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U.S. Fish and Wildlife Service
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AESO/SE
2-21-99-I-273

February 14, 2001

Ms. Marjorie Blaine
Senior Project Manager
U. S. Army Corps of Engineers
5202 East Commanche Street
Davis Monthan Air Force Base
Tucson, Arizona 85707

Dear Ms. Blaine:

This biological opinion responds to your request for consultation with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your original request for formal consultation was dated July 20, 2000, and received by us on July 21, 2000. The Service requested a 30-day extension on December 7, 2000. At issue are impacts that may result from the proposed construction of a 372.6-hectare (920-acre) master planned community (Madera Highlands) proposed by Harvard Investment, Inc., east of Green Valley in Pima County, Arizona. In order to proceed with the project, the applicant requires a Clean Water Act (CWA) Section 404 from the U. S. Army Corps of Engineers (Corps) for road, utility, and golf crossings associated with the development and a CWA Section 402 National Pollutant Discharge Permit (NPDES) for storm water discharges associated with construction activities in Arizona. The Corps is the designated Federal lead for this project. Impacts resulting from the project may affect Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*).

This biological opinion was prepared using information contained in the biological assessments (BA) prepared by Westland Resources, Inc. and Darling Environmental & Surveying, Ltd. (January 1998, February and July, 2000), site visits, office meetings, and our files. Literature cited in this biological opinion is not a complete bibliography of all literature available on the affected species, nor is it a complete review of the effects of development and subsequent habitat fragmentation on the species. A complete administrative record of this consultation is on file in our office.

CONSULTATION HISTORY

The informal consultation process for this project began April 6, 1999, with a site visit. At that time, the proposed action called for avoiding all known cactus on the site. A phone conversation with Corps personnel on October 6, 1999, indicated that the Corps would not be involved with this project because there were no impacts to waters of the U.S. In a subsequent meeting between the applicant and the Corps, it became evident that the proposed action would need a Section 404 permit (pers. comm. M. Blaine). On March 29, 2000, the Corps sent the Service a BA (Darling Environmental & Surveying, Ltd., February 2000) with a request to initiate formal consultation. The Service responded on May 1, 2000, requesting additional information before initiating formal consultation. On May 11, 2000, the Corps sent a revised BA. The Service felt that the methodology used to delineate suitable habitat was inappropriate and that the conservation measures proposed were not adequate. On June 5 and June 15, 2000, the Service met with Harvard Investments, Inc., their consultants, and the Corps to discuss and clarify some of these issues. The Corps provided a second revised BA to the Service on July 20, 2000, and requested initiation of formal consultation. Formal consultation was initiated on July 20, 2000, even though the latest proposed action did not fully address impacts to Pima pineapple cactus and its habitat. The Service met with Harvard Investments, Inc., Jim Tress (Westland Resources, Inc) and Marjorie Blaine (Corps) on August 17, 2000 and worked out the final details of the conservation measures for the proposed action. A Supplemental Report to the Madera Highlands BA (Westland Resources, Inc.) was submitted to the Service on August 29, 2000.

In this report the applicants agreed to purchase 131.2 ha (324 acres) of Pima pineapple cactus habitat and that the proposed action would not proceed until those lands had been secured or the interim conservation measures described in the report were in place (see Section 2.2.4 of the August 2000, Supplemental Report). On December 7, 2000, the Service requested a 30-day extension to complete formal consultation in order to visit the site proposed for the conservation of Pima pineapple cactus. The Service visited the site with Jim Tress on December 5, 2000, and concurred that the location was appropriate for conserving the cactus. The Service received the final site configuration and final modifications to the proposed action on December 22, 2000 (Westland Resources, Inc.).

