terminus of an adit, drift, or crosscut; usually the horizontal surface that is being advanced by mining (the working face).
Foot wall	The country rock below an orebody.
Hanging wall	The country rock above an orebody.
Level	Horizontal workings at different elevations (typically numbered 1, 2, 3, etc.).
Manway	A vertical underground passage with ladder for upward or downward movement of miners; can be in a winze, raise, or shaft.
Muck	Waste rock broken in mining and hauled to the surface dump.
Orebody	A mineral deposit removed for its mineral content.
Pillar	Usually a column of ore or coal left to support the back or roof or to support the hanging wall.
Portal	The surface opening of an adit or tunnel.

Raise	An underground mine opening driven upward from below to access an overlying orebody or provide access to an upper level.
Rib	The side of an underground opening.
Stope	Spaces created in the rock where the ore vein is removed.
Winze	A winze is an opening in an underground mine that is sunk downward (as opposed to a raise, which is mined upward) from inside to connect lower levels. The top of a winze is located underground, in contrast to a shaft where the top of the excavation is located on surface.

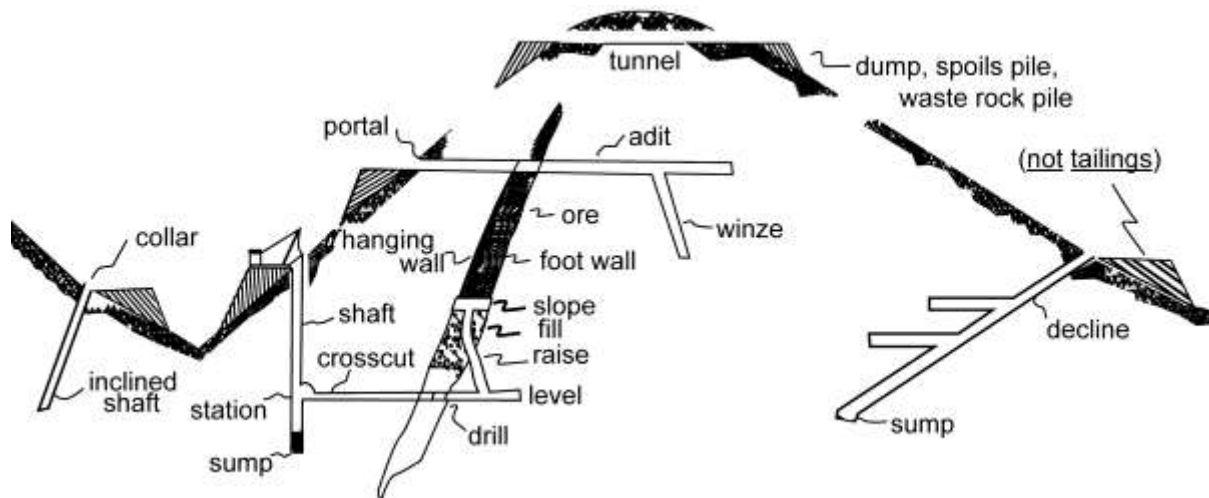


Figure A-1. Mine features (AGI 1997)

Appendix B

California Desert District Maps

APPENDIX B

CALIFORNIA DESERT DISTRICT MAPS

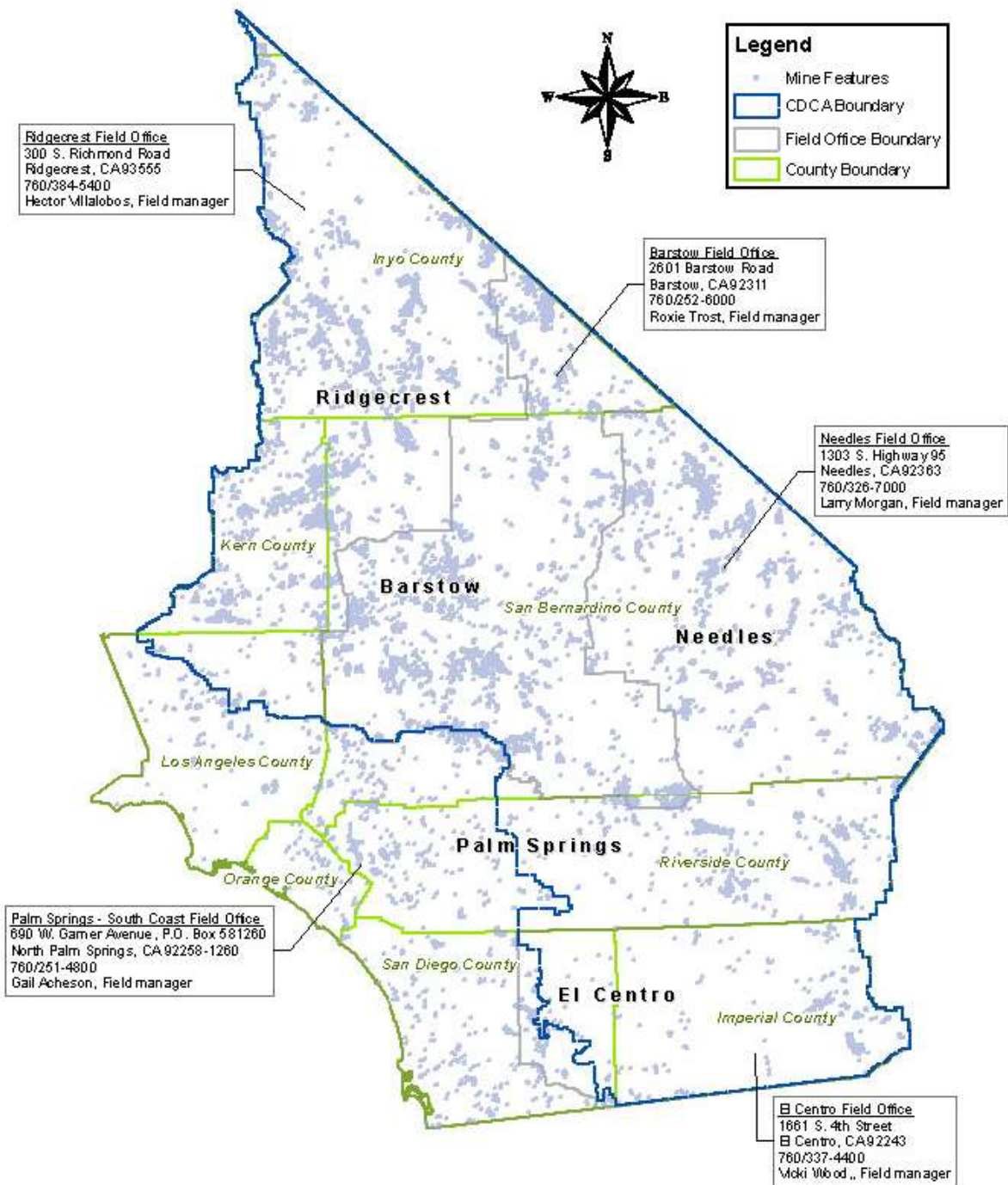


Figure B-1. California Desert District showing locations of district Field Offices and country boundaries

