



United States Department of the Interior
Fish and Wildlife Service

Arizona Ecological Services Field Office

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In Reply Refer To:

AESO/SE
2-21-97-F-339

April 13, 1998

Mr. John McGee
Forest Supervisor
Coronado National Forest
300 East Congress
Tucson, Arizona 85701

Dear Mr. McGee:

The U.S. Fish and Wildlife Service has reviewed the biological assessment (BA) for the proposed replacement of a culvert along the West Gate Road, located in Santa Cruz County, Arizona. Initial information was received and consultation initiated upon your request in the December 8, 1997, letter of initiation. This document represents the Services's biological opinion on the effects of the proposed action on the Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*) in accordance with section 7 of the Endangered Species Act of 1973, as amended, (16 U.S.C. 1531 et seq.).

This biological opinion is based on information provided in the BA, telephone conversations, field investigations, supplemental information amending the BA, and other sources of information. A complete administrative record of this consultation is on file at the Arizona Ecological Services Field Office, Phoenix, Arizona.

Consultation history

Informal consultation began with a field investigation and meeting held on February 26, 1997 at the project site with attending representatives from the Service and the Coronado National Forest. Conservation measures discussed during informal consultation are reflected within the "PROJECT DESCRIPTION" section of this biological opinion. Formal consultation was initiated with the December 8, 1997, letter and BA from the Forest. Additional information was submitted to amend the BA in memoranda of March 30, 1998 and April 1, 1998.

Description of proposed action

An earlier BA for work conducted by Santa Cruz County along the West Gate Road from the Community of West Gate to the Santa Cruz/Cochise County line was prepared on June 23, 1997

(U.S. Forest Service 1997). Due to effects on Huachuca water umbel, the County decided not to replace a culvert adjacent to a population of this species. The Service (1997) concurred with the effects determinations given in the 1997 assessment and work along the road was initiated except for replacing the culvert. It was understood following a site visit conducted on February 26, 1997, by the Service that one of the reasons to conduct the work including the culvert replacement was to increase public safety. Conditions of that concurrence were also given by the Service within the concurrence letter (U.S. Fish and Wildlife Service 1997). Santa Cruz County is now requesting approval from Sierra Vista Ranger District of the Coronado National Forest to replace a culvert under the West Gate Road which would drain into a small unnamed drainage which supports a population of the Huachuca water umbel. Please refer to enclosures A, B, and C for a representation of the project description which include: a project location map, the relevant distribution of Huachuca water umbel near the project, and an illustration of the culvert placement at the population site. These are appended at the end of this document.

The project site is in open-canopied madrean oak woodland at 5060 feet in elevation. Understory species include perennial bunch grasses consisting of side oats and hairy grammas, plains lovegrass, curly mesquite, skunkbush, and Schott's yucca. The unnamed drainage which supports the Huachuca water umbel population runs through the Center Pasture of the Manila Allotment. Observations were taken by Coronado National Forest staff members prior to discussions at the February 26, 1997, site visit. Concerns were raised with these observations regarding the range condition which at that time were being grazed under drought conditions. This pasture and the drainage riparian area appeared to meet or exceed utilization levels specified by the Forest Plan (40 to 45% by weight). Livestock were removed from this pasture and the allotment in the spring of 1997 and returned to the allotment in the Fall of 1997. Livestock were not moved into the Center pasture containing Huachuca water umbel.

The Huachuca water umbel occurs from the culvert to about 250 feet upstream at the private property boundary. At this upstream site, this species occurs on at least 35% of the area. Downstream of the culvert, it occurs for about 75 feet and is very scattered and is estimated to occur on less than 10% of the area. A third site farther down the drainage system appears to support the species at nearly the same density as the second site downstream of the culvert. Species density was estimated following the monitoring protocol which was developed for the Coronado National Forest. However, no specific transects were run at these sites.

Listed are the following measures to minimize potential adverse affects from the installment of the new culvert as documented within the BA.

- Widening of the road would occur only on the downstream side of the existing culvert.
- The edge of the uphill side of the existing road would serve as the new shoulder.
- The lower lip of the culvert would be 12 inches or more above the Huachuca water umbel site.

