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Fish and Wildlife Service

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The U.S. Fish and Wildlife Service has reviewed the biological assessment and evaluation (BA&E) for the proposed Carlota Copper project. Your February 6, 1995, request for formal consultation was received on February 7, 1995. This document represents the Service's biological opinion on the effects of the Carlota Copper project on the endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*) and Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended, (16 U.S.C. 1531 *et seq.*).

This biological opinion is based on information provided in the BA&E (Cedar Creek Associates, Inc., 1994/1996), the "Draft Environmental Impact Statement Carlota Copper Project" (DEIS) (Tonto National Forest, January 1995), Spill Control and Hazardous Material Management Plan (SCHMMP), Revision 1 (Carlota Copper Company, January 1996), Carlota Copper Project Final Design of Heap Leach Pad and Ancillary Facilities (Knight Piesold, 1995/1996), Draft Biological Mitigation Plan for the Carlota Copper Project on the Tonto National Forest (Cedar Creek Associates, Inc., March 1996), Conservation Assessment and Plan for the Arizona Hedgehog Cactus (*Echinocereus triglochidiatus* var. *arizonicus*) (Tonto National Forest, 1996), technical memoranda, and various other reports, meetings, and information submitted to the Service. A complete administrative record of this consultation is on file in this office.

It is the Service's biological opinion that the Carlota Copper Project, as proposed, is not likely to jeopardize the continued existence of the lesser long-nosed bat or Arizona hedgehog cactus. No critical habitat has been designated for these species, therefore, none will be affected.

CONSULTATION HISTORY

The Service has been informally consulting on this project since April, 1992. The 90-day formal consultation period began on February 7, 1995, the date your request was received by the Arizona Ecological Services Field Office. Notice of that receipt was sent to you in a letter dated

February 15, 1995. A request to add the lesser long-nosed bat and the bald eagle (*Haliaeetus leucocephalus*) to the formal consultation for the Carlota Copper project was received by the Service on April 25, 1995. On May 11, 1995, the Department of the Interior submitted comments to the Forest Service on the DEIS. The DOI concluded that the DEIS was inadequate and recommended that it be supplemented prior to issuance of a final Environmental Impact Statement. On May 11, 1995, the Service submitted comments regarding the Army Corps of Engineers' November 9, 1994, public notice 94-40899-KLR. The Service's comments regarding the permit issuance for public notice 94-40899-KLR concluded that the proposal would result in substantial and unacceptable impacts to aquatic resources of national importance. The Service also stated that the notice had not clearly demonstrated that alternatives to the project did not exist.

On June 16, 1995, the Service received notice that the Forest Service was withdrawing its request to include the bald eagle in the formal consultation. The Forest Service made the determination that the proposed Carlota Copper project may affect but is not likely to adversely affect the bald eagle. The Service concurs with the Forest Service's finding under the following conditions:

- 1) The Service will be contacted within 2 working days in the event of a spill or leak, and
- 2) A completed baseline bioaccumulation study is forwarded to the Service before the heap leach pad is put into operation. This study was completed by W.J. Miller and Associates (Miller, 1995).

On June 19, 1995 (day 132 of the consultation), the Forest Service and Carlota Copper Company requested the consultation be put on hold until additional information could be collected and incorporated into a more comprehensive mitigation plan for the Arizona hedgehog cactus. On April 24, 1996, a draft biological mitigation plan, conservation assessment and plan for the Arizona hedgehog cactus, revised spill plan, and changes to the project description was formally received by the Service and the consultation was resumed.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The following summary of the proposed action is drawn from project descriptions in the BA&E, DEIS, and additional changes provided by the Forest Service and Carlota Copper Company. The Carlota Copper Company is proposing to mine and process copper with facilities that include three open pits, three surface mine rock disposal areas, two heap-leach pads, a pregnant leachate solution (PLS) pipeline, a solvent-extraction/electrowinning (SX/EW) processing plant, a well field, raffinate pond, water pipeline, mine shop, warehouse, crusher/conveyor/stockpile and secondary crushing areas, administration building, laboratories, parking, sewage

treatment/disposal systems, access/haul/miscellaneous roads, powerlines, stormwater drainage control ditch, sediment control structures, permanent diversion channels in both Pinto Creek and Powers Gulch and water, fuel, and reagent tanks. A total of 1,428 acres will be disturbed within a 3,050-acre project area over a 23-year period. Reclamation activities will include closure of the leach pad in compliance with Federal and State regulations, removal of structures, partial pit backfill, protection of natural stream channels and diversion channels, and recontouring and revegetation of disturbed areas. Mine closure will be completed within two to three years following the end of operations and reclamation. The mine's operations are scheduled to conclude in approximately 2010.

The proposed project consists of open-pit mining using conventional techniques including blasting, truck hauling from the pit to the crusher, and conveyor transport from the crusher to the leach pads. Ore processing includes "curing" with sulfuric acid and leaching to produce a copper-bearing solution. The raffinate (barren solution) is applied to the leach pad, collected in an internal pond, and then pumped to the SX/EW plant for production of high quality copper cathodes.

The Carlota/Cactus pit will be located on the east side of the proposed project area and oriented in a southeast-northwest direction. The placement of this pit spans Pinto Creek and requires the diversion of the natural channel. The pit dimensions will be 5,000 feet long by 3,200 feet wide, and the ultimate pit-bottom elevation will range from approximately 2,950 to 2,850 feet above mean sea level(ft-amsl) or 500 to 650 feet below the present elevation of Pinto Creek (approximately 3,520 ft-amsl). Additionally, the Eder South pit, and Eder North pit will be smaller and cut into the side of the hill slope that forms the west side of Powers Gulch.

The proposed Carlota/Cactus pit is scheduled to be mined in five phases, the Eder South pit in at least three phases, and the Eder North pit in a single phase. Mining will begin in the Cactus area comprising the southeast portion of the pit and will move in a northwest direction in the subsequent phases. Ore mining in the Carlota/Cactus pit will be completed at the end of year 13, with production from the Eder pits beginning in year 8 of the project. A total of 100 million tons of ore and annual copper production of 33,000 tons is expected for the life of the mine.

Preproduction stripping occurs during construction and Project Year 1 will be the first full year of ore mining and copper production. The schedule was developed at a nominal production rate of 7 million tons of ore per year, with adjustments up and down to attempt to stabilize copper production at approximately 33,000 annual tons. The 7 million tons of ore per year equate to a daily production rate of approximately 20,000 tons. Total material moved during the first 8 project years averages 25 million tons per year (an average of 69,000 tons per day) and increases to 26 million tons per year in project years 9 and 10.

The Carlota/Cactus pit spans Pinto Creek, and development of the pit requires diverting the creek around the east and north of the Cactus side of the pit. The design of the first phase of the pit includes additional stripping to push back the pit wall in order to place the diversion channel on a bench in the pit. The diversion channel conveys both flood waters and sediments

around the east and north side of the Cactus portion of the pit. The diversion will be approximately 5,250 feet long and contain a series of engineered grade control structures and alluvium. The elevation of the channel inlet at the south end of the pit will be approximately 3,560 ft-amsl, and the elevation of the channel outfall will be approximately 3,480 ft-amsl. The slope of the diversion channel will be similar to that of the existing Pinto Creek drainage, averaging approximately 1.5 percent. Approximately 5,400 feet of Pinto Creek will be permanently displaced by the Carlota/Cactus pit. The diversion channel will be placed on a bench up to approximately 150-feet wide within the pit. The channel itself will have a minimum bottom width of 60 feet and channel side slopes at 0.5H:1V. As much of the channel as possible will be placed in competent Pinal Schist bedrock to provide a permanent stable base for the diversion, and a soil cement lining will be provided on the channel bottom and sides as necessary to afford scour protection. The lining will be a maximum of four feet on the channel bottom and eight feet on the sides. This diversion will be the permanent alignment of Pinto Creek through the pit area after mining is concluded. Designs and modifications will be evaluated and implemented as necessary to ensure long-term post-closure functioning. The southeast portion of the pit, around which the diversion channel flows, will be backfilled and buttressed with mine rock from later phases of the Carlota/Cactus pit. This backfill material will buttress the channel and slopes upward to a top elevation of approximately 3,600 ft-amsl. A wetland area also will be created at the head end of the Pinto Creek diversion.