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The proposed Federal action is the issuance of a U.S. Army Corps of Engineers Section 404 permit and an NPDES permit from EPA to the applicant, Harvard Investments, Inc. The applicant proposes to develop a 372.6-ha (920-acre) Master Planned Community, Madera Highlands, within Sahuarita, Pima County, Arizona. The project is located in sections 12 and 13, T.18S., R.13E. and sections 7 and 18, T.18S., R.14E. The Madera Highlands community will

include residential, neighborhood commercial uses, and 162 ha (400 acres) of open space. The site can be divided into two parts; the disturbed western portion composed of 149.8 ha (370 acres) and the remaining undisturbed 222.7 ha (550 acres) located on the eastern section of the parcel. The western portion includes an extensive pecan orchard, abandoned feedlot, and fallow agricultural fields, no Pima pineapple cactus were found in the western portion, which does not currently support suitable habitat for the cactus. All of the higher density development within Madera Highlands will occur here. The eastern portion of the site does contain Pima pineapple cactus and approximately 65.6 ha (162 acres) were delineated by the Service as suitable habitat for the cactus. Within this portion of the development, the applicant is proposing low-density housing and an 18-hole golf course. The average lot size will be 0.49 ha (1.2 acres). Maps and specific details of the proposed action are provided in the August 2000, Supplemental Report to the BA and are included here by reference.

The maximum amount of suitable habitat for Pima pineapple cactus that will be disturbed due to construction of the proposed housing development is 65.6 ha (162 acres). The total number of Pima pineapple cactus on this site are 49. All of them will be affected by the proposed action.

Proposed Conservation Measures

The applicant, Harvard Investments, Inc., proposes the following measures to minimize potential adverse effects to Pima pineapple cactus. These measures are taken from the August 2000, Supplemental Report to the BA, the December 22, 2000, letter modifying the proposed action (Westland Resources, Inc.) and subsequent phone conversations with Westland Resources, Inc and the Corps.

1. The applicant will purchase and set aside in perpetuity, 149 hectares (368 acres) of land for the loss of 65.6 hectares (162 acres) of occupied and suitable Pima pineapple cactus habitat that will be significantly altered with the development of the Madera Highlands property. The conservation lands are located in T.18S., R.9E. sections 26 and 35 and the applicant has already purchased 445.5 ha (1,100 acres) within these two sections. Within this site 149 hectares are occupied and considered suitable for Pima pineapple cactus. See Figure 1 for the boundaries of the cactus conservation area. There are 72 cacti present on the 149-hectare conservation area. Within 90 days from the date of the issuance of the COE 404 permit the applicant shall:

- a. identify the third-party holder of the 149 ha conservation easement with approval of the Service; approval by the Service shall not be unreasonably withheld;
- b. complete the management plan and Property Analysis Record (PAR) for the conservation easement; subject to the approval of the easement holder, Harvard Investment, Inc. and the Service;

c. establish the funding mechanism for management of lands within the conservation easement; and

d. transmit to the Service copies of the conservation easement, PAR and all other associated documents pertaining to the easement.

Item 1, as described above, will become a binding condition of the COE 404 permit.

2. All of the Pima pineapple cactus (49) within the Madera Highlands site will be transplanted to a 5.1-hectare (12.7-acre) conservation area on the site. This portion of the property will be protected in perpetuity through the establishment of a conservation easement. Within this area plants will be transplanted to the most suitable sites. The Service will provide transplanting protocol to the Corps and applicant prior to cactus removal. Initially, this area will not be fenced or otherwise delineated on the ground and no incompatible management of the area will be allowed. The relocated cacti will be monitored annually for five years. Data collected each year will include, at a minimum, photographs, measurements of plant size and growth activity, assessment of plant health/vigor, the number and distribution of secondary stems (pups), and evidence of flowering and fruiting. At a minimum, a yearly assessment of the integrity of the site shall be conducted. An annual monitoring report will be provided to the Service during the final quarter of each year. Corrective actions and a schedule for completion will be identified if any incompatible land uses are identified during the course of monitoring. All of these conditions shall become requirements of the conservation easement. The requirements listed under Section 1a- 1d will apply to this easement.

