APPENDIX B

APPENDIX B-1
CACTUS FERRUGINOUS PYGMY OWL SURVEY

WestLand Resources, Inc.
Engineering and Environmental Consultants

June 21, 1999

U.S. Army Corps of Engineers
Attn: Ms. Lois Goodman, Environmental Research Branch
P.O. Box 532711
Los Angeles, California 90053-2325

RE: CACTUS FERRUGINOUS PYGMY-OWL SURVEY - TANQUE VERDE CREEK PROJECT
CONTRACT NO. DACA09-99-D-0003, DELIVERY ORDER 0003
WESTLAND JOB NO. 408.01

Dear Ms. Goodman:

Under subcontract to Aspen Environmental Group, WestLand Resources, Inc. (WestLand) conducted three surveys for the federally endangered cactus ferruginous pygmy-owl (CFPO) at the Tanque Verde Creek project area. It is our understanding that the project includes two proposed components: 1) soil cement bank stabilization (1,700 feet on the north bank and two segments totaling approximately 6,000 feet on the south bank), and 2) an approximately 180-acre mesquite bosque preserve. The area surveyed includes an approximately 1.5-mile reach of Tanque Verde Creek (from the Craycroft Road bridge/Pantano Wash confluence upstream to the east side of the Tucson Country Club) and approximately 180 acres of adjacent land (T13S, R14E, portion of Section 25 and T13S, R15E portion of Section 30; Figure 1). The survey area is entirely within the City Limits of Tucson on lands administered by Pima County. No CFPO responses were heard and no CFPO were sighted during this survey effort. Survey methods and results are summarized in detail below.

Three complete surveys were conducted along the project area. Two sessions with a single surveyor were required for complete coverage of the area during each survey. The surveys were conducted in the morning hours from approximately one hour before to approximately two hours after sunrise and in the evening from approximately two hours before to approximately one hour after sunset. The first survey session was conducted on March 17th (p.m.) and 19th (a.m.), the second on April 21st (a.m. and p.m.), and the third on May 12th (p.m.) and 14th (p.m.), 1999.

The surveys followed the revised protocol proposed by the U.S. Fish & Wildlife Service (USFWS). Under the revised survey protocol, calling stations are spaced at 400-meter (1,300 feet) intervals, adjacent transects are spaced at up to 800-meter (2,600 feet) intervals, and the time spent at each calling station is 18 to 22 minutes (including travel time between stations). Calling stations were mapped on a 1"=1,200' aerial photograph of the property for use in the field. Surveys were conducted under USFWS Permit No. PRT-834782.

Fifteen calling stations provided complete coverage of the project area during each survey session. Weather conditions during the survey sessions varied – skies were clear to partly cloudy, temperatures were cool to warm (low 40s to low 90s °F), and winds were calm (no wind) to breezy (5 to 10 miles per hour). Background noises associated with vehicular traffic, barking dogs, and other activities on adjacent developed lands were moderate throughout the survey area during each survey session.

There is considerable evidence of past human disturbance within the creek and on adjacent properties (Figure 1). There are existing soil-cement structures on both the north and south banks of the creek upstream and

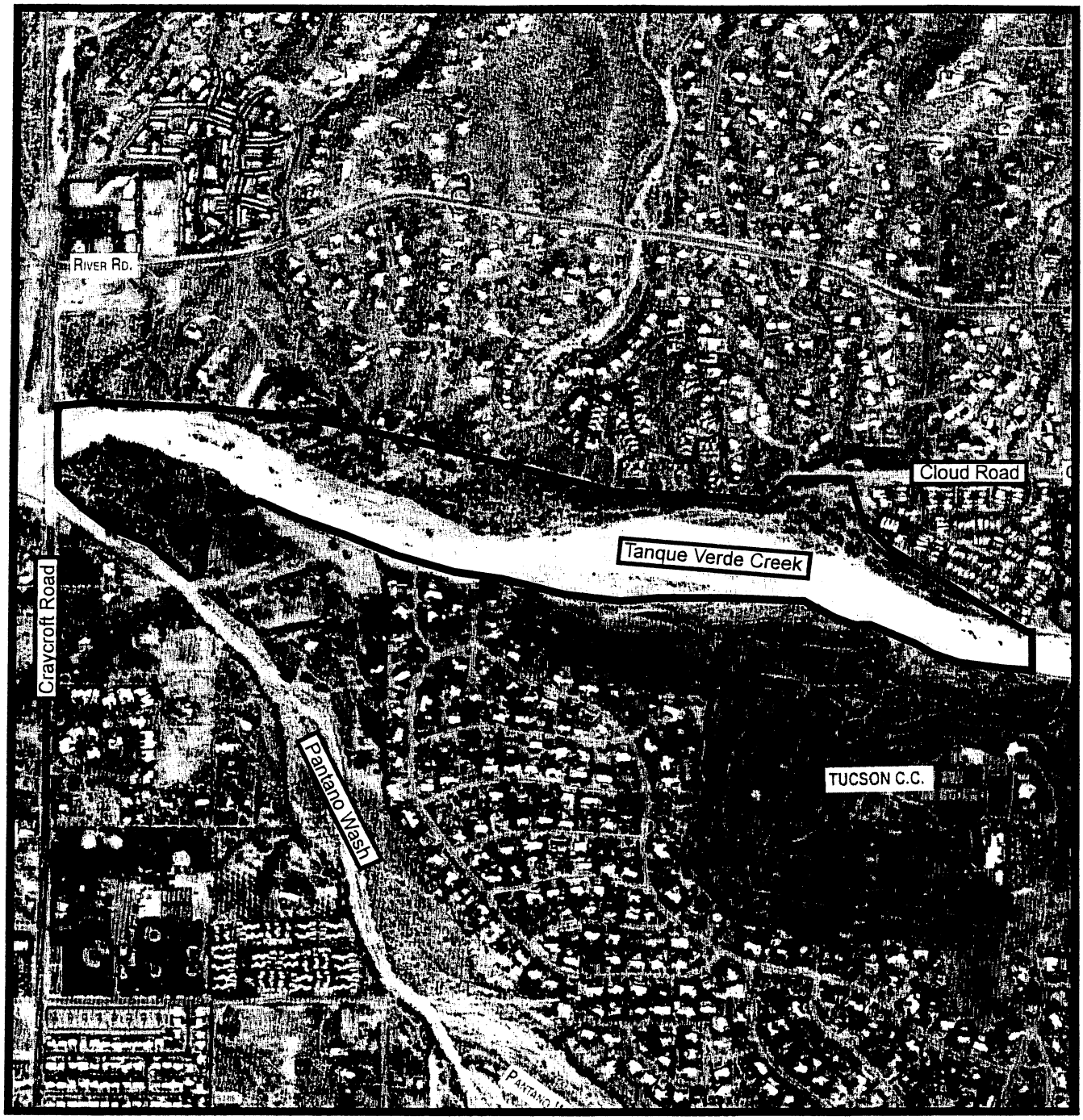
2343 E. Broadway Blvd., Suite 202 ·Tucson, AZ 85719 ·520·206·9585 Fax 520·206·9518

downstream of the project area. In addition, a recent wildfire has impacted portions of lands adjacent to the both banks of the creek, including a portion of the proposed mesquite bosque preserve. Adjoining both sides of the project area are variable-density residential developments. The Tucson Country Club golf course adjoins the south bank of the creek near the east end of the project area.

The area surveyed for this report is located at the confluence of Pantano Wash and Tanque Verde Creek. Elevations along the survey area range from approximately 2,440 to 2,460 feet above sea level. Tanque Verde Creek has a broad, sandy-bottomed channel in which water flows periodically only after moderate to large precipitation events. The sandy wash bottom is largely devoid of vegetation, but there are scattered clumps of vegetation, predominantly along the channel margins. Observed plant species in and along the channel include Fremont cottonwood (*Populus fremontii*), desert willow (*Chilopsis linearis*), burro brush (*Hymenoclea monogyra*), seep willow (*Baccharis salicifolia*), desert broom (*B. sarothroides*), velvet mesquite (*Prosopis velutina*), Mexican palo verde (*Parkinsonia aculeata*), Mexican elder (*Sambucus mexicana*), graythorn (*Ziziphus obtusifolia*), whitethorn acacia (*Acacia constricta*), catclaw acacia (*A. greggii*), four-wing saltbush (*Atriplex canescens*), and canyon ragweed (*Ambrosia ambrosioides*). Adjacent uplands host a similar suite of species. However, these areas have been impacted by a recent wildfire, which has reduced the amount of vegetation at the site as compared to pre-burn conditions. Many trees were consumed by the fire and many others that were killed, but not consumed, remain as standing dead material. Some plants within the burned areas appear to have survived the fire unharmed and, on the north side of the creek, we noted a considerable number of resprouts at the base of burned Mexican elder plants. Grasses and forbs appeared to be more abundant on burned portions of the survey area than on unburned portions. Desert ironwood (*Olneya tesota*) and saguaro (*Carnegiea gigantea*), species commonly associated with occupied CFPO habitats in southern Arizona were not observed within or adjacent to the survey area.

During the surveys, WestLand compared habitats within the survey area to habitats currently and historically occupied by CFPO in Arizona. High vegetation density, species richness, and structural diversity (i.e., relative vegetation densities of overstory, midstory, and understory layers) are commonly associated with habitats known to be occupied by CFPO although, based on new data, USFWS has recently broadened its concept of suitable habitats for the species. Most recent observations of CFPO in Arizona have been in Sonoran desertscrub with dense vegetation dominated by large trees including desert ironwood, blue palo verde (*Cercidium floridum*), and mesquite, and having high numbers of mature saguaros and high structural diversity. Historic records indicate that CFPO were most commonly encountered in dense riparian woodlands dominated by mesquite or in cottonwood-willow forests. The best data available on CFPO habitat suggests that vegetation in this survey area provides suitable nesting habitat for CFPO. The survey area does not contain mature saguaros with cavities that could provide potential nest sites for the species, but there are many trees large enough to have cavities suitable for CFPO nests within its boundaries. Two factors associated with the site that tend to lower its suitability as CFPO breeding habitat are: 1) the preponderance of developed lands in the area, and 2) vegetation in the area appears to lack the structural diversity often associated with occupied habitats. Based on this assessment, habitat quality along the portion of Tanque Verde Creek surveyed for this report appears low to moderate for CFPO. Habitat quality on the nearby lands also appears low to moderate for CFPO.