There will be three surface mine rock disposal areas and partial backfill of the Carlota/Cactus and Eder pits during the life of the mining operation. The disposal areas for the Carlota/Cactus mine rock will be the Main mine rock disposal area in the drainage area north west of the pit with the capacity of 115 million tons and a final elevation of 4,160 ft-amsl, and the Cactus Southwest mine rock disposal area in a small drainage southwest of the pit with a capacity of 27.5 million tons with an elevation of 4,360 ft-amsl. The Cactus pit backfill in the eastern end of the Carlota\Cactus pit will have a capacity of 51.5 million tons and an elevation of 3,600 ft-amsl. The Eder mine rock disposal area, located on the slope between the Eder North and South pits will have a capacity of 17.1 million tons with an elevation of 4,240 ft-amsl. The backfill material will be placed in the eastern portion of the mined-out pit along the western side of the Pinto Creek diversion channel. The backfill buttresses the in-pit side of the diversion channel and reduces the amount of material otherwise destined for the Main rock dump. A partial backfilling of the Eder pits in the last two years of the project using material from the Eder rock dump will be part of the project reclamation.

Open-pit mining will be conducted with hydraulic shovels and trucks to haul the ore to a crusher site and the mine rock to the disposal areas. The ore crushing facilities include a gyratory primary crusher and a cone secondary crusher capable of handling the entire 7 million tons per year of ore. The gyratory crusher will be located adjacent to the pit with an overland conveyer to transport the primary-crushed ore to a coarse-ore stockpile. The primary-crushed ores will be claimed from the coarse-ore stockpile and secondary crushed prior to placement on the heap-leach pad. The ore from the Eder pits will be primary-crushed at a portable crushing facility temporarily located at the mouth of the Eder South pit and either conveyed or trucked and dumped on the leach pad.

Dewatering of the pits may be required throughout the life of the mining operation. The ground water that exists in the pit areas tends to be fault-and fracture-controlled. Dewatering wells and mine pit sumps will both be used to control ground water in the pits. The heap-leach facilities were designed based on an annual production of 7 million tons per year of ore with a total reserve of 100 million tons and an ore density of 110 pounds per cubic foot.

The leach facilities include two valley-leach pads with internal PLS ponds, a raffinate pond location adjacent to the SX/EW plant, and the associate diversion channels. The main heap-leach pad will be constructed in two stages (Stages 1 and 2) and the north heap-leach pad will be constructed in Stage 3. Stage 1 will have adequate storage capacity for the first 2 years of operation and Stage 2 will require completion of construction of the main pad. Stage 3 construction of the north pad will start anytime after Stage 2 and may begin as late as year 9 of operations.

Areas within the pads that do not typically impound process fluids will have a liner system consisting of 12 inches of prepared subgrade overlain by a 60-mil high-density polyethylene (HDPE) liner. In areas where process fluids will be impounded, the liner system will consist of 12 inches of prepared subgrade overlain by a leachate collection and recovery system (LCRS) consisting of 12 inches of -1/2 inch crushed drain gravel sandwiched between 60 mil HDPE primary and secondary liners.

In areas of heavy traffic and/or where the heap is higher than 350 feet, a 12-inch protective layer consisting of mill tailing will be placed on the 60-mil HDPE primary liner. An 8-ounce (oz) non-woven geotextile will be placed on top of the protective layer to act as a fines barrier.

A spine drain system consisting of central spine and finger drains will be placed under the HDPE liner system to lower the phreatic surface of the local alluvial groundwater for both the main and north heap leach pads. The central spine and finger drains will consist of an open french drain system augmenting the existing gravels and alluvium in the main drainage of the pads. The in situ alluvial drain gravel will be left in place as much as possible. The central spine drain will be augmented with an 8-inch diameter perforated corrugated polyethylene tube (CPT) and the finger drains with a 4-inch diameter perforated CPT. Each drain will be encased in geotextile to prevent migration of fines into the drain and the in situ drain gravel replaced around the drain pipe may be screened, if necessary, to remove excess fines. Flow carried by the underdrain system will be transmitted under the leach pad (PLS) embankments via a concrete-encased outlet pipe to the underdrain collection pond.

The central spine drain for both pads will be located in the topographic low of Powers Gulch and the main drainage of the north pad. The central spine drain will extend along the entire length of the drainage within the basin of each pad. The finger drains will augment the central spine drain and will be located in side depressions which currently convey runoff into the main drainage of each pad.

The inlet control structure, located on the south side of the main heap leach pad, will be constructed with a cutoff trench founded in competent bedrock. This structure will minimize seepage of alluvial flows found in Powers Gulch, upstream of the main heap leach pad, thus preventing upstream alluvial flow from entering the spine drain system. In the unlikely event seepage is emitted from the inlet control structure or head of the diversion channel, the central spine drain will collect and transmit the flow to the underdrain collection pond for collection and monitoring. The central spine drain for the north pad extends to the head of its main drainage and no alluvial flow will be conveyed through the central spine drain from outside of the pad.

A 60-mil HDPE lined underdrain collection pond will be constructed downstream of the terminal embankments for the north and main pad facilities. These ponds will allow collection and monitoring of flow from the central spine and finger drains. In the event flow is transmitted to the underdrain collection ponds, the water will be pumped back to the heap leach pad for containment. As a protective measure, limestone will be placed on the downstream face of the main and north PLS embankment random fill zones, along the downstream face of the embankment foundation excavations, and at the spillway outlet of the underdrain collection ponds.

The solution collection system within the pad will consist of crushed ore, 6-inch or 2-inch minus material, with an internal drainage pipe network which will be placed directly over the protective layer/geotextile and the primary liner. The overliner material will be placed to enhance drainage immediately above the liner system. Solutions collected from the heap leach pad will be transmitted to the PLS ponds in the existing main drainages located in the center of the pads. All solution will flow by gravity directly to reclaim sumps (perforated HDPE pipe) located in reclaim structures immediately upstream of the main and north pad embankments. Process solutions from the PLS ponds will be pumped to the plant for copper extraction or will be recycled to the raffinate pond and back to the pad for pregnant solution building.

The PLS ponds are located at the lower end of the leach pads immediately upstream of the terminal embankments. The main pad embankment is sited in Powers Gulch drainage and the north embankment is sited within the north pad main drainage, which eventually meets with the Powers Gulch drainage downstream of the main embankment. Both ponds have been designed to optimize available space and to allow gravity solution flow from the leach pad to the pond. The PLS ponds will handle the required operational volumes, determined from the water balance, and the 100-yr/24-hr precipitation event with a 6-hour draindown. Both ponds will be double-lined, however, the double liner will only be deployed to an elevation equal to the average of 30 maximum operational volumes of the pond.

The embankments are designed as zoned earthfill/rockfill structures. Each embankment has a minimum crest width of 20 feet and upstream and downstream slopes of 2.5H:1V. The main PLS embankment has a maximum elevation of 3,824 feet, a maximum height of 103 feet and may impound up to 124.4 million gallons of process solutions and stormwater, excluding freeboard (3 feet). The north PLS embankment has a maximum elevation of 3,859 feet and a

maximum height of 98 feet. Excluding freeboard, the north PLS embankment can impound up to 32.5 million gallons of process solutions and stormwater.

The raffinate pond is located south of and below the plant site and above the heap leach pad. It will be a double-lined pond with an LCRS. An embankment has been sited in the bottom of one of the tributary drainages of Powers Gulch adjacent to the proposed plant site. Excluding freeboard, the pond will be able to contain 2.5 million gallons of process solutions. The embankment is a zoned rockfill/earthfill embankment with crest elevation of 3,897 feet, maximum height of 37 feet, a maximum crest width of 20 feet, an upstream slope of 2.5H:1V, and a downstream slope of 2H:1V.