- Equipment would be kept out of the channel on the upstream side of the culvert.
- Equipment would be restricted to the channel no lower than the rock armor on the downstream side of the culvert.
- Runoff protection would include 12 to 18 inch berms along this stretch of the road during chipsealing to confine oils to the road surface. Lining the stream channel with hay bales for further protection would be done where needed.
- An energy dissipater/splash apron would be installed on the downstream end of the culvert.
- Rocks 12 inches in diameter or greater would line the channel immediately below the dissipater.
- Any Huachuca water umbel plants that could be removed or damaged by the culvert installation will be held temporarily at the Sierra Vista Ranger District Office. These plants will be placed immediately upstream of the new culvert when installation is complete.

Huachuca Water Umbel

STATUS OF THE SPECIES (rangewide)

The Huachuca water umbel was listed as an endangered species on January 6, 1997. Critical habitat was not designated. The umbel is an herbaceous, semiaquatic perennial plant with slender, erect leaves that grow from creeping rhizomes. The leaves are cylindrical, hollow with no pith, and have septa (thin partitions) at regular intervals. The yellow/green or bright green leaves are generally 0.04-0.12 inches in diameter and often one to two inches tall, but can reach up to eight inches tall under favorable conditions. Three to 10 very small flowers are borne on an umbel that is always shorter than the leaves. The fruits are globose, 0.06-0.08 inches in diameter, and usually slightly longer than wide (Affolter 1985). The species reproduces sexually through flowering and asexually from rhizomes, the latter probably being the primary reproductive mode. An additional dispersal opportunity occurs as a result of the dislodging of clumps of plants which then may re-root in a different site along aquatic systems.

Huachuca water umbel was first described by A.W. Hill based on the type specimen collected near Tucson in 1881 (Hill 1926). Hill applied the name *Lilaeopsis recurva* to the specimen, and the name prevailed until Affolter (1985) revised the genus. Affolter applied the name *L. schaffneriana* ssp. *recurva* to plants found east of the continental divide.

Huachuca water umbel has been documented from 23 sites in Santa Cruz, Cochise, and Pima counties, Arizona, and in adjacent Sonora, Mexico, west of the continental divide (Saucedo 1990, Warren et al. 1989, Warren et al. 1991, Warren and Reichenbacher 1991, Service files). The

plant has been extirpated from six of the 23 sites. The 17 extant sites occur in four major watersheds - San Pedro River, Santa Cruz River, Rio Yaqui, and Rio Sonora. All sites are between 3,500 to 6,500 ft elevation.

Huachuca water umbel has an opportunistic strategy that ensures its survival in healthy riverine systems, cienegas, and springs. In upper watersheds that generally do not experience scouring floods, the umbel occurs in microsites where interspecific plant competition is low. At these sites, the umbel occurs on wetted soils interspersed with other plants at low density, along the periphery of the wetted channel, or in small openings in the understory. The upper Santa Cruz River and associated springs in the San Rafael Valley, where a population of Huachuca water umbel occurs, is an example of a site that meets these conditions. The types of microsites required by the umbel were generally lost from the main stems of the San Pedro and Santa Cruz rivers when channel entrenchment occurred in the late 1800's. Habitat on the upper San Pedro River is recovering, and Huachuca water umbel has recently been found along short reaches of the main channel.

The umbel was found in Empire Gulch 1996 by Peter Warren. Only a very small patch of Huachuca water umbel was found. During a second visit to the site, Dr. Warren was unable to locate the umbel (P. Warren, pers. comm. 1997). However, potential habitat is widespread along Cienega Creek and Dr. Warren believes (pers. comm. 1997) habitat conditions are improving for the umbel with recent improvements in grazing management. Cattle lightly graze the area where the water umbel occurs in Empire Gulch (P. Warren, pers. comm. 1997).

In stream and river habitats, Huachuca water umbel can occur in backwaters, side channels, and nearby springs. After a flood, it can rapidly expand its population and occupy disturbed habitat until interspecific competition exceeds its tolerance. This response was recorded at Sonoita Creek in August 1988, when a scouring flood removed about 95 percent of the Huachuca water umbel population (Gori et al. 1990). One year later, the umbel had recolonized the stream and was again codominant with watercress, *Rorippa masturtium-aquaticum* (Warren et al. 1991). The expansion and contraction of Huachuca water umbel populations appears to depend on the presence of "refugia" where the species can escape the effects of scouring floods, a watershed that has an unaltered hydrograph, and a healthy riparian community that stabilizes the channel.