A search of the Arizona Game & Fish Department (AGFD) Heritage Data Management System dated



LEGEND
Approximate Project Boundary

Work completed under subcontract to Aspen Environmental Group
Contract No. DACA09-99-D-003
Delivery Order 0003

N

Arizona

Feet 0 1200

ASPEN ENVIRONMENTAL GROUP
Tanque Verde Creek Project
Cactus Ferruginous Pygmy-owl Survey

Image Source:
Landiscor Aerial Information
September 21, 1996
T13S, R14E portion of
Section 25 & T13S, R15E portion
of Section 30

WestLand Resources, Inc.
Engineering and Environmental Consultants
2343 E. Broadway Blvd., Suite 202 Tucson, Arizona 85719
520.206.9585 Fax 520.206.9518

Figure 1

Aerial Photograph of Project Area

Digitizer/C:/Cochran/Projects/CFPO/Tanque Verde | Project No.: 0408.01 | Drawn by: JDC | Reviewed by: SJB | Date: April 1999

March 11, 1999 indicated that there are no recorded recent observations of CFPO within T13S, R14E or T13S, R15E. Most recent observations of the species are from northwest of Tucson, 10 to 15 miles northwest of the Tanque Verde Creek survey area. The closest known recent observation of the species is from 10 to 12 miles southeast of the Tanque Verde Creek project area (a 1995 observation from south of Tanque Verde ridge within Saguaro National Park [T15S, R16E]). Records from the early part of this century indicate that the species was commonly encountered in mesquite-dominated riparian woodlands along Tanque Verde Creek and other tributaries of the Santa Cruz River in the Tucson area. However, the extent of these habitats in northeast Tucson is currently much reduced as compared with their late 19th century and early 20th century distribution.

Thank you for the opportunity to complete this survey of the Tanque Verde Creek Bank Stabilization Project Area. If you have any questions or we can be of additional assistance, please contact me at 520-206-9585.

Sincerely,
WestLand Resources, Inc.

Scott Jay Bailey
Senior Biologist

SJB:jc
Attachment: Figure 1

cc: Ms. Natasha Nelson, Aspen Environmental Group

APPENDIX B-2
USFWS FINAL COORDINATION ACT REPORT (CAR)

United States Department of the Interior

U.S. Fish and Wildlife Service
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 640-2720 FAX: (602) 640-2730

In Reply Refer To:
AESO/FA

June 15, 2000

Mr. Robert E. Koplin
Chief, Planning Division
Los Angeles District
U.S. Army Corps of Engineers
Attn: Lois Goodman, CESPL-PD-RQ
P.O. Box 532711
Los Angeles, CA 90053-2352

Dear Mr. Koplin:

This report presents our analysis and recommendations for the Tanque Verde Bank Stabilization Project, Pima County, Arizona. It is provided pursuant to the Fish and Wildlife Coordination Act (FWCA) (48 stat. 401, as amended; 16 U.S.C. 661 et seq.) and constitutes the U.S. Fish and Wildlife Service (Service) report under Section 2(b) of the FWCA. This report is based on field investigations, literature research, file reviews, coordination with the Arizona Game and Fish Department (AGFD), and information provided by the U.S. Army Corps of Engineers (Corps). Literature cited is not a complete bibliography of all literature available on the proposed project, Rillito River and tributaries, nor biological resources within the study area.

PROJECT DESCRIPTION

Under the authorization of the Rillito River and Associated Streams Study (RRAS) and the Water Resources Development Act (WRDA), the Los Angeles District of the Corps is developing, in coordination with the Pima County Department of Transportation and Flood Control District (County), a Limited Reevaluation Report (LRR) and environmental assessment for the Tanque Verde Bank Stabilization Project. The LRR is intended to investigate the feasibility and incremental justification of adding bank protection and a riparian area preserve along Tanque Verde Creek between Craycroft Road and Sabino Canyon Road in Tucson, Pima County, Arizona (area map presented as Exhibit 1 in Corps 1998). The Corps and County are evaluating several alternatives to provide slope protection on the creek. The stated primary purpose of the project is to protect the private property, public infrastructure, and existing riparian vegetation from flood damages between Craycroft Road and Sabino Canyon Road. Properties and structures that would be protected include the North Rillito Interceptor (sewer line), the proposed Tanque Verde Interceptor Extension (sewer line), the Tucson Country Club, and 56 residential structures.

The authorized plan for the stabilization project for the Rillito River was developed by the Corps in 1986 (Corps 1986) and the general design was completed in 1992 (Corps 1992). The Rillito River and tributaries project includes approximately 10.8 miles of soil cement bank protection and 15 invert stabilizers. At the time of the final report there were no economically justified flood control solutions to problems on Tanque Verde Creek. Since that time, the County has requested the LRR to address flood related-problems, including bank erosion, along Tanque Verde Creek.

ALTERNATIVES

Alternative 1

This is the No-Action plan under which slope protection would not be provided. Environmental impacts associated with the proposed project would not occur and flood-related problems along Tanque Verde Creek would be expected to continue.

Alternative 2

This is the locally-preferred alternative and has been adopted by the Corps as the Recommended Plan. Structural features would include soil cement bank protection along approximately 1,600 feet of the north bank upstream of Craycroft Road, and along two segments of 4,000 feet and 2,000 feet in length on the south bank. The alignment of the proposed bank protection would generally follow the smooth curves of the existing bank. Where applicable, the ends would match existing soil cement. At the downstream end on the south bank, the proposed soil cement would key into the bank just upstream of the confluence with Pantano Wash. At the upstream end on the north bank, the soil cement would key into the existing bank and tie back to high ground. The soil cement would match the top of the existing bank, and the toe-down would extend ten feet below the existing thalweg (the deepest point in the channel invert).

The soil cement would consist of an 8-foot-thick layer of soil mixed with Portland cement placed in 6-inch to 1 -foot-high "lifts." Lifts would be successively placed until the desired bank protection height is reached. After compaction, the soil cement would provide a hard and durable surface expected to remain intact throughout the project life of 50 years.

The non-structural component of this alternative would involve acquiring rights-of-way to establish a permanent 500-foot buffer along a portion of the north bank. Public ownership of this land would prevent additional development and associated flood damages, while preserving the existing riparian vegetation. Acquisition of the buffer would be the responsibility of the local sponsor.

Alternative 3

This alternative is similar to Alternative 2, except that no slope protection would be provided for approximately 1,500 feet on the south bank just upstream of the Craycroft Road Bridge. The protection on the south bank would, instead, tie into the existing bank protection upstream of the golf course, and continue downstream of the golf course beyond the site of the historic meander. The unprotected portion of the south bank would be allowed to erode naturally.

Alternative 4

This plan would be similar to Alternative 2, except that a low soil cement berm (approximately 2-4 feet high) would be constructed along the existing bank of the mesquite (*Prosopsis* spp.) bosque on the north bank to provide erosion protection. The berm would stabilize the slope but allow overtopping by 5-10 year floods, allowing flushing flows. The toe-down of the berm would be 10 feet, as with the other slope protection. The bank protection along the riparian habitat would protect the property from bank erosion, but will not provide flood protection at a level that would allow development of the land.

EXISTING BIOLOGICAL RESOURCES

Tanque Verde Creek is an ephemeral stream which drains a 219 square mile watershed that extends into the Catalina and Tanque Verde Mountains north and east of Tucson, respectively. The creek joins Pantano Wash near Craycroft Road to become the Rillito River. The Rillito River continues for approximately 12.2 miles in a northwest direction to its confluence with the Santa Cruz River and includes a total drainage area of 934 square miles. The Tanque Verde Bank Stabilization Project area and adjacent lands have been subjected to considerable human disturbance. Soil cement banks exist on both banks upstream and downstream of the project area. During field investigations the Service noted a recent wildfire has impacted vegetation on both banks of the creek. Adjacent uplands contain residential developments, a golf course, and various other structures.

Tanque Verde Creek has a relatively broad, sandy-bottomed channel. The wash bottom contains little vegetation as these areas are periodically subjected to scouring flood flows. Along the channel margins and banks, vegetation species include Fremont cottonwood *(Populus fremontii)*, desert willow *(Chilopsis linearis)*, burro brush *(Hymenoclea monogyra)*, seep willow *(Baccharis salicifolia)*, desert broom *(B. sarothroides)*, velvet mesquite *(Prosopis velutina)*, Mexican palo verde *(Parkinsonia aculeata)*, Mexican elder *(Sambucus mexicana)*, graythorn *(Ziziphus obtusifolia)*, whitethorn acacia *(Acacia constricta)*, catclaw acacia *(A. greggii)*, four-wing saltbush *(Atriplex canescens)*, and canyon ragweed *(Ambrosia ambrosioides)*. Adjacent uplands contain similar species. These areas have been affected by a recent wildfire which killed many trees, although Westland Resources (1999) noted resprouts as well as grasses and forbs. Ruffner *et al.* (1983) considered the mesquite bosque near the confluence of Tanque Verde Creek and

Pantano Wash to be a unique biological area due to significant vegetation cover, species diversity, and proximity to water.

The project site is located in the Arizona Upland subdivision of the Sonoran desertscrub biotic community as described by Brown (1994). Common wildlife species likely include coyote (*Canis latrans*), javelina (*Tayasu tajacu*), kangaroo rats (*Dipodomys* spp.), black-tailed jackrabbit (*Lepus californicus*), cottontail (*Sylvilagus audubonii*), pocket mice (*Perognathus* spp.), ground squirrels (*Ammospermophilus spp.*), black-chinned sparrow (*Amphispiza bilineta*), roadrunner (*Geococcyx californianus*), Gambel's quail (*Lophortyx californicus*), Harris' hawk (*Parabuteo unicinctus*), thrashers (*Toxostoma spp.*), mourning dove (*Zenaida macroura*), whiptails (*Cnemidophorus* spp.), rattlesnakes (*Crotalus* spp.), horned lizards (*Phrynosoma* spp.), and lizards (*Urosaurus* spp.). The highly urbanized landscape probably limits the diversity of wildlife species that can utilize the project area. Many species requiring relatively large undisturbed home ranges, such as desert mule deer (*Odocoileus hemionus crooki*) and mountain lion (*Felis concolor*) are likely precluded due to their intolerance for high human activity and urban encroachment. No fish are present in the study area due to the lack of perennial water.

No threatened or endangered species are known to occur in the proposed action area. Westland Resources (1999) did not detect the endangered cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) nor did they observe ironwood (*Olneya tesota*) and saguaro (*Carnegia gigantea*), which are common habitat elements for the pygmy-owl, in the project area during surveys conducted during the spring of 1999.

FUTURE WITHOUT PROJECT SCENARIO

Under the future without project scenario, the Corps would not participate in the proposed Tanque Verde Bank Stabilization Project under the authority of the RRAS and WRDA. However, any localized bank protection would most likely require a Section 404 permit from the Corps Regulatory Branch.

FUTURE WITH PROJECT SCENARIO

Under the future with project scenario, the Corps would participate in the proposed Tanque Verde Bank Stabilization Project under the authority of the RRAS and WRDA. One of the proposed alternatives would be selected to provide bank stabilization and flood protection in the study area. The project's hydraulic analysis indicates the erosion rate on the north bank would likely be accelerated due to deflection of flows from the new soil cement bank protection on the opposite bank. Additionally, information provided by the Corps indicates that Alternative 2 would impact approximately 1 acre of mesquite bosque and 2.5 acres of desert wash, Alternative 3 would impact approximately 0.3 acres of mesquite bosque and 2.5 acres of desert wash, and Alternative 4 would impact approximately 1.9 acres of mesquite bosque and 3.6 acres of desert wash.