The plant PLS/SX pond is also south and downgradient of the plant site and upgradient of the heap-leach pad and will act as a surge pond for plant feed. It will store approximately one million gallons of process solutions, excluding freeboard. The plant PLS/SX pond is located in the bottom of the tributary drainage which houses the raffinate pond. It is situated upstream of the raffinate pond which adds a level of solution control redundancy to the overall design by providing potential downstream surge in the event of failure in the raffinate pond and ultimately in the pad. In the unlikely event of failure of the plant PLS/SX pond embankment, solutions would be routed to the raffinate pond and to the main pad PLS pond. The plant PLS/SX pond embankment is a zone earthfill/rockfill structure, with a crest elevation of 3,918 feet, maximum embankment height of 33 feet, a crest width of 40 feet, and upstream and downstream slopes of 2.5H:1V.

All embankments for all ponds have a synthetically-lined face followed by a 12-foot clay/silt seal zone which is keyed into the bedrock in the embankment foundation. The chimney drains for the main and north PLS pond embankments will consist of a 2-foot-wide layer consisting of pit-run gravels. Also, 8-oz. non-woven geotextile will be placed on the upstream and downstream sides of this zone to prevent piping. The chimney drain for the raffinate and plant PLS/SX pond will consist of 4-inch-diameter perforated CPT spaced on 30-foot centers wrapped in geotextile. To prevent piping at the raffinate and plant PLS/SX pond embankment, a layer of geotextile will be placed between random fill and seal zone materials. All embankments will have a random fill zone consisting of mine waste or rockfill obtained from borrow excavations.

As described above, all ponds have been designed as double-lined facilities with an LCRS. The LCRS in each pond terminates in a collection trench located along the toe of the respective embankments. This collection trench meets with an LCRS sump (10-inch-diameter solid HDPE pipe) which will act as an annulus for submersible pump insertion should the need arise. Both the raffinate and plant PLS/SX ponds are double-lined throughout.

The double-liner system for the main and north PLS ponds consists of a 60 mil HDPE secondary liner overlain by 12 inches of 1/2 inch drain gravel and a 60 mil HDPE primary liner. The liner system described will be placed on 12 inches of prepared subgrade. The double-liner system for the raffinate and plant PLS/SX ponds consists of a 40 mil HDPE secondary liner

overlain by a geonet and a 60 mil HDPE primary liner. This liner system will also be placed on 12 inches of prepared subgrade.

Process solution contained within the main PLS pond will be delivered to four 48-inch-diameter HDPE sumps (one of which will act as a dedicated backup). The north PLS pond will have the process solutions delivered to two 48-inch-diameter HDPE sumps (one of which will act as a dedicated backup). The sumps are located within reclaim structures located slightly upstream of the PLS embankments. The reclaim structures will consist of highly permeable crushed ore with minimal fines (less than 5 percent passing the No. 200 sieve). A siltation trap has been included at the base of each sump. Each sump will be equipped with a submersible pump which has a design capacity of 3,300 gpm for the main PLS pond and a 1,100 gpm capacity for the north PLS pond. The maximum design flow for the main pond is 9,000 gpm, and 1,650 gpm for the north pond. The solution will be pumped to the plant PLS/SX pond for processing back to the pad, depending upon pregnant solution building requirements.

The solution recovery system for the raffinate and plant PLS/SX ponds consists of five horizontal centripetal pumps sited downstream of the raffinate embankment. Each pump will be capable of pumping 3,300 gpm. Both ponds will have two pumps in operation at all times. The additional pump will provide standby pump capacity in the event of mechanical failure. Solutions from the raffinate ponds will be applied to the heap and plant PLS solutions will be pumped back to the SX/EW plant for processing.

Runoff from undisturbed areas upgradient of the leach pad and process ponds will be diverted around the heap-leach facility. Diversion channels will be built during initial construction of the leach pad and ponds. All diversion channels within the heap-leach facility are designed to pass the runoff from the 100-yr/24-hr storm event. The main diversion consists of a channel and an inlet control structure. As designed, flows will be routed through the inlet control structure and directed to the main channel which carries diverted flows for a distance of approximately 6,700 feet, along the west side of Powers Gulch adjacent to the heap-leach pad, and discharges this flow to the existing drainage downstream of the facility. The channel has been designed as a trapezoidal-shaped, shotcrete/bedrock-lined structure. In conjunction with the inlet control structure, the channel has the capacity to safely pass the 100-yr/24-hr storm event runoff, and the low flow channel may pass up to 56 cfs.

All ore mined from the Carlota/Cactus pit will be processed through the primary crusher site, the secondary crusher site and eventually transferred to the heap. Ore on the pad will be leached by raffinate pumped from the raffinate pond. The resulting PLS will be collected and processed through the SX/EW plant for copper cathode production (See DEIS for more specifics on ore processing). The mine facilities and warehouse area will be located on a leveled pad 750 ft by 350 ft, directly north of the Carlota/Cactus pit and to the west of the primary crushing facility. The building will be a pre-engineered steel structure and will accommodate the mine equipment warehouse, additional process plant warehouse space, mine operation and engineering offices, field storage and distribution, and equipment ready line. The overall process area which includes the SX/EW plant, raffinate pond, and buffer areas will cover 29 acres. The

administration building will be located east of the Carlota/Cactus pit and adjacent to the main access road to the project site. Privately-owned employee vehicles will not be allowed beyond the employee parking lot and employees will be picked up at the administration building area in company vans or buses and transported to their work areas in the mine or process areas. Information regarding additional facilities necessary for the project including sanitary and solid waste disposal facilities can be found in the DEIS.

The sediment and stormwater control plan will meet Federal and State requirements for the protection of water quality. The waste rock dumps will be constructed so that rainwater will temporarily contained on the top surface and not allowed to discharge until it meets state and federal discharge criteria. Various ditches and berms will direct rainwater falling on the sides of the sides of the waste dumps to control structures such as sediment ponds or silt fences and not allow discharge until it meets state and federal discharge criteria. Specific diversion designs will be reviewed and approved by the Forest Service for these configurations during project permitting and construction.

To minimize the potential for increased sediment yield that may be attributed to areas of disturbance, all or a combination of the following basic erosion and sediment control best management practices (BMP's) will be used. In addition to recontouring and revegetation, these measures include (1) sloping mine access and haul roads into the hillside to prevent erosion of the fill embankment and to promote deposition of road sediments within the roadway grader ditches; (2) installing sediment barriers to intercept and retain sediment immediately downslope from the disturbance site (typical examples include barriers of brush, straw bales, and silt fences); (3) constructing temporary diversion dikes that can divert surface runoff away from the unprotected slopes of disturbed areas; (4) designing and constructing perimeter berms at the top of the rock dumps to maintain a limited ponding capacity at those locations; and (5) installing temporary sediment traps or basins that can be sized to accommodate sediment discharge from one or more subbasins. Mine facility areas will be graded to minimize erosion and limit surface runoff. These areas will be maintained on an as-needed basis to provide continued effective drainage control. On primary roads, a series of ditches and culverts will be established to collect and convey surface runoff.

The mine will require approximately 750 gallons per minute (gpm) of water during its operation (1,210 acre-feet per year) with a peak demand of 1,200 gpm during dry months. The water will be obtained from three sources; pit dewatering, well field and low-quality water from the Pinal Creek Remediation Group. The pit dewatering will initially produce little water but as the pit deepens, an estimated 200 gpm may be produced. The water will be obtained from sump pumps and/or wells adjacent to the Carlota/Cactus pit. The well field is located about 1-2 miles north of the mine along the lower portion of Haunted Canyon and along Pinto Creek. It is about 8 acres in size and consists of 3 to 5 production wells, pipelines, pump station, powerline and access road. Currently, 3 exploration wells have been drilled to a depth of about 1,000 feet and field tests indicated pumping rates of 75-600 gpm per well were achievable. Pump tests also indicated a potential interconnection between surface water and the wells. Completion of the well field will be conducted in a manner which minimizes potential impacts to surface flow. To

satisfy make-up water needs with the least impact on clean water in the watershed, Carlota is entering into an agreement with the Pinal Creek Remediation Group to acquire up to 1,000 gpm of low-quality water from the Cottonwood Pond at BHP-Magma's Pinto Valley Mine. This water is pumped from Pinal Creek under a State-approved plan to remediate historic contamination of groundwater by mining in the Glove-Miami area. A pipeline will be constructed from the pond, around the Cottonwood Tailings Dump at the Pinto Valley Mine and the Carlota/Cactus Pit to the raffinate pond at the Carlota Mine. This water will be used based on need and availability.

