Exhibit 2

BIOLOGICAL OPINION SUMMARY
CENTRAL ARIZONA PROJECT WATER ASSIGNMENT- COTTONWOOD WATER WORKS, INC., AND CAMP VERDE WATER SYSTEM, INC TO CITY OF SCOTTSDALE

Date of opinion: March 30, 1998

Action agency: Bureau of Reclamation

Project: Central Arizona Project Water Assignment- Cottonwood Water Works, Inc., and Camp Verde Water System, Inc to City of Scottsdale

Location: Yavapai and Maricopa Counties, Arizona

Listed species affected:
Razorback sucker (*Xyrauchen texanus*) endangered with critical habitat
Bald eagle (*Haliaeetus leucocephalus*) threatened without critical habitat
Southwestern willow flycatcher (*Empidonax traillii extimus*) endangered with critical habitat
Arizona Cliffrose (*Purshia subintegra*) endangered.

Biological opinion: No jeopardy or adverse modification of critical habitat

Incidental take statement:
Anticipated take: *Exceeding this level may require reinitiation of formal consultation.*
Razorback sucker - anticipated take exceeded if project is not implemented as proposed
Bald eagle - none
Southwestern willow flycatcher - same as for razorback sucker
Arizona Cliffrose - not applicable
Reasonable and prudent measures: *Implementation of these measures through the terms and conditions is mandatory.* 1. Minimize loss and alteration of razorback sucker habitat. 2. Document activities that would result in incidental take of razorback sucker. 3. Maintain complete and accurate records. 4. Protect and enhance southwestern willow flycatcher habitat on the Verde River. 5. Develop methods of public education and shall promote voluntary water conservation practices in the Verde Valley.
Terms and conditions: *Terms and conditions implement reasonable and prudent measures and are mandatory requirements.* Provide technical advice and biological information on razorback sucker to water companies, provide FWS with annual reports on progress in acquiring surface water rights, provide FWS with information on wells drilled and implementation of cooperative agreements with AGFD and ADA, provide FWS with information on recharge projects planned by water companies, ensure construction of infrastructure is outside of occupied or suitable flycatcher habitat, work with landowners along the Verde River as part of a coordinated effort for the management of riparian habitat, participate in the Verde Watershed Association and seek to coordinate monitoring of flycatcher habitat and breeding territories on the Verde River, explore use of a portion of the southwestern willow flycatcher management funds to be used for Verde River flycatcher

territories, set aside one percent of the Trust to be used for public information and educational materials, and determine and promote methods to encourage voluntary water conservation measures in the Verde Valley.

Conservation recommendations: *Implementation of conservation recommendations is discretionary.* Reestablish stream gage at Camp Verde. Conduct additional surveys for southwestern willow flycatcher.

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Fish and Wildlife Service
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In Reply Refer To:
AESO/SE
2-21-97-F-314

March 30, 1998

MEMORANDUM

TO: Area Manager, Bureau of Reclamation, Phoenix Area Office, Phoenix, Arizona

FROM: Acting Field Supervisor

SUBJECT: Central Arizona Project (CAP) Water Assignment - Cottonwood Water Works, Inc., and Camp Verde Water System, Inc. to City of Scottsdale

This biological opinion responds to your request of November 24, 1997, for formal consultation pursuant to section 7 of the Endangered Species Act (Act) of 1973, as amended, regarding assignment to the City of Scottsdale, in Maricopa County, Arizona, of CAP water allocations belonging to Cottonwood Water Works, Inc. (CWW) and the Camp Verde Water System, Inc. (CVWS), in Yavapai County, Arizona. The species of concern are the endangered razorback sucker (*Xyrauchen texanus*), the endangered southwestern willow flycatcher (*Empidonax trailii extimus*), the endangered Arizona cliffrose (*Purshia subintegra*) and the threatened bald eagle (*Haliaeetus leucocephalus*). The consultation period began on November 25, 1997, the date your request was received in our office.

It is the Fish and Wildlife Service's biological opinion that implementation of this water assignment is not likely to jeopardize the continued existence of the razorback sucker, southwestern willow flycatcher, or Arizona cliffrose and is not likely to adversely modify the critical habitats of razorback sucker and southwestern willow flycatcher.

The following biological opinion is based on information provided in the June 17, 1997 final Environmental Assessment, (EA), June 27, 1997 Biological Assessment (BA), November 24, 1997 Supplemental Biological Assessment (SBA), a Reclamation memorandum of February 18, 1998 containing additional project information, various hydrologic and other data supplied by CWW, CVWS, and Salt River Project (SRP), data in our files, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern or other subjects considered in this opinion. A complete administrative record of this consultation is on file in this office.

CONSULTATION HISTORY

Informal consultation on this project began in 1992. At that time, the project specifics were still under development with several options being considered. Earlier exchanges of information on this and related projects and issues between the Bureau of Reclamation and the Service had occurred through National Environmental Policy Act (NEPA) scoping and comments and through Fish and Wildlife Coordination Act reports, from the 1970's, 1980's, and 1990's. In those earlier comments and reports, the Service had expressed concern about the issues covered by this opinion, including surface water depletion and adverse effects of residential, recreational, and industrial development facilitated by CAP water allocations. Service NEPA comments on the project option under consultation here were submitted to Reclamation on October 2, 1996 and July 1, 1997. In those comments, the Service expressed concerns specifically related to the need for section 7 consultation, water depletion of the Verde River, and the long-term consequences of development facilitated by increased water supply.

On June 12, 1997, Reclamation forwarded a Biological Assessment to the Service with findings of "may affect, is not likely to adversely affect" for all listed species and critical habitats. Following a meeting with Reclamation on June 26, 1997, the Service responded on June 30, 1997, and did not concur with that finding for razorback sucker, southwestern willow flycatcher, bald eagle, and Arizona cliffrose. The Service then met with SRP, to accept information SRP had available regarding this proposed project. Another meeting was held on July 11, 1997 between the Service, Reclamation, CWW, CVWS, and Congressman Stump's office to discuss this proposed project.

On July 30, 1997, the Service forwarded a July 25, 1997 request from CWW and CVWS for applicant status under the section 7 regulations. At an August 19, 1997 meeting, Reclamation informed the Service they were accepting CWW and CVWS as applicants and would formalize that in the letter initiating formal consultation. Reclamation also informed the Service that SRP had requested applicant status, but Reclamation had turned down that request on the basis that SRP did not meet the appropriate criteria.

On November 24, 1997, Reclamation submitted a Supplemental Biological Assessment to the Service with a request for initiation of formal consultation and identification of CWW and CVWS as applicants. The formal consultation period began on November 25, 1997, the date of receipt by the Service of the November 24 initiation letter. The Service acknowledged receipt of the formal initiation on December 19, 1997.

To address concerns raised by the Service and others, CWW and CVWS began work in the early summer 1997 on an agreement with Arizona Game and Fish Department, and in fall 1997 with the Arizona Department of Agriculture, to put in place protective measures that would prevent or mitigate some of the adverse impacts from the proposed project. Those agreements received their final signatures on January 27, 1998 and January 23, 1998, respectively. The substance of these agreements is addressed later in this opinion.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed project is the approval, by Reclamation, of CAP water exchange agreements between CWW, CVWS, and the City of Scottsdale. The CWW and CVWS received CAP allocations in 1983 from the Secretary of the Interior which consisted of 1,789 acre-feet (af) per year to CWW and 1,443 af/year to CVWS. In 1993, both CWW and CVWS entered into water-service subcontracts with Reclamation and the Central Arizona Water Conservation District (CAWCD). The CAWCD is a political subdivision of the State of Arizona formed to operate CAP. Reassignment of CAP allocations requires approval by Reclamation.