DISCUSSION

The Service is concerned about the cumulative effect on regional wildlife communities from the Rillito River and Associated Streams project and the proposed Tanque Verde Bank Stabilization Project. The Corps (1998) states that bank protection upstream of the Tanque Verde Creek study area has contributed to increased erosion along the downstream banks within and below the study area. While soil cement may protect an eroding bank, this protection does not eliminate the erosional force of flood waters. Rather, a soil cement bank deflects and redirects this erosional force to unprotected downstream banks. Localized bank protection will concentrate bank erosion along unprotected banks (Tetra Tech, Inc. 1999), necessitating the need for additional downstream bank protection. The Corps (1998) states that the selected plan should not worsen existing flood hazards for downstream developments without measures to compensate for the effects. These measures would likely consist of additional soil cement bank. We foresee the Rillito River and tributaries entirely lined with soil cement within the near future. We believe the subsequent loss of hydrologic function would result in substantial losses in the physical, chemical, and biological functioning of abiotic and biotic ecosystem components associated with the aquatic and terrestrial environments of the Rillito River and tributaries.

Pearthree and Baker (1987) concluded that the Rillito River system has been irreversibly altered by human intervention, and a return to natural characteristics is impossible due to the following reasons: 1) groundwater overdraft has so lowered the water table that the stabilizing influence of riparian vegetation has been lost, 2) urbanization has reduced the influx of sediments from tributaries into the main channels while increasing the influx of water from individual storms, and 3) channels have been constricted by constricted by bridges, bank fillings, bank stabilization and channelization measures. However, we believe that the Corps and County should not entirely dismiss the possibility of restoring some level of natural function to this system.

The Service encourages non-structural solutions to flood control, such as those described in Alternative 2. We believe rights-of-way and buffers along the banks and within the floodplain and flood prone area would be the best methods by which to prevent additional flood damages while preserving the functional capacity of the existing riparian ecosystems. Restoration and enhancement of riparian vegetation should be seriously considered and evaluated. Opportunities to provide supplemental water to sustain riparian vegetation sufficient to provide natural bank stabilization should be considered. We understand the Corps is pursuing restoration projects along the Rillito River. We look forward to the realization of habitat restoration within the Rillito River system.

We are concerned about the cumulative effects of past and present Corps projects within and around the Rillito River system, including cost-share projects and section 404 permitted projects. In our August 13, 1985, review of the draft survey report and finding of no significant impact (FONSI) for the RRAS project we indicated that we believed the environmental effects were significant enough to make a FONSI inappropriate, especially since no mitigation had been provided. In our subsequent December 16, 1985, FWCA report on the RRAS project we

recommended several measures to mitigate the loss of wildlife habitat, the most significant of which included land acquisition and preserving and restoring native riparian vegetation. We believe those actions remain appropriate and should be a shared federal and local sponsor responsibility. However, we are not aware of the current state of mitigation and are concerned about the further degradation of the Rillito River system, particularly the unique biological area at the confluence of Tanque Verde Creek and Pantano Wash. For these reasons we encourage the preparation of a supplemental environmental assessment to specifically address the cumulative impacts of the RRAS project and other channel modification, bank stabilization, and development along the Rillito River system. The cumulative impact analysis should address the totality of environmental impacts, including direct, indirect, secondary, and cumulative effects.

RECOMMENDATIONS

1) The Corps should continue to place emphasis on the use of non-structural methods to address flood control and flood-related problems. The Corps participation should be contingent upon acquisition and preservation of the buffer described in alternative 2.

2) Investigations should be conducted to evaluate opportunities to enhance and restore the physical, chemical, and biological functions of the Rillito River system; including restoration of natural hydrogeomorphic processes, preservation of existing riparian vegetation, re-planting of native riparian vegetation, and supplemental watering to ensure survival and growth.

3) A supplemental environmental assessment to specifically address the cumulative impacts of the RRAS project and other development on the Rillito River system should be prepared.

We appreciate the opportunity to review and provide recommendations for the Tanque Verde Bank Stabilization Project. If we can be of further assistance or you have questions, please contact Mike Martinez at (602)640-2720, x224.

Sincerely,

David L. Harlow
Field Supervisor

cc: Supervisor, Project Evaluation Program, Arizona Game and Fish Department, Phoenix, AZ

LITERATURE CITED

Brown, D.E. 1994. Biotic Communities: southwestern United States and northwestern Mexico. University of Utah Press.

Pearthree, M.S. and V.R. Baker. 1987. Channel change along the Rillito Creek System of Southeastern Arizona, 1941 through 1983. Implications for flood-plain management. Special Paper 6. Arizona Bureau of Geology and Mineral Technology Geological Survey Branch.

Ruffner, G.A., M.M. Sharp, R. A. Johnson, N.J. Brian. 1983. An assessment of the biological resources of Airport Wash, Rillito River and Associated Streams Project in Pima County.

Tetra Tech Inc., Infrastructure Southwest Group. 1999. Tanque Verde Creek, Craycroft Road to Sabino Road bank protection and riparian preserve project lateral migration analysis. Prepared for U.S. Army Corps of Engineers. May, 1999.

U.S. Army Corps of Engineers. 1998. Tanque Verde Creek, Pima County, Arizona. Limited Reevaluation Report. Los Angeles District, Planning Division, Water Resources Branch. September 1998.

U.S. Army Corps of Engineers. 1992. Design memorandum. Rillito River, Tucson, Arizona, Bank Protection. Los Angeles District. October 1992.

U.S. Army Corps of Engineers. 1986. Survey report and environmental assessment. Rillito River and Associated Streams, Tucson, Arizona. Los Angeles District. May 1986.

Westland Resources, Inc. Memorandum regarding Cactus Ferruginous Pygmy-Owl survey - Tanque Verde Creek Project. August 20, 1999.

APPENDIX B-3
USFWS THREATENED AND ENDANGERED SPECIES LIST

United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602) 640-2720 Fax (602) 640-2730

In Reply Refer To:
AESO/SE
2-21-98-I-338
[CCN 980993]

August 5, 1998

Mr. Robert S. Joe
Chief, Planning Division
Corps of Engineers, LA District
P.O. Box 532711
Los Angeles, California 90053-2325

RE: EA for Proposed Bank Protection on Tanque Verde Creek (Craycroft and Sabino Canyon Roads), Tucson, Arizona

Dear Mr. Joe:

This letter responds to your July 16, 1998, request for an inventory of threatened or endangered species, or those that are proposed to be listed as such under the Endangered Species Act of 1973, as amended (Act), which may potentially occur in your project area (Pima County). The enclosed list may include candidate species as well. We hope the enclosed county list of species will be helpful. In future communications regarding this project, please refer to consultation number 2-21-98-I-338.

Please be aware that you may also access limited county species lists for Arizona on our internet web site at the following:

http://ifw2es.fws.gov/endspcs/lists/

The enclosed list of the endangered, threatened, proposed, and candidate species includes all those potentially occurring anywhere in the county, or counties, where your project occurs. Please note that your project area may not necessarily include all or any of these species. The information provided includes general descriptions, habitat requirements, and other information for each species on the list. Also on the enclosed list is the Code of Federal Regulations (CFR) citation for each listed or proposed species. Additional information can be found in the CFR and is available at most public libraries. This information should assist you in determining which species may or may not occur within your project area. Site-specific surveys could also be helpful and may be needed to verify the presence or absence of a species or its habitat as required for the evaluation of proposed project-related impacts.

Endangered and threatened species are protected by Federal law and must be considered prior to project development. If the action agency determines that listed species or critical habitat may be adversely affected by a federally funded, permitted, or authorized activity, the action agency

must request formal consultation with the Service. If the action agency determines that the planned action may jeopardize a proposed species or destroy or adversely modify proposed critical habitat, the action agency must enter into a section 7 conference with the Service. Candidate species are those which are being considered for addition to the list of threatened or endangered species. Candidate species are those for which there is sufficient information to support a proposal for listing. Although candidate species have no legal protection under the Act, we recommend that they be considered in the planning process in the event that they become listed or proposed for listing prior to project completion.

If any proposed action occurs in or near areas with trees and shrubs growing along watercourses, known as riparian habitat, the Service recommends the protection of these areas. Riparian areas are critical to biological community diversity and provide linear corridors important to migratory species. In addition, if the project will result in the deposition of dredged or fill materials into waterways or excavation in waterways, we recommend you contact the Army Corps of Engineers which regulates these activities under Section 404 of the Clean Water Act.

The State of Arizona protects some plant and animal species not protected by Federal law. We recommend you contact the Arizona Game and Fish Department and the Arizona Department of Agriculture for State-listed or sensitive species in your project area.

The Service appreciates your efforts to identify and avoid impacts to listed and sensitive species in your project area. If we may be of further assistance, please contact Tom Gatz.

Sincerely,

Tom Gatz
Acting Field Supervisor

Enclosure

cc: Director, Arizona Game and Fish Department, Phoenix, AZ

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **PIMA**

4/9/98

LISTED TOTAL= 18

NAME: **HUACHUCA WATER UMBEL** *LILAEOPSIS SCHAFFNERIANA ssp RECURVA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 62 FR 665, 01-06-97

DESCRIPTION: HERBACEOUS, SEMI-AQUATIC PERENNIAL IN THE PARSLEY FAMILY (UMBELLIFERAE) WITH SLENDER ERECT, HOLLOW, LEAVES THAT GROW FROM THE NODES OF CREEPING RHIZOMES. FLOWER: 3 TO 10 FLOWERED UMBELS ARISE FROM ROOT NODES.

ELEVATION RANGE: 3500-6500 FT.

COUNTIES: PIMA, SANTA CRUZ, COCHISE

HABITAT: CIENEGAS, PERENNIAL LOW GRADIENT STREAMS, WETLANDS

AND IN ADJACENT SONORA, MEXICO, WEST OF THE CONTINENTAL DIVIDE. POPULATIONS ALSO ON FORT HUACHUCA MILITARY RESERVATION.

NAME: **KEARNEY'S BLUE STAR** *AMSONIA KEARNEYANA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 54 FR 2131, 01-19-1989

DESCRIPTION: A HERBACEOUS PERENNIAL IN THE DOGBANE FAMILY (APOCYNACEAE). THICKENED WOODY ROOT AND MANY PUBESCENT (HAIRY) STEMS THAT RARELY BRANCH. FLOWERS:WHITE TERMINAL INFLORESCENCE IN APRIL & MAY.

ELEVATION RANGE: 3600-3800 FT.

COUNTIES: PIMA

HABITAT: WEST-FACING DRAINAGES IN THE BABOQUIVARI MOUNTAINS.

PLANTS GROW IN STABLE, PARTIALLY SHADED, COARSE ALLUVIUM ALONG A DRY WASH IN THE BABOQUIVARI MOUNTAINS. RANGE IS EXTREMELY LIMITED. PROTECTED BY ARIZONA NATIVE PLANT LAW.