In addition to the water wells, monitor wells will be constructed as required in the Groundwater and Surface Water Monitoring Plan of the DEIS for the project. These wells will be used to monitor water quality under State permits and to determine impacts from pit dewatering and well field pumping on ground and alluvial water level elevations and to provide data for monitoring potential impacts to surface water.

Ground water will be pumped from the wells into a header or collection pipe that conveys the water to a holding tank near the confluence of Pinto Creek and Haunted Canyon. A booster pump located near the holding tank will pump water uphill to the SX/EW plant (a total elevation difference of approximately 700 feet). The header piping will be approximately 0.6 mile long while the main water supply pipeline from the booster pump to the SX/EW plant will cover a straight-line distance of approximately 1.3 miles. Because of the elevation difference and intervening terrain, the main water line will follow a longer circuitous path. The pipeline corridor will cross Haunted Canyon in the vicinity of the southernmost water well and proceed to the south, up a small drainage that starts at the junction of Pinto Creek and Haunted Canyon. The head of this small drainage is directly adjacent to the northwest boundary of the Main rock dump. The pipeline will proceed to the SX/EW plant area, through the Main rock dump area (either buried under one of the upper lifts or routed along one of the benches and along the ridge that divides Pinto Creek from Powers Gulch). A 320,000-gallon water storage tank will be located on a ridge northwest of the Main mine rock disposal area, and will store adequate water for normal operations and reserve water in case of fire. For further information on access roads and placement see DEIS. In addition, a power line will be installed that will result in the disturbance of 6 acres (See DEIS for specifics).

During the operational life of the mine, Carlota will need current, a NPDES Stormwater Pollution Prevention Plan (SWPPP) as required by the Clean Water Act and an Aquifer Protection Permit (APP) approved by the Arizona Department of Environmental Quality. The SWPPP will require Best Management Practices to minimize soil erosion using measures such as rock check dams, straw bales and siltation fences. At closure, sediment ponds will be replaced with appropriate non-water retaining controls. The APP will require Best Available Demonstrated Control Technology to prevent contamination of subsurface aquifers and will require a final Closure Plan for the operation. The Forest Service will incorporate a Reclamation and Closure Plan (RCP) as part of the final approved Plan of Operations. The RCP requires that salvageable soil will be removed from areas to be developed. Salvage will be from slopes up to 40% with consideration of equipment safety. The salvaged soil will be stored in stockpiles located out of the way of future disturbance, stabilized, and seeded to protect is from

wind and water erosion and to retain soil microbes. The RCP will be reviewed and updated annually. During the life of the mine, areas where operations have been completed will be reclaimed. Revegetation will be with native plant species as long as success criteria can be met. A reclamation bond will be posted by Carlota Copper Company as required by Forest Service regulations and the State will require financial assurances as part of their APP permit. The closure and reclamation costs for which financial guarantees are required are estimated to be in excess of \$10,000,000.

As part of the proposed action, a "Biological Mitigation Plan for the Carlota Copper Project on the Tonto National Forest" is included within the project description. This plan describes various actions to avoid, minimize, and/or mitigate project related impacts to the environment, and are required aspects of the implementation of the proposed project. This plan identifies specific mitigation actions which include establishing baseline data points and subsequent monitoring requirements, and criteria for determining effects of project impacts and/or the effectiveness of the mitigation actions. The mitigation plan provides a detailed account of these actions. An additional document, "Wetlands and Waters of the U.S. Compensatory Mitigation Plan for the Carlota Copper Project" will detail, when available, the monitoring/mitigation requirements under the Clean Water Act, section 404.

Following is a brief summary of the primary components of the mitigation plan, with emphasis on Arizona hedgehog cactus.

Biological Mitigation Plan for the Carlota Copper Project on the Tonto National Forest

1) Measures for Other Resources which Affect Biota

- Use of BADCT for leach pad design.
- Development and implementation of a SCHMMP.
- Measures to mitigate air quality impacts.
- Measures to mitigate water resources impacts.

2) Measures for Arizona Hedgehog Cactus

Monitor for adverse sulfuric acid effects.

Identify and monitor cacti susceptible to sulfuric acid emissions from either the heap leach pad or the SX/EW plant facilities.

Observational and photo data will be collected for the 33 cacti potentially subjected to the greatest sulfuric acid mist concentrations. Data will be recorded for these cacti and a control group which will document chronic evidence of necrotic tissue, pitting, burning, or discoloration due to effects of sulfuric acid deposition. This monitoring will occur year 0 through year 5. Monitoring will end year 6 if no effects have been observed.

Erect and monitor disturbance area markers.

The perimeter of the clearing limits in Arizona hedgehog cactus occupied habitat must be marked and occasionally inspected during operations to ensure that the integrity of a protected area (buffer) is maintained.

Prior to ground disturbing activities, supervisory and construction personnel will be instructed as to the intent and importance of these markers and that any activity beyond their limits is prohibited.

Periodically inspect Arizona hedgehog cactus proximal to disturbances.

A group of at least 151 cacti have been identified within 200 feet of the proposed Eder pits, Powers Gulch diversion, or within 100 feet of proposed roads. These cacti must be periodically monitored to determine if additional losses occur as a result of indirect impacts.

Each plant will be inspected once each year only for those years in which blasting has occurred within 200 feet of the specimens.

Arizona hedgehog cactus test plots.

Where avoidance of specimens is not possible, Arizona hedgehog cactus will be removed and transplanted to test plots designed to determine the optimum reestablishment habitat for the taxon. Monitoring should occur during the test plot phase and surviving plants and their progeny would be used to repopulate previously occupied habitat, post-mining. Any surplus plants recovered from the proposed disturbance area which are deemed unnecessary for reclamation testing will be provided to researchers or botanical gardens approved by the U.S. Fish and Wildlife Service.

Develop conservation plan.

Assist the Tonto National Forest in the development of a Conservation Plan for the Arizona hedgehog cactus which leads to the identification of verified "safe areas" where the taxon can be protected until it is determined that such protection is no longer necessary.

Redesign facilities to avoid Arizona hedgehog cactus.

Prior to construction, those facilities other than pits, will be reviewed and redesigned to the extent possible, to minimize losses of Arizona hedgehog cactus plants.

Develop and initiate a plan for an Arizona hedgehog cactus "Conservation Area."

Develop and initiate a plan designed to identify a loci of sufficient size of Arizona hedgehog cactus occupied habitat which can then be subjected to mineral withdrawal actions for the protection from future mining impacts. This activity

would be considered compensation for the area of occupied habitat and lost individuals as a result of Carlota's proposed mining operations.

Carlota has made a commitment by letter (signed by Robert C. Walish, March 12, 1996) to hold a group of eleven mining claims, totalling 186 acres with approximately 700 Arizona hedgehog cacti, on the fringe of the Carlota project area adjacent to the proposed "Five-point Mountain Safe Area" until they can be withdrawn from mineral entry by the Federal government. At that time Carlota will relinquish interest in these claims.

Acquire grazing permit - Bellevue Allotment.

Acquire one grazing permit for lands within occupied Arizona hedgehog cactus habitat and initiate "non-use" of the permit to reduce a documented threat to the species over a portion of its range. At the conclusion of mining, the disposition of the permit would be dependant upon Forest Service allotment management plans. This action would also include identification, and initiation of non-use, of the Powers Gulch Pasture.

3) Measures for Riparian Areas

Arnett Creek/Picketpost Mountain Analysis Area fencing.