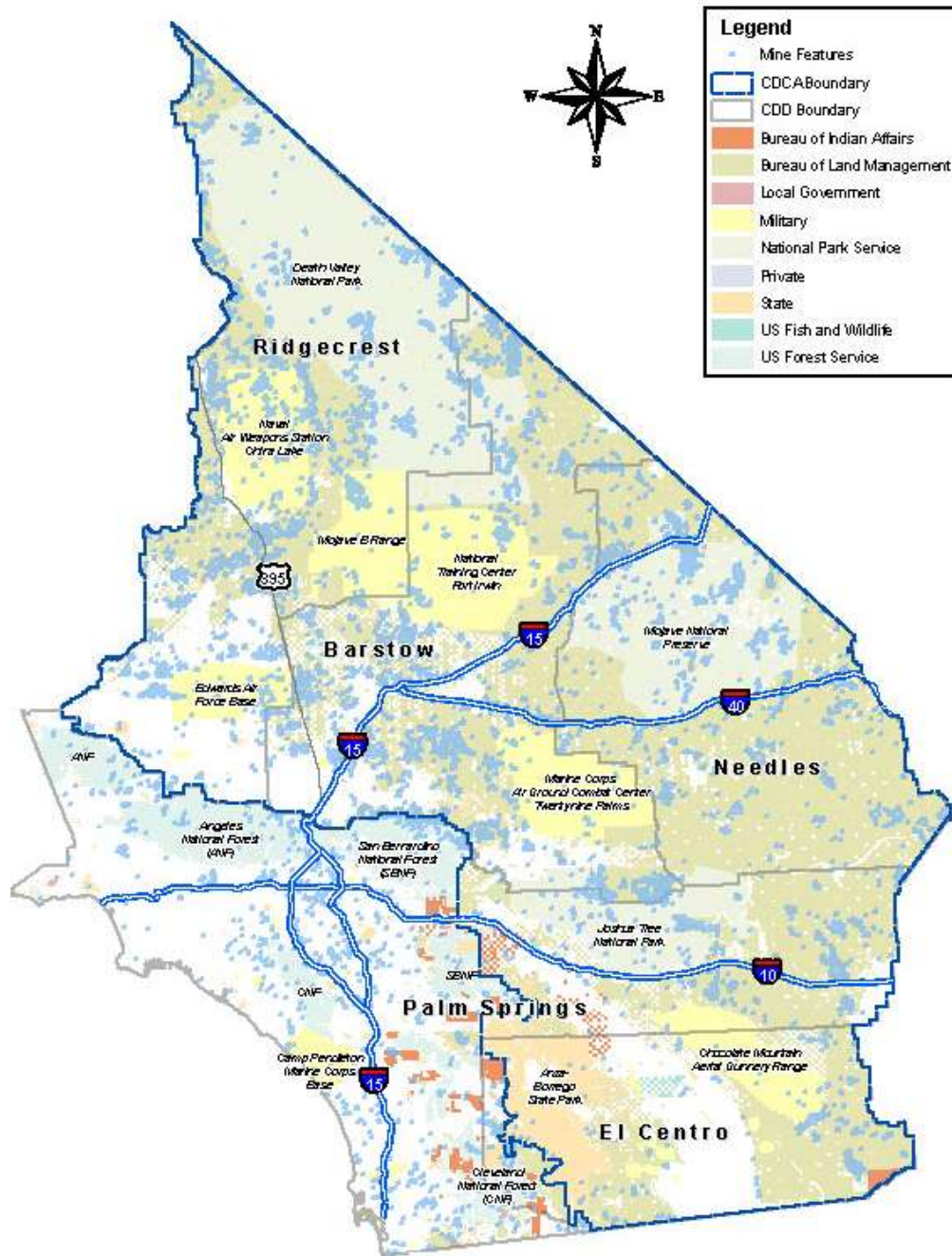


Figure B-2. Land use types within the CDD

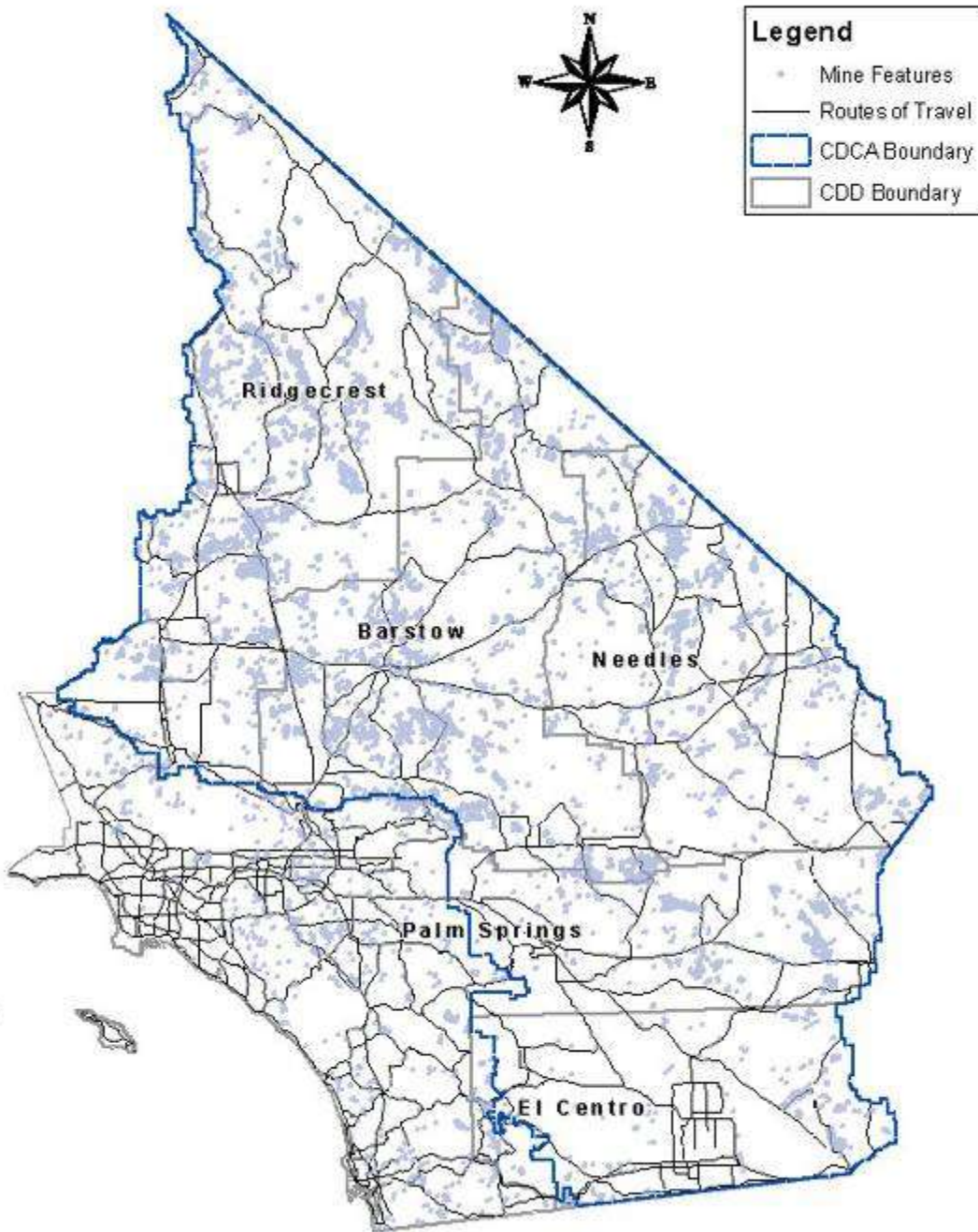


Figure B-3. CDD Road Network



Figure B-4. National and State parks, forests, and monuments and Watchable Wildlife Areas within the CDD

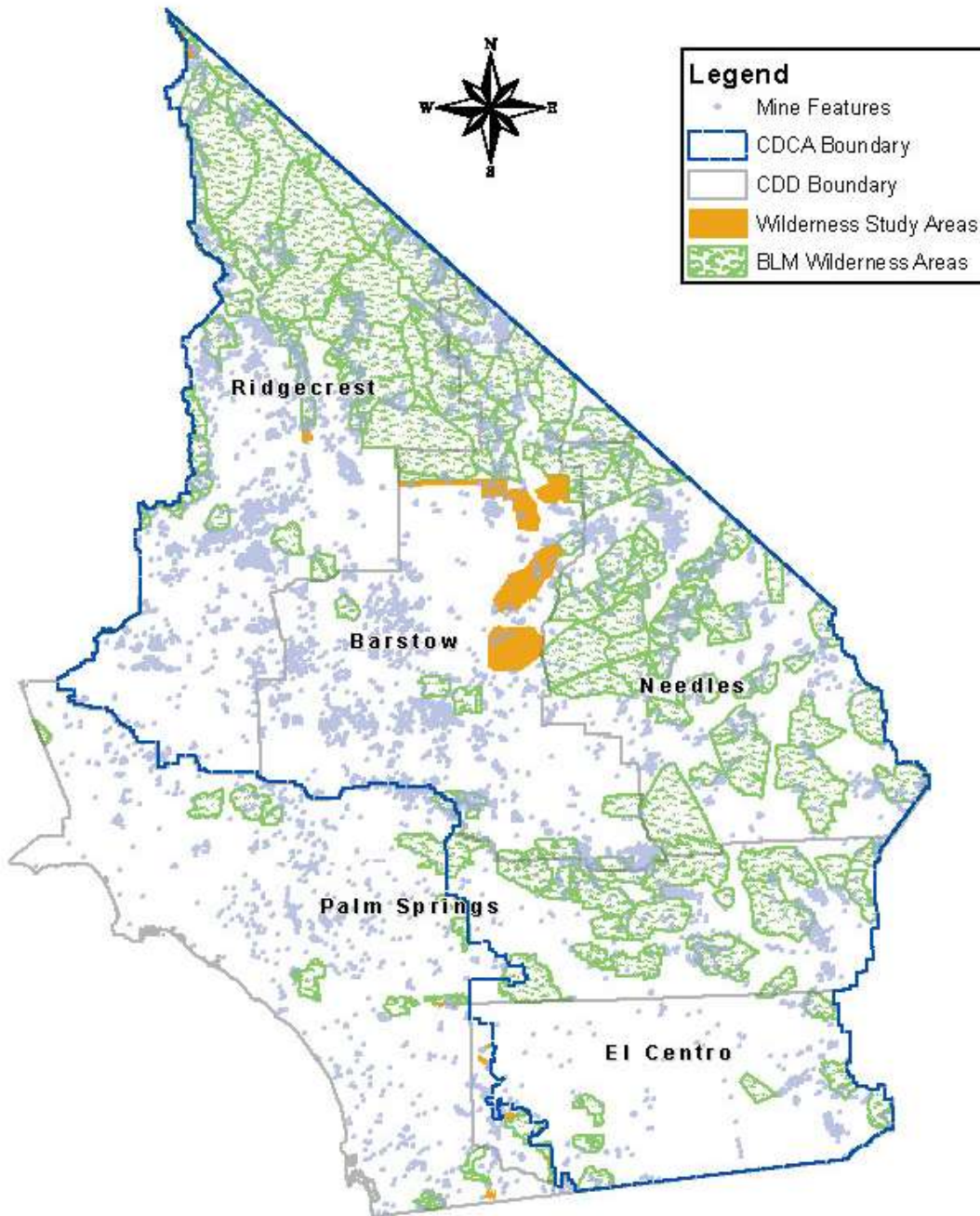


Figure B-5. Wilderness and Wilderness Study Areas (WSAs) within the CDD

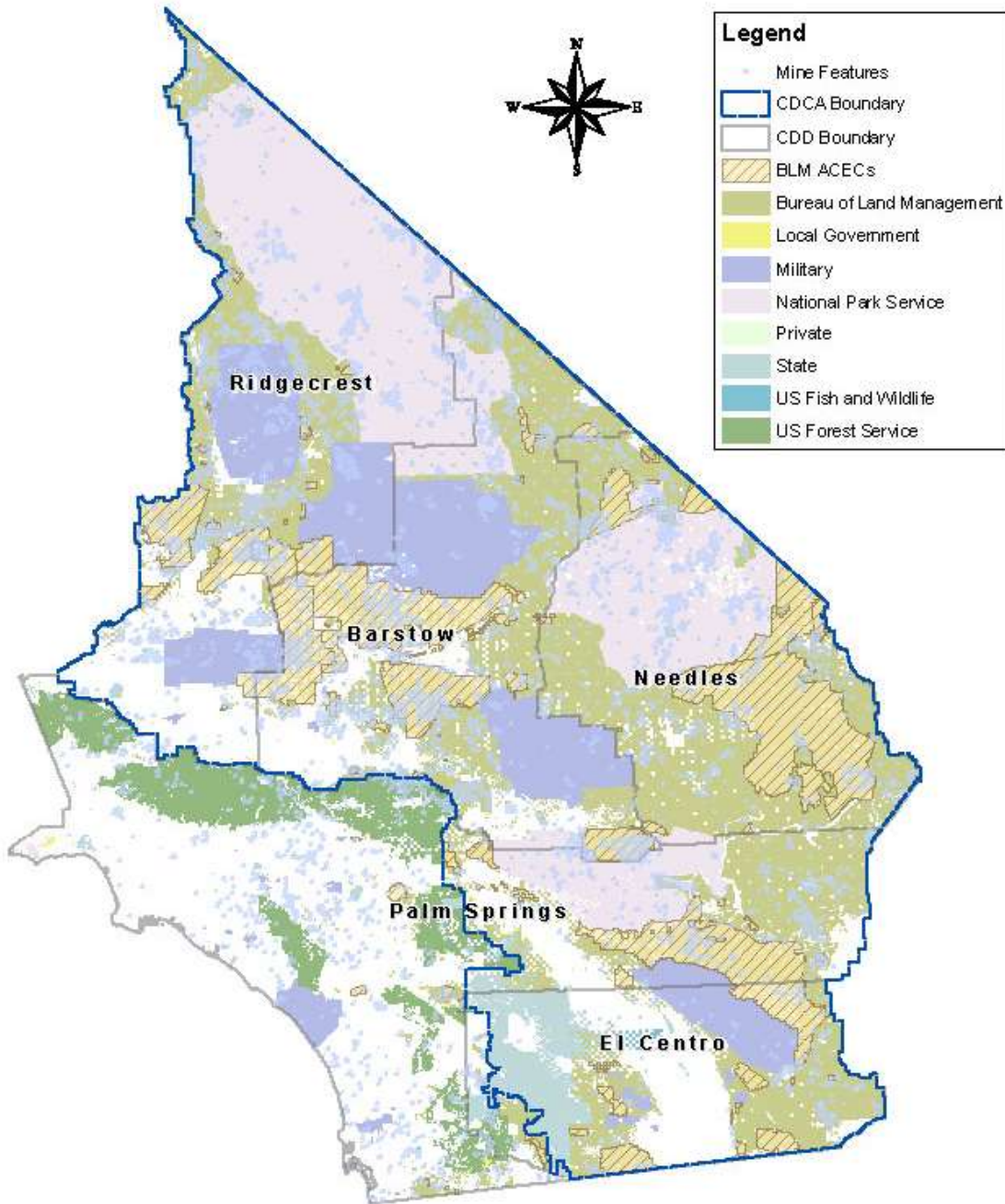


Figure B-6. Areas of Critical Environmental Concern (ACECs) within the CDD

Appendix C

Preliminary Identification Process

APPENDIX C

PRELIMINARY IDENTIFICATION PROCESS

The preliminary analysis conducted by the BLM to identify AML features needing remediation and closure is described in this appendix. At the completion of this preliminary analysis, identified features are eligible for consideration under the process described in the associated PEA. The analysis described in this appendix is not part of the remediation and closure process that has been evaluated in the PEA, but has been included as background to describe the process of the selection and prioritization of AML features for closure.

1. Preliminary Process - Priorities

Mine features are selected and prioritized according to procedures specified in BLM's AML Program Policy Handbook (H-3720-1), in conjunction with BLM physical safety risk assessments for projects at AML sites. The first priority sites are mine features listed in, or eligible for listing in, the BLM's AML inventory database including mine features where a death or injury is known to have occurred at the site; mine features that are situated on, or in immediate proximity to populated places, locations designated as recreation or high-use areas; or mine features located near OHV routes. BLM maintains a working list of AMLs that are to be evaluated and prioritized for remediation. If an AML feature is of such risk to human health and safety that the remediation process should begin immediately, then that site is added to the list with an explanation of the urgent situation.