The service areas of CWW (16,000 acres) and CVWS (14,800 acres) are in the vicinity of the towns of Cottonwood and Camp Verde, Arizona (Figure 1) in central Arizona. They are located alongside the Verde River in what is known as the Verde Valley. Native vegetation of the Verde Valley is semidesert grassland with a well-developed cottonwood (*Populus* sp.)/willow (*Salix* sp.) riparian community along the Verde River. Scottsdale is part of the Phoenix metropolitan area in south-central Arizona. Scottsdale is located in the Sonoran desert palo verde (*Cercidium* sp.)/creosote (*Larrea tridentata*) vegetative communities.

Both CWW and CVWS are Arizona corporations and public utilities subject to regulation by the State of Arizona, primarily the Arizona Corporation Commission. The Arizona Department of Environmental Quality regulates water quality issues involved in this proposed action and the Arizona Department of Water Resources (ADWR) regulates water rights and water sources. Local zoning regulations govern placement of water facilities, power lines, and water mains. Authority to place water lines and other facilities within public road rights-of-way are granted by Yavapai County or the municipal entity.

Originally CWW and CVWS planned to effectuate their CAP allocations by exchanging them with downstream water users who held surface water rights in the vicinity of the Verde Valley. For various reasons, including environmental concerns, these plans were abandoned. The present proposed project is for CWW and CVWS to assign their CAP water allocations to the City of Scottsdale in return for $3,555,200 ($1,967,900 to CWW and $1,587,300 to CVWS), which would be used for development of alternative water supplies, primarily from groundwater sources. Scottsdale, which already has an existing CAP allocation of 26,576 af/year, is located in proximity to the CAP aqueduct, from which it would withdraw its allocation.

After deduction of certain charges to CAWCD, the monies which CWW and CVWS would receive for their allocations would be placed into two separate "Water Trust Funds." These funds would be under oversight authority of the ADWR, pursuant to state law A.R.S. 45-1002 *et seq.*, and ADWR approval is required for release of any funds to CWW or CVWS. Several provisions of the Trust

Funds are pertinent to this consultation. Both funds require that all wells drilled or pumped under Trust Fund monies be deep wells that penetrate the Verde Formation of the Tertiary Age and the underlying geologic units of the regional aquifer system, as defined in (Owen-Joyce and Bell, 1983). It is also required that the casing of the wells be perforated only opposite the Verde formation and shall not be perforated opposite the alluvium of the Quaternary Age, which underlies the Verde River channel and its floodplain. The Trust Funds allow for use of fund monies for acquisition of surface water rights or recharge projects, should they become viable options. The Trust Funds could not be used to construct or operate any new surface diversions.

Specific well fields for the CWW and CVWS groundwater wells to be developed or acquired under the Trust Funds have not been identified. As a result, the locations of new facilities, such as roads, power lines, water lines, storage tanks, water treatment facilities, etc. have also not been identified. However, both CWW and CVWS anticipate developing three wells each with the Trust Funds. A typical well site would require a 100 X 100 foot cleared area and additional space for storage tanks. Overall, the six well sites are expected to disturb less than 5 acres of upland. Both CWW and CVWS expect to use existing utility right-of-ways (e.g., streets, roads, highways) for water mains and power lines, to the maximum extent possible.

Scottsdale would take delivery of its CAP water through existing facilities. These facilities include a turnout located immediately west of Pima Road on the CAP Hayden-Rhodes Aqueduct, a 15-mile raw water pipeline and pump station along Pima Road, and a conventional water treatment plant located within a 40-acre area north of Union Hills Road and west of Pima Road. These facilities were subjected to NEPA and other environmental clearances in 1984, as part of Reclamation's approval of the initial water service subcontract with Scottsdale.

In addition to the provisions of the Trust Funds, the CWW and CVWS have made commitments pertinent to this consultation that are embodied in cooperative agreements between the CWW and Arizona Game and Fish Department (AGFD), between CVWS and AGFD, and between CWW and the Arizona Department of Agriculture (ADA). For CWW, these commitments include:

- provision to AGFD of well logs on wells drilled or acquired by CWW with Trust Fund monies,
- within 5 years after the effective date of a law or court decision which defined subflow in the State of Arizona or specifically the Verde River above Childs, CWW will cease operation and withdraw from service certain wells not developed or acquired through the Trust Fund if it is reasonably determined that those wells are pumping subflow of the Verde River or its tributaries, unless CWW holds valid surface water rights or recharge credits for the amount of water pumped from those wells,
- AGFD will provide technical assistance to CWW in development of recharge projects,
- CWW will notify AGFD before any facilities development, using Trust Fund monies, that will result in ground disturbance outside of existing utility easements and will cooperate with AGFD, to the extent reasonable, in pursuing alternatives or mitigation for any proposed activities that AGFD believes would adversely affect "protected species or habitat,"

- CWW will notify ADA before development, using Trust Fund monies, of any facilities that will result in ground disturbance outside of existing utility easements and will cooperate with ADA to the extent reasonable, in salvage of "protected plants," pursuing alternatives, or mitigation for any proposed activities that ADA believes would adversely affect "protected native plant populations or habitat,"
- CWW will not construct or develop wells, storage tanks, pipelines, mains or other facilities, using Trust Fund monies, within the Arizona cliffrose recovery area,
- CWW will not develop wells, construct storage tanks or other facilities within the cliffrose recovery area whose function is to serve customers outside of the recovery area, regardless of the source of the funding,
- CWW, in the event of a request for service within the Arizona cliffrose recovery area will advise ADA of the request, contract a site-specific inventory, confer with ADA regarding routing, location, and construction practices to avoid negatively impacting Arizona cliffrose, and if ADA believes the proposed activity will negatively affect Arizona cliffrose, CWW and ADA will consult with the Service.

For CVWS, the commitments include:

- provision to AGFD of well logs on wells drilled or acquired by CVWS with Trust Fund monies,
- within 5 years after court confirmation of the exchange with Scottsdale, CVWS will reduce its water withdrawals from shallow (in Quaternary alluvium) wells from 353 af/year to 176.5 af/year, unless CVWS holds valid surface water rights or recharge credits for that amount of water or unless the courts grandfather in the existing usage as a water right (CWW and CVWS have submitted Statements of Claim for water rights related to their shallow wells and it is their belief that they will eventually receive a grandfathered right to a very small portion of their claims. It is uncertain when the courts may adjudicate these claims.),
- metering of CVWS pumpage from all shallow wells (in Quaternary alluvium) and reporting of that usage to AGFD annually,
- within 5 years after the effective date of a law or court decision which defines subflow in the State of Arizona or specifically the Verde River above Childs, CVWS will cease operation and withdraw from service certain wells not developed or acquired through the Trust Fund if it is reasonably determined that those wells are pumping subflow of the Verde River or its tributaries, unless CVWS holds valid surface water rights or recharge credits for the amount of water pumped from those wells,
- AGFD will provide technical assistance to CVWS in development of recharge projects,
- CVWS will notify AGFD before any facilities development, using Trust Fund monies, that will result in surface ground disturbance outside of existing utility easements and will cooperate with AGFD, to the extent reasonable, in pursuing alternatives or mitigation for any proposed activities that AGFD believes would adversely affect "protected species or habitat."