NAME: **NICHOL'S TURK'S HEAD CACTUS** *ECHINOCACTUS HORIZONTHALONIUS VAR NICHOLII*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 44 FR 61927, 10-26-1979

DESCRIPTION: BLUE-GREEN TO YELLOWISH-GREEN, COLUMNAR, 18 INCHES TALL, 8 INCHES IN DIAMETER. SPINE CLUSTERS HAVE 5 RADIAL & 3 CENTRAL SPINES; ONE DOWNWARD SHORT; 2 SPINES UPWARD AND RED OR BASALLY GRAY. FLOWER:PINK FRUIT:WOOLLY WHITE

ELEVATION RANGE: 2400-4100 FT.

COUNTIES: PINAL, PIMA, YUMA

HABITAT: SONORAN DESERTSCRUB

FOUND IN UNSHADED MICROSITES IN SONORAN DESERTSCRUB ON DISSECTED ALLUVIAL FANS AT THE FOOT OF LIMESTONE MOUNTAINS AND ON INCLINED TERRACES AND SADDLES ON LIMESTONE MOUNTAINSIDES.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **PIMA**

4/9/98

NAME: **PIMA PINEAPPLE CACTUS** *CORYPHANTHA SCHEERI ROBUSTISPINA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 57 FR 14374, 04-20-1992

DESCRIPTION: HEMISHPERICAL STEMS 4-7 INCHES TALL 3-4 INCHES DIAMETER. CENTRAL SPINE 1 INCH LONG STRAW COLORED HOOKED SURROUNDED BY 6-15 RADIAL SPINES. FLOWER: YELLOW SALMON OR RARELY WHITE NARROW FLORAL TUBE.

ELEVATION RANGE: 2300-5000 FT.

COUNTIES: PIMA, SANTA CRUZ

HABITAT: SONORAN DESERTSCRUB OR SEMI-DESERT GRASSLAND COMMUNITIES

OCCURS IN ALLUVIAL VALLEYS OR ON HILLSIDES IN ROCKY TO SANDY OR SILTY SOILS. THIS SPECIE CAN BE CONFUSED WITH JUVENILLE BARREL CACTUS (FEROCACTUS). HOWEVER, THE SPINES OF THE LATER ARE FLATTENED, IN CONTRAST WITH THE ROUND CROSS-SECTION OF THE CORYPHANTHA SPINES. ALSO THE AREOLES (SPINE CLUSTERS) OF CORYPHANTHA ARE ON TUBERCULES (BUMPS), WHILE THE AREOLES OF FEROCACTUS ARE ON RIDGES (RIBS).

NAME: **JAGUAR, UNITED STATES POPULATION** *PANTHERA ONCA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 62 FR 39147, 7-22-97

DESCRIPTION: MUSCULAR CAT WITH RELATIVELY SHORT, MASSIVE LIMBS AND A DEEP-CHESTED BODY. CINNAMON-BUFF IN COLOR WITH BLACK SPOTS.

ELEVATION RANGE: <8000 FT.

COUNTIES: COCHISE, PIMA, SANTA CRUZ

HABITAT: IN ARIZONA, RANGED WIDELY THROUGHOUT A VARIETY OF HABITATS FROM SONORAN DESERT TO CONIFER FORESTS

MOST RECORDS ARE FROM THE MADREAN EVERGREEN-WOODLAND, SHRUB-INVADED SEMI-DESERT GRASSLAND, AND ALONG RIVERS. HISTORIC RANGE IS CONSIDERED TO HAVE EXTENDED BEYOND THE COUNTIES LISTED ABOVE. REPORTS OF INDIVIDUALS IN THE SOUTHERN PART OF THE STATE CONTINUE TO BE RECEIVED. THE MOST RECENT RECORDS OF A JAGUAR IN THE U.S. ARE FROM THE NEW MEXICO/ARIZONA BORDER AREA AND IN SOUTHCENTRAL ARIZONA, BOTH IN 1996, AND CONFIRMED THROUGH PHOTOGRAPHS. UNCONFIRMED SIGHTINGS AND TRACKS CONTINUE TO BE REPORTED.

NAME: **JAGUARUNDI** *FELIS YAGOUAROUNDI TOLTECA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 41 FR 24064; 06-14-76

DESCRIPTION: SMALL CAT WITH SHORT LEGS; SLENDER,ELONGATE BODY; AND LONG TAIL. HEAD SMALL & FLATTENED WITH SHORT ROUNDED EARS. REDDISH-YELLOW OR BLACKISH TO BROWN-GRAY IN COLOR AND WITHOUT SPOTS.

ELEVATION RANGE: 3500-6000 FT.

COUNTIES: SANTA CRUZ, PIMA, COCHISE

HABITAT: CAN BE FOUND IN A VARIETY OF HABITATS (SEE BELOW)

SEMI-ARID THORNY FORESTS, DECIDOUS FORESTS, HUMID PRE-MONTANE FORESTS, UPLAND DRY SAVANNAHS, SWAMPY GRASSLANDS, RIPARIAN AREAS, AND DENSE BRUSH. UNCONFIRMED REPORTS OF INDIVIDUALS IN THE SOUTHERN PART OF THE STATE CONTINUE TO BE RECEIVED. NO SPECIMENS HAVE BEEN COLLECTED IN ARIZONA.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **PIMA**

4/9/98

NAME: **LESSER LONG-NOSED BAT** *LEPTONYCTERIS CURASOAE YERBABUENAE*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 53 FR 38456, 09-30-88

DESCRIPTION: ELONGATED MUZZLE, SMALL LEAF NOSE, AND LONG TONGUE. YELLOWISH BROWN OR GRAY ABOVE AND CINNAMON BROWN BELOW. TAIL MINUTE AND APPEARS TO BE LACKING. EASILY DISTURBED.

ELEVATION RANGE: <6000 FT.

COUNTIES: COCHISE, PIMA, SANTA CRUZ, GRAHAM, PINAL, MARICOPA

HABITAT: DESERT SCRUB HABITAT WITH AGAVE AND COLUNMNAR CACTI PRESENT AS FOOD PLANTS

DAY ROOSTS IN CAVES AND ABANDONED TUNNELS. FORAGES AT NIGHT ON NECTAR, POLLEN, AND FRUIT OF PANICULATE AGAVES AND COLUMNAR CACTI. THIS SPECIES IS MIGRATORY AND IS PRESENT IN ARIZONA , USUALLY FROM APRIL TO SEPTMBER AND SOUTH OF THE BORDER THE REMAINDER OF THE YEAR.

NAME: **MEXICAN GRAY WOLF** *CANIS LUPUS BAILEYI*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67; 43 FR 1912, 03-09-78

DESCRIPTION: LARGE DOG-LIKE CARNIVORE WITH VARYING COLOR, BUT USUALLY A SHADE OF GRAY. DISTINCT WHITE LIP LINE AROUND MOUTH. WEIGH 60-90 POUNDS.

ELEVATION RANGE: 4,000-12,00IFT.

COUNTIES: APACHE, COCHISE, GREENLEE, PIMA, SANTA CRUZ

HABITAT: CHAPPARAL, WOODLAND, AND FORESTED AREAS. MAY CROSS DESERT AREAS.

HISTORIC RANGE IS CONSIDERED TO BE LARGER THAN THE COUNTIES LISTED ABOVE. UNCONFIRMED REPORTS OF INDIVIDUALS IN THE SOUTHERN PART OF THE STATE (COCHISE, PIMA, SANTA CRUZ) CONTINUE TO BE RECEIVED. INDIVIDUALS MAY STILL PERSIST IN MEXICO. EXPERIMENTAL NONESSENTIAL POPULATION INTRODUCED IN THE BLUE PRIMITIVE AREA OF GREENLEE AND APACHE COUNTIES.

NAME: **OCELOT** *FELIS PARDALIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 47 FR 31670; 07-21-82

DESCRIPTION: MEDIUM-SIZED SPOTTED CAT WHOSE TAIL IS ABOUT 1/2 THE LENGTH OF HEAD AND BODY. YELLOWISH WITH BLACK STREAKS AND STRIPES RUNNING FROM FRONT TO BACK. TAIL IS SPOTTED AND FACE IS LESS HEAVILY STREAKED THAN THE BACK AND SIDES.

ELEVATION RANGE: <8000 FT.

COUNTIES: SANTA CRUZ, PIMA, COCHISE

HABITAT: HUMID TROPICAL & SUB-TROPICAL FORESTS, SAVANNAHS, AND SEMI-ARID THORNSCRUB.

MAY PERSIST IN PARTLY-CLEARED FORESTS, SECOND-GROWTH WOODLAND, AND ABANDONED CULTIVATION REVERTED TO BRUSH. UNIVERSAL COMPONENT IS PRESENCE OF DENSE COVER. UNCONFIRMED REPORTS OF INDIVIDUALS IN THE SOUTHERN PART OF THE STATE CONTINUE TO BE RECEIVED.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **PIMA**

4/9/98

NAME: **SONORAN PRONGHORN** *ANTILOCAPRA AMERICANA SONORIENSIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67

DESCRIPTION: BUFF ON BACK AND WHITE BELOW, HOOFED WITH SLIGHTLY CURVED BLACK HORNS HAVING A SINGLE PRONG. SMALLEST AND PALEST OF THE PRONGHORN SUBSPECIES.

ELEVATION RANGE: 2000-4000 FT.

COUNTIES: PIMA, YUMA, MARICOPA

HABITAT: BROAD, INTERMOUNTAIN ALLUVIAL VALLEYS WITH CREOSOTE-BURSAGE & PALO VERDE-MIXED CACTI ASSOCIATIONS

TYPICALLY, BAJADAS ARE USED AS FAWNING AREAS AND SANDY DUNE AREAS PROVIDE FOOD SEASONALLY. HISTORIC RANGE WAS PROBABLY LARGER THAN EXISTS TODAY. THIS SUBSPECIES ALSO OCCURS IN MEXICO.

NAME: **DESERT PUPFISH** *CYPRINODON MACULARIUS*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 51 FR 10842, 03-31-1986

DESCRIPTION: SMALL (2 INCHES) SMOOTHLY ROUNDED BODY SHAPE WITH NARROW VERTICAL BARS ON THE SIDES. BREEDING MALES BLUE ON HEAD AND SIDES WITH YELLOW ON TAIL. FEMALES & JUVENILES TAN TO OLIVE COLORED BACK AND SILVERY SIDES.

ELEVATION RANGE: <5000 FT.

COUNTIES: LA PAZ, PIMA, GRAHAM, MARICOPA, PINAL, YAVAPAI, SANTA CRUZ

HABITAT: SHALLOW SPRINGS, SMALL STREAMS, AND MARSHES. TOLERATES SALINE & WARM WATER

CRITICAL HABITAT INCLUDES QUITOBAQUITO SPRING, PIMA COUNTY, PORTIONS OF SAN FELIPE CREEK, CARRIZO WASH, AND FISH CREEK WASH, IMPERIAL COUNTY, CALIFORNIA. TWO SUBSPECIES ARE RECOGNIZED: DESERT PUPFISH (C. m. macularis) AND QUITOBAQUITO PUPFISH (C. m. eremus).

NAME: **GILA TOPMINNOW** *POECILIOPSIS OCCIDENTALIS OCCIDENTALIS*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-1967

DESCRIPTION: SMALL (2 INCHES), GUPPY-LIKE, LIVE BEARING, LACKS DARK SPOTS ON ITS FINS. BREEDING MALES ARE JET BLACK WITH YELLOW FINS.