2. Preliminary Process – Identification and Prioritization

Prior to implementation of the remediation and closure process, BLM identifies eligible AML sites. For a mine feature to be initially considered for remediation each of the following must apply:

- The mine feature is considered as causing unnecessary or undue degradation, a violation of Section 302(b) of the Federal Land Policy and Management Act of 1976 (FLPMA), if associated with an unpatented mining claim, mineral lease, or mineral material contract. In these cases, the liable party is directed to remediate the matter under the appropriate authority. If there is no liable party, then BLM takes immediate action within the constraints of law to remediate the matter.
- The mine feature is located on public lands and at a location such that the BLM administers the surface (including split estate – federal surface with private minerals).
- The reclamation technique must be practical utilizing existing access routes and/or walking into the mine shaft or adit carrying all necessary tools and equipment.

3. AML Physical Hazard Site Assessment Process

The following steps outline a process for identifying, assessing, cataloging, and prioritizing features known to create a physical hazard to public and wildlife.

A) Utilization of Existing Abandoned Mine Land Data:

- In 1998, the Office of Mine Reclamation began inventorying abandoned mined lands as part of a program to describe the "scope and magnitude" of abandoned mine issues in California. To support this effort, the Office began digitizing mining features from scanned USGS topographic quadrangles. Each of the 7.5-minute USGS topographic quadrangles was examined and all mining features were digitized and annotated with information derived from the map. Positional accuracy was dependent upon the accuracy of the original source maps.
- These data along with data from other ALM sources are displayed on the National Integrated Land System - GeoCommunicator's Site Mapper (http://www.geocommunicator.gov/GeoComm/site_mapper/home/index.shtm). Site Mapper is an interactive map used to graphically display abandoned mines and BLM sites including recreation, administrative, campgrounds, and buildings. Site Mapper displays the location of the sites by latitude and longitude.

B) Prioritization of Abandoned Mines:

- From a risk standpoint, there are higher visitor safety expectations at places where the BLM has invited the public to visit, such as a designated recreation area, as opposed to a remote location on public lands.
- Accordingly, priority is placed on remediating AML sites in close proximity to urban interface, areas with high use like camp grounds, and areas which are available for off-highway vehicle recreation areas.

C) Evaluation of Existing Data to Determine Abandonment Status:

- Is the feature located on an active mining claim?
- If so, does the claimant consider the feature to be an asset?
- Can a possible responsible party be found?

4. Mining Claimants and FAST!

One of the primary issues with closing abandoned mines, as mentioned in the previous section, is identifying the rightful owners and obligating them to perform the closure with their own funding. On December 12, 2008 the BLM Director issued Instruction Memorandum No. 2009-34 (the Notice), dissemination of Fix a Shaft Today (FAST!) Safety Notice to Mining Claimants.

FAST! is a collaborative partnership between the BLM, the U.S. Forest Service, the National Association of Abandoned Mine Land Programs, the mining industry (including the National Mining Association), mining claimants, Bat Conservation International, landowners, recreation user groups, and volunteers. Part of this effort encourages mining claimants to fix safety hazard problems on their claims. In the Safety Notice, information about recent accidents involving casual visitors and off-highway vehicle users was provided. In addition, mining claimants were asked to take action to mitigate any safety hazards on their claims. BLM State Directors were asked to disseminate the Safety Notice to mining claimants in their states, along with a description of recent accidents in their states. In California, approximately 2208 Notices were sent to the current mining claimants beginning on April 13, 2009.

The FAST! effort addresses only safety hazards associated with mines where a mining claimant can be identified as a responsible owner of the feature. If the mining claimant accepts responsibility of the assessed mine hazard, the mining claimant becomes responsible for maintaining that feature in a safe and secure condition, and in compliance with any measures required to mitigate the potentially hazardous situation. The BLM may require a new or modified operation plan to define measures required to secure the feature(s) from becoming a hazardous situation. This plan may include financial responsibility for site maintenance and compliance with remediation measures, including protection of public health and the environment. The BLM regulates these sites as “activities exceeding casual use” and the mining claimants are required to comply with surface management regulations at 43 CFR 3809.10.

If the mining claimant has either refused or otherwise failed to take mitigation action promptly to protect public health and the environment, and has not exercised any right of appeal of a decision to do so, the BLM undertakes the necessary remediation measures in accordance with the guidelines set forth in Chapter 9 of H-3720-1, Abandoned Mine Lands Program Policy Handbook. BLM may seek damages from the claimant(s) of record to defray all costs associated with remediation of the hazard. If the claimant(s) appeals any decision to require or modify a plan of operation, and a stay has not been granted, BLM takes any remediation measures needed to protect public and the environment from immediate threat during the resolution of such mining claimant appeals. If a stay has been granted, BLM will work via the Administrative process to lessen any hazardous situation, ideally with the cooperation of the mining claimant(s). Depending upon the resolution of any appeal, either the mining claimant or the BLM completes remediation of the mining hazard.

5. AML Sites Eliminated from the Consideration in the Remediation and Closure Process

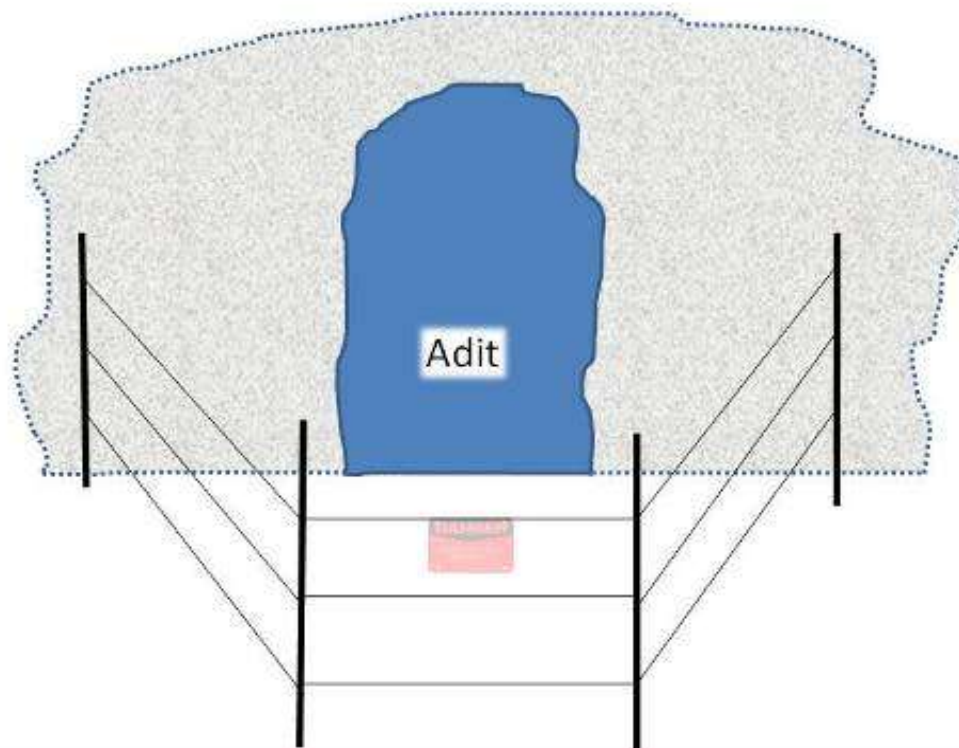
AML sites excluded from proposed remediation and closure process include:

- AML sites for which a potential responsible party exists and can be located;
- AML sites which have the potential to impact surface or ground water;
- AML sites which include toxic or hazardous materials; and
- AML sites with significant complexity, such as sites with structures, multiple levels and openings, and those that play a greater role in an area’s mining history.

Appendix D
Remediation Methods

APPENDIX D REMEDICATION METHODS

Figure D-1. Smooth 3-wire Adit Fence



Mine Adit Barbless-wire Fence. Note that this drawing shows a fence at a mine adit portal and is not intended to show exact specifications.



Figure D-2. Smooth 3-wire Shaft Fence

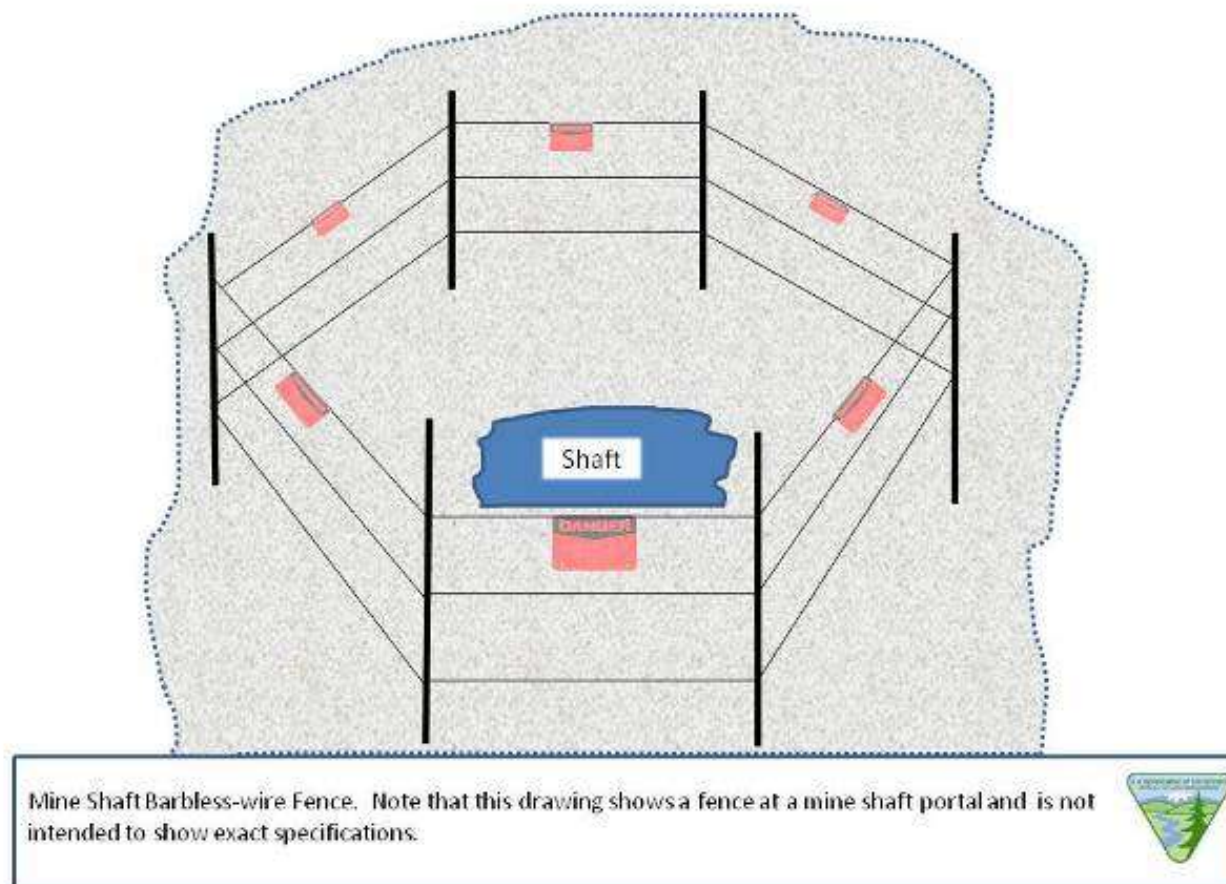
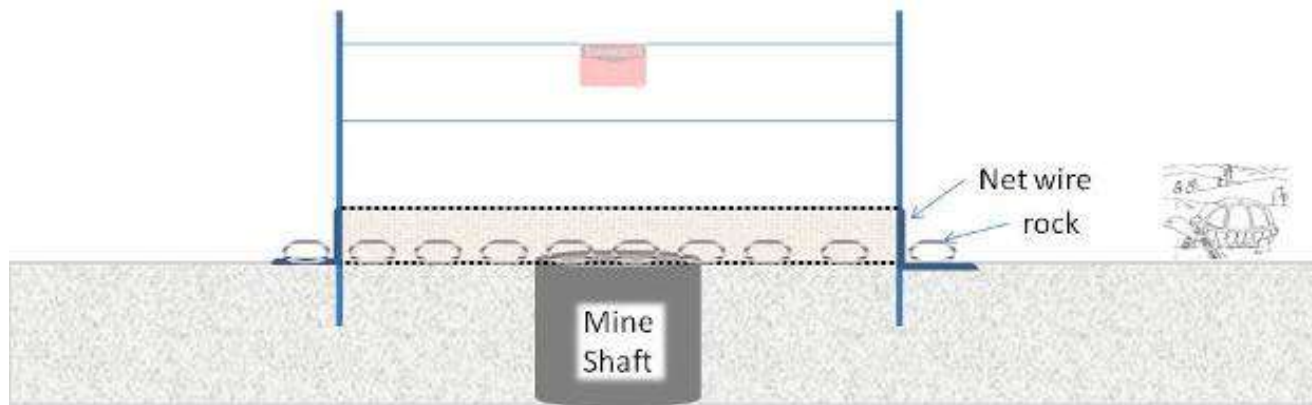