In addition to the commitments and provisions of the ADWR Trust Fund oversight and the cooperative agreements with AGFD and ADA, CWW and CVWS have agreed to attempt to acquire

surface agricultural water rights in the Verde Valley for retirement from irrigation use. Acquisition of such rights would be dependent on availability, cost, and legal adjudication. These purchased water rights would be used to secure the pumping from existing shallow wells for continuity of service in the event of well or system failure. Under existing Arizona law, withdrawal of water from the shallow wells in the Verde Valley does not require an existing surface water right. However, this may change due to the Verde basin water adjudication presently underway and CWW and CVWS are concerned with loss of use of those wells if the adjudication finds that the shallow wells require a water right. Therefore, as stated in the BA, any surface water rights acquired by CWW or CVWS with Trust Funds monies would be used to offset pumping from existing shallow wells operated by the water companies.

Both CWW and CVWS have also agreed to cooperate with all appropriate entities to implement a plan (not yet in existence) that would allow the water represented by acquired surface water rights, and not withdrawn through the shallow wells, to bypass existing agricultural diversion structures and enhance Verde River base flows. They have also agreed to continue investigating the viability of implementing groundwater recharge in association with waste water treatment facilities.

The proposed Federal activity is approval of the reassignment of the CWW and CVWS CAP allocations to Scottsdale. The purpose of the CAP allocation was to provide the benefits of CAP to the water service areas of CWW and CVWS for municipal and industrial use. Although it was recognized at the time of the allocation that CWW and CVWS would be unable to take direct delivery of CAP water, it was anticipated that somehow CWW and CVWS would be able to derive water from their CAP allocation to meet their future water needs. It was also anticipated that the water provided by the CAP allocation could be used to avert conflicts with downstream water rights holders over water rights.

Reclamation states in its BA and its February 18, 1998 memorandum that CWW and CVWS would fully develop all available water sources without the CAP allocation or the funds derived from their transfer and that municipal and industrial development would occur at the same level in the area, with or without the water developed by funds received for CAP allocations. Therefore, increased level or rate of development is not a result of funds received via CAP, thus is not a result of a Reclamation action (the "but for" test) and cannot be considered interdependent or interrelated to the proposed action of Reclamation approval of the CAP transfer.

The stated purpose of the Colorado River Basin Project Act of 1968 (P.L. 90-537), which authorized CAP, was the "provision of additional and adequate water supplies for use in the upper as well as in the lower Colorado River Basin" and for "(providing) for municipal, industrial, and other beneficial purposes." Recently, the purpose of CAP, was cited by the Central Arizona Water Conservation District as; to "reduce the dangerous overdraft of groundwater resources in central Arizona, while maintaining as much as possible of the area's irrigated farmland and providing a source of additional water to support anticipated municipal and industrial growth" (Central Arizona Water Conservation District, 1997). The Final Environmental Impact Statement for the Central

Arizona Project specifically defines the purpose of the exchange allocations, such as those for CWW and CVWS, as to "enhance the economic development potential of service areas outside the central service area" (U.S. Bureau of Reclamation, 1972). And, the Final Environmental Impact for water allocations and water service contracting states that CAP water availability could create two types of "primary impact-inducing elements: 1) the water delivery system, and 2) municipal and industrial growth" (U.S. Bureau of Reclamation, 1982). Thus, municipal and industrial developments have long been recognized as part of the purpose and result of CAP and its water allocations, exchanges, and deliveries. If entities receiving CAP allocations, such as CWW and CVWS were expected to obtain and use the same water supplies and the same level of development without CAP as they would under CAP, then their allocations would not meet the purpose of CAP. The Service must assume that all allocations of CAP water, including those to CWW and CVWS, were intended to meet the purpose of CAP. Therefore, for the purposes of this consultation, the Service assumes the original CAP purpose applies and that additional municipal and industrial growth would result from or be facilitated by the use of funds received in exchange for the CAP allocations of CWW and CVWS.

Because the proposed Federal action would result in or facilitate increased municipal and industrial growth and economic development, that development is an interdependent and interrelated action to the Federal action under consultation. Under the section 7 regulations, the effects of indirect, interdependent, and interrelated actions must be considered as part of the analysis in section 7 consultation. Indirect actions are those that are caused by the proposed action and are later in time, but still reasonably certain to occur (e.g., increased recreational use of the Verde River and its riparian corridor due to increased population supported by increased water supply), interdependent actions are those that have no independent utility apart from the action under consultation (e.g., construction of new housing developments to use the water developed under the Trust Funds), and interrelated actions are those that are part of a larger action and depend on the larger action for their justification (e.g., construction of new water supply lines to the new residential development) (50 CFR 402.02). Therefore, effects from development and operation of all water facilities must be considered in this opinion and the resultant potential effects of the increased population, housing, industry, recreation, etc. must also be considered. However, there is little information to quantify what portion of the much larger overall development in the Verde Valley is attributable to the proposed project. Because the amount of water to be developed by this project is small compared to the overall existing and projected water usage in the area, we have assumed that the development increment attributable to the proposed project is small.

SPECIES DESCRIPTIONS AND STATUS

Razorback Sucker Description and Status

The razorback sucker was listed as endangered on October 23, 1991 (USFWS, 1991). Critical habitat was designated for razorback sucker on March 21, 1994 (USFWS, 1994a). Within the Gila

River basin, critical habitat includes portions of the Gila, Verde and Salt rivers, including the river and its 100-year floodplain. The Verde River and its 100-year floodplain in the project area are within the designated critical habitat, which extends along the Verde River from just below Perkinsville to Horseshoe Dam.

Razorback sucker grows to more than two feet in length and has a distinctive abrupt, sharp-edged dorsal ridge behind the head (Minckley, 1973). The species was once common throughout the Colorado River basin, but is now rare, occurring sporadically in about 750 miles of the upper basin (Bestgen, 1990). In the lower basin a substantial population exists only in Lake Mohave. Upstream from Lake Mohave, the razorback sucker occurs in Lake Mead and Grand Canyon. Downstream from Lake Mohave, it occurs sporadically in the mainstem and associated impoundments and canals (USFWS, 1991). Habitat alteration and destruction along with competition and predation from introduced nonnative fish species are responsible for the species' decline (Marsh and Brooks, 1989; Minckley *et al.*, 1991). As part of the recovery program, reintroduction of razorback sucker has been attempted through stocking into numerous locations in the Gila, Salt, and Verde River basins, including the Blue River (Creef *et al.*, 1992; Hendrickson, 1993).

Adult razorback sucker inhabits a wide variety of riverine habitats including mainstream and backwater areas such as slow runs, deep eddies, pools, and sloughs (Bestgen, 1990). It also inhabits reservoirs. Larval and juvenile razorback sucker habitat use is poorly understood, but is thought to be shallow, slow-moving areas, backwaters and littoral zones (Langhorst and Marsh, 1986; Bestgen, 1990). Razorback sucker spawns from January to May and initiation of spawning appears to be tied to water temperature (Langhorst and Marsh, 1986; Tyus and Karp, 1990). Spawning occurs in shallow water over large gravel, cobble, or coarse sand with little or no fine sediment on wave-washed lakeshores or riverine riffles (Minckley *et al.*, 1991). Razorback sucker lives up to about 50 years (McCarthy, 1987). It feeds on plankton, algae and detritus in reservoirs, with riverine populations also consuming a large amount of benthic invertebrates (Bestgen, 1990).

