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In Reply Refer To:

AESO/SE
02-21-05-F-0265

August 5, 2005

Mr. Robert Hollis
Division Administrator
Federal Highway Administration
400 East Van Buren Street
One Arizona Center, Suite 410
Phoenix, AZ 85004-2285

Dear Mr. Hollis:

This biological opinion (BO) responds to the Federal Highway Administration's (FHWA) request for consultation pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. *et. seq.*, ESA) (Act). Your request for formal consultation was dated February 3, 2005, and received by us on the same day. At issue are impacts that may result to the endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) (PPC) from the proposed Change of Access located within your right-of-way (ROW) for Interstate 19, within Section 9 of Township 19 South, Range 13 East, in Pima County, Arizona.

This BO is based on information provided in the December 2004 biological evaluation (BE) prepared by WestLand Resources, Inc., meetings, and other sources of information. Literature cited in this BO is not a complete bibliography of all literature available on the species of concern, the effects from residential development, the project area, or other subjects considered in this opinion. A complete administrative record of this consultation is on file at the Arizona Ecological Services Office.

Consultation History

February 3, 2005: We met with the applicant and the Arizona Department of Transportation (ADOT) to discuss formal consultation for adverse effects to PPC and habitat, and to suggest mitigation measures that could be taken as part of the proposed project.

May 13, 2005: We provided a draft BO to ADOT.

July 14, 2005: Final resolution on purchase of the conservation bank credits.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The applicant proposes to alter their original planned access within the ADOT ROW to connect the public roadway of Canoa Ranch Road with the Interstate 19 (I-19) frontage road at the existing "T" intersection, in alignment with the crossroad at the Canoa Ranch interchange, resulting in a typical four-way intersection (see the BE, Figure BE-2; the Project). Associated actions are limited to excavation and removal of dirt north and south of the east-west alignment for the extension of Canoa Ranch Road within ADOT's ROW (see the BE, Figure BE-3; the Project) and associated intersection improvements.

Proposed Conservation Measures

1. The applicant will ensure the revegetation of areas adjacent to the paved roadways will consist of native plant species.
2. The applicant will purchase one-acre credit in a Fish and Wildlife Service- (FWS) approved conservation bank for PPC (Pima County's conservation bank). This purchase will offset the unavoidable loss of PPC and habitat associated with this project.

STATUS OF THE SPECIES

Pima Pineapple Cactus

Life History

The final rule listing Pima pineapple cactus as endangered was published on September 23, 1993 (58 FR 49875). The rule became effective on October 25, 1993; no critical habitat has been designated. Factors that contributed to the listing include habitat loss and degradation, habitat modification and fragmentation, limited geographic distribution and plant species rareness, illegal collection, and difficulties in protecting areas large enough to maintain functioning populations. The biological information below is summarized from the proposed and final rules, and other sources.

Pima pineapple cactus is a low-growing hemispherical cactus with adults varying in stem diameter from 5.0 cm (2.0 inches) to 21.0 cm (8.3 inches) and height from 4.5 cm (1.8 inches) to 45.7 cm (18.0 inches). Individuals are considered adults when they reproduce sexually. Plants can be either single or multi-stemmed with yellow flowers blooming with the summer rains. Clusters of Pima pineapple cactus stems are formed primarily from vegetative clones produced at the plant base (Benson 1982, Roller 1996). The diagnostic field character of this taxon is the presence of one stout, straw-colored, hooked central spine. Radial spines extend laterally around the central spine and average 10 to 15 spines on large cacti and 6 on small cacti (Benson 1982).

Pima pineapple cactus occurs south of Tucson, in Pima and Santa Cruz counties, Arizona and adjacent northern Sonora, Mexico. It is distributed at very low densities throughout both the Altar and Santa Cruz valleys, and in low-lying areas connecting the two valleys.