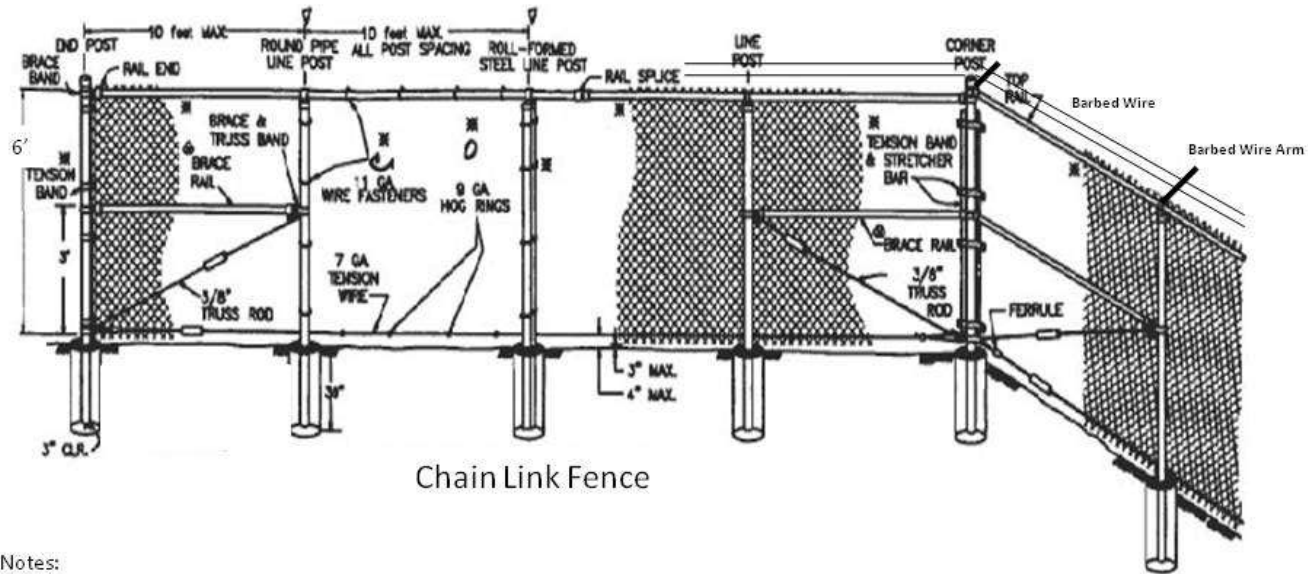
Figure D-3. Fence with a Tortoise Exclusion



Barbless-wire fence and Desert Tortoise exclusion fence. Note that this drawing shows a fence with net wire that has been attached at a mine shaft portal to prevent the Desert Tortoise from being injured and is not intended to show exact specifications.



Figure D-4. Chain Link Fence



Chain Link Fence

Notes:

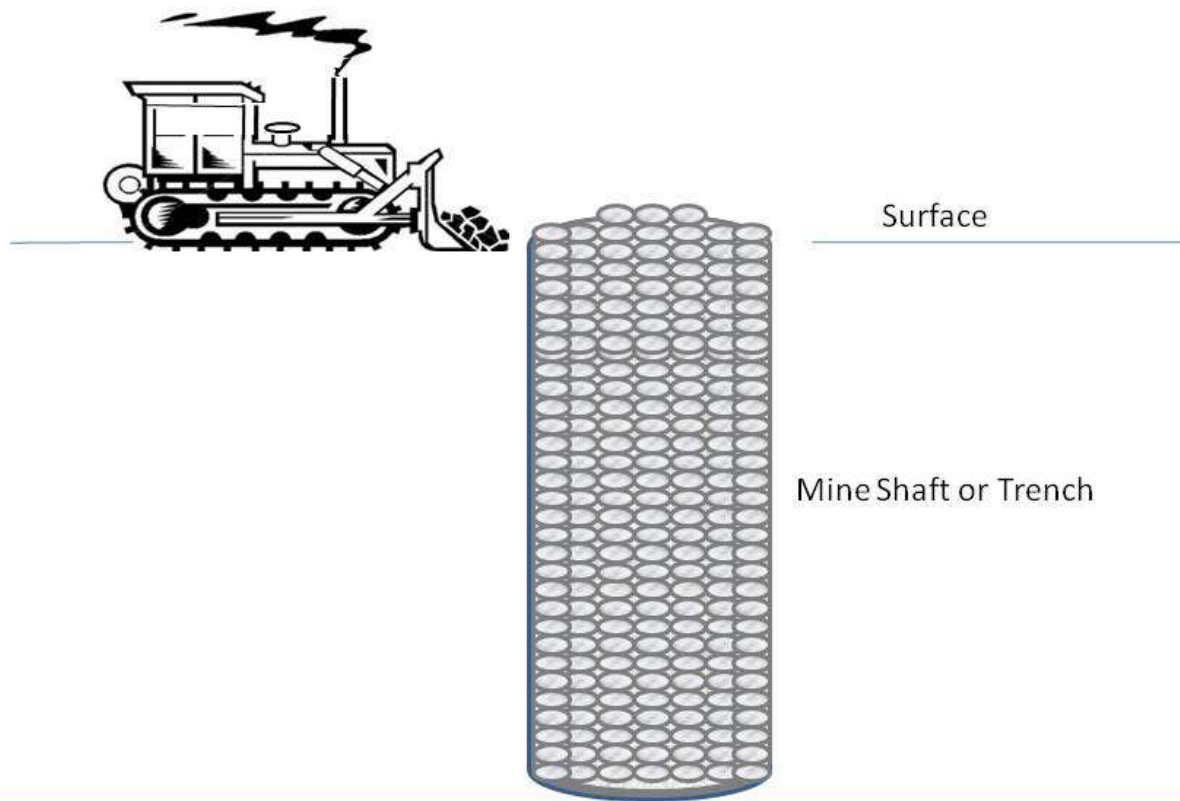
1. POST SPACING: LINE POSTS SHALL BE EVENLY SPACED, 10' MAX CENTER TO CENTER.
2. BARBED WIRE ARM: SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
3. TERMINAL LINE POSTS, & TOP/BRACE RAIL SHALL BE ACCORDING TO THE SPECIFICATIONS.
4. POST SETTING SHALL BE ACCORDING TO THE FOLLOWING TABLE:

POST SETTING REQUIREMENT			
TYPE OF POST	HOLE DIA.	HOLE DEPTH	POST EMBEDMENT
LINE	9"	38"	36"
TERMINAL	12"	38"	36"

Chain Link Fence would be installed around an abandoned mine feature in a similar fashion shown for a smooth wire fence.



Figure D-5. Backfill



Permanent Mine Closure. Note: this drawing is of a mine shaft backfill using a piece of heavy equipment. The drawing is not intended to show exact volumes or mine specifications.



Figure D-6. Polyurethane Foam (PUF) Plug

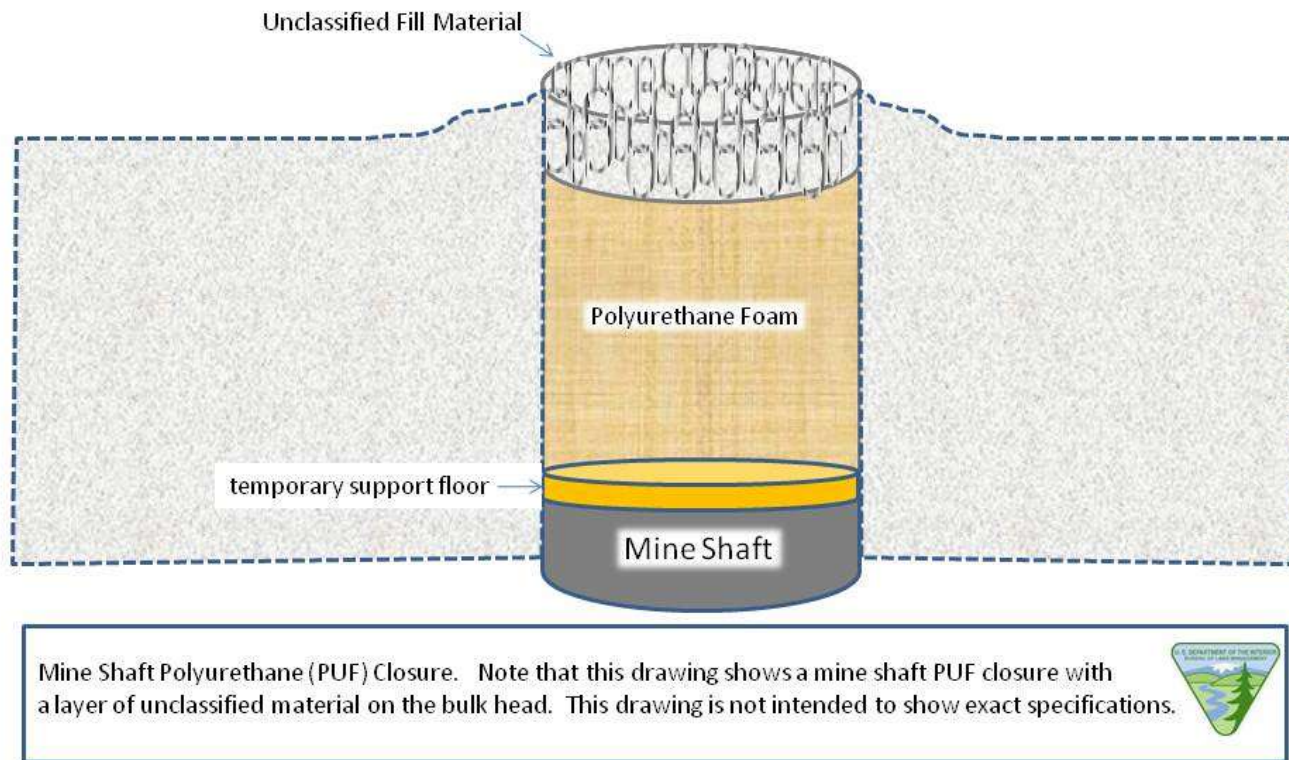
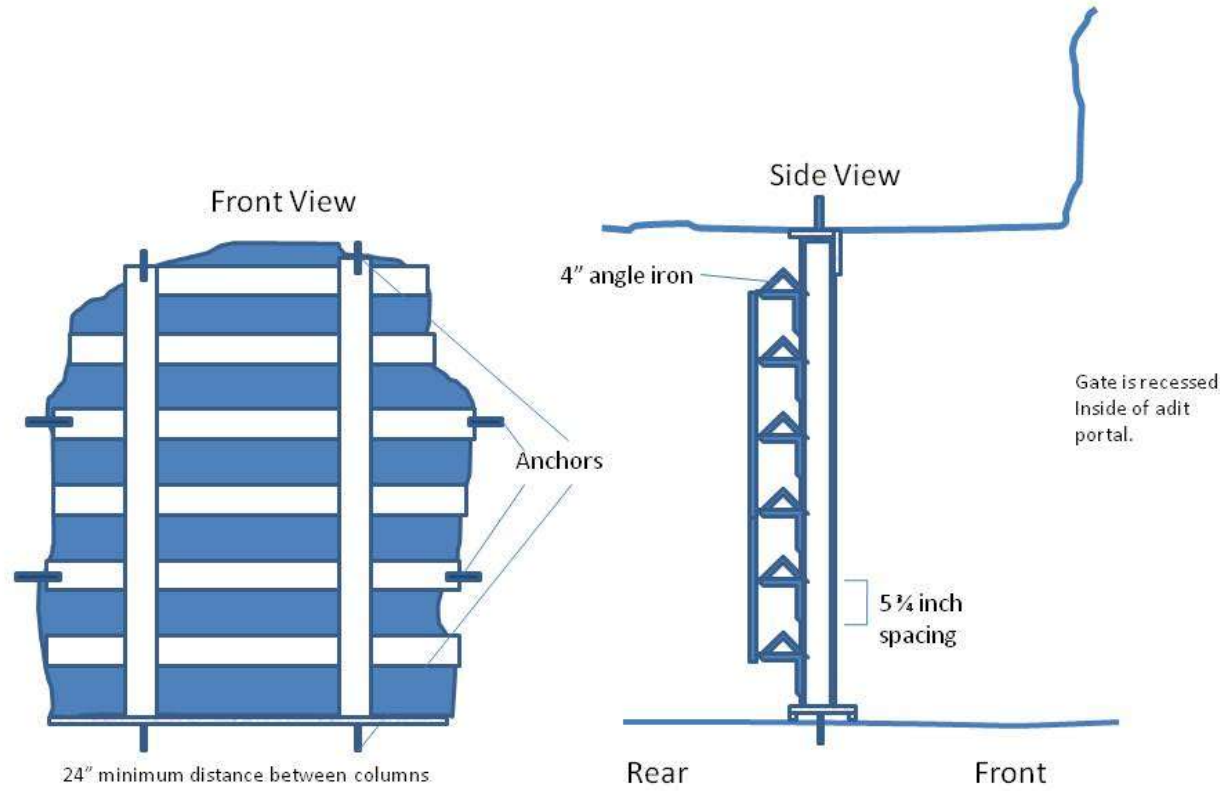