ELEVATION RANGE: <4500 FT.

COUNTIES: GILA, PINAL, GRAHAM, YAVAPAI, SANTA CRUZ, PIMA, MARICOPA, LA PAZ

HABITAT: SMALL STREAMS, SPRINGS, AND CIENEGAS VEGETATED SHALLOWS

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **PIMA**

4/9/98

NAME: **AMERICAN PEREGRINE FALCON** *FALCO PEREGRINUS ANATUM*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 35 FR 16047, 10-13-70; 35 FR 8495, 06-02-70

DESCRIPTION: A RECLUSIVE, CROW-SIZED FALCON SLATY BLUE ABOVE WHITISH BELOW WITH FINE DARK BARRING. THE HEAD IS BLACK AND APPEARS TO BE MASKED OR HELMETED. WINGS LONG AND POINTED. LOUD WAILING CALLS ARE GIVEN DURING BREEDING PERIOD.

ELEVATION RANGE: 3500-9000 FT.

COUNTIES: MOHAVE COCONINO NAVAJO APACHE SANTA CRUZ MARICOPA COCHISE YAVAPAI GILA PINAL PIMA GREENLEE GRAHAM

HABITAT: CLIFFS AND STEEP TERRAIN USUALLY NEAR WATER OR WOODLANDS WITH ABUNDANT PREY

THIS IS A WIDE-RANGING MIGRATORY BIRD THAT USES A VARIETY OF HABITATS. BREEDING BIRDS ARE YEAR-ROUND RESIDENTS. OTHER BIRDS WINTER AND MIGRATE THROUGH ARIZONA. SPECIES IS ENDANGERED FROM REPRODUCTIVE FAILURE FROM PESTICIDES.

NAME: **BALD EAGLE** *HALIAEETUS LEUCOCEPHALUS*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 60 FR 35999, 07-12-95

DESCRIPTION: LARGE, ADULTS HAVE WHITE HEAD AND TAIL. HEIGHT 28 - 38"; WINGSPAN 66 - 96". 1-4 YRS DARK WITH VARYING DEGREES OF MOTTLED BROWN PLUMAGE. FEET BARE OF FEATHERS.

ELEVATION RANGE: VARIES FT.

COUNTIES: YUMA, LA PAZ, MOHAVE, YAVAPAI, MARICOPA, PINAL, COCONINO, NAVAJO, APACHE, SANTA CRUZ, PIMA, GILA, GRAHAM

HABITAT: LARGE TREES OR CLIFFS NEAR WATER (RESERVOIRS, RIVERS AND STREAMS) WITH ABUNDANT PREY

SOME BIRDS ARE NESTING RESIDENTS WHILE A LARGER NUMBER WINTERS ALONG RIVERS AND RESERVOIRS. AN ESTIMATED 200 TO 300 BIRDS WINTER IN ARIZONA. ONCE ENDANGERED (32 FR 4001, 03-11-1967; 43 FR 6233, 02-14-78) BECAUSE OF REPRODUCTIVE FAILURES FROM PESTICIDE POISONING AND LOSS OF HABITAT, THIS SPECIES WAS DOWN LISTED TO THREATENED ON AUGUST 11, 1995. ILLEGAL SHOOTING, DISTURBANCE, LOSS OF HABITAT CONTINUES TO BE A PROBLEM.

NAME: **CACTUS FERRUGINOUS PYGMY-OWL** *GLAUCIDIUM BRASILIANUM CACTORUM*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 62 FR 10730, 3-10-97

DESCRIPTION: SMALL (APPROX. 7"), DIURNAL OWL REDDISH BROWN OVERALL WITH CREAM-COLORED BELLY STREAKED WITH REDDISH BROWN. SOME INDIVIDUALS ARE GRAYISH BROWN

ELEVATION RANGE: <4000 FT.

COUNTIES: MARICOPA, YUMA, SANTA CRUZ, GRAHAM, GREENLEE, PIMA, PINAL, GILA

HABITAT: MATURE COTTONWOOD/WILLOW, MESQUITE BOSQUES, AND SONORAN DESERTSCRUB

RANGE LIMIT IN ARIZONA IS FROM NEW RIVER (NORTH) TO GILA BOX (EAST) TO CABEZA PRIETA MOUNTAINS (WEST). ONLY A FEW DOCUMENTED SITES WHERE THIS SPECIES PERSISTS ARE KNOWN, ADDITIONAL SURVEYS ARE NEEDED. LISTING EFFECTIVE APRIL 9, 1997.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

4/9/98

NAME: **MASKED BOBWHITE** *COLINUS VIRGINIANUS RIDGEWAYI*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 35 FR 4001, 03-11-1967; 35 FR 8495, 06-02-70

DESCRIPTION: MALES BRICK-RED BREAST AND BLACK HEAD AND THROAT. FEMALES ARE GENERALLY NONDESCRIPT BUT RESEMBLE OTHER RACES SUCH AS THE TEXAS BOBWHITE.

ELEVATION RANGE: 1000-4000 FT.

COUNTIES: PIMA

HABITAT: DESERT GRASSLANDS WITH DIVERSITY OF DENSE NATIVE GRASSES, FORBS AND BRUSH

SPECIES IS CLOSELY ASSOCIATED WITH ACACIA ANGUSTISSIMA. FORMERLY OCCURRED IN ALTAR AND SANTA CRUZ VALLEYS, AS WELL AS SONORA, MEXICO. PRESENTLY ONLY KNOWN FROM REINTRODUCED POPULATION ON BUENOS AIRES.

NAME: **MEXICAN SPOTTED OWL** *STRIX OCCIDENTALIS LUCIDA*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 56 FR 14678, 04-11-91

DESCRIPTION: MEDIUM SIZED WITH DARK EYES AND NO EAR TUFTS. BROWNISH AND HEAVILY SPOTTED WITH WHITE OR BEIGE.

ELEVATION RANGE: 4100-9000 FT.

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE, YAVAPAI, GRAHAM, GREENLEE, COCHISE, SANTA CRUZ, PIMA, PINAL, GILA, MARICOPA

HABITAT: NESTS IN CANYONS AND DENSE FORESTS WITH MULTI-LAYERED FOLIAGE STRUCTURE

GENERALLY NESTS IN OLDER FORESTS OF MIXED CONIFER OR PONDERSA PINE/GAMBEL OAK TYPE, IN CANYONS, AND USE VARIETY OF HABITATS FOR FORAGING. SITES WITH COOL MICROCLIMATES APPEAR TO BE OF IMPORTANCE OR ARE PREFERED.

NAME: **SOUTHWESTERN WILLOW FLYCATCHER** *EMPIDONAX TRAILLII EXTIMUS*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: No CFR: 60 FR 10694, 02-27-95

DESCRIPTION: SMALL PASSERINE (ABOUT 6") GRAYISH-GREEN BACK AND WINGS, WHITISH THROAT, LIGHT OLIVE-GRAY BREAST AND PALE YELLOWISH BELLY. TWO WINGBARS VISIBLE. EYE-RING FAINT OR ABSENT.

ELEVATION RANGE: <8500 FT.

COUNTIES: YAVAPAI, GILA, MARICOPA, MOHAVE, COCONINO, NAVAJO, APACHE, PINAL, LA PAZ, GREENLEE, GRAHAM, YUMA, PIMA, COCHISE, SANTA CRUZ

HABITAT: COTTONWOOD/WILLOW & TAMARISK VEGETATION COMMUNITIES ALONG RIVERS & STREAMS

MIGRATORY RIPARIAN OBLIGATE SPECIES THAT OCCUPIES BREEDING HABITAT FROM LATE APRIL TO SEPTEMBER. DISTRIBUTION WITHIN ITS RANGE IS RESTRICTED TO RIPARIAN CORRIDORS. DIFFICULT TO DISTINGUISH FROM OTHER MEMBERS OF THE EMPIDONAX COMPLEX BY SIGHT ALONE. TRAINING SEMINAR REQUIRED FOR THOSE CONDUCTING FLYCATCHER SURVEYS. CRITICAL HABITAT ON PORTIONS OF THE 100-YEAR FLOODPLAIN ON SAN PEDRO AND VERDE RIVERS; WET BEAVER AND WEST CLEAR CREEKS, INCLUDING TAVASCI MARSH AND ISTER FLAT; THE COLORADO RIVER, THE LITTLE COLORADO RIVER, AND THE WEST, EAST, AND SOUTH FORKS OF THE LITTLE COLORADO RIVER, REFERENCE 60 CFR:62 FR 39129, 7/22/97.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

4/9/98

PROPOSED TOTAL= 1

NAME: **SAN XAVIER TALUSSNAIL** *SONORELLA EREMITA*

STATUS: PROPOSED ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 56 FR 13691, 03-23-1994

DESCRIPTION: LESS THAN ONE INCH (AVE 19 MM), LIGHT BROWN, PILL SHAPED, DARK STRIPE ENCIRCLES OUTER PERIMETER

ELEVATION RANGE: 3850 - 3920 FT.

COUNTIES: PIMA

HABITAT: LIMESTONE TALUS ON NORTHSIDE OF A SINGLE HILL.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

4/9/98

CANDIDATE TOTAL= 5

NAME: **ACUNA CACTUS** *ECHINOMASTUS ERECTOCENTRUS ACUNENSIS*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: <12 INCHES HIGH SPINE CLUSTERS BORNE ON TUBERCLES, EACH WITH A GROOVE ON THE UPPER SURFACE. 2-3 CENTRAL SPINES AND 12 RADIAL SPINES. FLOWERS PINK TO PURPLE

ELEVATION RANGE: 1300-2000 FT.

COUNTIES: PINAL, PIMA

HABITAT: WELL DRAINED KNOLLS AND GRAVEL RIDGES IN SONORAN DESERT SCRUB

IMMATURE PLANTS DISTINCTLY DIFFERENT FROM MATURE PLANTS. THEY ARE DISC-SHAPED OR SPHERICAL AND HAVE NO CENTRAL SPINES UNTIL THEY ARE ABOUT 1.5 INCHES . RADIAL SPINES ARE DIRTY WHITE WITH MAROON TIPS.

NAME: **GILA CHUB** *GILA INTERMEDIA*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: DEEP COMPRESSED BODY, FLAT HEAD. DARK OLIVE-GRAY COLOR ABOVE, SILVER SIDES. ENDEMIC TO GILA RIVER BASIN.

ELEVATION RANGE: 2000 - 3500 FT.

COUNTIES: SANTA CRUZ, GILA, GREENLEE, PIMA, COCHISE, GRAHAM, YAVAPAI

HABITAT: POOLS, SPRINGS, CIENEGAS, AND STREAMS

MULTIPLE PRIVATE LANDOWERS, INCLUDING THE NATURE CONSERVANCY, THE AUDUBON SOCIETY, AND OTHERS. ALSO FT. HUACHUCA. SPECIES ALSO FOUND IN SONORA, MEXICO.