Groups of flowers begin to bloom for single-day periods five to seven days after the first monsoon rains. Flowering is triggered by as little precipitation as 3 mm (0.12 inch). Generally, flowers begin opening midmorning and close at dusk (Roller 1996). Adult plants bloom one to three days each year; flowering is usually over by the end of August. Cross-pollination produces significantly more viable seeds than self-pollination. Fruits are mature within two weeks following successful pollination. Germination has been observed in the field during the summer monsoon rainy season (Roller 1996). Anecdotal observations indicate the species' flowers are visited by a variety of native bees and European honey bees, which have been observed to leave the flowers with their forehead and hind legs covered in Pima pineapple cactus pollen.

Habitat fragmentation and isolation may be an important factor limiting future seed set of this cactus. Recent data show that the species cannot successfully self pollinate in situ and is reliant on invertebrate pollinators. One hypothesis is that the spatial distribution pattern of individual Pima pineapple cacti within a given area may regulate pollinator visitations, thus resulting in more successful cross-pollination and subsequent seed set over the population (Roller 1996). If the pollinators are small insects with limited ability to fly over large distances, habitat fragmentation may contribute to a decrease in pollinator effectiveness with a subsequent decrease in seed set and recruitment.

Population Stability

Extrapolations from recent (1992-1997) surveys of known Pima pineapple cactus locations suggest that the cactus may be more numerous than previously thought. Projections based only on known individuals may underestimate the total number of individuals. This in no way indicates that the cactus is not rare or endangered. Pima pineapple cactus is widely dispersed in very small clusters across land areas well-suited for residential, commercial, or mining development. Field observations suggest a great deal of land area within the range boundaries would not support Pima pineapple cactus today due to historical human impacts. Thus, populations are already considerably isolated from each other in many portions of the range, and population size and apparent recruitment varies significantly across the range. On a more local scale, population variability may relate to habitat development, modification, and/or other environmental factors such as slope, vegetation, pollinators, dispersal mechanisms, etc.

The transition zone between the two regions of vegetation described by Brown (1982) as semidesert grassland and Sonoran Desert scrub contains denser populations, better recruitment, and individuals exhibiting greater plant vigor. Vegetation within this transition zone is dominated by mid-sized mesquite trees, half shrubs (snakeweed, burroweed, and desert zinnia), and patches of native grass and scattered succulents. Because populations are healthier in this transition zone, conservation within these areas is very important (Roller and Halvorson 1997). However, this important habitat type is not uniformly distributed throughout the plant's range. Populations of Pima pineapple cacti are patchy, widely dispersed, and highly variable in density. The higher population densities have only been documented at three sites. Compared to other

surveys, two of these sites are very small in scale and range from 6.3-7.5 plants per ha (1-3 plants per acre). Other densities across the majority of the plant's range vary between one plant per 1.9 ha (4.6 acres) and one plant per 8.5 ha (21 acres) (Mills 1991, Ecosphere 1992, Roller 1996).

Land areas surrounding developed parts of Green Valley and Sahuarita, Arizona, (including adjacent areas of the San Xavier District of the Tohono O'odham Nation) may be important for the conservation of this species within its range. Analysis of surveys conducted from 1992 to 1995 with a multivariate statistical analysis documented a pattern of greater population densities, higher ranks of cactus vigor, and better reproduction occurring within the transition vegetation type found in this area of the northern Santa Cruz Valley (Roller and Halvorson 1997). This area could be defined as an ecotone boundary between semidesert grassland and Sonoran desert scrub.

Seedling and sub-adult size classes are uncommon in documented populations across the plant's range. However, this may be a function of the difficulty of finding such small, well-camouflaged plants in a large-scale survey, or because the establishment phase of the seedling may be limited in some unknown way. Research on Pima pineapple cactus reproduction has suggested that the establishment phase of Pima pineapple cactus life history may limit recruitment within populations (Roller 1996). Evidence presented to support this conclusion was the abundance of flowers, fruits, and viable seed, and the rarity of seedling presence at different sites spread throughout the plant's range (Roller 1996). Other research has confirmed that the establishment phase of other Sonoran cacti species may be critical for survival to reproductive maturity (Steenbergh and Lowe 1977).