Bald Eagle Description and Status

The bald eagle south of the 40th parallel was listed as endangered under the Endangered Species Act of 1966 on March 11, 1967 (USFWS, 1967). It was reclassified to threatened status on July 12, 1995 (USFWS, 1995a). No critical habitat has been designated for this species. The bald eagle is a large hawk that historically ranged throughout North America except extreme northern Alaska and Canada and central and southern Mexico. Bald eagles nested on both coasts of the United States, from Florida to Baja California in the south and from Labrador, New Foundland, to the Aleutian Islands, Alaska, in the north.

The bald eagle occurs in association with aquatic ecosystems, frequenting estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. Suitable habitat for bald eagles includes those areas with an adequate food base, perching areas, and nesting sites. In winter, bald eagles often

congregate at specific wintering sites that are generally close to open water and that offer good perch trees and night roosts (USFWS, 1995a).

There were an estimated one-quarter to one-half million bald eagles on the North American continent when Europeans first arrived. Initial population declines probably began in the late 1800s, and coincided with declines in the number of waterfowl, shorebirds, and other prey species. Direct killing of bald eagles was also prevalent. Additionally, there was a loss of nesting habitat. These factors reduced bald eagle numbers until the 1940s when protection for the bald eagle was provided through the Bald Eagle Protection Act (16 U.S.C. 668). The Act accomplished protection and a slower decline in bald eagle populations by prohibiting numerous activities adversely affecting bald eagles and increasing public awareness of bald eagles. The widespread use of dichloro-diphenyl-trichloroethane (DDT) and other organochlorine compounds in the 1940s for mosquito control and as a general insecticide caused additional declines in bald eagle populations. DDT accumulated in individual birds following ingestion of contaminated food. DDT breaks down into dichlorophenyl-dichloroethylene (DDE) and accumulates in the fatty tissues of adult females, leading to impaired calcium release necessary for egg shell formation. Thinner egg shell led to reproductive failure, and is considered a primary cause of declines in the bald eagle population. DDT was banned in the United States in 1972 (USFWS, 1995a).

Since listing, bald eagles have increased in number and expanded in range due to the banning of DDT and other persistent organochlorine compounds, habitat protection, and recovery efforts. Surveys in 1963 indicated 417 active nests in the lower 48 states with an average of 0.59 young produced per nest. In 1994, 4,450 occupied breeding areas were reported with an estimated average of 1.17 young produced per occupied nest (USFWS, 1995a).

Hunt *et al.* (1992) summarize the earliest records of bald eagles in the literature for Arizona. Coues noted bald eagles in the vicinity of Fort Whipple (now Prescott) in 1866, and Henshaw reported bald eagles south of Fort Apache in 1875. The first bald eagle breeding information was recorded in 1890 near Stoneman Lake by S.A. Mearns. Additionally, Bent reported breeding eagles at Fort Whipple in 1866 and on the Salt River Bird Reservation (since inundated by Roosevelt Lake) in 1911. Additionally, there are reports of bald eagles along rivers in the White Mountains from 1937, and reports of nesting bald eagles along the Salt and Verde Rivers as early as 1930.

From 1970 to 1990, 226 known eaglets fledged in Arizona, for an average of 10.8 young produced per year. Successful nests contained an average of 1.6 young per year (Hunt *et al.*, 1992). In 1996, there were 36 known breeding areas, with 30 of those being occupied. Within those breeding areas, 31 were active, meaning eggs or young were present. Fifteen nesting attempts were successful, with 25 young fledged (Beatty *et al.*, 1997). Results for the 1997 breeding season are not yet available.

In addition to breeding bald eagles, Arizona provides habitat for wintering bald eagles, which migrate through the state between October and April each year. For 1996, the standardized statewide 1996 Arizona winter count totaled 361 bald eagles, including 232 adults, 127 subadults, and two of

unknown age. The most concentrated population of wintering bald eagles is found at Lake Mary and Mormon Lake, where 69 birds were located (Beatty and Driscoll, 1996). Results for winter 1997 are not yet available.

It is not known if the population of bald eagle in Arizona declined as a result of DDT contamination because records were not consistently kept during this time period. However, the possibility for contamination was present as DDT was used in Arizona and Mexico. Use of DDT in Mexico could potentially have contaminated waterfowl that then migrated through Arizona in addition to directly affecting juvenile and subadult eagles that traveled into Mexico. Many of the nest sites in Arizona are in rugged terrain not suitable for agricultural development, and may therefore have avoided the direct effects of DDT (Hunt *et al.*, 1992).

Bald eagle breeding areas in Arizona are predominantly located in the upper and lower Sonoran life zones. The Luna Lake breeding area is unique in Arizona in that it is found in coniferous forests at Luna Lake, as opposed to occurring in Sonoran vegetation communities. All breeding areas in Arizona are located in close proximity to a variety of aquatic habitats including reservoirs, regulated river systems, and free-flowing rivers and creeks. The alteration of natural river systems has been both beneficial and detrimental to the bald eagle. While large portions of riparian forests were inundated or otherwise destroyed following construction of dams and other water developments, the reservoirs created by these structures enhance habitat for the waterfowl and fish species on which bald eagles prey.

Arizona bald eagles are considered distinct behaviorally from bald eagles in the remaining lower 48 states in that they frequently construct nests on cliffs. Of 111 nests known in 1992, 46 were in trees, 36 on cliffs, 17 on pinnacles, 11 in snags, and one on an artificial platform. However, while there were more nests in trees, one study found that cliff nests were selected 73 percent of the time, while tree nests were selected 27 percent of the time. Additionally, eagles nesting on cliffs were found to be marginally more successful at reproducing. Bald eagles in the southwest are additionally unique in that they lay eggs in January or February, which is early compared with bald eagles in other areas. It is believed that this is a behavioral adaptation to allow chicks to avoid the extreme desert heat of midsummer. Young eagles will remain in the vicinity of the nest until June (Hunt *et al.*, 1992).

Bald eagles in Arizona consume a diversity of food items, including some invertebrates. However, their primary food is fish, which are generally consumed twice as often as birds, and four times as often as mammals. Bald eagles are known to catch live prey, steal prey from other predators (especially osprey), and use carrion. Carrion constitutes a higher proportion of the diet for juveniles and subadults than it does for adult eagles. Diet varies depending on what species are available locally. This can be affected by the type of water system on which the breeding area is based (Hunt *et al.*, 1992).

A recovery plan was developed for bald eagles in the southwest recovery region in 1982 (USFWS, 1982). Goals of the recovery plan were to achieve an overall reproductive output of 10 to 12 young

per year and to determine occupancy of one or more pairs on a drainage other than the Salt or Verde Rivers. These goals have been met, and the bald eagle was reclassified nationwide to threatened status. While bald eagles in the southwest were initially considered a distinct population, the final rule notes that the Service has determined that bald eagles in the southwestern recovery region are part of the same bald eagle population found in the remaining lower 48 states.