NAME: **SONOYTA MUD TURTLE** *KINOSTERNON SONORIENSE LONGIFEMORALE*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: PRIMARILY A POND TURTLE, PREFERS MUD OR SANDY BOTTOMS. BODY 3 1/2 TO 6 1/2. HEAD AND NECK MOTTLED WITH CONTRASTING LIGHT AND DARK MARKINGS. FOUND IN QUITOBAQUITO SPRINGS.

ELEVATION RANGE: 1,100 FEET FT.

COUNTIES: PIMA

HABITAT: PONDS AND STREAMS.

SPECIES ALSO FOUND IN RIO SONOYTA, SONORA, MEXICO.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **PIMA**

4/9/98

NAME: **MOUNTAIN PLOVER** *CHARADRIUS MONTANUS*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: WADING BIRD; COMPACTLY BUILT; iIN BREEDING SEASON WITH WHITE FOREHEAD AND LINE OVER THE EYE; CONTRASTING WITH DARK CROWN; NONDESCRIPT IN WINTER. VOICE IS LOW, VARIABLE WHISTLE. ELEVATION RANGE: 0 FT.

COUNTIES: YUMA, SANTA CRUZ, PIMA, COCHISE

HABITAT: OPEN ARID PLAINS, SHORT-GRASS PRAIRIES, AND SCATTERED CACTUS.

NAME: **CHIRICAHUA LEOPARD FROG** *RANA CHIRICAHUENSIS*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: CREAM COLORED TUBERCULES (spots) ON A DARK BACKGROUND ON THE REAR OF THE THIGH, DORSOLATERAL FOLDS THAT ARE INTERRUPTED AND DEFLECTED MEDIALLY, AND A CALL GIVEN OUT OF WATER DISTINGUISH THIS SPOTTED FROG FROM OTHER LEOPRD ELEVATION RANGE: 3000-8300 FT.

COUNTIES: SANTA CRUZ, APACHE, GILA, PIMA, COCHISE, GREENLEE, GRAHAM, YAVAPAI, COCONINO, NAVAJO

HABITAT: STREAMS, RIVERS, BACKWATERS, PONDS, AND STOCK TANKS THAT ARE FREE FROM INTRODUCED FISH AND BULLFROGS

REQUIRE PERMANENT OR NEARLY PERMANENT WATER SOURCES. POPULATIONS NORTH OF THE GILA RIVER ARE THOUGHT TO BE CLOSELY-RELATED, BUT DISTINCT, UNDESCRIBED SPECIES.

APPENDIX B-4
ARIZONA DEPARTMENT OF GAME AND FISH COMMENTS ON CAR

United States Department of the Interior
Fish and Wildlife Service
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602) 640-2720 Fax (602) 640-2730

June 7, 2000

FACSIMILE TRANSMISSION

To: Lois Goodman, U.S. Army Corps of Engineers, (213) 452-4204

From: Mike A. Martinez

Re: AGFD comments on draft Tanque Verde report

Pages: 2 (including this page)

Comments:

FYI. These are the comments that the Arizona Game and Fish Department submitted on the draft FWCA report for the Tanque Verde Creek bank stabilization project. We have received the Corps' comments and I should have the report finalized shortly. If you have questions or additional information needs, or if there are problems with copy quality, please contact me at the above phone number or address. Thanks.

THE STATE OF ARIZONA

GAME & FISH DEPARTMENT

2221 West Greenway Road, Phoenix, Arizona 85023-4399 (602) 942-3000
www.gf.state.az.us

Governor
Jane Dee Hull

Commissioners:
Chairman, William Berlat, Tucson
W. Hays Gilstrap, Phoenix
Dennis D. Manning, Alpine
Michael M. Golightly, Flagstaff
Joe Carter, Safford

Director
Duane L. Shroufe

Deputy Director
Steve K. Ferrell

February 18, 2000

Mr. David L. Harlow
Field Supervisor
U.S. Fish and Wildlife Service
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951

Re: Draft Fish and Wildlife Coordination Act Report; U.S. Army Corps of Engineers; Tanque Verde Bank Stabilization Project in Pima County

Dear Mr. Harlow:

The Arizona Game and Fish Department (Department) has reviewed the draft Fish and Wildlife Coordination Act (FWCA) Report for the proposed Tanque Verde Bank Stabilization Project. This report was developed by the U.S. Fish and Wildlife Service (Service) pursuant to Section 2(b) of the FWCA, and provides the Service's recommendations for addressing adverse impacts to wildlife habitat as a result of the proposed bank stabilization project.

Overall, the Department agrees with the Service's analysis and recommendations. We would appreciate the opportunity to review the revised documents (e.g., Environmental Assessment, Limited Reevaluation Report) associated with this proposal before they are finalized. Thank you.

Sincerely,

John Kennedy
Project Evaluation Program Supervisor
Habitat Branch

cc: Joan Scott, Habitat Program Manager, Region V, Tucson

APPENDIX B-5: INCREMENTAL COST ANALYSIS AND HABITAT EVALUATION

Tanque Verde Creek
Incremental Cost Analysis and Habitat Evaluation (Modified HEP) for Biological Resources Mitigation Measures

I. INTRODUCTION

The purpose of this analysis is to provide information supporting the recommendations in the Environmental Assessment for biological resources mitigation measures. When mitigation is necessary, Corps regulations (ER 1105-2-100:7-35) require an incremental cost analysis of mitigation options. The purpose of this analysis is to compare mitigation options by cost and the amount of quantifiable units (e.g., Habitat Units, acres) that the mitigation replaces. This allows determination of the most cost-effective mitigation option or combination of options that best meet the mitigation goals.

An incremental cost analysis of a mitigation option's cost-effectiveness requires that resources impacted or lost due to implementation of the proposed action and resources gained from mitigation options be quantitatively estimated. The Corps has utilized a modified HEP analysis for this project to calculate Habitat Units (HUs) for existing conditions and for the Alternatives, including the No Action Alternative. The following analysis uses this modified HEP as a habitat-based method to characterize biological values of fish and wildlife habitat (mesquite bosque/desert riparian and desert wash) in the project area.

The modified HEP process documents the quality and quantity of available habitat for selected wildlife species and/or habitat elements associated with a project and its alternatives. The Habitat based analysis provides the information to compare both the relative values of different habitat areas at one point in time, and the relative values of the same areas at different target years during the life of the project. By combining the two types of comparisons, the impact of proposed or anticipated land and water use changes on wildlife habitat can be quantified.

The modified HEP Analysis that the Corps has adopted for this project emphasizes general habitat conditions rather than habitat requirements of target species to calculate HUs. Focusing on target species is difficult when appropriate habitat suitability models are not available. This modified HEP utilizes an ecosystem approach to calculate habitat values for the different project alternatives and mitigation options. A similar approach has been utilized for Corps projects in Alamo Lake in Arizona (USACE, 1996) and Cucamonga/Deer Creek in California (USACE, 2000), among others. In this case, habitat types (typically defined by dominant vegetation type) are selected and evaluated based on the quality and amount of habitat resources provided to wildlife. The highest attainable value, where the HSI=1.0, is the optimum habitat condition. It should be noted that the HSI may never reach 1.0 during the life of the project.

II. MITIGATION FORMULATION PROCESS

A. Mitigation Goals: The following mitigation objectives were developed for the resources that would be affected:

1. Avoidance and minimization of impacts are preferable to other mitigation measures.
2. Where impacts are unavoidable, the overall goal is to mitigate fully (100% mitigation) the expected project-related significant impacts to significant resources.
3. In-kind mitigation for losses of most habitat types.
4. No net loss of habitat value.

B. Habitat-based Evaluation of Impacts and Mitigation: A Modified HEP analysis was used to evaluate the alternatives and to determine mitigation requirements as described below. Calculations of Habitat outputs (habitat units or HUs) in the Modified HEP analysis are shown in Tables 1.1.1 through 1.4.3.

In order to perform the incremental analysis, a habitat-based analysis was used to give a numerical value to biological resources of concern. The procedure used was based roughly on the U.S. Fish and Wildlife Service (FWS) Habitat Evaluation Procedure (HEP). HEP is a formal process whereby tested habitat suitability models for certain species are used which direct the measurement of certain habitat variables for the selected species, (e.g., percent of canopy cover, number of snag trees, stream temperature, percent ground cover, etc.). In the modified HEP used for this evaluation, the selected variables were habitat-based, rather than species-based. For this analysis, all variables are weighted equally. Each variable is assigned a Suitability Index (SI), between 0.0 and 1.0, based on a comparison between field conditions and optimal conditions. The variables are combined, using a formula provided in the model, to obtain a Habitat Suitability Index (HSI). This is then used to obtain a numerical rating of habitat units. Because the number of available, applicable HEP models is limited, and resources to conduct a formal analysis were limited, HSIs and Habitat Units (HUs) for this project were estimated using a simplified model based on collected field data and observations, available literature, selected elements of HEP models, and professional judgment.

A numerical rating or HSI between 0.0 and 1.0 has been assigned to the habitat based on the average value of the variables. The HSI was then multiplied by the area, in acres, of the habitat to obtain the HUs for each habitat type for each alternative. Table 1 summarizes the HSIs, Acres, and HUs for each Alternative for the selected Target Years during the life of the project.

III. ASSESSMENT OF HABITAT IMPACTS/MODIFIED HEP ANALYSIS

A. In the simplified HEP model (see Tables1.1.1 through 1.4.2) for this project, the following variables (V1 through V4) were selected as indicative of overall habitat quality:

V1 = Wildlife Diversity.
V2 = Plant species and Vegetation diversity
V3 = Vegetation Structure and Cover
V4 = Water Availability/Hydrologic Conditions

For the purposes of this analysis, all variables are weighted equally. Refer to the attached tables (1.1.1 through 1.4.2) for the HSIs, and HUs for the different alternatives.

B. The habitats considered in this analysis are:

1. Desert Riparian/Mesquite Bosque. This habitat occurs both in the construction area (approximately 22 acres) and in the proposed preserve (approximately 48 acres).

2. Desert Wash. This habitat occurs in the construction area only. Desert wash is considered to consist of 8.0 acres for all alternatives, and includes those areas that will be excavated for placement of bank protection, covered with bank protection, or disturbed for access and toe-down.

C. HUs/Period of Analysis and Average Annual Habitat Units (AAHUs)

Habitat Units have been estimated at three points in time for each of the alternatives. T = 0 refers to the time immediately preceding construction, T = 5 refers to the time 5 years following construction, and T = 50 refers to the time 50 years following construction or the expected end of the project life. Habitat units were calculated for the period of analysis for each alternative and divided by 51 to obtain AAHUs. A period of 51 years is used to calculate HUs because the period of analysis begins at year 0 rather than year 1. (See HEP Tables 1.1.1 through 1.4.2 for HU calculations and the Habitat Outputs Summary, Table 2 for AAHUs. AAHUs are calculated as follows:

a. To calculate the total HU's over the first six (6) years (years 0-5) of the project, average the HUs at T=0 with HU's at T=5, and multiply X 6.
b. To calculate the total HUs over the remaining 45 years of the project, average the HUs at T=5 with HUs at T=50 and multiply X 45.
c. Add total HUs for the first 6 years with total HUs for the remaining 45 years to obtain HUs over the life of the project.
d. Divide total HUs by 51 to obtain AAHUs.