Retirement of Powers Gulch Pasture - Bellevue Allotment.

Acquire grazing permit - Bellevue Allotment.

Monitor and maintain natural riparian conditions in Haunted Canyon.

4) Measures for Upland Habitats

Revegetation of 938 acres of upland disturbance.

Maintain six existing wildlife watering sources in the Brushiest Allotment.

Identification and preservation of alternate bat roosts.

Arnett Creek/Picketpost Mountain Analysis Area fencing.

Retirement of Powers Gulch Pasture - Bellevue Allotment.

Acquire grazing permit - Bellevue Allotment.

Road closure.

5) Measures for Aquatic Habitats

Arnett Creek/Picketpost Mountain Analysis Area fencing.

Retirement of Powers Gulch Pasture - Bellevue Allotment.

Acquire grazing permit - Bellevue Allotment.

Avoid adverse sedimentation.

Monitor aquatic habitat in Pinto Creek and Haunted Canyon.

STATUS OF THE SPECIES

LESSER LONG-NOSED BAT

The lesser long-nosed bat (bat) was listed (originally, as Sanborn's long-nosed bat) as endangered on September 30, 1988 (53 FR 38456). No critical habitat has been designated for this species. The lesser long-nosed bat is a small leaf-nosed bat. It has a long muzzle and a long tongue. These features are adaptations to collect nectar from the flowers of columnar cactus, such as the saguaro and organ pipe, and from paniculate agaves (Hoffmeister, 1986). This migratory species is found throughout its historic range from southern Arizona, through western Mexico, and south to El Salvador. It occurs in southern Arizona from the Picacho Mountains southwest to the Agua Dulce Mountains and southeast to the Chiricahua Mountains and south to Mexico. Arizona roosts are occupied from late April to September (Cockrum and Petryszyn, 1991). Adult females, most of which are pregnant, and their recent young are the first to arrive, and they form maternity colonies at lower elevations near concentrations of flowering columnar cacti. After the young are weaned, these colonies disband in July and August; some females and young move to higher elevations, primarily in the southeastern parts of Arizona near concentrations of blooming paniculate agaves. Adult males are known mostly from the Chiricahua Mountains but also occur with adult females and young of the year at maternity sites (Fleming, 1994).

ARIZONA HEDGEHOG CACTUS

The Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus* Rose ex Orcutt) was listed as an endangered species on November 26, 1979 (44 FR 61556). No critical habitat has been designated for this cactus. At the time of the listing, Arizona hedgehog cactus was only known from the general vicinity of the type locality, a limited area along the Gila/Pinal county boundary in central Arizona, roughly between the towns of Miami and Superior. Recent surveys and other studies have added information to further define the range of the species to include the Pinal, Dripping Springs, Superstition, and Mescal mountains. Within this distribution, Cedar Creek Associates (*in* Tonto National Forest, 1996), using all available distribution and ecological data, has estimated that Arizona hedgehog cactus occupies approximately 18,900 acres (30 square miles) of habitat. Cacti displaying similar morphological characters as Arizona hedgehog cactus have been reported from east-central and south-central Arizona. Work by Bellsey et al. (1995) determined that the plants from south-central Arizona are not related to *E. triglochidiatus* var. *arizonicus* from the type locality. The taxonomic determination for the east-central Arizona specimens is currently uncertain, but until such time that the taxonomy is resolved, or these plants can be morphologically distinguished from Arizona hedgehog cactus, they will be considered as the listed entity pursuant to requirements of the ESA. However, the species status and environmental baseline included within this opinion only considers *E. triglochidiatus* var. *arizonicus* as known from the general vicinity of the type locality.

Arizona hedgehog cactus is a robust, succulent perennial, with dark green cylindroid stems that occur singly, or most often, in clusters of a few to approximately ten stems (Benson, 1982).

Occasionally, a plant may have over 100 stems (Tonto National Forest, 1996). Stems arise from the base of the plant and are large, typically 9 to 16 inches high and 3 to 4 inches in diameter. Specimens as large as approximately 24 inches in height have been recorded (Tonto National Forest, 1996). Each stem has strong, tuberculate ribbing. The number of ribs per stem has been given as approximately ten (Benson, 1982; Earle, 1980). However, the most common number of ribs in the vicinity of the type locality is nine, followed by eight and then ten ribs (Tonto National Forest, 1996). There are 1 to 3 gray or pinkish central spines with the largest one deflexed. The 5 to 11 radial spines are short, slightly curved, and robust. However, there is considerable variability in spine characteristics. Flowers erupt along sides of the stem and are a brilliant scarlet to deep red color. The flower is broad, about 2 inches in diameter (Arizona Game and Fish Department, 1994).

Arizona hedgehog cactus habitat consists of exposed bedrock or boulders within Interior Chaparral, Madrean Evergreen Woodland, and Desert Grassland plant communities in an elevation range of approximately 3,400 to 5,300 ft. This habitat is characterized by rugged, steep-walled canyons, and boulder pile ridges and slopes. Typically, the cactus is scattered on open, rocky exposures, rooting in shallow soils and narrow crevices among the boulders (Phillips *et al.*, 1979; USDOI, 1979; USFWS, 1985). Arizona hedgehog cactus may be found beneath the understory of shrubs, but moderate to high shrub densities and associated deeper soils tend to preclude the cactus (Tonto National Forest, 1996). Substrates on which Arizona hedgehog cactus are normally found include Orthoclase-rich granite of late Cretaceous age, primarily Schultze Granite. Also found in mid-Tertiary age Dacite, and to a lesser extent in Pinal Schist (AGFD, 1994; Tonto National Forest, 1996).

Arizona hedgehog cactus begins to produce flower buds in early April with anthesis (flowering) from late April to mid-May. Weather conditions can hasten, prolong, or delay flowering by several weeks (AGFD, 1994). The pollination ecology of the species is largely unknown, but it is an obligate outcrosser. Likely pollinators include insects, primarily bees, and perhaps hummingbirds (Ferguson, 1989). Fruits are present from May through June. Approximately 100 small seeds are produced per fruit with several fruits often occurring per plant. The amount of variation in annual seed production, and seed viability and longevity are unknown (Phillips, 1985). Seed dispersal is expected to be by birds and mammals (Tonto National Forest, 1996). Germination can occur in mid-summer. The seeds do not appear to require after-ripening or have other special germination requirements in addition to protection from extended direct sunlight and extreme temperatures [above 43°C (110°F)] (Phillips, 1985). Natural insect predators include borers and leaf-foot bugs (Coreidae) which attack the stems. Also, rodents may gnaw on stems and eat the fruits (which may contribute to dispersal). Root rot may also be an important cause of mortality (Crosswhite, 1976; Phillips *et al.*, 1979).

Threats to the Arizona hedgehog cactus include habitat destruction by mining, mineral exploration, road construction, power-line construction and utility corridors, off-road vehicle use and other recreational activities, rangeland improvements including water developments, trampling by livestock, and illegal collecting. Additional potential threats to the cactus include

wildfire, herbicide and pesticide application, and insect predation (USDOJ, 1979; USFWS, 1985; AGFD, 1994).

The taxonomic status of Arizona hedgehog cactus is currently under debate. Different investigators have assigned the entity from the type locality (vicinity of Globe, Arizona) to different species of cacti and at different taxonomic levels (species or variety). The specimens from east-central Arizona which have recently and tentatively been assigned to *E. triglochidiatus* var. *arizonicus* adds another challenge to the taxonomic situation. Those who have contributed to these investigations include: D. Ferguson (1989); S. Mills (SWCA, Inc., Tucson, AZ); D. Mount (University of Arizona, Tucson, AZ); B. Parfitt (Missouri Botanical Garden, St. Louis, MO); Parfitt and Christy (1991); D. Pinkava (Arizona State University, Tempe, AZ); F. Reichenbacher (Southwestern Field Biologists, Tucson, AZ); S. Viert (Cedar Creek Associate, Fort Collins, CO) and A. Zimmerman. However, until there is a general consensus within the scientific community with published literature, the Service continues to consider Arizona hedgehog cactus as a valid and unique variety of plant that merits endangered species designation and full protection of the Act.