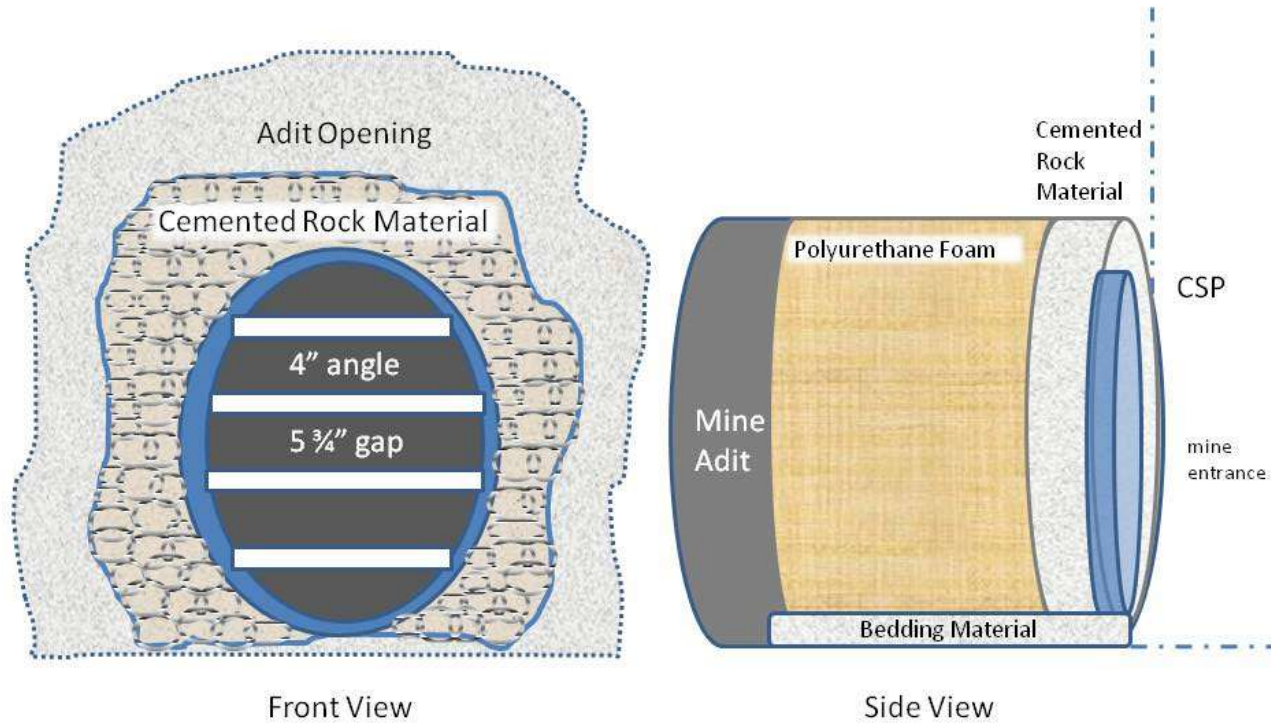
Figure D-7. Wildlife-friendly Gate



California Desert District Wildlife-friendly Gate. Note this drawing is a general representation and not intended to show exact specifications. Designs may be modified as needed on a case by case basis.



Figure D-8. Corrugated Steel Pipe and Wildlife-friendly Gate



Corrugated Steel Pipe (CSP) Adit Closure with a Wildlife-friendly Gate. Note that this drawing shows what a CSP and a wildlife friendly gate in an adit portal opening and is not intended to show exact specifications.



Figure D-9. Corrugated Steel Pipe and a Wildlife-friendly Cupola

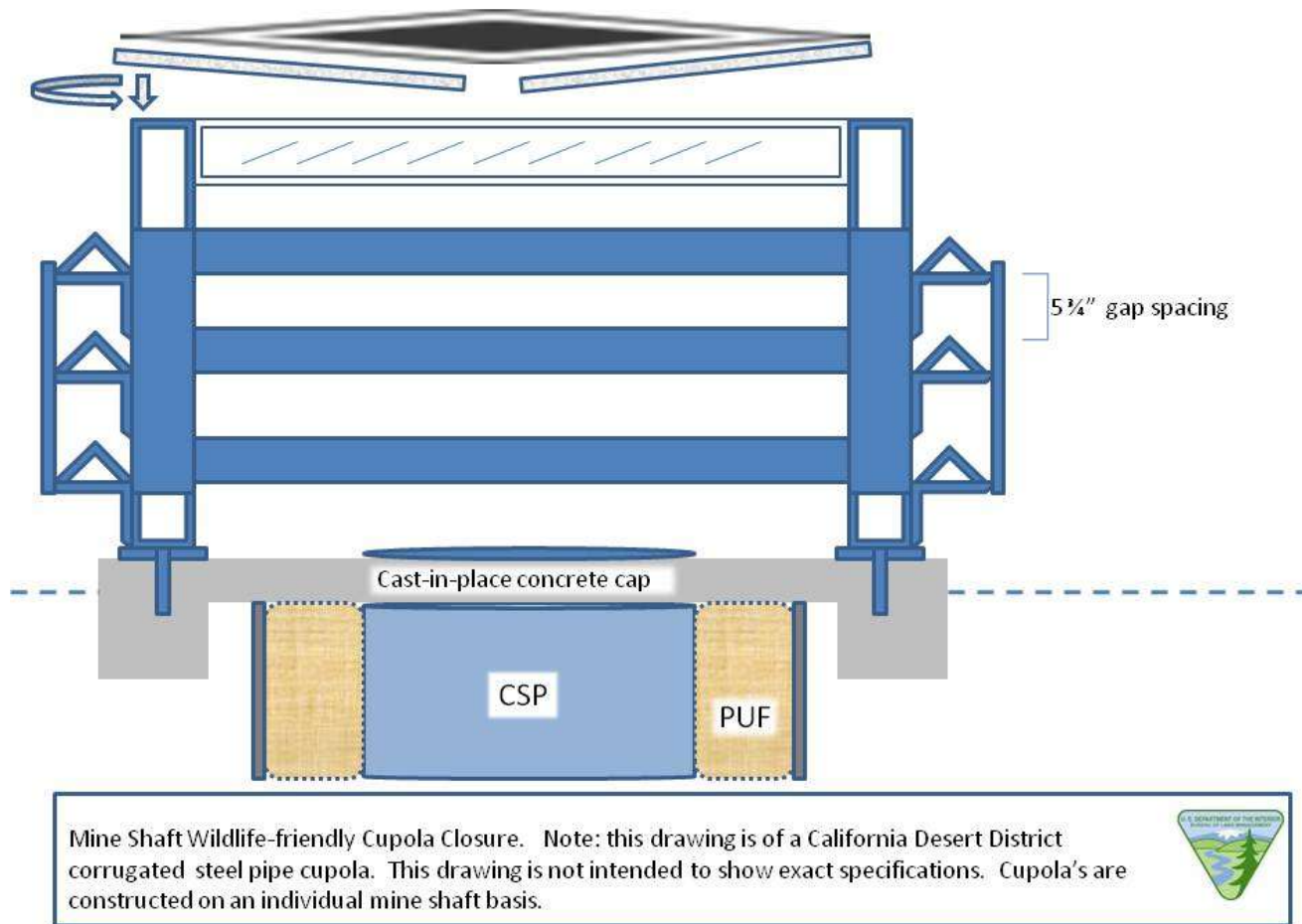
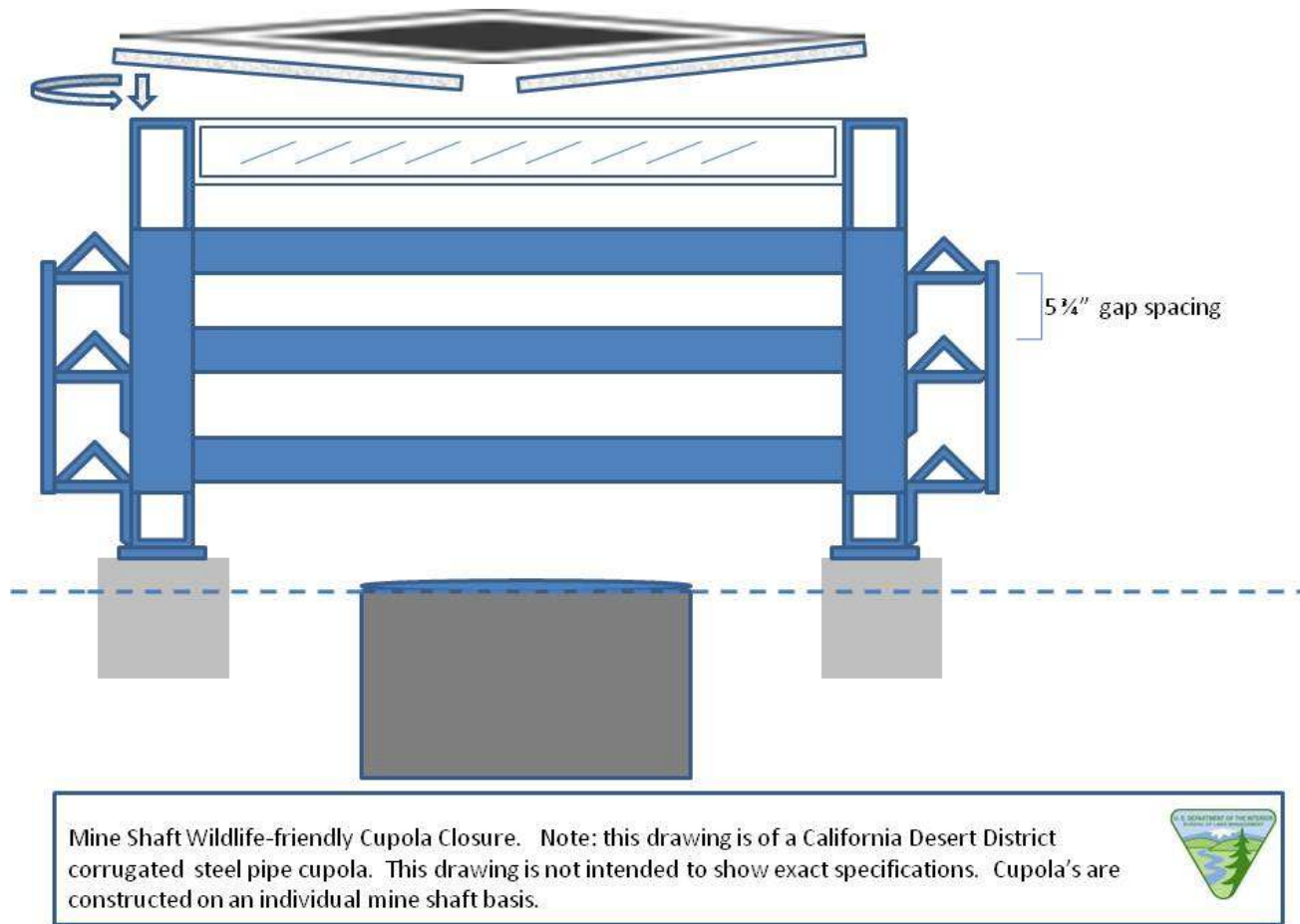