STATUS OF THE SPECIES

Pima Pineapple Cactus

Life History

The final rule listing Pima pineapple cactus as endangered was published September 23, 1993 (58 FR 49875). The rule became effective on October 25, 1993; critical habitat was not designated at that time. 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 following 5 to 7 days after the first monsoon rains. Flowering is triggered by as little precipitation as 3 mm (0.12 inches). 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 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. As well, field observations suggest a great deal of land area within the range boundaries would not support Pima pineapple cactus today due to historic 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) with 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 established a pattern of greater population densities, higher ranks of cactus vigor and 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 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 through 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 720 m (2,362 ft) and 1,440 m (4,593 ft) (Phillips et al. 1981, Benson 1982, Ecosphere 1992), in vegetation characterized as either or a 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), (10 to 20 percent of the U.S. range) has 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 known at this time, 2,203 (58 percent) of them have been removed throughout the range. This quantity includes observed and authorized mortalities and individuals transplanted since the species was listed in 1993 to present. 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 other projects that have no federal nexus.

Transplanted individuals are not considered as functioning within the context of a self-sustaining population. Efforts to transplant individual cacti to other locations have only had 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. The Service hopes that continued experimentation will improve the success rate of transplantation. In the meantime, until information suggests that reintroduction efforts are successful, transplanted individuals will not be counted as operative units of the entire population.

The approach to transplanting Pima pineapple cactus involves three general phases: i) selection of suitable habitat to sustain viable populations, ii) replanting techniques and, iii) salvage operations which include proper removal of the plant and root system. The Service is currently updating the transplant protocol through the recovery planning process. The Service views transplanting cacti as a measure of last resort for conserving the species. Transplanting will be allowed only when on-site and off-site habitat conservation is not possible and the death of cacti is unavoidable.

The area of habitat authorized to be modified or destroyed between 1987 and 2000 (i.e., habitat developed or significantly modified beyond the point where restoration would be a likely alternative) is approximately 9,886 ha (24,429 acres) which represents 43 percent of the total area surveyed to date. In 1998, more than 445.5 ha (1,100 acres) of Pima pineapple cactus were lost including 143 ha (353 acres) from the Las Campanas Housing Development project, and 304.6 ha (752 acres) from the ASARCO, Inc. Mission complex project. In 2000, 237.3 ha (586 acres) of habitat were lost with the expansion of a state prison in Tucson. 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, is expected to be significant.

Most of the documented habitat development has occurred south of Tucson down 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, 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 species' 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 species' range at higher elevations and lower plant densities.

Based on surveys and habitat analysis, land 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.

Under section 9 of the Act, the taking of listed animals is specifically prohibited, regardless of landownership status. For listed plants, these prohibitions and the protection they afford do not apply. Listed plant species are protected only from deliberate removal from Federal lands. There is no protection against removal from, or destruction of, plants on any non-Federal lands under the Act by a land owner. The Arizona Native Plant Law may delay vegetation clearing on private property for the salvage of specific plants species within a 30-day period. Although the Arizona State Native Plant Law does prohibit 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.

Section 7 protection extends to listed plants regardless of landownership if there is a Federal nexus. However, without Federal agency involvement, section 7 does not apply to projects on non-Federal lands. Much of the development likely on State or private lands has a limited

exposure to Federal regulatory requirements. Additional Pima pineapple cacti and associated habitat on these lands are almost certain to be lost as development in southern Arizona continues through the Santa Cruz Valley. Efforts to transplant individual cacti to other locations have had limited success, and as development increases, suitable locations will become scarce as habitat is converted.

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

Other specific threats which 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 does exist and can be applied. Mining has resulted in the loss of hundreds, if not thousands, of acres of potential habitat throughout the range of the species. Much of the mining activity has been occurring in the Green Valley area, which is the center of the species' 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).

Very little is known regarding the effects of low to moderate levels of livestock grazing on Pima pineapple cactus distribution. Currently, a study has been established to observe the effects of grazing on Pima pineapple cactus on the Coronado National Forest. The species is patchy in distribution and widely dispersed and occupies relatively xeric soils (i.e., these plants do not inhabit areas immediately adjacent to or along water tanks or streambanks) (Roller 1996). The grazing use of these sites varies considerably. Some areas have received use above the authorized intensity (Falk, pers. obs.). The monitoring from allotments on the Coronado have not shown significant differences between cacti in the exclosures and those that are not protected. However, the plots have been monitored only for 5 years and the differences may not be seen for many years to come. Young cacti could be trampled by livestock, or site hydrology may be altered in ways that might affect seedling establishment and recruitment.