Density of umbel plants and size of populations fluctuate in response to both flood cycles and site characteristics. Some sites, such as Black Draw, have a few sparsely-distributed clones, possibly due to the dense shade of the even-aged overstory of trees, dense nonnative herbaceous layer beneath the canopy, and deeply entrenched channel. The Sonoita Creek population occupies 14.5 percent of a 5,385 ft² patch of habitat (Gori et al. 1990). Some populations are as small as 11-22 ft². The Scotia Canyon population, by contrast, has dense mats of leaves. Scotia Canyon contains one of the larger Huachuca water umbel populations, occupying about 57 percent of the 1,450 m (4,756 ft) perennial reach (Gori et al. 1990; Jim Abbott, Coronado National Forest, Tucson, AZ, in litt. 1994).

While the extent of occupied habitat can be estimated, the number of individuals in each

population is difficult to determine because of the intermeshing nature of the creeping rhizomes and the predominantly asexual mode of reproduction. A 'population' of Huachuca water umbel may be composed of one or many genetically distinct individuals.

Through out the range of Huachuca water umbel in southeastern Arizona the landscape in general appears to have been influenced by Europeans for hundreds of years, and to an apparent lesser extent Native Americans for an even longer time (Bahre 1991). The effect of this influence, though not always obvious, has been pervasive and widespread. The direct and indirect impacts that humans have induced upon their landscape have been a source of much debate. Part of this debate lies in the complexity of the proposed agents of change which are often interdependent and the unreliable nature of retroactive study that often describes historic conditions and infers cause without follow-up experimentation. Abundant evidence suggests that land use changes associated with growing human populations through urban and rural development have fragmented the landscape and appear to be increasing erosion rates, lowering the groundwater table, and influencing the spread of noxious invasive plants in southeastern Arizona (Bahre 1991, 1995).

Overgrazing, mining, hay harvesting, timber harvest, fire suppression, and other activities in the nineteenth century led to widespread erosion and channel entrenchment in southeastern Arizona streams and cienegas when above-average precipitation and flooding occurred in the late 1800's (Bahre 1991, Bryan 1925, Dobyns 1981, Hastings and Turner 1980, Hendrickson and Minckley 1984, Martin 1975, Sheridan 1986, Webb and Betancourt 1992). These events contributed to long-term or permanent degradation and loss of cienega and riparian habitat throughout southern Arizona and northern Mexico. Much habitat of the Huachuca water umbel and other cienega-dependent species was presumably lost at that time.

Wetland degradation and loss continues today. Human activities such as groundwater overdrafts, surface water diversions, impoundments, channelization, improper livestock grazing, chaining, agriculture, mining, sand and gravel operations, road building, nonnative species introductions, urbanization, wood cutting, and recreation all contribute to riparian and cienega habitat loss and degradation in southern Arizona. The local and regional effects of these activities are expected to increase with the increasing human population.

Nine known *Lilaeopsis* populations occur in the San Pedro River watershed in Arizona and Sonora on sites owned or managed by private landowners, Fort Huachuca Military Reservation, the Coronado National Forest, and the BLM Tucson Field Office. Removal of grazing from BLM-administered lands within the riparian areas is ongoing. Trespass cattle have also been a problem within the Riparian National Conservation Area (RNCA) both inside and outside of allotments, particularly near the confluence of the Babocomari and San Pedro rivers, and on the San Pedro River at and just below Highway 90, at Fairbank, and in the vicinity of the St. David Diversion. The BLM has been recently removing trespass cattle from this area. To date, 79 cattle have been removed (Mark Fredlake, BLM, pers. comm. 1997).

Two extirpated populations in the upper San Pedro watershed occurred at Zinn Pond in St. David

and the San Pedro River near St. David. Cienega-like habitats were probably common along the San Pedro River prior to 1900 (Hendrickson and Minckley 1984, Jackson et al. 1987). These habitats are beginning to recover.