Figure D-10. Wildlife-friendly Cupola



Appendix E

Engineering Specifications for Select Closure Methods

APPNDIX E

ENGINEERING SPECIFICATIONS FOR SELECT CLOSURE METHODS

The closure technique utilized would depend on site-specific characteristics, and selection would depend on which method best minimized the recognized hazards, while avoiding or reducing cultural and environmental impacts. Any method utilized would typically only include the area of the footprint of the site. The methods being considered are:

1. Fencing
2. Filling
 - a. Backfilling
 - b. Polyurethane Foam (PUF) Plug
 - c. Blasting
3. Installation of Gates, Cupolas, Culverts, or Grates

This appendix includes additional engineering specifications for PUF plugs and gates, cupolas, culverts, and grates. These procedures include in-depth procedural and minimum specification requirement documentation, and are technically out of the scope of this document, but have been included to provide a more thorough background for the methods considered for mine closure.

1. Polyurethane Foam (PUF) Plug

A PUF closure consists of installing a false bottom form, installing the polyurethane plug to specifications, and backfilling over the PUF to the specified level using common fill. The PUF plug would be composed of hand-mixed or prepackaged polyurethane foam. The plug is either co-blown (a mixture of solvent and water) or water blown (100 percent water) for installation. In some instances a cast-in-place concrete slab, rock armoring, or construction of a rock wall may be used to prevent vandalism. Drainage pipes, access ways and ventilation pipes may be required.

Co-blown (245FA solvent and water) foams have a minimum core density of 2.0 pounds per cubic foot, closed cell content greater than 90 percent, compressive strength greater than 25 pounds per square inch, and a minimum installed density of 1.85 pounds per cubic foot. Water (100 percent) blown foams have a minimum core density of 2.5 pounds per cubic foot, closed cell content greater than 90 percent, compressive strength greater than 28 pounds per square inch, and a minimum installed density of 2.0 pounds per cubic foot. Either system is ideally 1:1 by volume however pre-metered bags could use an off-ratio system. Exothermic reaction rates are required to be low for both systems. The PUF is applied in lifts with a maximum rise of 16 inches. Installed PUF lifts pass through the tack-free stage before the next lift is applied. At no time does sprayed or poured PUF penetrate the surface of the rising foam from a previous lift. Unless otherwise specified by the task order, the depth of PUF in horizontal openings is determined by the following formula:

$$1.5 \times A \text{ or } B; \text{ whichever is the smallest dimension} \\ \text{(with a minimum of 4' and maximum of 8' depth)} \\ A = \text{width} \\ B = \text{height}$$

PUF is mixed by hand or prepackaged polyurethane foam may be used. If a proportioning unit is used, the unit is required to be capable of maintaining a minimum temperature of 125 F. The hose shall maintain or increase component temperature from the proportioner. In all instances, PUF application must not exceed the maximum proportioned specifications. The installed PUF characteristics shall conform to the following standards:

Table E-1. PUF CHARACTERISTICS

Characteristic	Standard
Density	ASTM D-1622
Closed cell content	D-2856 or equivalent
Compressive strength	D-1621
Water absorption	D-2842

2. Gates, Cupolas, Culverts or Grates

For certain cases it may be desirable to maintain limited and controlled accessibility to an AML feature. In these cases, protective remedies which allow controlled access by authorized individuals and or wildlife would be employed. Such techniques include gates, cupolas, culverts, or grates in a variety of designs that would be built from a wide range of materials. Specifications for materials and design of gates, cupolas, and grates are developed after site inspection by technical specialist. Accepted specifications for material used in eaves and roof cross braces include channel (6" x 10.5 lb/ft), 2-inch x 3/8 square tubing, and/or 4-inch x 3/8 square tubing.

Gates

Wildlife-friendly Gates at a minimum consist of:

- 4-inch x 3/8-inch steel angle iron for horizontal bars
- 6-inch x 3/8-inch steel angle iron for horizontal bar hangers
- 4-inch by 3/8-inch steel square tubing for gate columns
- 4-inch by 3/8-inch flat bar for bracing
- Metric Size 25, or Standard #8, rebar for anchors
- Structural steel channel iron, 6-inch by 10.5 pound per foot (lb/ft)
- structural steel construction that conforms to the requirements of ASTM A-36 (all purpose steel)

Wildlife-friendly gates are held in place by anchors that have been sunk into competent bedrock by a rock drill. At minimum, one anchor per column is placed in the floor and ceiling of the mine and one anchor per side of the gate is placed in the adit walls. Horizontal anchor attachments are spaced at 25% and 75% of the height for gates taller than 48 inches, as a general guideline. End anchors are used on bars that extend more than 30 inches beyond the columns. Anchor holes are drilled to a depth no less than 6 inches and are 1-inch or metric equivalent in size. A Metric #25 rebar, or an equivalent steel substitute can be driven to the depth of each hole and used as the anchoring mechanism.

Channel iron (6"x10.5 lb/ft) spanning the width of the adit floor with pre-cut holes is placed tabs down over the anchors and welded in place. Six inch angle irons cut to a length of 6 inches with pre-cut holes are welded to anchors in the ceiling. Columns of the gate are welded into place. Horizontal bars are evenly spaced with gaps equal to 5¾-inch intervals and extending to the adit walls. These are welded in place on hangers attached to each column. A removable horizontal bar with a hidden latch and shrouded (boxed-in) lock is required. Generally, locks consist of a tamper-resistant bolt similar to the "MacGuard" bolts or equivalent. To finish the gate, a 4 inch flat iron is welded on the back of the horizontal bars.

Unless otherwise specified, gates are not coated, but any coatings that are applied are brushed on, not sprayed, to avoid volatiles from entering the feature unless, the steel is pre-coated prior to construction. Adit and cave gates usually are constructed during a season when bats are not vulnerable, or when air is flowing out of the entrance.

Cupolas

Wildlife-friendly Cupolas at a minimum consist of:

- 4-inch x 3/8-inch steel angle iron for horizontal bars
- 6-inch x 3/8-inch steel angle iron for horizontal bar hangers
- 4-inch x 3/8-inch steel square tubing for cupola columns
- 4-inch x 3/8-inch flat bar for horizontal bar bracing
- 3-lb expanded steel metal for roof material
- 6-inch x ¼-inch flat bar for sill plates and roof bracing
- Concrete 3000 psi rated
- Fine and coarse aggregate shall conform to ASTM C-33. Water shall be potable. Admixtures shall conform to ASTM C-494. Calcium chloride would not be permitted.
- standard 3/4-inch rebar for concrete anchors
- be constructed of structural steel that conforms to the requirements of ASTM A-36 (all purpose steel)

Appendix F

Threatened and Endangered Species and California State Species of Special Concern

Table F-1. Threatened and Endangered Species and California Species of Special Concern

Group	Name	Population	Status	Habitat
Amphibians	Arroyo (=arroyo southwestern) toad (<i>Bufo californicus</i> (= <i>microscaphus</i>))	Southern California	Endangered	low gradient drainages with extensive terrace systems, braided channels, and large areas of fine sediment deposits that are episodically reworked by flooding; vegetation includes live oak, sycamore, and cottonwood groves interspersed with grasslands and sage scrub on high terraces, willows, alder, and mulefat on temporary alluvial benches adjoining the active channels; streams may be either permanent or seasonal; seasonal streams must flow for at least 4–5 mo in spring and summer support breeding populations (1)
Amphibians	California red-legged frog (<i>Rana draytonii</i>)	Coastal California	Threatened	dense, shrubby or emergent riparian vegetation closely associated with deep, still or slow moving water; deepwater pools with dense stands of overhanging willows and an intermixed fringe of cattails; dormant state during summer or dry weather, in small mammal burrows and moist leaf litter (2)
Amphibians	California tiger Salamander (Sonoma) (<i>Ambystoma californiense</i>)	Central Coast and Central Valley, California	Endangered	rodent burrows in open grassland areas or beneath large oaks, with burrows in woodland areas less commonly occupied, except for the brief breeding season, breed in fishless, seasonal and semi-permanent wetlands (3)
Amphibians	Desert slender salamander (<i>Batrachoseps aridus</i>)	Southern California	Endangered	seep formations within steep-sided, protected canyons, beyond the reach of direct sunlight year-round; vegetation includes sugar bush, willow, Washington palms, creosote, mesquite, and various grasses and mosses, maidenhair fern, Fremont cottonwood, waterweed, deer grass, California fuschia, wild grape, bush, and scrub oaks; breeding terrestrial; active nocturnally (4)
Amphibians	Mountain yellow-legged frog (<i>Rana muscosa</i>)	southern California and Central Valley	Endangered	streams in narrow rock-walled canyons and streams in the chaparral belt (5)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Birds	California condor (<i>Gymnogyps californianus</i>)	Western US	Endangered	rugged canyons, gorges, and forested mountains (8)
Birds	California least tern (<i>Sterna antillarum browni</i>)	Southern California	Endangered	open sandy beaches, sandbars, gravel pits, or exposed flats along shorelines of inland rivers, lakes, reservoirs, and drainage systems (9)
Birds	Coastal California gnatcatcher (<i>Poliioptila californica californica</i>)	Southern California	Threatened	scrub dominated plants with low-growing, drought-deciduous shrubs and subshrubs, including California sagebrush (<i>Artemisia californica</i>), California buckwheat (<i>Eriogonum fasciculatum</i>), and sages (<i>Salvia mellifera</i> , <i>S. apian</i>), breeding territories have been documented chaparral and grassland/ruderal habitat (10)
Birds	Least Bell's vireo (<i>Vireo bellii pusillus</i>)	Southern California	Endangered	riparian habitats; breeds in willow riparian forest supporting a dense, shrubby understory of mulefat (<i>Baccharis salicifolius</i>) and other mesic species; oak woodland with a willow riparian understory; adjacent chaparral, coastal sage scrub, or desert scrub habitats (11)
Birds	Light-footed clapper rail (<i>Rallus longirostris levipes</i>)	Southern California	Endangered	coastal salt marshes, lagoons, and their maritime environs; nesting habitat includes tall, dense cordgrass (<i>Spartina foliosa</i>) and pickleweed (<i>Salicornia virginica</i>) in the low littoral zone, wrack deposits in the low marsh zone, and hummocks of high marsh within the low marsh zone (12)
Birds	Marbled murrelet (<i>Brachyramphus marmoratus</i>)	CA, OR, WA, AK	Threatened	mainly near saltwater, up to 11 miles inland in central California. Over 90 percent of all; occasionally coastal lakes; nesting habitat - mature or old-growth forest stands near the coastline with large trees, a multistoried canopy, moderate to high canopy closure or an open crown canopy, large snags, and numerous downed snags in all stages of decay (13)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Birds	Southwestern willow flycatcher (<i>Empidonax traillii extimus</i>)	Temperate North America	Endangered	breeds only in riparian woodland, typically adjacent to or even over water; typically with a canopy and an understory of shrubs or saplings; vegetative composition varies greatly from site to site; vegetation includes native willows, ash, alder, coast live oak, mature nonnative tamarisk cottonwoods, boxelders and narrow strips of riparian vegetation, aquatic plants such as cattail and bulrush (16)
Birds	Western snowy plover (<i>Charadrius alexandrinus nivosus</i>)	Pacific coastal pop.	Threatened	mainland coast, peninsulas, offshore islands, bays, estuaries, or rivers of the Pacific coast from southern Washington to southern Baja California, Mexico; nests occur on sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries.
Birds	Yuma clapper rail (<i>Rallus longirostris yumanensis</i>)	Western US	Endangered	generally associated with tidal marshes; occupies fresh-water marshes during the breeding seasons yet largely winters in brackish marshes south of the United States; breeds in heavily-vegetated fresh-water marshes with cover ranging from moderately dense stands of <i>Typha domingensis</i> (cattail) and <i>Scirpus</i> spp. (bulrush) to dense, nearmonotypic stands of <i>Typha</i> (18)
Crustaceans	California freshwater shrimp (<i>Syncaris pacifica</i>)	California	Endangered	low elevation (less than 116 meters, 380 feet) and low gradient streams that are structurally diverse with undercut banks, exposed roots, overhanging woody debris, or overhanging vegetation (19)
Crustaceans	Conservancy fairy shrimp (<i>Branchinecta conservatio</i>)		Endangered	vernal pools
Crustaceans	Longhorn fairy shrimp (<i>Branchinecta longiantenna</i>)		Endangered	vernal pools
Crustaceans	Riverside fairy shrimp (<i>Streptocephalus woottoni</i>)		Endangered	vernal pools