ENVIRONMENTAL BASELINE

LESSER LONG-NOSED BAT

Loss of roost and foraging habitat, as well as direct taking of individual bats during animal control programs, particularly in Mexico, have contributed to the current status of the species. Suitable day roosts and suitable concentrations of food plants, are the two resources that are critical for the lesser long-nosed bat (Fleming, 1994). As indicated above, the lesser long-nosed bat consumes nectar and pollen of paniculate *Agave* flowers and the nectar, pollen, and fruit produced by a variety of columnar cacti. Caves and mines are used as day roosts. The factors that make roost sites usable have not yet been identified; narrow or specialized requirements may not be necessary for day roosts. Whatever the factors are that determine selection of roost locations, the species appears to be sensitive to human disturbance. Instances are known where a single brief visit is sufficient to cause a high proportion of lesser long-nosed bats to temporarily abandon their day roost and move to another. Perhaps most disturbed bats return to their preferred roost in a few days. However, the sensitivity suggests that the presence of alternate roost sites may be critical when human disturbance occurs. Interspecific interactions with other bat species may also influence lesser long-nosed bat roost requirements.

Known major roost sites include 16 large roosts in Arizona and Mexico (Fleming, 1994). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy these sites was greater than 200,000. Twelve major maternity roost sites are known for Arizona and Mexico. According to the same surveys, the maternity roosts are occupied by over 150,000 lesser long-nosed bats. The numbers above indicate that although there may be relatively large numbers of these bats known to exist, the relative number of known large roosts is small. Disturbance of these roosts and the food plants associated with them could lead to the loss of

the roosts. The limited numbers of maternity roosts may be the critical factor in the survival of this species.

ARIZONA HEDGEHOG CACTUS

The Tonto National Forest, Globe Ranger District, manages approximately 90 percent of the known occupied habitat of Arizona hedgehog cactus. This cactus also occurs on Arizona State Land Department trust lands, Bureau of Land Management administered lands, and private lands. A substantial population of Arizona hedgehog cactus is found within the Superstition Mountain Wilderness Area (Tonto National Forest, 1996). Direct access to a large portion of the cactus' range is very limited due to the rugged topography and remote nature of these habitats. Cedar Creek Associates (1994; and *in* Tonto National Forest, 1996) has estimated that there are over 250,000 individual Arizona hedgehog cactus plants. This estimate is considered to be conservative because it does not include up to several thousand plants occurring in satellite populations disjunct from the main distribution of the species and actual sample counts tend to under-count smaller plants.

Arizona hedgehog cactus has horticultural value and is commercially available from cactus and succulent dealers. Illegal collection of Arizona hedgehog cactus plants has been identified as a primary threat to the species (USDOJ, 1979). Removal of plants may occur for landscaping or for suspected hallucinogenic purposes. The extent of possible collection pressures remains uncertain. Comparisons of isolated and roadside populations suggest there may be diminished population levels at easily accessible sites. Those plants most susceptible to collection would be those that could be easily dislodged from the soil rather than those growing within the rock matrix. However, as part of the intensive surveys conducted within the project area by Cedar Creek Associates (1994; and *in* Tonto National Forest, 1996), including portions of the Highway U.S. 60 corridor, reduced densities along the highway were not discernable when compared with plant densities from more remote locations. Seed collection is also a potential threat. Any effect collecting of plants and seeds may have on the long-term reproduction and survival of Arizona hedgehog cactus is not known (USFWS, 1985). However, any effects would be expected to be site-specific. If there is a major change in the market demands for Arizona hedgehog cactus, either for landscaping or hallucinogenic purposes, it could result in substantive impacts to the cacti.

Construction of Highway U.S. 60 and its later realignment destroyed Arizona hedgehog cactus and its habitat. Cedar Creek Associates (1994) estimated that 2,348 cacti were lost from approximately 67 acres of presumed occupied habitat, and an additional 85 acres of presumed unoccupied but potential habitat was eliminated by highway construction. These estimates were based on habitat characteristics, including vegetation type, topography, and parent geologic material of adjacent sites and the recorded densities of Arizona hedgehog cactus in similar habitats. The construction of powerlines parallel to the highway and the Silver King substation for the Salt River Project resulted in the loss of an additional 18 acres of occupied habitat. (Cedar Creek Associates, 1994). Six plants were removed and transplanted by Boyce Thompson Arboretum in 1978 to permit construction of the Silver King substation (Phillips *et al.*, 1979).

Livestock grazing may lead to impacts to Arizona hedgehog cactus due to direct trampling of plants and/or through habitat degradation. Physical damage to cacti by livestock has been documented (Tonto National Forest, 1996). However, Cedar Creek Associates (1994) notes that plants damaged by livestock are observed primarily in those areas most accessible to livestock, and, in active pastures, occur at a rate of approximately one out of every 400 to 500 plants observed. Habitat degradation due to livestock grazing which resulted in impacts to Arizona hedgehog cactus have not been documented. Damage and direct herbivory by javelina appears to be frequent and widespread (Tonto National Forest, 1996).

The greatest threat to Arizona hedgehog cactus are mining and related activities (USDOl, 1979). Within the Globe-Miami-Superior area, major mining operations in or adjacent to Arizona hedgehog cactus habitat are currently being conducted by Magma, Cyprus, and Carlota Copper. Other smaller mines and mining claims occur within and at the periphery of the range of the cactus. Although the surface geology of the habitat is not well mineralized, potential subsurface mineral deposits may warrant test drilling. In certain locations within occupied habitat, mining claims have been filed. Roads to provide exploration access and exploratory drilling for underlying deposits are a threat to the species even though these roads often detour around the prime Arizona hedgehog cactus habitat of rocky outcrops. The amount of potential disturbance from mining is dependent on whether a mine is open pit or shaft, and how much surface area (of occupied or potential habitat) will eventually be covered by tailings (USFWS, 1985). Cedar Creek Associates (1994) estimated that the Magma and Cyprus operations eliminated approximately 2,195 acres of potential habitat. There is no evidence, based on post-project surveys, that either plants or occupied habitat was directly lost to either of these mining operations.

Effects of the Action

LESSER LONG-NOSED BAT

The project area is just east of what is considered to be the known range of the lesser long-nosed bat. However, the Forest Service has recognized that the range delineation is based on roost records and that roosts of lesser long-nosed bats are difficult to find, that lesser long-nosed bats can travel up to 30 miles from their day roost while foraging, that the project area contains potential foraging habitat of the bat, and that the project area may occur within the foraging range of the bat (Cedar Creek Associates, 1994). The closest record of lesser long-nosed bats is from Picacho Peak, which is approximately 50 miles from the project site.

Surveys for lesser long-nosed bats and evaluations of their habitat were conducted in the project area in April and July of 1992, and in May-June and July of 1993. Abandoned mine adits in the project area were considered potential roost sites, but no individuals of this species or their sign were discovered. Mist-netting at surface water and riparian corridors within the project area was conducted, although the focus of this effort was on surveying for other bat species. This effort also did not reveal the presence of lesser long-nosed bats in the project area.

Vegetation in the vicinity of the project area includes a small pocket of saguaros near the project area that was deemed insufficient to solely support lesser long-nosed bat foraging. The golden-flowered agave (*Agave chrysantha*) is present in the project area to the extent that they could be used by foraging lesser long-nosed bats. Five "habitats" were defined for the project area. Agaves on three (interior chaparral, juniper grassland, and riparian) of those were rare or nonexistent. Density of agaves on the other two (rubbleland chaparral and dry-slope desert brush) were determined. Densities in rubbleland chaparral ranged from 0 to 2.6 agaves (mean = 0.6) with flower stalks and 3.2 to 16.0 agaves (mean = 7.6) without flower stalks per acre. Densities in dry-slope desert brush ranged from 0.4 to 1.8 agaves (mean = 1.1) with flower stalks and 11.5 to 28.9 agaves (mean = 20.2) without flower stalks per acre. The Forest Service concluded that the golden-flowered agave is present in sufficient densities in these two habitat types within the project area to provide summer foraging habitat for the lesser long-nosed bat.