While the bald eagle has been reclassified to threatened, and although the status of the birds in the southwest recovery region is on an upward trend, the population remains small and under threat from a variety of factors. Threats persist largely due to the proximity of bald eagle breeding areas to major human population centers. Additionally, because water is a scarce resource in the southwest recovery region, recreation is concentrated along available water courses. Some of the threats and disturbances to bald eagle include entanglement in monofilament (fishing line) and fishing hooks, overgrazing and related degradation of riparian vegetation, shooting, alteration of water systems for water distribution systems, maintenance of existing water development features such as dams or diversion structures, and disturbance from recreation. The use of breeding area closures and close monitoring through the Bald Eagle Nestwatch program have been and will continue to be essential to the recovery of this species.

Southwestern Willow Flycatcher Description and Status

The southwestern willow flycatcher is a small passerine bird (Order Passeriformes; Family Tyrannidae) measuring approximately 15 centimeters (5.75 inches) in length from the tip of the bill to the tip of the tail and weighing only 11 grams (0.4 ounces). It has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two white wingbars are visible (juveniles have buffy wingbars). The eye ring is faint or absent. The upper mandible is dark, and the lower is light yellow grading to black at the tip.

The southwestern willow flycatcher is an insectivore typically perching on a branch and making short direct flights, or sallying, to capture flying insects. The southwestern willow flycatcher is a riparian obligate, nesting along rivers, streams, and other wetlands where dense growths of willow (*Salix* sp.), *Baccharis*, buttonbush (*Cephalanthus* sp.), boxelder (*Acer negundo*), saltcedar (*Tamarix* sp.) or other plants are present, often with a scattered overstory of cottonwood (*Populus* sp.) and/or willow.

One of four currently-recognized willow flycatcher subspecies (Phillips, 1948; Unitt, 1987; Browning, 1993), the southwestern willow flycatcher is a neotropical migratory species that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips, 1948; Stiles and Skutch, 1989; Peterson, 1990; Ridgely and Tudor, 1994; Howell and Webb, 1995). The historical range of the southwestern willow flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern

Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt, 1987).

The States of California and New Mexico list the southwestern willow flycatcher as endangered (California Department of Fish and Game, 1992; New Mexico Department of Game and Fish, 1988). The State of Arizona considers the southwestern willow flycatcher a species of special concern (Arizona Game and Fish Department, 1996). The Service included the southwestern willow flycatcher on its Animal Notice of Review as a category 2 candidate species on January 6, 1989 (USFWS, 1989a). A proposal to list the southwestern willow flycatcher as endangered, with critical habitat, was published on July 23, 1993 (USFWS, 1993), and a final rule without critical habitat was published on February 27, 1995 (USFWS, 1995b), becoming effective on March 29, 1995. Following the review of comments received during the public comment period, the Service deferred the designation of critical habitat, invoking an extension on this decision until July 23, 1995. A moratorium on listing actions under the Act passed by Congress in April 1995 required the Service to cease work on the designation of critical habitat. On April 26, 1996, the moratorium was lifted and on May 16, 1996, the Service published a notice in the Federal Register announcing listing prioritization guidance. Listing actions were placed in categories of decreasing order of priority: Tier 1 - Emergency listings; Tier 2 - Finalization of listing decisions on proposed species; and Tier 3 - all other listing actions (proposed rules, petition findings, critical habitat designations). On May 13, 1997, the Southwest Center for Biological Diversity filed a lawsuit claiming that the Service violated the Act by not finalizing critical habitat for the southwestern willow flycatcher. On March 20, 1997, the District Court ordered the Service to finalize critical habitat for the flycatcher by July 18, 1997. As ordered, the critical habitat was published on July 18, 1997, and became effective on August 21, 1997. A correction notice was published in the Federal Register on August 20, 1997.

Life History

The southwestern willow flycatcher forages within and above dense riparian vegetation, taking insects on the wing or gleaning them from foliage (Wheelock, 1912; Bent, 1963). No information is available on specific prey species. However, fecal samples containing identifiable invertebrate body parts were collected during banding operations from more than 70 southwestern willow flycatchers in California, Arizona, and southwestern Colorado (M. Sogge, pers. comm.). These samples could yield important data on prey use at various locations and timing throughout the breeding season.

The southwestern willow flycatcher begins arriving on breeding grounds in late April and May (Sogge and Tibbitts, 1992; Sogge *et al.*, 1993; Sogge and Tibbitts, 1994; Muiznieks *et al.*, 1994; Maynard, 1995; Sferra *et al.*, 1995). Migration routes are not completely known. However, willow flycatchers have been documented migrating through specific locations and drainages in Arizona that do not currently support breeding populations, including the upper San Pedro River (BLM, unpubl. data), Colorado River through Grand Canyon National Park (Sogge and Tibbitts, 1992; Sogge *et al.*,

1993; Sogge and Tibbitts, 1994), lower Colorado River (Muiznieks *et al.*, 1994, Spencer *et al.* 1996), Verde River tributaries (Muiznieks *et al.*, 1994), and Cienega Creek (BLM, *in litt.*). These observations probably include the subspecies *E. t. brewsteri* and *E. t. adastus*. *Empidonax* flycatchers rarely sing during fall migration, so that as a means of distinguishing some migrating *Empidonax* without a specimen is not feasible (Blake, 1953; Peterson and Chalif, 1973). However, willow flycatchers have been reported to sing and defend winter territories in Mexico and Central America (Gorski, 1969; McCabe, 1991).

Nesting begins in late May and early June and young fledge from late June through mid-August (Willard, 1912; Ligon, 1961; Brown, 1988a,b,;Whitfield, 1990; Sogge and Tibbitts, 1992; Sogge *et al.*, 1993; Muiznieks *et al.*, 1994; Whitfield, 1994; Maynard, 1995). Southwestern willow flycatchers typically lay three to four eggs in a clutch (range = 2-5). The breeding cycle, from laying of the first egg to fledging, is approximately 28 days. Eggs are laid at one-day intervals (Bent, 1963; Walkinshaw, 1966; McCabe, 1991); they are incubated by the female for approximately 12 days; and young fledge approximately 12 to 13 days after hatching (King, 1955; Harrison, 1979). Southwestern willow flycatchers typically raise one brood per year but have been documented raising two broods during one season (Whitfield, 1990). They have also been documented renesting after nest failure (Whitfield, 1990; Sogge and Tibbitts, 1992; Sogge *et al.*, 1993; Sogge and Tibbitts, 1994; Muiznieks *et al.*, 1994; Whitfield, 1994; Whitfield and Strong, 1995).

Whitfield, who has accumulated the largest data set on southwestern willow flycatchers, reported the following data on survivorship of adults and young: of 58 nestlings banded since, 1993, 21 (36%) returned to breed; of 57 birds banded as adults (after hatch year) since 1989, 18 (31%) returned to breed at least 1 year (10 males, 8 females); 5 (9%) returned to breed for 2 years (all males); and 2 (3.5%) returned to breed for 3 years (M. Whitfield, Kern River Preserve, pers. comm.). Whitfield (1995) also documented statistically significant variation in return rates of juveniles as a function of fledging date; approximately 21.9% of juveniles fledged on or before July 20th returned to her study area the following year, whereas only 6.4% of juveniles fledged after July 20th returned the following year.