Status and Distribution

Generally, the Pima pineapple cactus grows on gentle slopes of less than 10 percent and along the tops (upland areas) of alluvial bajadas nearest to the basins coming down from steep rocky slopes. The plant is found at elevations between 2,360 ft. and 4,700 ft. (Phillips *et al.* 1981, Benson 1982, Ecosphere 1992), in vegetation characterized as either or as combination of both the Arizona upland of the Sonoran Desert scrub and semidesert grasslands (Brown 1982).

The acquisition of baseline information began with surveys documenting the presence of Pima pineapple cactus as early as 1935. More intensive surveys were initiated in 1991, and other research established in 1993 further investigated the reproductive biology, distribution, fire effects, and mortality associated with various threats. Therefore, the best available baseline information is relatively recent and may not represent actual changes in distribution since the decline in the status of the species began.

Widely scattered surveys have been conducted across sites that varied considerably in cacti density. Densities ranged between 0.1-7.5 plants per ha (0.05-3 plants per acre). Pima pineapple cactus occurs in 50 townships within its U.S. range. However, a considerable amount of land area within the range boundaries does not provide habitat for the species due to elevation, topography, hydrology, plant community type, and human degradation. To date, an estimated 22,959 ha (56,730 acres or 10 to 20 percent of the U.S. range) have been surveyed. Not all of

this area has been intensively surveyed; some has only been partially surveyed using small land blocks to estimate densities rather than 100 percent ground surveys. A conservative estimate of total cacti located to date would be 3,800 individuals. The majority of those were located after 1991.

It is important to clarify that the above number represents the total number of locations ever found and not the current population size. It would be impossible to estimate densities over the remaining unsurveyed area because of the clumped and widely dispersed pattern of distribution of this species. Of the 3,800 individuals recorded to date, 2,203 (58 percent) of them have been removed. This quantity includes observed and authorized mortalities and individuals transplanted since the species was listed in 1993. A small portion of these mortalities were caused by natural factors (i.e., drought). Moreover, this figure does not take into account those cacti that are removed from private land or lost to other projects that have not undergone Section 7 review.

Transplanted individuals are not considered as functioning within the context of a self-sustaining population. Efforts to transplant individual cacti to other locations have had only limited success and the mortality rate has been high, especially after the first year. Furthermore, once individuals are transplanted from a site, it is considered to be extirpated as those individuals functioning in that habitat are irretrievably lost. We view transplanting cacti as a measure of last resort for conserving the species. Transplanting will be recommended only when on-site and off-site habitat conservation is not possible and the death of cacti is unavoidable.

The area of habitat reviewed under Section 7 of the ESA between 1987 and 2000 (i.e., habitat developed or significantly modified beyond the point where restoration would be a likely alternative) is approximately 24,429 acres, which represents 43 percent of the total area surveyed to date. In 1998, more than 1,100 acres of Pima pineapple cactus habitat were lost including 752 acres from the ASARCO, Inc. Mission complex project. In 2000, 586 acres of habitat were lost with the expansion of a state prison in Tucson. In 2001, 177 acres of habitat were lost through development, but 888 acres of occupied and suitable habitat were conserved through conservation easements. In 2002-2003, 76.5 acres of occupied habitat was destroyed, but 36 acre-credits were purchased in the PPC conservation bank, thus protecting 36 acres of PPC habitat, and an additional 58.5 acres of PPC habitat were conserved in a conservation easement. We are aware of housing developments along Valencia Road, Pima County, Arizona, in the vicinity of T15S, R12E, Section 15 and surrounding areas, which support Pima pineapple cactus. These developments affect several hundred acres of habitat and have not been evaluated through the Section 7 process. The number of acres lost through private actions, not subject to Federal jurisdiction, is not known but, given the rate of urban development in Pima County, we believe it is significant.