Alternative 1. No Action

a. Construction Area (Excluding Proposed Preserve Area)

Desert Riparian/Mesquite Bosque Habitat. HUs are expected to decrease slightly under future without project conditions the in construction area with no action. Fluctuations would occur, but the long-term trend will be toward a gradual loss of habitat value, possibly noticeable after about 5 years. The decline in habitat value will be due to unauthorized activities such as trespassing, vandalism, wood-cutting, and invasion by domestic animals. Habitat units are expected to decrease from the 15.13 HUs at T=0 to 12.65 HUs at T=50.

Desert Wash. The habitat values in the desert wash are expected to remain low. Habitat units are expected to fluctuate around 1.90 HUs from T=0 to T=50.

AAHUs. AAHUs in the construction area are calculated as 15.93 for the No Action Alternative (see Table 2).

b. Proposed Preserve Area

The assumption is that if no bank protection project is authorized in the remainder of the project area, the preserve area will remain undeveloped, but various forms of disturbance will occur that will reduce the habitat value over time. Use by domestic animals, limited agriculture, wood-cutting, trespassing, littering, fires, and erosion are some of the factors likely to affect habitat quality. Erosive forces are expected to convert portions of the mesquite bosque habitat to desert wash habitat. HUs are expected to decrease from 33.00 at T=0 to 8.10 at T=50. Most erosion and loss of habitat is likely to occur as a result of one or a few major flood events. For the purpose of this analysis, it assumed that the first major flood event will occur after year 5 and that the extent of lateral erosion will be the full 650 feet over the period of analysis as predicted in the Lateral Migration Analysis. Since all but the widest point of the proposed preserve area is 650 feet or less in width, the entire preserve is subject to lateral erosion. After a riparian area is scoured by erosive forces, it reverts to desert wash habitat. If the scoured area is free of major flood flows for several years, new riparian habitat will develop. The successional riparian habitat will have lower habitat suitability than the original riparian habitat, but higher values than desert wash. The composition of the vegetation will also change because it will be closer to the water table. Cottonwoods, and shrubs such as broom baccharis and burrobush will replace the mesquite and other species as dominants. Other native trees and large shrubs, such as palo verde and Mexican elderberry may become established if several years elapse between major flood events. Invasion by non-native species, especially salt cedar, is also to be expected. Calculations of habitat units between year 5 and year 50 of this analysis in the preserve area are based on the assumption that habitat will fluctuate between desert wash and desert riparian habitat, with an average of 50% of each type present during this period, and with a lower HSI value assigned to the successional riparian habitat than to the mesquite bosque. These assumptions apply to Alternatives 2 and 3, in addition to the No Action Alternative.

AAHUs. AAHUs in the proposed preserve area over the period of analysis are calculated at 24.53 for the No Action Alternative.

c. Combined Construction Area and Proposed Preserve Area. The combined AAHUs for the construction area and Proposed Preserve area = 40.46 for future without project conditions. (15.93 + 24.53 = 40.46). The mitigation goal for the Recommended Plan and other alternatives is to maintain the AAHUs at 40.46 or greater over the life of the project or period of analysis.

Alternative 2.

a. Construction area

Desert Riparian/Mesquite Bosque Habitat. HUs are expected to decrease from 15.13 at T=0 to 10.76 at T=50 as a result of the loss of surface water from Tanque Verde Creek on the north side due to soil cement bank protection, the direct removal of approximately 1 acre of habitat due to construction, and various disturbance-related activities including trespassing, vandalism, wood-cutting, and invasion by domestic animals

Desert Wash. Habitat units are expected to decrease from 1.90 at T=0 to 1.16 at T=50 in the Desert Wash habitat due to the permanent loss of habitat on the protected banks and the temporary loss of habitat in the access and toe-down areas.

AAHUs. AAHUs in the overall construction area (excluding the preserve area) are calculated as 13.80 for Alternative 2, or a net loss of 2.13 AAHUs when compared with the No Action Alternative (see Table 2).

b. Proposed Preserve Area (Acquired as Mitigation). If the preserve is acquired as mitigation with no bank protection, habitat units are expected to decrease from 33.00 at T=0 to 9.30 at T=50.

Acquisition and preservation of this 48-acre site would eliminate or reduce some of the potential sources of disturbance (domestic animals, limited agriculture, wood-cutting, trespassing, littering, and fires), but the potential for erosion remains. Removing the sources of disturbance will allow habitat values to increase between major storm events. As vegetation structure improves, additional wildlife will be attracted to the area. Due to the cumulative effects of channelization projects in the system, considerable loss of habitat due to bank erosion in the preserve area is anticipated over the life of the project as a result of major flood flows. Erosion (lateral migration) of the north bank would be limited to the northern boundary of the geologic flood plain; however, this encompasses almost the entire preserve area. After major floods, in which desert riparian habitat is lost, the habitat will revert back to desert wash, followed by partial recovery of riparian habitat. The new riparian habitat would be different in composition from the mesquite bosque, and would probably be dominated by cottonwoods and shrubs, possibly including the invasive salt cedar. As the channel widens due to erosion, the rate of lateral migration slows. Due to the potentially dynamic nature of the preserve area, for the purposes of this modified HEP analysis, it is estimated that at the end of the period of analysis, the 48-acre site would consist of 50% (24 acres) desert wash and 50% (24 acres) successional riparian habitat

AAHUs. AAHUs in the proposed preserve area are calculated at 25.06 for Alternative 2.

c. Combined Construction area and Proposed Preserve Area (Acquired as Mitigation). The combined AAHUs for the construction area and Proposed Preserve area = 38.86 for Alternative 2 (13.80 + 25.06 = 38.86).

The mitigation goal for the Recommended plan is to maintain a minimum of 40.46 AAHUs. With the preserve, a deficiency of 1.6 AAHUs remains. The 48-acre preserve is, therefore, not adequate mitigation for Alternative 2.

Alternative 3.

a. Construction area

Desert Riparian/Mesquite Bosque Habitat. HUs are expected to decrease from 15.13 at T=0 to 11.12 at T=50 as a result of the loss of surface water from Tanque Verde Creek on the north side due to soil cement bank protection, the direct removal of approximately 1 acre of habitat due to construction, and various disturbance-related activities including trespassing, vandalism, wood-cutting, and invasion by domestic animals

Desert Wash. Habitat units are expected to decrease from 1.90 at T=0 to 1.39 at T=50 in the Desert Wash habitat due to the permanent loss of habitat on the protected banks and the temporary loss of habitat in the access and toe-down areas.

AAHUs. AAHUs in the overall construction area are calculated as 14.41 for Alternative 3 (see Table 2).

b. Proposed Preserve Area (Acquired as Mitigation). If the preserve is acquired as mitigation with no bank protection, habitat units are expected to decrease from 33.00 at T=0 to 9.30 at T=50, the same as for Alternative 2. (See discussion for Alternative 2).

AAHUs. AAHUs in the proposed preserve area are calculated at 25.06, for Alternative 3, the same as for Alternative 2.

c. Combined Construction area and Proposed Preserve Area (Acquired as Mitigation). The combined AAHUs for the construction area and Proposed Preserve area = 39.47 for Alternative 3.

The mitigation goal for Alternative 3 is to maintain a minimum of 40.46 AAHUs. With the preserve, a deficiency of 0.99 AAHU remains. The 48-acre preserve is, therefore, not adequate mitigation for Alternative 3. In addition, Alternative 3 is not the Recommended Plan because it does not provide the required level of bank protection.

Alternative 4.

a. Construction area

Desert Riparian/Mesquite Bosque Habitat. HUs are expected to decrease from 15.13 at T=0 to 10.76 at T=50 as a result of the loss of surface water from Tanque Verde Creek on the north side due to soil cement bank protection, the direct removal of approximately 1 acre due to construction, and various disturbance-related activities including trespassing, vandalism, wood-cutting, and invasion by domestic animals

Desert Wash. Habitat units are expected to decrease from 1.90 at T=0 to 0.90 at T=50 in the Desert Wash habitat due to the permanent loss of habitat on the stabilized banks and the temporary loss of habitat in the access and toe-down areas.

AAHUs. AAHUs in the construction area are calculated as 13.55 for Alternative 4 (see Table 2).

b. Proposed Preserve Area (Acquired as Mitigation, Modified Bank Stabilization Added). If the preserve is acquired as mitigation and modified bank stabilization added, habitat units are still expected to decrease from 33.00 at T=0 to 30.62 at T=50; however, this would be more than double the HUs in the same time-frame as the No Action Alternative. Habitat Unit losses would be due to direct disturbance during construction, minor alteration to hydrologic conditions, and a probable decrease in wildlife diversity in the greater Tucson area. The modified bank protection measures could slightly decrease ground and surface water supply to the mesquite bosque, but severe lateral erosion due to major flood events would be eliminated or greatly reduced. As with Alternatives 2 and 3, acquisition and preservation of this 48-acre site would eliminate or reduce many of the other potential sources of disturbance

AAHUs. AAHUs in the proposed preserve area, if acquired and protected, are calculated at 31.34 for Alternative 4.

c. Combined Construction area and Proposed Preserve Area. The combined AAHUs for the construction area and Proposed Preserve area = 44.89 for Alternative 4.

The mitigation goal for the recommended plan is to maintain a minimum of 40.46 AAHUs. The difference between 44.89 AAHUs and 40.46 AAHUs is +4.43 AAHUs. The 48-acre preserve is, therefore, adequate mitigation for Alternative 4

Table 1. HSI, Acres And Habitat Unit Summary

Alternative	Target Year	Factor	Construction Area			Preserve (Protected In Alts. 2, 3 & 4)	Construction Area + Preserve	
			Mesquite Bosque	Desert Wash	Combined			
1	T=0	HSI	0.69	0.24		0.69		
		Acres	22.00	8.00	30.00	48.00	78.00	
		HU	15.13	1.90	17.03	33.00	50.03	
	T=5	HSI	0.69	0.24		0.69		
		Acres	22.00	8.00	30.00	48.00	78.00	
		HU	15.13	1.90	17.03	33.00	50.03	
	T=50	HSI	0.58	0.24		0.34		
		Acres	22.00	8.00	30.00	24.00	54.00	
		HU	12.65	1.90	14.55	8.10	22.65	
AAHU								40.46
2	T=0	HSI	0.69	0.24		0.69		
		Acres	22.00	8.00	30.00	48.00	78.00	
		HU	15.13	1.90	17.03	33.00	50.03	
	T=5	HSI	0.66	0.24		0.69		
		Acres	21.00	4.88	25.88	48.00	73.88	
		HU	13.91	1.16	15.07	33.00	48.07	
	T=50	HSI	0.51	0.24		0.39		
		Acres	21.00	4.88	25.88	24.00	49.88	
		HU	10.76	1.16	11.92	9.30	21.22	
AAHU								38.86
3	T=0	HSI	0.69	0.24		0.69		
		Acres	22.00	8.00	30.00	48.00	78.00	
		HU	15.13	1.90	17.03	33.00	50.03	
	T=5	HSI	0.66	0.24		0.69		
		Acres	21.70	5.87	27.57	48.00	75.57	
		HU	14.38	1.39	15.77	33.00	48.77	
	T=50	HSI	0.51	0.24		0.39		
		Acres	21.70	5.87	27.57	24.00	51.57	
		HU	11.12	1.39	12.52	9.30	21.82	
AAHU								39.47
4	T=0	HSI	0.69	0.24		0.69		
		Acres	22.00	8.00	30.00	48.00	78.00	
		HU	15.13	1.90	17.03	33.00	50.03	
	T=5	HSI	0.66	0.24		0.68		
		Acres	21.00	3.78	24.78	47.10	71.88	
		HU	13.91	0.90	14.81	31.79	46.60	
	T=50	HSI	0.51	0.24		0.65		
		Acres	21.00	3.78	24.78	47.10	71.88	
		HU	10.76	0.90	11.66	30.62	42.28	
AAHU								44.89