The Huachuca water umbel was located on the San Pedro River RNCA in 1994. Mark Fredlake (BLM) and Dave Gori (The Nature Conservancy, Tucson, AZ) located 43 patches of Huachuca water umbel during 1995 and 1996. These patches occur in five disjunct areas, including approximately two miles downstream of Fairbank, near Brunchow Hill downstream of Charleston, immediately north and south of Highway 90, approximately 2.5 miles downstream of Highway 90, and approximately one mile north of Hereford. The umbel is sensitive to flooding and populations may disappear while others become established during and after severe flood events. Two patches of Huachuca water umbel on the San Pedro River were lost during a winter flood in 1994 and had still not recolonized that area as of May of 1995, demonstrating the dynamic and often precarious nature of occurrences within a riparian system (Al Anderson, Grey Hawk Ranch, *in litt.* 1995). However, after high flows in 1996, no apparent loss or reduction in approximately 12 Huachuca water umbel patches were noted by Dr. Peter Warren (The Nature Conservancy, Tucson, pers. comm. 1997). The entire San Pedro RNCA is considered potential habitat for the Huachuca water umbel. It is the largest contiguous potential habitat of the umbel, and as such is considered the most important site for recovery.

Few human impacts to umbel habitat in the San Pedro River have occurred since establishment of the RNCA; however, recreation and associated impacts are becoming increasingly evident. The greatest threat to umbel habitat on the San Pedro River is continued groundwater pumping in excess of recharge in the Sierra Vista sub-watershed. Recreation is occurring in some areas, and may be adversely affecting the umbel through trampling and bank erosion in some areas, particularly at the Highway 90 locality.

Dredging extirpated the Huachuca water umbel from House Pond, near the extant population in Black Draw (Warren et al. 1991). The umbel population at Zinn Pond in St. David near the San Pedro River was probably lost when the pond was dredged and deepened. This population was last documented in 1953 (Warren et al. 1991).

Livestock grazing can affect the umbel through trampling and changes in stream hydrology and loss of stream bank stability. However, existence of the umbel appears to be compatible with well-managed livestock grazing (Service 1997). In heavily grazed areas, stream headcutting can threaten cienegas where the umbel occurs. Such headcutting occurs at Black Draw just south of the international boundary and at Los Fresnos, in the San Rafael Valley, Sonora. Groundwater pumping has eliminated habitat in the Santa Cruz River north of Tubac, and threatens habitat in the San Pedro River. Severe recreational impacts in neglected areas can compact soils, destabilize stream banks, and decrease riparian plant density, including densities of the Huachuca water umbel. Populations in Bear Canyon in the Huachuca Mountains have been impacted by trampling and off-highway vehicles.

A suite of nonnative plant species has invaded wetland habitats occupied by the Huachuca water umbel. In some cases their effect on the umbel is unclear. However, in certain microsites, the nonnative Bermuda grass, *Cynodon dactylon*, may directly compete with the umbel. Bermuda grass forms a thick sod in which many native plants are unable to establish. Watercress is another nonnative plant now abundant along perennial streams in Arizona. It is successful in disturbed areas and can form dense monocultures that can compete and adversely affect Huachuca water umbel populations.

Limited numbers of populations and the small size of populations makes the Huachuca water umbel vulnerable to extinction as a result of stochastic events that are often exacerbated by habitat disturbance. For instance, the restriction of this taxon to a relatively small area in southeastern Arizona and adjacent Sonora increases the chance that a single environmental catastrophe, such as a severe tropical storm or drought, could eliminate populations or cause extinction. Populations are in most cases isolated, as well, which makes the chance of natural recolonization after extirpation less likely. Small populations are also subject to demographic and genetic stochasticity, which increases the probability of population extirpation (Shafer 1990, Wilcox and Murphy 1985).

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 anticipated impacts of Federal action considered by the Service to be within the action area are those within the unnamed drainage system, the adjacent upland watershed, and downstream systems which this unnamed drainage contributes to.