Walkinshaw (1966), who studied *E. t. trailii* in Michigan, estimated that 40.9% of the males at his study site returned to breed for at least 2 years, 22.7% returned for at least 3 years, 13.6% returned for at least 4 years, and at least 4.5% returned during their year 5. Female return rates were substantially lower. Only 22.6% returned to breed for 1 year. Whitfield and Walkinshaw do not incorporate potential emigration rates into their estimates of returns and, thus, may underestimate actual survivorship. However, these data are consistent with survival rates for other passerines (Gill, 1990) suggesting that the life span of most southwestern willow flycatchers is probably two to three years (i.e. most flycatchers survive to breed one or two seasons).

Brood parasitism of southwestern willow flycatcher nests by the brown-headed cowbird (*Molothrus ater*) has been documented throughout the flycatcher's range (Brown, 1988a,b; Whitfield, 1990;

Muiznieks *et al.*, 1994; Whitfield, 1994; Hull and Parker, 1995; Maynard, 1995; Sferra *et al.*, 1995; Sogge, 1995b). Cowbirds lay their eggs in the nests of other species directly affecting their hosts by reducing nest success. Cowbird parasitism reduces host nest success in several ways. Cowbirds may remove some of the host's eggs, reducing overall fecundity. Hosts may abandon parasitized nests and attempt to renest, which can result in reduced clutch sizes, delayed fledging, and reduced overall nesting success and fledgling survivorship (Whitfield, 1994; Whitfield and Strong, 1995). Cowbird eggs, which require a shorter incubation period than those of many passerine hosts, hatch earlier giving cowbird nestlings a competitive advantage over the host's young for parental care (Bent, 1963; McGeen, 1972; Mayfield, 1977a,b; Brittingham and Temple, 1983). Where studied, high rates of cowbird parasitism have coincided with southwestern willow flycatcher population declines (Whitfield, 1994; Sogge, 1995a; Sogge, 1995c; Whitfield and Strong, 1995), or, at a minimum, resulted in reduced or complete elimination of nesting success (Muiznieks *et al.*, 1994; Whitfield, 1994; Maynard, 1995; Sferra *et al.*, 1995; Sogge, 1995a; Sogge, 1995c; Whitfield and Strong, 1995). Whitfield and Strong (1995) found that flycatcher nestlings fledged after July 20th had a significantly lower return rate and that cowbird parasitism was often the cause of delayed fledging.

Habitat Use

The southwestern willow flycatcher breeds in dense riparian habitats from sea level in California to over 7000 feet in Arizona and southwestern Colorado. Throughout its wide geographic and elevational range, its riparian habitat can be broadly described based on plant species composition and habitat structure (Sogge *et al.*, 1997). These attributes are among the most conspicuous components of flycatcher habitat, but not necessarily the only important components. They are easily identified from photographs or during field visits and have been useful in conceptualizing, selecting, and evaluating suitable survey habitat. Photographs and accompanying text provided in Sogge *et al.* (1997) characterize the considerable variation in habitat structure and plant species composition found at breeding sites throughout the southwestern willow flycatcher's range. Two components that vary less across this subspecies' range are vegetation density and the presence of surface water. Those and other characteristics, such as size and shape of habitat patches, are described further below.

Based on the diversity of plant species composition and complexity of habitat structure, four basic habitat types can be described for the southwestern willow flycatcher. Those types are described below and should be referenced with photographs provided in Sogge *et al.* (1997). When reviewing the habitat descriptions below and applying them to a particular location in the field, keep in mind that characteristics of actual breeding sites fall somewhere on a continuum from monotypic to multiple plant species, and from a relatively simple habitat structure characterized by a single vegetation stratum to more complex habitat patches characterized by multiple-strata.

Monotypic willow: Nearly monotypic, dense stands of willow (often *S. exigua* or *S. geyeriana*) 3 to 7 meters in height with no distinct overstory layer; usually very dense structure in at least lower 2 m; live foliage density is high from the ground to canopy.

Monotypic exotic: Nearly monotypic, dense stands of exotics such as saltcedar (*Tamarisk* sp.) or Russian olive (*Elaeagnus angustifolia*) 4 to 10 meters (m) in height forming a nearly continuous, closed canopy (with no distinct canopy layer); lower 2 m may be very difficult to penetrate due to branch density; however live foliage volume may be relatively low from 1 to 2 m above ground; canopy density uniformly high.

Native broadleaf dominated: Comprised of dense stands of single species (often Goodding's or other willows) or mixtures of native broadleaf trees and shrubs including, but not limited to, cottonwood, willows, boxelder, ash, buttonbush, and stinging nettle from 4 to 15 m in height; characterized by trees of different size classes; may have distinct overstory of cottonwood, willow or other broadleaf species, with recognizable subcanopy layers and a dense understory of mixed species; exotic/introduced species may be a rare component, particularly in understory.

Mixed native/exotic: Dense mixtures of native broadleaf trees and shrubs (such as those listed above) mixed with exotic species such as tamarisk and Russian olive; exotics are often primarily in the understory, but may also be a component of overstory; the native and exotic components may be dispersed throughout the habitat or concentrated as a distinct patch within a larger matrix of habitat; overall, a particular site may be dominated primarily by natives, exotics, or be a more or less equal mixture.

There are other potentially important dimensions or characteristics of southwestern willow flycatcher habitat, including: size, shape, and distribution of vegetation patches; hydrology; prey types and age-specific fecundity), the distribution of breeding groups across the landscape, flycatcher dispersal patterns, migration routes, site fidelity, philopatry, and degree of conspecific sociality (e.g., coloniality). Most of these attributes are not well understood for the southwestern willow flycatcher. However, some of these factors may be critical to understanding current population dynamics and habitat use. For example, characterizations of suitable breeding habitat may be significantly biased if observed patterns of habitat use are influenced by intrinsic dispersal patterns and capabilities rather than overall habitat quality.

Ultimately, habitat suitability should be measured in terms of reproductive success and survivorship that result in a positive rate of population growth. Without long term data that correlate or experimentally verify which combination of the above attributes contribute to population growth, habitat descriptions should be viewed broadly and considered descriptors of "suitable survey habitat."

The size and shape of occupied riparian habitat patches vary considerably. Southwestern willow flycatchers have been found nesting in patches as small as 0.8 hectares (*e.g.*, Grand Canyon) and as large as several hundred hectares (e.g., Roosevelt Lake, Lake Mead). When viewed from above, the mixed vegetation types in particular often appear as a mosaic of plant species and patch shapes and sizes. In contrast, narrow, linear riparian habitats one or two trees wide do not appear to contain attributes attractive to nesting flycatchers. However, flycatchers have been found using these habitats during migration.

Open water, cienegas, marshy seeps, or saturated soil are typically in the vicinity of flycatcher territories and nests; flycatchers sometimes nest in areas where nesting substrates were in standing water (Maynard, 1995; Sferra *et al.*, 1995, 1997). However, hydrological conditions at a particular site can vary remarkably in the arid Southwest within a season and between years. At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e., May and part of June). However, the total absence of water or visibly saturated soil has been documented at several sites where the river channel has been modified (e.g., creation of pilot channels), where modification of subsurface flows has occurred (e.g., agricultural runoff), or as a result of changes in river channel configuration after flood events (Spencer *et al.*, 1996).