Most of the documented habitat loss has occurred south of Tucson through the Santa Cruz Valley to the town of Amado. This area is critical for the future recovery of the species. The expansion of urban centers, human population, and mining activities will continue to eliminate habitat and individuals, and result in habitat fragmentation.

The protection of habitat and individuals is complicated by the varying land ownership within the range of this species. An estimated 10 percent of the potential habitat for Pima pineapple cactus is held in Federal ownership. The remaining 90 percent is on Tribal, State, and private lands. Most of the federally owned land is either at the edge of the plant's range or in scattered parcels. The largest contiguous piece of federally-owned land is the Buenos Aires National Wildlife Refuge, located at the southwestern edge of the plant's range at higher elevations and lower plant densities.

Based on surveys and habitat analysis, areas south of Tucson through the Santa Cruz Valley to the town of Amado and surrounding developed parts of Green Valley and Sahuarita, and parts of the San Xavier District of the Tohono O'odham Nation, appear to support abundant populations, some recruitment, and units of extensive habitat still remain. However, the primary threat to the status of this species throughout its range is the accelerated rate (i.e., since 1993) at which this prime habitat is being developed, fragmented, or modified.

The Arizona Native Plant Law may delay vegetation clearing on private property for the salvage of specific plant species within a 30-day period. Although the Arizona State Native Plant Law prohibits the illegal taking of this species on State and private lands without a permit for educational or research purposes, it does not provide for protection of plants in situ through restrictions on development activities.

Based on current knowledge, urbanization, farm and crop development, and exotic species invasion alter the landscape in a manner that would be nearly irreversible in terms of supporting Pima pineapple cactus populations. Prescribed fire can have a negative effect if not planned properly.

Other specific threats that have been previously documented (U.S. Fish and Wildlife Service 1993), such as overgrazing and mining, have not yet been analyzed to determine the extent of effects to this species. However, partial information exists. Mining has resulted in the loss of hundreds, if not thousands, of acres of potential habitat throughout the range of the plant. Much of the mining activity has been occurring in the Green Valley area, which is the center of the plant's distribution and the area known to support the highest densities of individuals. Overgrazing by livestock, illegal plant collection, and fire-related interactions involving exotic Lehmann lovegrass (*Eragrostis lehmanniana*) may also negatively affect Pima pineapple cactus populations (U.S. Fish and Wildlife Service 1993).

Even with complete data on historical change related to Pima pineapple cactus distribution and abundance, we cannot reliably predict population status due to compounding factors such as climate change, urbanization, and legal and political complexities (McPherson 1995). We do not know if the majority of populations of Pima pineapple cactus can be sustainable under current reduced and fragmented conditions. Thus, there is a need to gather information on limits to the plant's distribution under current habitat conditions.

In summary, monitoring has shown that the range-wide status of the Pima pineapple cactus appears to have been recently affected by threats that have completely altered or considerably modified more than a third of the species' surveyed habitat, and have caused the elimination of

nearly 60 percent of documented locations. Dispersed, patchy clusters of individuals are becoming increasingly isolated as urban development, mining, and other commercial activities continue to detrimentally impact the habitat. The remaining habitat also is subject to degradation or modification from current land-management practices, increased recreational use when adjacent to urban expansion (i.e., off-road vehicle use and illegal collection), and the continuing aggressive spread of nonnative grasses into habitat. Habitat fragmentation and degradation will likely continue into the foreseeable future based on historical data and growth projections produced by the Pima County Association of Governments (1996). There is very little Federal oversight on conservation measures that would protect or recover the majority of the potential habitat. Even some areas which have had Section 7 consultations on them have been modified and may not be able to support viable populations of the Pima pineapple cactus over the long-term.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform from which to assess the effects of the action now under consultation.