Effects of livestock grazing in riparian systems, and specifically, on the Huachuca water umbel and its habitat, are many and complex. Cattle are attracted to water and forage in riparian areas and, as a result, spend a disproportionate time in riparian areas, if not controlled. Grazing can alter plant species composition and growth form, density of stands, vigor, and seed production (Ryder 1980). Heavy grazing in riparian areas typically results in reduced understory and bankline vegetation, bushy growth forms caused by browsing of terminal buds, and in some cases, replacement of native species by nonnatives such as saltcedar, *Tamarix chinensis* (Krueper 1995). Reduced vegetation cover and trampling of banks results in increased soil erosion and higher peak flows (Lusby 1979). Other effects include decreased water quality (Szaro 1989), soil compaction (Lusby et al. 1971, Fleischner 1994), and decreased nutrient retention (Sewards and Valet 1995).

Grazing in the watershed of a riparian system can also affect riparian functions. Disturbance of

soils, cryptobiotic crusts, and removal of vegetation in the watershed by grazing combine to increase surface runoff and sediment transport and decrease infiltration of precipitation (Belsky and Blumenthad 1997, DeBano and Schmidt 1989, Belnap 1992, Gifford and Hawkins 1978, Blackburn 1984). Effects are cumulative and interactive. Loss of vegetation cover and trampling of soils promote deterioration of soil structure which in turn accelerates vegetation loss. These changes in the watershed tend to increase peak flows and reduce low flows (DeBano and Schmidt 1989), making the stream more "flashy". The Huachuca water umbel is sensitive to changes in water level and may be eliminated during floods or drought. Thus, changes in the watershed attributable to grazing can reduce habitat quality for the umbel. Adverse effects to watershed function are especially well-documented for heavy grazing regimes; however, less information is available for watersheds grazed moderately or lightly. In regard to comparisons of watershed condition under light, moderate, or not grazed regimes, some studies show no difference in soil loss, infiltration capacity, or bulk density among (Blackburn 1984), while others show measurable differences in watershed function (Gifford and Hawkins 1978).

Assessing the effects of grazing in the Center pasture of the Manila allotment on watershed function is problematic because no assessment of watershed conditions has been made. Although part of the available range condition information included observations of soil condition, with a measure of the percentage of the potential species composition of the natural vegetation represented by the current plant community. Watershed condition, as we refer to it here, is a measure of current versus potential condition of soils and vegetation communities in regard to water infiltration rates, erosion rates, and runoff rates. A watershed in good condition will have low rates of erosion and runoff and high rates of infiltration, given the potential of the site in terms of existing soils and potential vegetation communities. As discussed above, grazing disturbs soils and alters vegetation communities in a way that often degrades watershed condition. Range condition is related to grazing intensity, and grazing intensity is related to watershed condition; thus range condition and watershed condition are likely related, as well. However, the relationship between range condition and watershed condition is complex; in southeastern Arizona the two are probably often, but not necessarily, correlated. This is particularly true where native perennial grasses are, or should be, abundant. Exceptions may be areas in which Lehmann lovegrass is common. Areas dominated by Lehman lovegrass may exhibit good watershed condition but poor range condition. Assuming range condition is largely correlated with watershed condition, portions of the allotments in fair or poor condition are expected to exhibit lower water infiltration and retention rates, greater sediment transport, and erosion of surface soils and headcutting, in comparison to rangelands in good or excellent condition, given similar soils, terrain, and potential vegetation communities. Although characterization of range condition does not conclusively support degraded watershed condition, they are suggestive of degraded watersheds, with associated adverse effects to the Huachuca water umbel and its habitat.

The range condition of the Manila Allotment was characterized to be in fair condition based on recent observations of species composition, plant vigor and soil condition by Laura Dupee of the range and watershed management staff for Sierra Vista Ranger District in the March 30, 1998, memo amending the BA. No transects have been done recently. Livestock were removed from

the allotment in the spring of 1997 because of the drought and the apparent reaching or exceeding utilization levels specified in the Forest Plan. Livestock were returned in October 1997 to the Manila allotment, but not to the Center pasture which contains the drainage which supports the Huachuca water umbel population. Prior to livestock returning to the Center pasture with the drainage supporting Huachuca water umbel, an inspection will be done to ensure grazing will not pose a threat to the population. Utilization levels will be in conformance with the 1996 Forest Plan amendment, which establishes guidelines of 30 to 35 percent utilization during the growing season. This information is included in the instructions to the permittee in the annual operation plan for the allotment. Key areas in the pasture, which include the area where the umbel is found, will be monitored to ensure adherence to the Forest Plan standards and guidelines.