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Crustaceans	San Diego fairy shrimp (<i>Branchinecta sandiegonensis</i>)		Endangered	vernal pools
Crustaceans	Vernal pool fairy shrimp (<i>Branchinecta lynchi</i>)		Threatened	vernal pools
Crustaceans	Vernal pool tadpole shrimp (<i>Lepidurus packardii</i>)		Endangered	vernal pools
Fishes	Desert pupfish (<i>Cyprinodon macularius</i>)		Endangered	cieneegas, springs, small streams and margins of large rivers; tolerance for wide temperature fluctuation, low oxygen concentrations, and high salinity (20)
Fishes	Razorback sucker (<i>Xyrauchen texanus</i>)	Southwestern US	Endangered	colorado river drainage
Fishes	Santa Ana sucker (<i>Catostomus santaanae</i>)	3 CA river basins	Threatened	native only to the Los Angeles, San Gabriel, Santa Ana, and Santa Clara River systems in southern California
Fishes	Tidewater goby (<i>Eucyclogobius newberryi</i>)	Pacific Coast	Endangered	coastal
Fishes	Unarmored threespine stickleback (<i>Gasterosteus aculeatus williamsoni</i>)	Southern California	Endangered	slow-moving reaches or quiet-water microhabitats in streams and rivers, usually shaded by dense and abundant vegetation; algal mats or barriers (e.g., sand bars, floating vegetation, low-flow road crossings) may provide refuge for the species (21)
Flowering Plants	Ash-grey paintbrush (<i>Castilleja cinerea</i>)	San Bernadino Mountains	Threatened	pebble plain openings within montane coniferous forests, pinyon-juniper (<i>Pinus-Juniperus</i> spp.) woodlands, dry montane meadows, and Mojavean desert scrub (22)
Flowering Plants	Bakersfield cactus (<i>Opuntia treleasei</i>)	Southern California	Endangered	Sandy soils in flood plains, ridges, bluffs, and rolling hills in the Pacific grassland and Mojavean Desert between 120 and 300 meters (23)
Flowering Plants	Bear Valley sandwort (<i>Arenaria ursina</i>)	big bear lake area only	Threatened	pebble plains (24)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Flowering Plants	Big-leaved crownbeard (<i>Verbesina dissita</i>)	Southern California	Threatened	Chaparral, Coastal Sage Scrub (25)
Flowering Plants	Braunton's milk-vetch (<i>Astragalus brauntonii</i>)	only in hills around Los Angeles	Endangered	Chaparral, Valley Grassland, Coastal Sage Scrub, Closed-cone Pine Forest (26)
Flowering Plants	California Orcutt grass (<i>Orcuttia californica</i>)	Southern California	Endangered	Valley Grassland, Freshwater Wetlands, wetland-riparian (27)
Flowering Plants	California taraxacum (<i>Taraxacum californicum</i>)	San Bernardino Mountains only	Endangered	Yellow Pine Forest, wetland-riparian, meadows (28)
Flowering Plants	Coachella Valley milk-vetch (<i>Astragalus lentiginosus</i> var. <i>cochellae</i>)	Southern California	Endangered	Creosote Bush Scrub (29)
Flowering Plants	Coastal dunes milk-vetch (<i>Astragalus tener</i> var. <i>titi</i>)	Coastal Central and Southern California	Endangered	Coastal Strand, Northern Coastal Scrub, Coastal Sage Scrub, wetland-riparian, dunes, coastal (30)
Flowering Plants	Cushenbury buckwheat (<i>Eriogonum ovalifolium</i> var. <i>vineum</i>)	eastern California	Endangered	Creosote Bush Scrub, Pinyon-Juniper Woodland (31)
Flowering Plants	Cushenbury milk-vetch (<i>Astragalus albens</i>)	big bear lake area only	Endangered	Joshua Tree Woodland, Pinyon-Juniper Woodland (32)
Flowering Plants	Cushenbury oxytheca (<i>Oxytheca parishii</i> var. <i>goodmaniana</i>)	Southeastern California	Endangered	Pinyon-Juniper Woodland between 4265 and 7545 feet (33)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Flowering Plants	Del Mar manzanita (<i>Arctostaphylos glandulosa</i> ssp. <i>crassifolia</i>)	Coastal Southern California	Endangered	coastal chapperal (34)
Flowering Plants	Encinitas baccharis (<i>Baccharis vanessae</i>)	Southern California	Threatened	coastal Chaparral (35)
Flowering Plants	Gambel's watercress (<i>Rorippa gambellii</i>)	Distribution in california; range unknown	Endangered	Freshwater Wetlands, Coastal Sage Scrub, Chaparral (36)
Flowering Plants	Hidden Lake bluecurls (<i>Trichostema austromontanum</i> ssp. <i>compactum</i>)	Southern California	Threatened	Lodgepole Forest, Red Fir Forest, Closed-cone Pine Forest, wetland-riparian, lake-margins, edges (37)
Flowering Plants	Kern mallow (<i>Eremalche kernensis</i>)	Central and Southern California	Endangered	Valley Saltbush Scrub natural community, under and around saltbushes (<i>Atriplex</i> spp.); associated herbs include red brome (<i>Bromus madritensis</i> ssp. <i>rubens</i>), red-stemmed filaree (<i>Erodium cicutarium</i>), woolly goldfields (<i>Lasthenia minor</i>), and white Sierran layia (<i>Layia pentachaeta</i> ssp. <i>albida</i>); shrub cover is less than 25% and herbaceous cover is ; elevation ranges from 95 to 275 m; the soil type is alkaline, sandy loam or clay (38)
Flowering Plants	Laguna Beach liveforever (<i>Dudleya stolonifera</i>)	Orange County Coastline	Threatened	Chaparral, Valley Grassland, Foothill Woodland, Coastal Sage Scrub (39)
Flowering Plants	Lane Mountain milk-vetch (<i>Astragalus jaegerianus</i>)	is known from only four populations in the vicinity of Fort Irwin in the Mojave Desert	Endangered	Creosote Bush Scrub, Joshua Tree Woodland (40)
Flowering Plants	Lyon's pentachaeta (<i>Pentachaeta lyonii</i>)	Southern California	Endangered	openings in chapparal and valeey grasland (41)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Flowering Plants	Marcescent dudleya (<i>Dudleya cymosa</i> ssp. <i>marcescens</i>)	Coastal Southern California	Threatened	Chaparral (43)
Flowering Plants	Marsh Sandwort (<i>Arenaria paludicola</i>)	Southern California	Endangered	Freshwater Wetlands, wetland-riparian (42)
Flowering Plants	Mexican flannelbush (<i>Fremontodendron mexicanum</i>)	Central and Southern California	Endangered	Chaparral, Foothill Woodland, Closed-cone Pine Forest (44)
Flowering Plants	Munz's onion (<i>Allium munzii</i>)	Southern California	Endangered	Chaparral, Foothill Woodland, Pinyon-Juniper Woodland, Valley Grassland (45)
Flowering Plants	Nevin's barberry (<i>Berberis nevinii</i>)	S. F. Bay Area and Southern California	Endangered	non-wetland riparian areas; Chaparral, Foothill Woodland, Coastal Sage Scrub (46)
Flowering Plants	Orcutt's hazardia (<i>Hazardia orcuttii</i>)	Southern California	Candidate	Chaparral, Coastal Sage Scrub (47)
Flowering Plants	Orcutt's spineflower (<i>Chorizanthe orcuttiana</i>)	San Diego County	Endangered	open, sandy areas near the coast, Chaparral, Coastal Sage Scrub, Closed-cone Pine Forest (48)
Flowering Plants	Otay mesa-mint (<i>Pogogyne nudiuscula</i>)	San Diego County	Endangered	Vernal Pools in Chaparral, Coastal Sage Scrub, Freshwater Wetlands, wetland-riparian (49)
Flowering Plants	Otay tarplant (<i>Deinandra</i> (= <i>Hemizonia</i>) <i>conjugens</i>)	San Diego County	Threatened	coastal scrub; valley and foothill grassland; clay substrates (50)
Flowering Plants	Parish's daisy (<i>Erigeron parishii</i>)	Southern California	Threatened	Creosote Bush Scrub, Pinyon-Juniper Woodland (51)
Flowering Plants	Pedate checker-mallow (<i>Sidalcea pedata</i>)	Southern California	Endangered	meadows; Yellow Pine Forest, wetland-riparian (52)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Flowering Plants	Peirson's milk-vetch (Astragalus magdalenae var. peirsonii)	San Diego and Imperial Counties	Threatened	Creosote Bush Scrub, dunes (53)
Flowering Plants	Salt marsh bird's-beak (Cordylanthus maritimus ssp. maritimus)	S. F. Bay Area and Southern California	Endangered	Coastal Strand, Coastal Salt Marsh, wetland-riparian; salt-marsh, dunes, coastal (54)
Flowering Plants	San Bernardino bluegrass (Poa atropurpurea)	Southern California	Endangered	Yellow Pine Forest, meadows (55)
Flowering Plants	San Bernardino Mountains bladderpod (Lesquerella kingii ssp. bernardina)	Southern California	Endangered	Yellow Pine Forest, Pinyon-Juniper Woodland (56)
Flowering Plants	San Diego ambrosia (Ambrosia pumila)	Southern California	Endangered	vernal-pools, disturbed; Chaparral, Valley Grassland, Coastal Sage Scrub, Freshwater Wetlands (59)
Flowering Plants	San Diego button-celery (Eryngium aristulatum var. parishii)	Southern California	Endangered	vernal-pools; Valley Grassland, Coastal Sage Scrub, Freshwater Wetlands, wetland-riparian (60)
Flowering Plants	San Diego mesa-mint (Pogogyne abramsii)	San Diego County	Endangered	vernal pool; Chaparral, Coastal Sage Scrub, Freshwater Wetlands, wetland-riparian (61)
Flowering Plants	San Diego thornmint (Acanthomintha ilicifolia)	S. F., San Diego and Central Valley	Threatened	scrub and vernal pools; Chaparral, Valley Grassland, Coastal Sage Scrub, Freshwater Wetlands, wetland-riparian (62)
Flowering Plants	San Fernando Valley Spineflower (Chorizanthe parryi var. fernandina)	Coastal Southern California	Candidate	Coastal Sage Scrub (63)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Flowering Plants	San Francisco lessingia (<i>Lessingia germanorum</i> (=L.g. var. <i>germanorum</i>))	Coastal Southern and Central California	Endangered	Northern and Coastal Scrub; dunes (64)
Flowering Plants	San Jacinto Valley crownscale (<i>Atriplex coronata</i> var. <i>notatior</i>)	Southern California	Endangered	playas, vernal-pools; Alkali Sink, Freshwater Wetlands, wetland-riparian (65)
Flowering Plants	San Joaquin adobe sunburst (<i>Pseudobahia peirsonii</i>)	Southern Central Valley	Threatened	Valley Grassland, Foothill Woodland (66)
Flowering Plants	Santa Ana River woolly-star (<i>Eriastrum densifolium</i> ssp. <i>sanctorum</i>)	Southern California	Endangered	Chaparral, Coastal Sage Scrub, alluvial fans (67)
Flowering Plants	Santa Monica Mountains dudleyea (<i>Dudleya cymosa</i> ssp. <i>ovatifolia</i>)	Coastal Southern California	Threatened	Chaparral, Coastal Sage Scrub (68)
Flowering Plants	Slender-horned spineflower (<i>Dodecahema leptoceras</i>)	Southern California	Endangered	Chaparral, Coastal Sage Scrub, alluvial fans (69)
Flowering Plants	Slender-petaled mustard (<i>Thelypodium stenopetalum</i>)	Southern California	Endangered	Yellow Pine Forest, wetland-riparian; meadows (70)
Flowering Plants	Southern mountain wild-buckwheat (<i>Eriogonum kennedyi</i> var. <i>austromontanum</i>)	southern California	Threatened	Yellow Pine Forest, pebble-plain (71)
Flowering Plants	Spreading navarretia (<i>Navarretia fossalis</i>)	southern California	Threatened	freshwater-marsh, vernal-pools; Shadscale Scrub, Freshwater Wetlands, wetland-riparian (72)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Flowering Plants	Suisun thistle (<i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>)	S. F. and Southern California	Endangered	salt-marsh; Coastal Salt Marsh, wetland-riparian (73)
Flowering Plants	Thread-leaved brodiaea (<i>Brodiaea</i> <i>filifolia</i>)	Mendocino and Southern California	Threatened	vernal-pools; Valley Grassland, Foothill Woodland, Coastal Sage Scrub, Freshwater Wetlands, wetland-riparian (74)
Flowering Plants	Triple-ribbed milk- vetch (<i>Astragalus</i> <i>tricarinatus</i>)	Southern California	Endangered	Creosote Bush Scrub, Joshua Tree Woodland (75)
Flowering Plants	Vail Lake ceanothus (<i>Ceanothus</i> <i>ophiochilus</i>)	Riverside County	Threatened	Chaparral (76)
Flowering Plants	Ventura Marsh Milk- vetch (<i>Astragalus</i> <i>pycnostachyus</i> var. <i>lanosissimus</i>)	Southern California	Endangered	salt-marsh, coastal, wetlands; wetland-riparian (77)
Flowering Plants	Verity's dudleya (<i>Dudleya verityi</i>)	Ventura County	Threatened	Chaparral, Foothill Woodland, Coastal Sage Scrub
Flowering Plants	Willowy monardella (<i>Monardella linoides</i> ssp. <i>viminea</i>)	Coastal Southern California	Endangered	Chaparral, Closed-cone Pine Forest riparian (78)
Flowering Plants	Yellow larkspur (<i>Delphinium luteum</i>)	S. F. Bay area and Los Angeles	Endangered	Coastal Prairie, Chaparral, Northern Coastal Scrub (79)
Insects	Caseys June Beetle (<i>Dinacoma caseyi</i>)	Palm Springs	Proposed Endangered	fine silts and sands (80)
Insects	Delhi Sands flower- loving fly (<i>Rhaphiomidas</i> <i>terminatus</i> <i>abdominalis</i>)	San Bernadino County	Endangered	Dehli Sands only (81)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Insects	El Segundo blue butterfly (<i>Euphilotes battoides allyni</i>)	Los Angeles County	Endangered	coastal sand dunes (82)
Insects	Laguna Mountains skipper (<i>Pyrgus ruralis lagunae</i>)	San Diego County	Endangered	host plant <i>Horkelia clevelandii</i> or <i>Potentilla glandulosa</i> ; restricted range in Laguna, Cuyamaca, and San Jacinto Mountains of California, and northwestern Baja California, Mexico (83)
Insects	Palos Verdes blue butterfly (<i>Glaucopsyche lygdamus palosverdesensis</i>)	Los Angeles County	Endangered	host plants <i>Astragalus trichopodus lonchus</i> , <i>Lotus scoparius</i> (deerweed) within disturbed patches in coastal sage scrub communities throughout the Palos Verdes peninsula (84)
Insects	Quino checkerspot butterfly (<i>Euphydryas editha quino</i> (=E. e. <i>wrighti</i>))	San Diego and Riverside Counties	Endangered	found in association with topographically diverse open woody canopy landscapes including coastal sage scrub, open chaparral, juniper woodland, and native grassland (85)
Mammals	Buena Vista Lake ornate Shrew (<i>Sorex ornatus relictus</i>)	Southern Central Valley	Endangered	found associated with mesophytic (moist vegetative) communities; areas with a dense mesophytic cover and an abundant layer of litter; associated with Fremont cottonwood, willows, alkali heath, wild rye grass, and Baltic rush (86)
Mammals	Pacific pocket mouse (<i>Perognathus longimembris pacificus</i>)	Southern California	Endangered	fine-grain, sandy substrates in open coastal sage scrub, coastal strand, coastal dune, and river alluvium habitats (87)
Mammals	Palm Springs round-tailed ground Squirrel (=Coachella Valley) (<i>Xerospermophilus tereticaudus chlorus</i>)	Salton Sea	Candidate	areas where hummocks of sand accumulate at the base of large shrubs that provide burrow sites and adequate cover; areas of coarse sands associated with washes; transitions between dunes and creosotebush; may feed in cultivated fields and lawns (104)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Mammals	Peninsular bighorn sheep (<i>Ovis canadensis nelsoni</i>)	Southern California	Endangered	east facing, lower elevation slopes of the Peninsular Ranges along the northwestern edge of the Sonoran Desert; steep topography is required for lambing and rearing habitat and for escaping from predators; open terrain with good visibility is critical for predator avoidance; in the hot, arid habitat, water availability in some form is critical; a wide range of forage resources and vegetation associations is needed (88)
Mammals	Riparian brush rabbit (<i>Sylvilagus bachmani riparius</i>)	Southern California	Endangered	dense, brushy areas of Valley riparian forests, marked by extensive thickets of wild rose (<i>Rosa</i> spp.), blackberries (<i>Rubus</i> spp.), and willows (<i>Salix</i> spp.); mats of low-growing vines and shrubs where they build tunnels under and through the vegetation (89)
Mammals	Riparian woodrat (=San Joaquin Valley) (<i>Neotoma fuscipes riparia</i>)	Oregon, California, Baja	Endangered	Arboreal; evergreen or live oaks and other thick-leaved trees and shrubs; most numerous where shrub cover is dense and least abundant in open areas; willow thickets with an oak overstory (90)
Mammals	San Bernardino Merriam's kangaroo rat (<i>Dipodomys merriami parvus</i>)	Southern California	Endangered	alluvial scrub/coastal sage scrub habitats on gravelly and sandy soils adjoining river and stream terraces, and on alluvial fans; rarely in dense vegetation or rocky washes (91)
Mammals	Stephens' kangaroo rat (<i>Dipodomys stephensi</i> (incl. <i>D. cascus</i>))	Southern California	Endangered	intermediate successional stage grassland communities characterized by moderate to high amounts of bare ground, high forb cover, moderate slopes, and well-drained soils; prefers grassland communities dominated by herbaceous plants rather than by annual grasses (92)
Mammals	Tipton kangaroo rat (<i>Dipodomys nitratoides nitratoides</i>)	Southern Central Valley	Endangered	iodine bush shrubland (Valley Sink Scrub) and Valley Saltbush Scrub; terrace grasslands devoid of woody shrubs, sparse-to-moderate shrub cover is associated with populations of high density; burrow systems are in open areas; burrows in slightly elevated mounds, the berms of roads, canal embankments, railroad beds, and bases of shrubs and fences; soft soils, such as fine sands and sandy loams, and powdery soils of finer texture and of higher salinity (93)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