Habitat effects of livestock overuse could include erosion, hydrological and micro-climatic changes, invasion or expansion of exotic grasses due to livestock preferences for native grass species over exotics. Some range management practices such as mechanical imprinting, chaining, ripping, and seeding of non-native grasses have contributed to the modification and loss of habitat and individual cacti. Overgrazing in some areas continues today.

It is uncertain the extent to which overgrazing affects the cactus by altering the structure and function of the ecosystem. However, long-term grazing, (particularly overgrazing), fire suppression, and drought in arid grassland ecosystems have all been hypothesized as being the cause, either individually or collectively, of changes in community structure and function (Bahre

1985). Altered edaphic (stability and water infiltration ability) conditions, caused by damage to micro-biotic and biological crusts over soils with grazing, have been documented in arid land systems (Schlesinger et al. 1990, Fleischner 1994).

Vegetation associated with higher Pima pineapple cactus densities, reproduction, and greater levels of cactus vigor is described as a mid-sized mesquite shrub land with an assortment of other succulent species and native bunch grasses. Many of the species dominant in this vegetation type are associated with grazing (i.e., “increasers” under some grazing practices). Less intensively grazed pastures did support greater native grass coverage with more species present. However, even with an increased bunch grass abundance, the fuel structure of the community was not continuous and allowed for substantial open patches along the drip line of shrub species where the cactus often occurs (Roller and Halvorson 1997). Also, specific levels of soil movement are required for seed germination because the seed will not germinate on the surface; it generally germinates at a depth of 0.5-1.5 cm (0.2 - 0.6 inches) (Roller 1996). Few locations throughout the plant’s range have documented the presence of seedlings or sub-adults. However, all but one of the known locations had been grazed within three years of the observation. Whether light to moderate grazing practices provide the appropriate level of soil movement to cause seed germination has not been determined. Over-land sheet flow across these areas may also move soil and deposit it over sediments. The study established on the Coronado National Forest should provide some insight on seed germination relative to specific grazing intensities.

Reduced herbaceous biomass within the immediate proximity of individuals may reduce heat intensity with fire. Reduced herbaceous cover and continuity decrease fire frequencies in semidesert grasslands, and over the long-term increase cactus survival following fire (McPherson 1995, Thomas and Goodson 1992, Wright and Bailey 1982).

The invasion of Lehmann lovegrass combined with fire is a threat to Pima pineapple cactus populations. Continuous distributions of fuels and greater biomass near the apex of individual plants are believed to increase mortality following fire (Roller and Halvorson 1997). Fire increases Lehmann lovegrass distribution; correspondingly, fire intensity and fire frequency increases with Lehmann lovegrass invasion (McPherson 1995), a positive-feedback cycle.

Even with complete data on historical change related to Pima pineapple cactus distribution and abundance, the Service cannot reliably predict population status due to compounding factors such as climate change, urbanization, 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, the need for information on what limits the plant’s distribution under current habitat conditions is significant.

Based on monitoring results, the range-wide status of the Pima pineapple cactus appears to have been recently affected by threats that completely alter or considerably modify more than a third of the species’ surveyed habitat, and have caused the elimination of nearly 60 percent of documented locations. These values are supplied to serve as an extrapolation of the situation

which might be taking place across the rest of the entire population. Current information regarding the status of this species must be supplemented by more precise and thorough spatial analysis through the use of geographical information systems, databases and on the ground surveys.

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 its habitat. Habitat fragmentation and degradation will likely continue into the foreseeable future based on historic data and growth projections produced by the Pima County Association of Governments (1995). There is very little Federal oversight on conservation measures that would protect or recover the majority of the potential habitat. Even some areas legally protected under the Act 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, and the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation. It also includes 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 to assess the effects of the action under consultation.

The project is composed of two distinct action areas; the land within the boundaries of the Madera Highlands development, 372.6 ha (920 acres) and the off-site conservation lands, 149 ha (368 acres).