Nest placement and nesting substrate

Southwestern willow flycatcher nests are open cup structures, approximately 8 centimeters (cm) high and 8 cm wide (outside dimensions), exclusive of any dangling material at the bottom. Nests are typically placed in the fork of a branch with the nest cup supported by several small-diameter vertical stems. The main branch from which the fork originates may be oriented vertically, horizontally, or at an angle, and stem diameter for the main supporting branch can be as small as three to four cm. Vertical stems supporting the nest cup are typically one to two cm in diameter. Occasionally, southwestern willow flycatchers place their nests at the juncture of stems from separate plants, sometimes different plant species. Those nests are also characterized by vertically-oriented stems supporting the nest cup. Spencer *et al.* (1996) measured the distance between flycatcher nests and shrub/tree center for 38 nests in monotypic saltcedar and mixed native broadleaf/saltcedar habitats. In monotypic saltcedar stands (n=31), nest placement varied from 0.0 m (center stem of shrub or tree) to 2.5 m. In the mixed riparian habitat (n=7), nest placement varied from 0.0 to 3.3 m.

Nest height relative to the base of nest substrate also varies across the southwestern willow flycatcher's range and may be correlated with height of nest substrate and/or overall canopy height. Table 1 presents data on nest heights in different riparian habitat types across the flycatcher's range. Southwestern willow flycatcher nests have been found as low as 0.6 m above the ground to 14 m above the ground. The data presented in Table 1 demonstrate that flycatchers using predominantly native broadleaf riparian habitats nest relatively low to the ground (between 1.8 m and 2.1 m on

average), whereas those using mixed native/exotic and monotypic exotic riparian habitats nest relatively high above the ground (between 4.3 m and 7.4 m on average).

Historic egg/nest collections and species' descriptions from throughout the southwestern willow flycatcher's range confirm the bird's widespread use of willow for nesting (Phillips, 1948; Phillips *et al.*, 1964; Hubbard, 1987; Unitt, 1987; T. Huels *in litt.*, 1993; San Diego Natural History Museum, 1995). Of the 34 nests found by Brown in 1902 near Yuma on the lower Colorado and Gila rivers, 33 were in Goodding's willow and one was in arrowweed. Data from historic egg collections from southern California and more current studies indicate that 75 to 80% of nests were placed in willows (San Diego Natural History Museum, 1995).

Currently, southwestern willow flycatchers use a wide variety of plant species for nesting substrates. At the monotypic willow stands that characterize high elevation sites in Arizona, Geyer willow was used almost exclusively for nesting (Muiznieks *et al.*, 1994). At the inflow to Lake Mead on the Colorado River, Goodding's willow was the primary nesting substrate (R. McKernan unpubl. data). Along a 20-mile stretch of the Gila River in Grant County, New Mexico, where boxelder is the dominant understory species, 76% of flycatcher nests were placed in boxelder, with the remainder

Table 1. Nest height and nest substrate height data by riparian habitat type for the southwestern willow flycatcher.

Habitat Type	Mean Nest Ht. Relative to Base of Nest Substrate [m] n	Mean Nest Substrate Height [m] ± 1 STD (range)	± 1 STD (range)	Source
Monotypic stands of Geyer willow (Apache Co., AZ)	33	1.8 ±0.3 (1.0 - 2.3)	4.4 ±0.5 (3.5 - 6.0)	Muiznieks *et al.* (1994), Sferra *et al.* (1995) Spencer *et al.* (1996,, 1997)
Mixed native broadleaf, predominantly Goodding's willow (Yuma Co., AZ)	28	2.1 ±0.8 (1.2 - 4.9)	-	H. Brown 1902 collections (T. Huels *in litt.*)
Mixed native broadleaf (Kern Co., CA)	134	2.1 ±0.1 (0.6 - 10)	5.6 ±0.3 (1 - 14)	Whitfield and Strong (1995)
Mixed native broadleaf/saltcedar (throughout AZ)	70	4.8 ±1.8 (1.5 - 10.5)	7.4 ±2.3 (3.5 - 17.0)	Muiznieks *et al.* (1994), Sferra *et al.* (1995) Spencer *et al.* (1996, 1997)
Mixed native broadleaf/exotic (Grant Co., NM)	45	7.4 ±3.6 (2.0 - 14)	12.7 ±5.2 (4 - 28)	Skaggs (1995)
Monotypic saltcedar (throughout AZ)	43	4.3 ±1.3 (2.7 - 8.0)	7.7 ±2.0 (3.4 - 12.0)	Muiznieks *et al.* (1994), Sferra *et al.* (1995) Spencer *et al.* (1996, 1997)

in Russian olive and saltcedar (Skaggs, 1996). At the inflows of Tonto Creek and Salt River to Roosevelt Lake in Gila County, Arizona, both of which are comprised of monotypic stands of saltcedar, 100% of flycatcher nests were placed in saltcedar (Muiznieks *et al.*, 1994; Sferra *et al.*, 1995; Spencer *et al.*, 1996). On the San Luis Rey River in San Diego County, California, approximately 90% of flycatcher nests were placed in live oak (*Quercus agrifolia*), which became the dominant plant species adjacent to the stream after willows were removed in the 1950's as a water conservation measure and a reservoir upstream reduced flood frequency and streamflow volume (W. Haas, San Diego Natural History Museum, pers. comm., 1995). Other plant species that southwestern willow flycatcher nests have been documented in include: buttonbush, black twinberry (*Lonicera involucrata*), Fremont cottonwood, white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), Russian olive, and *S. hindsiana.*

Territory size

Southwestern willow flycatcher territory size, as defined by song locations of territorial birds, probably changes with population density, habitat quality, and nesting stage. Early in the season, territorial flycatchers may move several hundred meters between singing locations (Sogge *et al.*, 1995; Petterson and Sogge, 1996). It is not known whether these movements represent polyterritorial behavior or active defense of the entire area encompassed by singing locations. However, during incubation and nestling phases territory size, or at least the activity centers of pairs, can be very small and restricted to an area less than 0.5 hectare. Sogge *et al.* (1995) estimated a breeding territory size of 0.2 hectares for a pair of flycatchers occupying a 0.6-hectare patch on the Colorado River. Activity centers may expand after young are fledged but while still dependent on adults.

Distribution and abundance

Unitt (1987) noted that taxonomic confusion between *E. trailli* and *E. alnorum* (alder flycatcher) and among other *Empidonax* species that migrate through the southwestern U.S. probably accounted for the relative lack of research on the southwestern willow flycatcher. The alder and willow flycatchers, formerly known as Traill's flycatcher, were not officially recognized as separate species until the American Ornithologist's Union published its sixth edition Checklist of North American Birds (American Ornithologist's Union, 1983). The lack of systematic, rangewide collections of southwestern willow flycatchers preclude a complete description of this subspecies' former distribution and abundance. However, the more than 600 egg, nest, and specimen records available from museums throughout the U.S. in combination with state, county, and local faunal accounts from the first half of the 20th Century do indicate that, historically, the southwestern willow flycatcher was more widespread and, at least, locally abundant.