Group	Name	Population	Status	Habitat
Reptiles	Coachella Valley fringe-toed lizard (<i>Uma inornata</i>)	Coachella Valley, Riverside County	Threatened	Sparsely-vegetated arid areas with fine wind-blown sand, including dunes, washes, and flats with sandy hummocks formed around the bases of vegetation; loose sand for burrowing (94)
Reptiles	Desert tortoise (<i>Gopherus agassizii</i>)	Southern California	Threatened	firm ground to dig burrows, or rocks for shelter ; arid sandy or gravelly locations along riverbanks, washes, sandy dunes, alluvial fans, canyon bottoms, desert oases, rocky hillsides, creosote flats and hillsides (95)
Reptiles	Giant garter snake (<i>Thamnophis gigas</i>)	Central Valley	Threatened	marshes, sloughs, drainage canals, and irrigation ditches, especially around rice fields, and occasionally in slow-moving creeks; locations with vegetation close to the water (96)
California State Species of Special Concern				
Group	Name	Population	Status	Habitat
Birds	western yellow-billed cuckoo (<i>Coccyzus americanus occidentalis</i>)	Western US	Endangered	forested or shrub/scrub riparian areas (97)
Birds	Inyo California Towhee (<i>Pipilo crissalis eremophilus</i>)	Inyo County	Endangered (also Federal)	desert riparian areas (98)
Mammals	Sierra Nevada bighorn sheep (<i>Ovis canadensis sierrae</i>)	Sierra Nevada Mountains	Endangered	exhibit seasonal movement patterns to meet varying needs for food, water and safety; summer - alpine and sub-alpine zones from 10,000 ft to 14,000 ft.; open slopes where the terrain is rough and rocky with sparse vegetation and steep slopes and canyons; winter - high windswept cliffs or lower elevations down to 4800 ft in order to find forage on the sagebrush-steppe slopes (99)
Mammals	Amargosa Vole (<i>Microtus californicus scirpensis</i>)	Southern California	Endangered (also Federal)	mesic areas, wetlands (100)

Table F-1. Threatened and Endangered Species and California Species of Special Concern (Continued)

California State Species of Special Concern				
Group	Name	Population	Status	Habitat
Mammals	San Joaquin kit fox (<i>Vulpes macrotis mutica</i>)	Central Valley	Endangered	grasslands and scrublands with active oil fields, wind turbines, and an agricultural matrix of row crops, irrigated pasture, orchards, vineyards, and grazed annual grasslands (nonirrigated pasture); Northern Hardpan Vernal Pool, Northern Claypan Vernal Pool, Alkali Meadow, and Alkali Playa, Valley Sink Scrub, Valley Saltbush Scrub, Upper Sonoran Subshrub Scrub, and Annual Grassland; Interior Coast Range Saltbush Scrub, Valley Oak Woodland (101)
Mammals	giant kangaroo rat (<i>Dipodomys ingens</i>)	Central Valley	Endangered	grassland and shrub communities on a variety of soil types and on slopes up to about ; preferred habitat - annual grassland communities on gentle slopes of generally less than 10 percent, with friable, sandy- loam soils; Upper Sonoran subshrub scrub associations (102)
Reptiles	blunt-nosed leopard lizard (<i>Gambelia sila</i>)	Central Valley	Endangered	open, sparsely vegetated areas of low relief on the San Joaquin Valley floor and in the surrounding foothills; Nonnative Grassland and Valley Sink Scrub communities; shrubs of the family Chenopodiaceae, such as iodine bush, and seepweeds; Valley Needlegrass Grassland, Nonnative (Annual) Grassland, and Alkali Playa communities including purple needlegrass (<i>Nassella pulchra</i>) and alkali sacaton; Valley Saltbush Scrub, chenopod shrubs, common saltbush (<i>Atriplex polycarpa</i>) and spiny saltbush (<i>Atriplex spinifera</i>) (103)

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