Within the 372.6 ha footprint of the site, 65.6 ha (162 acres) of habitat were delineated as habitat for the cactus which comprises 60 percent of the total site proposed for development. The delineation did not include all areas where cactus were found, but does capture 96 percent of the cacti on the site. Within the eastern portion of the site, 162 ha (400 acres) will be left in some form of open space, either natural areas or greens associated with the golf course. Very little of the proposed open space overlaps with delineated habitat for the cactus. The remainder of the site is highly disturbed by past agricultural practices and is no longer suitable for Pima pineapple cactus, although cacti were probably there before the conversion to pecan orchards. There are 49 cacti scattered throughout the 65.6 ha of suitable habitat in the eastern portion of the proposed development.

Vegetation within the eastern portion of the proposed development site is relatively undisturbed desert scrub. The area directly to the north is undeveloped private land, as is land directly to the

south. The eastern boundary of the project area adjoins State land. The Santa Rita Experimental Range is approximately 2.4 km (1.4 miles) to the east of the proposed project. The surrounding parcels of State land have not been surveyed, but similar habitat surrounds the site, and there are probably Pima pineapple cactus present in those areas. There are known locations of cacti on the Santa Rita Experimental Range.

The off-site conservation area, located in T.18S., R.9E., sections 26 and 35, is approximately 37 km (23 miles) west of the proposed development. These two sections of land are a private in holding surrounded on the north, east and west by State land and Buenos Aires National Wildlife Refuge on the south. Only a portion of the land within the two sections contains Pima pineapple cactus. Habitat within that portion is undisturbed desert scrub. There are 72 Pima pineapple cactus within the 149-hectare proposed conservation area. The remainder of the site is mixed mesquite scrub with several washes containing xeroriparian vegetation. There is also an extensive area of clay deposition. These areas typically do not support populations of the cactus, which is why they are not included in the proposed conservation area. The entire 445.5 hectares was surveyed for Pima pineapple cactus and a total of 75 cacti were found. The proposed conservation area captures 96 percent of the known Pima pineapple cactus.

EFFECTS OF THE PROPOSED ACTION

There are 65.6 ha (162 acres) of occupied and suitable habitat within the project area, all of which is proposed for development. The proposed housing development will directly affect all 49 cactus present on the site. All of the cacti present on the site will be transplanted to the 5.1 hectare on-site conservation area. This area is located in the north portion of the development. It is not within an area delineated as Pima pineapple cactus habitat nor does it have cactus on it. The Service did review the site and concurred that it is appropriate for the transplant effort. The site does contain habitat qualities associated with the cactus. It is also located within an open space area of the proposed development and away from most of the lots, except on the west side. It is further removed from the developed lots by a small wash that will remain in place. Past efforts to transplant individual cactus to other locations has had only limited success. Transplanting is best done in the fall, when precipitation is low, to reduce the chances of bacterial infection from wet soil. The transplanted cacti will be monitored yearly for 5 years, allowing time to assess the success of this transplanting effort.

To minimize the effects of the proposed action on habitat loss, the applicant is setting aside 149 ha (328 acres) for preservation. This offsets the loss of 65.6 (162 acres) of occupied and suitable habitat. The average density of Pima pineapple cactus in the conservation area is 0.17 cactus per ha (0.07 cactus per acre). The average density of the cactus in the proposed development site is 0.12 per ha (0.5 cactus per acre). These are typical densities for the cactus indicating that the habitat is well suited for the species. The ratio of 2:1 replacement for the loss of habitat takes into account not just the loss of habitat, but the removal of 49 cacti that will no longer function as a population. Indeed, because the survival rate for transplanted cacti is low, all of the transplanted cacti may be lost. This will be significant to the entire population in the general area

for the following reasons: a) high densities of cacti on the development site probably indicate high quality habitat, b) the demography of the population may be affected if cacti on this site are more vigorous, reproduce at a higher rate, and acted as source of propagules, c) healthier individuals in better habitat have a much higher probability of surviving disturbance, extended drought, or other events that can induce widespread mortality, d) in terms of metapopulation dynamics, the cacti may be part of a larger population that will now experience fragmentation, and e) there may be genetic implications (i.e. altered gene flow) for the cacti remaining in the area (Silvertown and Lovett Doust 1993, Crawley 1997). There is also the unquantifiable effect on the seed bank, which could have long-term effects on the viability of the population. It is difficult to predict the long-term consequences associated with translocating cacti and the subsequent effect on the structure of the population. Additional loss of habitat and individuals continues a downward trend for the species. The ongoing high rate of habitat loss will continue to impede recovery for this species.