One PPC, and 3.6 acres of undisturbed potential habitat (out of a total of 7.2 acres) exist within the ROW. The action area is defined as the footprint of the project and a 0.25 mile area surrounding the project boundaries, the latter of which encompasses the area most likely to incur indirect effects from the project. PPC are known and suspected to occur on lands surrounding the project. Development may affect the overall population dynamics of PPC in the general area. While an attempt has been made to minimize the effects of roadways on PPC, there may be additional effects over a larger area that cannot be quantified. PPC are known from the areas surrounding the project, and there will likely be continued and increased housing development (and associated roads) in the general area into the foreseeable future.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, which will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

The proposed action will result in the loss of one PPC and the permanent alteration of 7.2 acres; of which 3.6 acres are undisturbed PPC habitat. The topography will be permanently changed by asphalt pavement roadways, paved road shoulders, and a sub-surface storm drain to carry surface run-off (easterly) through the underpass, along with associated signing and lights.

The applicant has proposed to offset the effects to PPC and its habitat by the purchase of one-acre credit in a FWS-approved conservation bank for PPC. This project contributes to the recovery of PPC and its habitat because it provides for off-site protection of occupied PPC habitat within the conservation bank, which is protected in perpetuity. PPC will not be able to survive in the long-term in small, fragmented areas surrounded by urban development. Large, contiguous blocks of habitat must be protected and managed for their natural values. All proposed conservation actions included in the project description are critical to offset impacts to PPC and its habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, 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 the Act.

Development in this geographic region can be expected to increase. State and private lands not presently developed in the area are quickly becoming urbanized. Much of this development has no Federal nexus. Without any protection under the Act, the only protection available is through the Arizona Native Plant Law, which provides only for salvage for scientific and educational purposes. Regardless of salvaged cacti transplant success, the habitat would be lost. Much of the habitat and the individuals of the species are at significant risk of destruction or continued degradation. There is little regulatory authority to use in reducing those risks.

CONCLUSION

After reviewing the current status of PPC, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of PPC. No critical habitat has been designated; therefore, none will be affected. In making our determination we considered the following:

- The status of PPC continues to degrade. We estimate that almost one-half of the known population has been destroyed as a result of urban and mining development. New populations of PPC, detected during project surveys, are often transplanted, leaving their contribution to PPC conservation in doubt. Habitat continues to be developed and habitat loss and fragmentation remain significant threats for this species.
- Cumulative effects considered in our analysis include recreational use, residential developments, single-family residences, and commercial projects where zoning and development plans make them reasonably certain to occur, but no Federal nexus is anticipated. Areas where these cumulative effects are anticipated to occur include areas where PPC have been documented and in suitable habitat. Cumulative effects are likely to contribute to habitat degradation and fragmentation.

- The applicant will offset the loss of PPC habitat by purchasing one-acre credit in a FWS-approved conservation bank for PPC. The bank provides protection in perpetuity for the cactus and its habitat. The bank contributes to the overall recovery and conservation of the species.

INCIDENTAL TAKE STATEMENT

Sections 7(b)(4) and 7(o)(2) of the ESA do not apply to listed plant species; however, protection of listed plants is provided to the extent that the 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. Neither anticipated incidental take, nor recovery permits, are needed from us for implementation of the proposed action.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the 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.

1. We recommend that the applicant aid, support, cooperate, or consider funding PPC surveys in areas in which the applicant has future project plans.
2. We recommend the applicant consider purchasing additional PPC credits in a FWS-approved conservation bank.

In order that we are kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the Change of Access (I-19) project. 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 retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded (not applicable to this consultation); (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 not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

We appreciate your efforts to identify and minimize effects from this project. If we can be of further assistance, please contact Mima Falk (520) 670-6150 (x225) or Sherry Barrett (520) 670-6150 (x223). Please refer to consultation number 02-21-05-F-0265 in future correspondence regarding this project.

Sincerely,

/s/ Steven L. Spangle
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ

Acting Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Director, Arizona Game and Fish Department, Tucson, AZ
WestLand Resources, Inc., Tucson, AZ

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