As discussed above, one of the effects of livestock grazing on watersheds is reduced water infiltration rates as a result of reduced vegetation cover and compaction of soils (Lull 1959). In a forested area of Colorado, a five year exclusion of cattle resulted in a 60 percent increase in water infiltration rates, whereas infiltration rates on nearby grazed areas declined (Smith 1967). In the Davis Mountains-Big Bend area of Texas, Leithead (1959) suggested that ranges in good condition absorb moisture five to six times faster than ranges in poor condition. On Walnut Gulch in the San Pedro River watershed, Arizona, Tromble et al. (1974) found that infiltration rates were 33 percent higher in areas not grazed as compared to heavily grazed rangelands.

Based on studies in many vegetation communities under a variety of grazing strategies, Gifford and Hawkins (1978) found that the effect of grazing on infiltration rates can be roughly estimated as follows: Moderate/light grazing reduces infiltration rates to about 0.75 of the not grazed condition, and heavy grazing reduces infiltration to about 0.67 of the moderate/light condition, or 0.5 of the not grazed condition.

Gifford and Hawkins' (1978) review indicates that grazing significantly affects infiltration under a variety of conditions and vegetation communities. As discussed earlier, the major threat to the water umbel on the San Pedro River is the likelihood that groundwater pumping in excess of recharge will in time lower the groundwater elevation and result in dewatering of the San Pedro River. Infiltration is necessary for recharge of the aquifer. Changes in infiltration rates over the watershed are expected to be correlated with changes in recharge rates. An estimated 1.2 million acre-feet of precipitation falls on the Sierra Vista sub-watershed. Of this only 13,860 acre-feet (one percent) is recharged into the groundwater aquifer (ASL 1994). Conceptually, very small increases in infiltration rates could yield relatively large increases in groundwater recharge. For instance if infiltration into the groundwater aquifer increased by one percent throughout the Sierra Vista sub-watershed, recharge would exceed all current groundwater uses and losses, and in time and at current pumping rates, the cones of depression in the aquifer would diminish. Grazing on the allotments in the watershed is likely reducing infiltration rates. Whether such reduction is causing a reduction in recharge is unknown. Most aquifer recharge occurs in and along stream courses that drain the mountains on the edges of the watershed (ASL 1994) (Huachuca, Mule, Dagoon, and Whetstone mountains), rather than on the bajada. However, some level of recharge probably occurs on the bajadas. Extrapolating from Gifford and Hawkins' analysis, this recharge

is likely reduced as a result of grazing activities. The level of reduction is probably small in relation to the recharge throughout the watershed. Nevertheless, reduced recharge resulting from grazing may be contributing to the current deficit between groundwater recharge and use.

Reduced infiltration rates caused by grazing also results in increased runoff. In the Black Hills National Forest livestock grazing resulted in a 60 percent increase in summer storm runoff (Orr 1975). Runoff in turn promotes soil erosion. Smith (1967) found three to 10 times more sediment loss in grazed pastures as compared to pastures which were not grazed. In another study, following elimination of livestock from the watershed, vegetation cover increased 150 percent, the proportion of annual summer runoff dropped 72 percent, and sediment loss dropped 50 percent (Forsling 1931). Based on these findings, rangelands in fair and poor condition are expected to contribute loads and runoff to the San Pedro River than if these lands were not grazed. Elevated sediment loads caused by grazing could bury patches of water umbel and higher peak flows caused by increased runoff could scour out plants and cause down-cutting and loss of wetland habitat.

Groundwater pumping in the Sierra Vista sub-watershed has increased dramatically since the early 1960's (ASL 1994). Annual water use exceeds supplies by approximately 11,200 acre-feet and has resulted in cones of depression in the aquifer at areas with significant groundwater pumping. These areas include Sierra Vista and Fort Huachuca, Huachuca City, and the Hereford - Palominas (Water and Environmental Systems Technology, Inc. 1994). Although the relationships between groundwater pumping and river flow are complicated, continued unmitigated groundwater withdrawal threatens to reduce or eliminate baseflows in the San Pedro River (Arizona Department of Water Resources 1991, ASL 1995, Water and Environmental Systems Technology, Inc. 1994). A reduction in base-flow as a result of groundwater pumping in the Sierra Vista - Fort Huachuca area could occur within 25 years, but such effects could be reduced by water conservation, watershed management, effluent recharge, or other measures to reduce water use or increase recharge (ASL 1995, Water and Environmental Systems Technology, Inc. 1994). The San Pedro River is the largest contiguous habitat of the Huachuca water umbel and is considered the most important recovery area for the taxon.