Table 1.1.1 Habitat Evaluation - Alternative 1 - (No Action) - Construction Area					
Habitat Type	**Criteria**	**Habitat Suitability Index (HSI)**			**AAHU**
		T = 0	**T = 5**	**T = 50**	
Desert Riparian/Mesquite Bosque (Confluence Tanque Verde Creek/ Pantano Wash)	wildlife diversity	0.75	0.75	0.60	
	plant species and vegetation diversity	0.75	0.75	0.60	
	vegetation structure and cover	0.75	0.75	0.60	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.69	0.69	0.58	
Acreage		22.00	22.00	22.00	
Habitat Units	(Average HSI X Acreage)	15.13	15.13	12.65	14.03
Desert Wash	wildlife diversity	0.15	0.15	0.15	
	plant species and vegetation diversity	0.15	0.15	0.15	
	vegetation structure and cover	0.15	0.15	0.15	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.24	0.24	0.24	
Acreage		8.00	8.00	8.00	
Habitat Units		1.90	1.90	1.90	1.90
Construction Area Habitat Units		17.03	17.03	14.55	15.93

Table 1.1.2 Habitat Evaluation - Alternative 1 - (No Action) - Preserve Area					
Habitat Type	**Criteria**	**Habitat Suitability Index (HSI)**			**AAHU**
		T= 0	**T= 5**	**T= 50**	
Desert Riparian/Mesquite Bosque	wildlife diversity	0.75	0.75	0.30	
	plant and vegetation diversity	0.75	0.75	0.30	
	vegetation structure and cover	0.75	0.75	0.25	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.69	0.69	0.34	
Acreage		48.00	48.00	24.00	
Habitat Units		33.00	33.00	8.10	22.01
Desert Wash	wildlife diversity	0.15	0.15	0.15	
	plant species and vegetation diversity	0.15	0.15	0.15	
	vegetation structure and cover	0.15	0.15	0.15	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.24	0.24	0.24	
Acreage		0.00	0.00	24.00	
Habitat Units		0.00	0.00	5.70	2.51
Preserve Area Habitat Units		33.00	33.00	13.80	24.53
Combined Habitat Units		50.03	50.03	28.35	40.46

Table 1.2.1 Habitat Evaluation - Alternative 2 - Construction Area					
Habitat Type	**Criteria**	**Habitat Suitability Index (HSI)**			**AAHU**
		T= 0	**T= 5**	**T= 50**	
Desert Riparian/Mesquite Bosque	wildlife diversity	0.75	0.75	0.55	
	plant and vegetation diversity	0.75	0.75	0.55	
	vegetation structure and cover	0.75	0.75	0.55	
	water availability/hydrologic conditions	0.50	0.40	0.40	
Average HSI		0.69	0.66	0.51	
Acreage		22.00	21.00	21.00	
Habitat Units		15.13	13.91	10.76	12.59
Desert Wash	wildlife diversity	0.15	0.15	0.15	
	plant species and vegetation diversity	0.15	0.15	0.15	
	vegetation structure and cover	0.15	0.15	0.15	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.24	0.24	0.24	
Acreage		8.00	4.88	4.88	
Habitat Units		1.90	1.16	1.16	1.20
Construction Area Habitat Units		17.03	15.07	11.92	13.80

Table 1.2.2 Habitat Evaluation - Alternative 2 - Preserve Area (Acquired)					
Habitat Type	**Criteria**	**Habitat Suitability Index (HSI)**			**AAHU**
		T= 0	**T= 5**	**T= 50**	
Desert Riparian/ Mesquite Bosque	wildlife diversity	0.75	0.75	0.40	
	plant and vegetation diversity	0.75	0.75	0.35	
	vegetation structure and cover	0.75	0.75	0.30	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.69	0.69	0.39	
Acreage*		48.00	48.00	24.00	
Habitat Units		33.00	33.00	9.30	22.54
Desert Wash	wildlife diversity	0.15	0.15	0.15	
	plant species and vegetation diversity	0.15	0.15	0.15	
	vegetation structure and cover	0.15	0.15	0.15	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.24	0.24	0.24	
Acreage		0.00	0.00	24.00	
Habitat Units		0.00	0.00	5.70	2.51
Preserve Area Habitat Units		33.00	33.00	15.00	25.06
Combined Habitat Units		50.03	48.07	26.92	38.86

Table 1.3.1 Habitat Evaluation - Alternative 3 - Construction Area					
Habitat Type	**Criteria**	**Habitat Suitability Index (HSI)**			**AAHU**
		T= 0	**T= 5**	**T= 50**	
Desert Riparian/ Mesquire Bosque	wildlife diversity	0.75	0.75	0.55	
	plant and vegetation diversity	0.75	0.75	0.55	
	vegetation structure and cover	0.75	0.75	0.55	
	water availability/hydrologic conditions	0.50	0.40	0.40	
Average HSI		0.69	0.66	0.51	
Acreage*		22.00	21.70	21.70	
Habitat Units		15.13	14.38	11.12	12.98
Desert Wash	wildlife diversity	0.15	0.15	0.15	
	plant species and vegetation diversity	0.15	0.15	0.15	
	vegetation structure and cover	0.15	0.15	0.15	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.24	0.24	0.24	
Acreage		8.00	5.87	5.87	
Habitat Units		1.90	1.39	1.39	1.42
Construction Area Habitat Units		17.03	15.77	12.52	14.41

Table 1.3.2 Habitat Evaluation - Alternative 3 - Preserve Area (Acquired))					
Habitat Type	**Criteria**	**Habitat Suitability Index (HSI)**			**AAHU**
		T= 0	**T= 5**	**T= 50**	
Desert Riparian/ Mesquite Bosque	wildlife diversity	0.75	0.75	0.40	
	plant and vegetation diversity	0.75	0.75	0.35	
	vegetation structure and cover	0.75	0.75	0.30	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.69	0.69	0.39	
Acreage*		48.00	48.00	24.00	
Habitat Units		33.00	33.00	9.30	22.54
Desert Wash	wildlife diversity	0.15	0.15	0.15	
	vegetation structure and cover	0.15	0.15	0.15	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.24	0.24	0.24	
Acreage		0.00	0.00	24.00	
Habitat Units		0.00	0.00	5.70	2.51
Preserve Area Habitat Units		33.00	33.00	15.00	25.06
Combined Habitat Units		50.03	48.77	27.52	39.47

Table 1.4.1 Habitat Evaluation - Alternative 4 - Construction Area					
Habitat Type	**Criteria**	**Habitat Suitability Index (HSI)**			**AAHU**
		T= 0	**T= 5**	**T= 50**	
Desert Riparian/Mesquite Bosque	wildlife diversity	0.75	0.75	0.55	
	plant and vegetation diversity	0.75	0.75	0.55	
	vegetation structure and cover	0.75	0.75	0.55	
	water availability/hydrologic conditions	0.50	0.40	0.40	
Average HSI		0.69	0.66	0.51	
Acreage		22.00	21.00	21.00	
Habitat Units		15.13	13.91	10.76	12.59
Desert Wash	wildlife diversity	0.15	0.15	0.15	
	plant species and vegetation diversity	0.15	0.15	0.15	
	vegetation structure and cover	0.15	0.15	0.15	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.24	0.24	0.24	
Acreage		8.00	3.78	3.78	
Habitat Units		1.90	0.90	0.90	0.96
Construction Area Habitat Units		17.03	14.81	11.66	13.55

Table 4.4.2 Habitat Evaluation - Alternative 4 - Preserve Area (Acquired, Bank Stabilization Added)					
Habitat Type	**Criteria**	**Habitat Suitability Index (HSI)**			**AAHU**
		T= 0	**T= 5**	**T= 50**	
Desert Riparian/ Mesquite Bosque	wildlife diversity	0.75	0.75	0.70	
	plant and vegetation diversity	0.75	0.75	0.75	
	vegetation structure and cover	0.75	0.75	0.70	
	water availability/hydrologic conditions	0.50	0.45	0.45	
Average HSI		0.69	0.68	0.65	
Acreage		48.00	47.10	47.10	
Habitat Units		33.00	31.79	30.62	31.34
Desert Wash	wildlife diversity	0.15	0.15	0.15	
	plant species and vegetation diversity	0.15	0.15	0.15	
	vegetation structure and cover	0.15	0.15	0.15	
	water availability/hydrologic conditions	0.50	0.50	0.50	
Average HSI		0.24	0.24	0.24	
Acreage		0.00	0.00	0.00	
Habitat Units		0.00	0.00	0.00	0.00
Preserve Area Habitat Units		24.00	22.37	20.61	31.34
Combined Habitat Units		41.03	37.18	32.27	44.89

Table 2 - Summary of Habitat Outputs

HABITAT OUTPUTS	ALTERNATIVE			
	Alt.1 (No Action)	Alt.2	Alt.3	Alt. 4 (Recommended Plan)
Total T=50	14.55	11.92	12.52	11.66
a. CONSTRUCTION AREA AVERAGE ANNUAL HABITAT UNITS (AAHUs)	15.93	13.80	14.41	13.55
b. PRESERVE AREA AAHUs	24.53	25.06	25.06	31.34
c. TOTAL AAHUs = (a + b)	40.46	38.86	39.47	44.89
d. MITIGATION REQUIREMENT = Construction Area No Action (Alt. 1) AAHUs - Unmitigated With Project AAHUs		2.14	1.52	2.38
e. MITIGATION PROVIDED = [b - Preserve Area No Action (Alt.1) AAHUs]		0.53	0.53	6.81
f. Net AAHUs Gain (+) or Loss (-) With Mitigation = [c - No Action (Alt. 1) AAHUs Including Preserve Area]		-1.61	-1.00	4.43
g. MEETS MITIGATION REQUIREMENT?		No	No	Yes

Table 3 COMPARATIVE COSTS OF MITIGATION MEASURES

Mitigation Measure	Cost	Net AAHUS	Cost/AAHU
Acquire 48-Acre Mesquite Bosque as County Preserve (No Bank Protection	$780,560.00	0.53	$1,472,754.72
Add Modified Bank Protection to County Preserve	$1,021,214.00	6.28	$162,613.69