The off-site conservation lands will be an important contribution towards the recovery of Pima pineapple cactus. The cactus will not be able to survive in the long-term in small, fragmented areas surrounded by urban development. Large, contiguous blocks of habitat need to be set aside and managed for their natural values. The conservation area is characterized by relatively pristine desert scrub, no internal roads and little evidence of human use. Some fencing will be necessary along one road to reduce the likelihood of off-road vehicle use. Funds will be allocated for the long term management of the site and monitoring of Pima pineapple cactus. All of the proposed conservation actions included in the biological assessment are critical to offset impacts to Pima pineapple cactus and its habitat.

The Service does not anticipate any indirect effects in the action area. The roads associated with this development are all internal and originate from existing roads. All roads within the proposed development end in cul-de-sacs. There are no roads that allow for access to the surrounding private and State lands.

This development will result in the loss of 65.6 ha of suitable habitat and 49 cacti. This effect to the population should be offset by the conservation and management of the 149 ha of Pima pineapple cactus habitat in perpetuity in the Altar Valley.

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.

As described previously, development in this geographic area can be expected to increase. Private lands not presently developed in the action area are quickly becoming urbanized. It is unknown what the plans are for the surrounding State and private lands. Both State and private lands will likely continue to be subject to livestock grazing. Another master planned community,

Quail Creek, is north of the proposed development. Much of this development will have little or 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. Without the protection under section 9 that applies on non-Federal lands, there is little regulatory authority to use in reducing those risks.

CONCLUSION

After reviewing the current status of Pima pineapple cactus, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of Pima pineapple cactus. No critical habitat has been designated; therefore, none will be affected. The Service bases this conclusion on the following:

- 1) The applicant will purchase and convey a conservation easement on 149 hectares (328 acres) of occupied and suitable habitat for Pima pineapple cactus. The conservation easement will be held by an appropriate third party. The easement will be held in perpetuity for the conservation and recovery of Pima pineapple, and the management of habitat will directly benefit the species.
- 2) The applicant will establish a 5-1 ha (12.7-acre) conservation easement within the Madera Highlands proposed development. That easement will have the same requirements as that listed in #1 above. All Pima pineapple cactus within the 372.6-ha (920-acre) site will be translocated to this area. The cacti will be monitored annually for 5 years.

INCIDENTAL TAKE STATEMENT

Sections 7(b)(4) and 7(o)(2) of the Act do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that the Act 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 incidental take nor recovery permits are needed from the Service for implementation of the proposed action.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act 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 this species. Actions proposed as part of the proposed project are not included here. The Service recommends the following actions:

1. The applicant should coordinate transplanting the cacti to the on-site conservation area with personnel that have experience in transplanting cacti. The Service recommends consulting with staff from the Arizona Sonora Desert Museum. This will give the applicant some background in the proper transplanting techniques and increase the chances for survival.
2. The Service recommends that the applicant notify the homeowners adjacent to the on-site conservation area of the purpose and long-term management guidelines for the maintenance of site. This action may help to conserve the site integrity and homeowners may assist in the monitoring of the site.
3. The Corps should work with the Service to implement the Pima Pineapple Cactus Recovery plan, when finalized, in regard to the issuance of Section 404 permits.

REINITIATION NOTICE

This concludes formal consultation on the proposed sand and gravel operation in Pima County, Arizona. 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) new information reveals effects of the agency action that may affect Pima pineapple cactus in a manner or to an extent not considered in this opinion; (2) the agency action is subsequently modified in a manner that causes an effect to the Pima pineapple cactus that was not considered in this opinion; or (3) a new species is listed or critical habitat designated that may be affected by the action.

If we can be of further assistance, please contact Mima Falk (520) 670-4550 or Sherry Barrett (520) 670-4617.

Sincerely,

/s/ David L. Harlow
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
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