EFFECTS OF THE PROPOSED ACTION

A list of measures to considerably reduce the potential direct and indirect effects of the proposed culvert replacement are listed under the "PROJECT DESCRIPTION" section of this biological opinion. The direct and indirect effects of project include the removal or washing out of individuals or clumps of Huachuca water umbel; and changes in channel morphology with the installment of the culvert adjacent to the populations. Any displaced individuals or clumps of the species will be temporarily held in at the District Office until construction is complete and then transplanted back into the drainage upstream of the culvert. The culvert will increase the velocity of flow into the drainage at a point location would increase erosion and sediment into the system. However the energy dissipater/splash apron, and rock armor lining of the bank and drainage where the culvert discharges would be installed to reduce the these impacts to changes in channel

morphology. With road construction of this type oil and/or other environmental contaminants could enter into the drainage system and impact Huachuca water umbel, however the use of soil berms along the edge of the road and haybales lining the drainage bank should mitigate this potential.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline.

Thirteen of the 17 extant populations occur entirely or in part on Federal lands. Thus, the effects of most actions on this plant will be subject to section 7 consultation and are not considered cumulative (i.e. grazing and recreation effects). The most serious cumulative effect of which the Service is aware is groundwater pumping in excess of recharge in the upper San Pedro River sub-watershed. As discussed above, groundwater pumping threatens to lower groundwater elevations and reduce or eliminate surface flows in the San Pedro River (ASL 1994). The City of Sierra Vista has proposed effluent recharge and management of surface runoff, which may prevent dewatering of some reaches, but would also alter water quality and flow regimes, with unknown effects on the water umbel and its habitat.

SUMMARY OF EFFECTS

The Service believes that the proposed project is not likely to jeopardize the continued existence of the Huachuca water umbel. We present this conclusion for the following reasons:

1. The proponent's project description includes substantial features to minimize the adverse effects of the action on the Huachuca water umbel.
2. Although the proposed action adversely affects individuals and habitat resulting from changes in channel morphology within the immediate proximity of the new culvert to be installed, the extent of the affect will likely be limited and site specific.

CONCLUSION

After reviewing the current status of the Huachuca water umbel, the environmental baseline for the action area, and the anticipated effects of the proposed re-alignment, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Huachuca water umbel. No critical habitat has been designated for this species, thus none will be affected.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the Huachuca water umbel. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. If effects (positive or negative) related to the project are observed, a monitoring report describing how the effects following project implementation would be important for evaluating how effective the specified conservation measures were at reducing impacts associated with the project. The analysis of future related projects would benefit significantly from such information. For example, if plants were impacted and/or transplanted upstream following implementation, then information regarding the rate of recovery or success of recovery, changes in abundance related directly and/or indirectly is very important for assessing future projects and the conservation of this species.
2. Incorporate this specific site into the monitoring protocol already established for the other known populations within the Huachuca Mountains.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species, the Service requests notification of implementation of any conservation actions.

REINITIATION - CLOSING STATEMENT

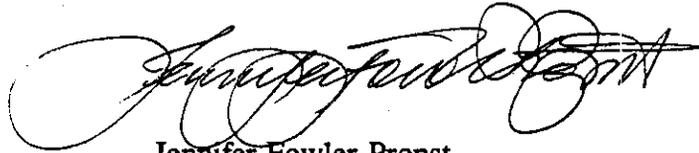
This concludes formal consultation on the action(s) outlined in the your request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount 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.

Mr. John McGee

13

If you have any questions or need further information, please contact Tricia Roller or Angie Brooks. Please refer to the consultation number, 2-21-97-F-339 in future correspondence concerning this project.

Sincerely,

A handwritten signature in black ink, appearing to read "Jennifer Fowler-Propst", with a large, sweeping flourish extending to the right.