No disturbance of the rubbleland chaparral will occur. Development of the proposed project would result in loss of 353 acres of dry-slope desert brush which would be a 40 percent loss of such habitat within the project area. The Forest Service concluded this loss could result in a minor reduction in potential summer foraging habitat for lesser long-nosed bats in the region of the Pinal Mountains.

The lesser long-nosed bat could be affected by the loss of potential foraging habitat. Noise and vibration from construction and operation could also be impacts if there are unknown roosts nearby. The heap leach pads and the acid solution ponds may affect lesser long-nosed bats. The odor (fumes) may alter the bats' normal behavior and perhaps even interfere with their detection of food plants.

ARIZONA HEDGEHOG CACTUS

The Carlota Copper project primarily impacts Arizona hedgehog cactus along the periphery of the cactus' distribution. However, implementation of the proposed action will result in various direct, indirect, temporary, and permanent effects to the species.

Excavation of the Eider pits, associated access roads, and Powers Gulch leach pad and diversion outfall structure will eliminate an estimated 217 cacti and 23.94 acres of occupied habitat. Also, approximately 238 acres of currently unoccupied habitat will be lost (Cedar Creek Associates, 1994). An additional 149 cacti are within 200 feet of proposed pits, within 100 feet of proposed roads, or are immediately adjacent to the Powers Gulch diversion. These 149 cacti do not currently overlap planned disturbances, but are situated close enough to mine-related facilities that actual construction or future modifications of operations may cause additional losses from among these 149 specimens (Cedar Creek Associates, 1994). Other mine related actions which may affect Arizona hedgehog cactus include potential breach of the large leach pad retention facilities which would result in the loss of "a few" cacti occurring downgradient of the leach pad. Up to 33 cacti are potentially exposed to concentrated sulfuric acid mist plumes due to

their proximity to the tankhouse vents. The closest cacti to the tankhouse is approximately 700 feet away (Cedar Creek Associates, 1994).

Assessment of project related impacts is not strictly an evaluation of numbers of individuals lost and acres of habitat converted. Other indirect aspects of potential project related impacts are often more difficult to assess, but are, nonetheless, very important to the long-term survival and/or recovery of the species. These include any aspects of the project which could compromise the ecological integrity of Arizona hedgehog cactus populations or the functions and processes of the ecosystem of which it is a part. The Carlota Copper project will include gross alterations of topography over large areas. Of this, only a small portion provides habitat (occupied and unoccupied) for the cactus. However, these project impacts will have drastic effects to certain aspects of the ecosystem. The long-term ramifications of these ecosystem perturbations to Arizona hedgehog cactus are largely unknown. The way in which facilities development, mine operations, and large-scale habitat alterations will affect the cactus depends, in part, on how project implementation and habitat fragmentation will affect population dynamics (population structure, abundance, mortality, and fecundity), pollination ecology, and seed dispersal mechanisms. Many aspects of Arizona hedgehog cactus life history, including pollination ecology, are poorly understood. How various aspects of the proposed project may effect invertebrate populations and any potential pollinators are unknown.

To address these various uncertainties, the development of the "Conservation Assessment and Plan for the Arizona Hedgehog Cactus" was critically important. This plan provided important information to assess the ramification of potential impacts to Arizona hedgehog cactus from the proposed action. Equally important, the Conservation Plan addressed how the survival and recovery of Arizona hedgehog cactus could be supported by: 1) identifying those areas which presently exhibit ecologically viable populations and reduced impact potential which could then be managed as "safe zones" for the species; and 2) develop management goals and objectives for these "safe areas" which would maximize the long-term protection of the species. In this way, the proposed mitigation efforts for the cactus not only addresses specific project impacts but also contributes, in a meaningful way, toward recovery objectives for the species. Without the Conservation Plan, effective mitigation and compensation for project impacts could not have been identified.

The Biological Mitigation Plan identifies a variety of actions needed to avoid, minimize, or mitigate the various project related impacts. However, the impacts to Arizona hedgehog cactus from the Carlota Copper project remain a serious concern as it could possibly delay successful recovery of the species. Due only to the thoroughness of the efforts of Cedar Creek Associates and Tonto National Forest in assessing the current status of the species, evaluating existing threats, and developing management goals and objectives for the species as part of the Conservation Plan, that, with full implementation of all aspects of the Mitigation Plan for Arizona hedgehog cactus, could project related impacts be accommodated without substantial compromise to the recovery of the species.

The relationship of the Conservation Plan to the Mitigation Plan for the proposed action is especially apparent in the identification of "safe areas." "Safe areas" are intended to represent logical ecological units represented across the species' distribution where the Federal government can manage land uses and activities in the interest of protecting the long-term health and well being of the species. "Safe areas" are to be ecologically defensible sites where the ecological integrity of the system can be maintained and threats to the cactus minimized. These areas are to represent some of the better (or best) Arizona hedgehog cactus habitat, as demonstrated by appropriate population densities and age classes, and the presence of healthy specimens (Cedar Creek Associates, 1996). Potential threats to the species within these areas are minimal, or have been/should be reduced or eliminated. Any land management actions within "safe areas" should not compromise the management priority of Arizona hedgehog cactus. The process leading to the identification of "safe area" locations is detailed in the Conservation Plan. Field verification that these proposed locations meet "safe area" requisites, and establishing baseline demographic monitoring plots are an important part of the process to validate the "safe areas."

Impacts due to mining activities have been identified as one of the principle threats to Arizona hedgehog cactus (USDOI, 1979). These threats are, in part, being realized through the Carlota Copper project. Providing habitat protection from similar threats is one aspect identified within the Mitigation Plan to address the loss of cactus individuals and habitat. Carlota has committed to relinquish mining claims for an area of appropriate size and cactus population to directly compensate, in part, for project related impacts. Further, for this protection to balance the permanent impacts to the species with a long-term benefit, the area afforded protection from the threat of mining must be within an ecologically defensible area with a viable population of cactus. To these ends, the "safe area" concept was implemented. Carlota has identified a group of eleven mining claims, totalling 186 acres, along the fringe of the Carlota project area. Approximately 700 cacti occur within these claims; this also includes the Arizona hedgehog cactus type locality (the location of the collection of the specimen from which the taxon was described). This area is adjacent to the proposed "Five-point Mountain Safe Area." Carlota has committed by letter (signed by Robert C. Walsh, March 12, 1996) to relinquish interest in these claims at such time as they are withdrawn from mineral entry by the Federal government. Though these eleven claims are on lands managed by Tonto National Forest, and any potential adverse impacts to the species occurring under these claims would still require formal consultation with the Service, eliminating the threat of future mining at this site provides an important level of protection to the species and adds to the integrity of the proposed "Five-points Mountain Safe Area."

It is imperative that all aspects of the Mitigation Plan be implemented for the endangered Arizona hedgehog cactus. As this Plan is part of the project description, all identified actions to avoid, minimize, or mitigate impacts to the cactus are considered as part of the overall evaluation of project related impacts to the species. Special note is made of the efforts by Carlota to avoid impacts to individual cactus in designing project facilities. Continued avoidance of impacts to cacti, as identified in the Mitigation Plan through flagging of sensitive areas, education of construction personnel, and design considerations, is required.

Included as part of this consultation is the evaluation of effects to Arizona hedgehog cactus from all direct and indirect impacts resulting from the implementation of the proposed action as described in the project description, including the application of all associated mitigation measures. The Mitigation Plan includes ways in which various indirect effects of the action can be monitored, assessed, and quantified. The Service recognizes that despite intensive field work, the actual number of individual cacti which will be impacted may differ slightly from that projected in the DEIS. By considering many of the potential indirect effects and "pessimistic" estimates as presented in the DEIS and BA&E, this consultation provides for some level of uncertainty of impacts within the scope of the projected project impacts and implemented conservation actions, while also providing for increased management flexibility to the Forest and Carlota.