Jennifer Fowler-Propst
Acting Field Supervisor

Enclosures

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ES)
Botanist, Fish and Wildlife Service, Tucson Sub-office of Arizona Ecological Services
Field Office, Tucson AZ
District Ranger, Sierra Vista Ranger District, Hereford, AZ

Director, Arizona Game and Fish Department, Phoenix, AZ
Director, Arizona Department of Agriculture, Phoenix, AZ

LITERATURE CITED

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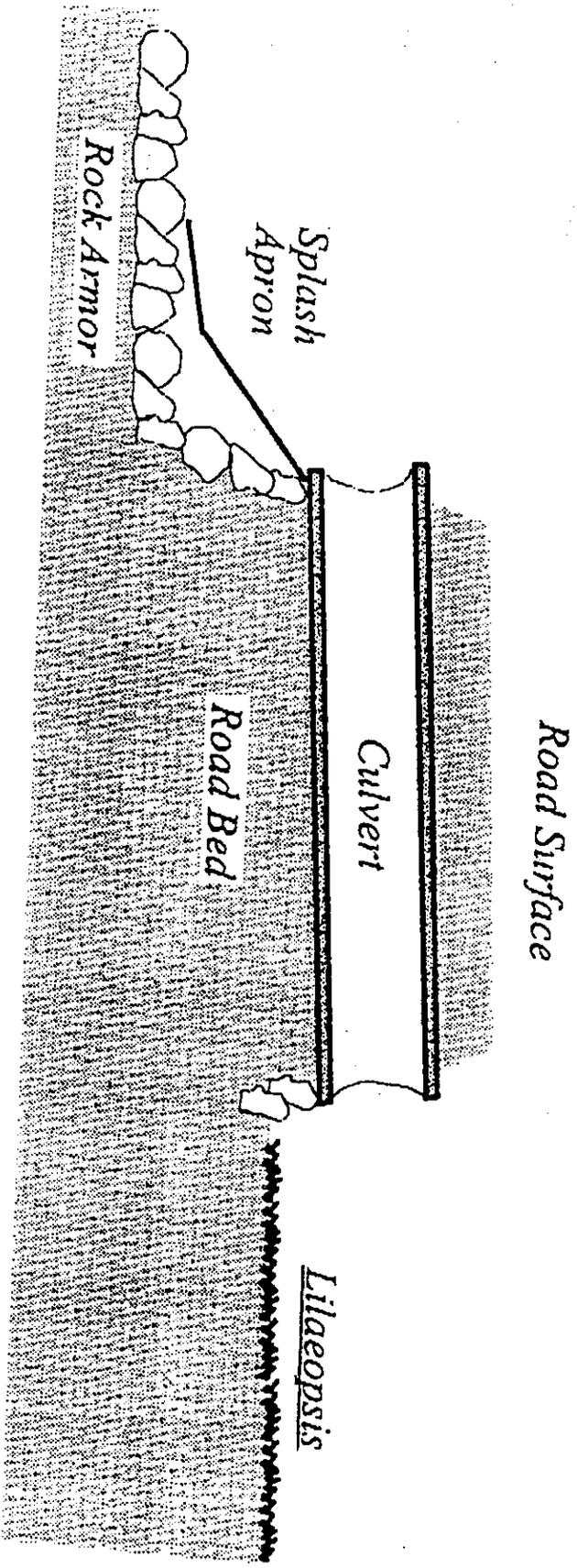
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**Culvert Placement
at
Lilaopsis Site**
(a cross section view)
1 inch = 6.3 feet
Ldeucken
13may97

**WEST GATE ROAD
CULVERT REPLACEMENT**

Attachment C



WEST GATE ROAD
CULVERT REPLACEMENT

Lilaeopsis Location Map

scale 1 inch = 1220 feet

*



Lilaeopsis
Occurrence



New Culvert

L. Deeken

25 June 97

N

36

T. 21 S.

T. 22 S.

Private Property

5100

A

D

Adaptation of
Pyeatt Ranch
U.S.G.S. Quadrangle

R. 18 E.

WEST GATE ROAD CULVERT REPLACEMENT

General Location Map

Scale 2.62 inches = 1 mile



Project Location

1.0 October

20 Nov 97



T.21S.

T.22S.

Adaptation of
Pyeatt Ranch
U.S.G.S. Quadrangle

R.18E.

R.19E.