Impacts considered within the scope of this consultation include:

- 1) Loss of 23.94 acres of occupied habitat and 217 Arizona hedgehog cactus directly impacted by pit excavation and facilities development. Due to the difficulty in counting all plants during survey efforts, the loss of up to 54 additional plants within this identified acreage is included.
- 2) Sub-lethal impacts to the 185 cacti (149 + 33 + "a few") identified as being in close proximity to mine-related activities. Direct loss of up to 92 of these individuals are included provided all measures of the Mitigation Plan are implemented to avoid losses were possible.
- 3) Loss of an additional 2.5 acres of occupied habitat immediately adjacent to habitat considered as part of the preceding 23.94 acres. Any loss of plants within this additional acreage is expected to be those accounted for above as cacti in close proximity to mine-related activities.
- 4) Loss of approximately 238 acres of currently unoccupied habitat to mine operations. An additional 120 acres of unoccupied habitat is included provided that the area is surveyed to verify that it is unoccupied habitat.

Reinitiation of consultation with the Service would be required if/and when the number of Arizona hedgehog cactus or acreage of habitat impacted exceeds that detailed above. Any change to mine development plans or operations which result in loss of cacti and/or occupied habitat disjunct from the projected impact areas (not adjacent to identified pits, facilities, or roads) would also require reinitiation of consultation with the Service. If, at any time, any appropriate cactus protective measure identified in the Mitigation Plan is not implemented, it would constitute an impact not considered within the consultation and so would require reinitiation of consultation.

Cumulative Effects

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of ESA.

LESSER LONG-NOSED BAT

The amount of land disturbance from mining is expected to increase in the foreseeable future as the existing mines expand their operations (Tonto National Forest, 1995). The amount of additional disturbance in the Globe-Miami Mining District is difficult to estimate and will partially depend on the existence, extent, and grade of ore, as well as economic conditions. Cyprus Miami Mining Corporation has recently upgraded its smelter facility and plans to expand leaching facilities at the Cyprus Miami Mine on its patented mining claims and public lands administered by the Bureau of Land Management and the Forest Service. The proposed expansion includes adding new leach pads, an overburden deposition area, stormwater impoundments, solution collection and transfer facilities, and supporting roadways and power installations. Magma Pinto Valley Mining Company needs to expand its mine rock disposal areas, tailings dams, and miscellaneous facilities over approximately 1,200 additional acres. Preliminary plans for expansion of the Ray Mine have been submitted to Pinal County. However, information is not available on details of the expansion. Other mines and mining projects continue to operate in the area. The only definitive proposal for a new mining project in the general area for the foreseeable future is for the Magma Copper Florence Project. A pre-feasibility study is being conducted by Magma Copper Company for an open-pit or in situ copper mine near Florence. The size of the proposed project area would be small for the in situ process and approximately 1,220 to 1,900 acres for an open-pit mine.

The increased demand for electrical power will continue for ongoing and future mining activities and other commercial and residential development in the Globe-Miami Mining District. The only other proposed energy project is the Salt River Project Power Line Upgrade. This project would involve reliability maintenance improvements on a section of a 115-kv transmission line that runs between Superior and Ray.

Future improvements are in the planning stages for State Highway 88 from the Tonto National Monument to the U.S. Highway junction. The Arizona Department of Transportation has also proposed improvements to the U.S. Highway 60-70 system.

The development of undisturbed private land for residential or commercial purposes is occurring in several areas, including the areas around Top-of-the-World, Globe, Superior, the San Carlos Indian Reservation, and smaller parcels of land such as those near Roosevelt Lake.

ARIZONA HEDGEHOG CACTUS

Approximately 90 percent of all Arizona hedgehog cactus habitat is found on Federal lands. Consequently, most potential projects occurring in cactus habitat would require separate consultations under section 7 of the ESA. However, certain future state, local, or private actions may affect Arizona hedgehog cactus. Cyprus Miami Mining Corporation has proposed expanding their operations which may impact approximately 620 acres of presumably unoccupied Arizona hedgehog cactus habitat (Cedar Creek Associates, 1994). Improvements and expansion of highway U.S. 60 by Arizona Department of Transportation between Superior and Globe could destroy plants and habitat. Illegal collection of Arizona hedgehog cactus may be occurring at an unknown magnitude. Certain mineral explorations on Federal lands do not require separate permit and as such may be occurring unregulated with undocumented impacts to plants and habitat.

CONCLUSION

After reviewing the current status of lesser long-nosed bat and Arizona hedgehog cactus, the environmental baseline for the action area, the effects of the proposed Carlota Copper Project, and the cumulative effects, it is the Service's biological opinion that the Carlota Copper Project, as proposed, is not likely to jeopardize the continued existence of the lesser long-nosed bat and Arizona hedgehog cactus. No critical habitat has been designated for these species, therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Sections 7(b)(4) and 7(o)(2) of ESA do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that ESA requires a Federal permit for removal or reduction to possession of endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any regulation of any State or in the course of any violation of a State criminal trespass law.

AMOUNT OR EXTENT OF TAKE

The Service does not anticipate that the proposed action will result in the incidental take of any lesser long-nosed bats.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of ESA directs Federal agencies to utilize their authorities to further the purposes of ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibility for these species.

LESSER LONG-NOSED BAT

- 1) The loss of potential foraging habitat for the lesser long-nosed bat from any and all aspects of the project should be minimized to the greatest extent possible.
- 2) Transplantation of agaves from the areas of greatest density to similar densities in appropriate habitat should be conducted according to methods that are recognized as successful. The transplanting effort should be monitored to determine its success.
- 3) The leaching solutions containing reagents such as sulfuric acid should be retained in a closed system, or ponds and ditches containing the solutions should be covered with netting or sheeting. These measures should be initiated to preclude any contact of wildlife with the leaching solutions.
- 4) Additional surveys for lesser long-nosed bat roosts should be conducted in the vicinity of the proposed project. Reports of the surveys should be provided to the Service.

ARIZONA HEDGEHOG CACTUS

- 1) Continue implementation of the Conservation Plan. This plan provides appropriate management direction through the "Species and Habitat Management Objectives" which may lead to downlisting of Arizona hedgehog cactus.
- 2) Continue long-term demographic monitoring. This provides essential data to determine project related impacts and also provides basic information required to support downlisting the species.

- 3) Provide special management area designations or other means to formalize specific management guidelines which establish management priorities for Arizona hedgehog cactus "safe areas."
- 4) Complete the mineral withdrawal process for claims relinquished by Carlota for the protection of Arizona hedgehog cactus. Pursue withdrawal of adjacent mineral claims, if vacant, within the "Five-points Mountain Safe Area" and other identified "safe areas."
- 5) Pursue resolution of potential conflicts of management actions with Arizona hedgehog cactus within identified "safe areas."
- 6) As opportunities arise, pursue acquisition of private lands with Arizona hedgehog cactus habitat, especially adjacent to the "Five-points Mountain Safe Area."
- 7) Closely monitor the implementation of the Carlota Copper Project Mitigation Plan. Maintain tallies of Arizona hedgehog cactus plants and acres of habitat impacted by project related activities. Provide summary reports to the Service periodically (annually, if possible) on the status of the implementation of the Mitigation Plan, numbers of plants and acres of habitat impacted, and efforts taken to avoid, where possible, impacts to Arizona hedgehog cactus.

In order for the Service to be kept informed of actions that either minimize or avoid adverse effects or that benefit listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

In future communications on this project, please refer to consultation number 2-21-92-F-419. If we may be of further assistance, please contact Bill Austin or Angie Brooks.



Sam F. Spiller

Attachment

cc: Chief, Fish and Wildlife Service, Arlington, VA (DES)
Regional Director, Fish and Wildlife Service, Albuquerque, NM (GM:AZ, ARW)
Plant Program Manager, Arizona Department of Agriculture, Phoenix, AZ
Director, Arizona Game and Fish Department, Phoenix, AZ

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