Phillips (1948) first described *E.T. extimus* from a specimen collected by Gale Monson on the lower San Pedro River near Feldman, Arizona. The taxonomic validity of *E.T. extimus* was subsequently

reviewed by Hubbard (1987), Unitt (1987), and Browning (1993), and has been accepted by most authors (e.g., Aldrich, 1951; Behle and Higgins, 1959; Phillips *et al.*, 1964; Oberholser, 1974; Monson and Phillips, 1981; Harris *et al.*, 1987a,b; Schlorff, 1990a,b; Harris, 1991). Unitt (1987) reviewed historical and contemporary records of *E.T. extimus* throughout its range, determining that it had "declined precipitously..." and that although the data reveal no trend in the past few years, the population is clearly much smaller now than 50 years ago, and no change in the factors responsible for the decline seem likely.

Overall, Unitt (1987) documented the loss of more than 70 breeding locations rangewide, including locations along the periphery and within core drainages that form this subspecies; range. Unitt estimated that, rangewide, probably was comprised of 500 to 1000 pairs. Below is a state by state comparison of historic and current data for the southwestern willow flycatcher. Since 1992, more than 800 historic and new locations have been surveyed rangewide to document the status of the southwestern willow flycatcher (some sites in southern California have been surveyed since the late 1980's). Survey efforts in most states were done under the auspices of the Partners In Flight program, which served as the coordinating body for survey training sessions and review and synthesis of data. The extensive and, in some cases, intensive nature of these efforts have provided a critical baseline for the current distribution, abundance, and reproductive success of southwestern willow flycatchers rangewide.

California

The historic range of southwestern willow flycatchers in California apparently included all lowland riparian areas in the southern third of the state. It was considered a common breeder where suitable habitat existed (Wheelock, 1912; Willett, 1912, 1933; Grinnell and Miller, 1944). Unitt (1984, 1987) concluded that it was once common in the Los Angeles basin, the San Bernardino/Riverside area, and San Diego County. Specimen and egg/nest collections confirm its former distribution in all coastal counties from San Diego Co. to San Luis Obispo Co., as well as in the inland counties, Kern, Inyo, Mohave, San Bernardino, and Imperial. Unitt (1987) documented that the flycatcher had been extirpated, or virtually extirpated (i.e., few territories remaining) from the Santa Clara River (Ventura Co.), Los Angeles River (Los Angeles Co.), Santa Ana River (Orange and Riverside counties), San Diego River (San Diego Co.), lower Colorado River (Imperial and Riverside counties and adjacent counties in Arizona), Owen's River (Inyo Co.), and the Mohave River (San Bernardino Co.). Its former abundance in California is evident from the 72 egg and nest sets collected in Los Angeles County, alone, between 1890 and 1912, and from Herbert Brown's 34 nests and nine specimens taken in June of 1902 from the lower Colorado river near Yuma. Local collections of this magnitude suggest that this subspecies was locally very abundant.

Survey and monitoring efforts since the late 1980's have confirmed the southwestern willow flycatcher's presence at 18 locations on 11 drainages in southern California (including Colorado River). Current known flycatcher breeding sites are restricted to 3 counties, San Diego, Riverside,

Santa Barbara, and Kern. Combining survey data for all sites surveyed since the late 1980's for a composite population estimate, the total known southwestern willow flycatcher population in southern California is 114 territories (Table 2). Of the 18 sites where flycatchers have been documented, 72% (13) contain 5 or fewer territorial flycatchers; 22% (4 sites) have single pairs, or unmated territorial birds. Only 3 drainages are known to have 20 or more flycatcher territories, the San Luis Rey River (San Diego Co.), South Fork Kern River (Kern Co.), and Santa Ynez River (Santa Barbara Co.).

Authorized (permitted) and unauthorized activities in riparian habitats continue to adversely affect occupied flycatcher habitat in southern California. For example, approximately one kilometer of occupied habitat on the Santa Ynez River in Santa Barbara County was modified or completely eliminated in 1996 when expansion of agricultural fields resulted in clearing of riparian vegetation (USFWS, *in litt.*). Despite the vast potential for riparian habitat and southwestern willow flycatcher recovery on Camp Pendleton in San Diego County, a programmatic section 7 consultation resulted in a conservation target of 20 southwestern willow flycatcher pairs (Table 3). The Base currently has approximately 22 pairs of flycatchers, in contrast to the 348 pairs of the sympatric and endangered least Bell's vireo (*Vireo bellii pusillus*), which through the Base's conservation efforts increased from a low of 27 pairs in 1984. Army Corps of Lake Isabella (Kern County) will result in long-term inundation of the 485-hectare (ha) South Fork Wildlife Area, also proposed critical habitat for the flycatcher. The Wildlife Area represents a significant recovery area occupied by 8 to 10 pairs of flycatchers prior to inundation and lies downstream of one of California's largest southwestern willow flycatcher breeding groups on the Kern River Preserve.

Arizona

Historic records for Arizona indicate the former range of the southwestern willow flycatcher included portions of all major river systems (Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro) and major tributaries, such as the Little Colorado River and headwaters, and White River.

Unitt (1987) noted that "probably the steepest decline in the population levels of *extimus* has occurred in Arizona." The bird has been extirpated, or virtually extirpated from the Santa Cruz River (Pima Co.), upper San Pedro River (Cochise Co.), lower San Pedro River at PZ Ranch (Pinal Co.), Blue River (Greenlee Co.), Colorado River at Lees Ferry (Coconino Co.), Colorado River (Yuma Co.), Gila River (Yuma Co.), and Verde River at Tuzigoot Bridge (Yavapai Co.).

Currently, 150 territories are known from 39 sites along 9 drainages statewide, including the Colorado River (Table 2). As in California, the majority of breeding groups in Arizona are

Table 2. Rangewide population status for the southwestern willow flycatcher (based on composite of 1993-1995 survey data and 1996 survey data from lower Colorado River)[1].

	No. of Sites with Territories	No of. Drainages with Territories	No. of Sites (Drainages) with ≤5 Territories	with 6-20 Territories	with >20 Territories	No. of Territories
New Mexico	19	8	16 (6)	2 (0)	1 (2)	173
Arizona	39	9	29 (4)	10 (4)	0 (2)	150
California	18	11	13 (8)	3 (1)	2 (3)	114
Colorado	6	5	6 (5)	0 (0)	0 (0)	13
Utah	2	1	2 (1)	0 (0)	0 (0)	2
Nevada	1	1	1 (1)	0 (0)	0 (0)	2
Texas	?	?	?	?	?	?
Total	**85**	**35**	**67 (24)**	**15 (4)**	**3 (7)**	**454**

1 Based on surveys conducted at >800 historic and new sites in NM (Maynard 1995, Cooper 1996, Skaggs 1996); AZ (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, Sferra *et al.* 1995, Sogge 1995a, Sogge *et al.* 1995, Spencer *et al.* 1996, 1997, McKernan *in litt.*); CA (Camp Pendleton 1994, Whitfield 1994, Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, San Diego Natural History Museum 1995, Whitfield and Strong 1995, Griffith and Griffith 1996 *in litt.*); CO (T. Ireland 1994 *in litt.*, Stransky 1995); UT (McDonald *et al.* 1995, Sogge 1995b); NV (C. Tomlinson 1995 *in litt.*). Systematic surveys have not been conducted in Texas. For sites surveyed multiple years, highest single-year estimate of territories was used to tabulate status data. Tabulations do not include documented extirpations within survey period. Thus, individual state estimates and rangewide totals may be biased upward.

Table 3. Agency actions that have undergone section 7 consultation and levels of incidental take permitted for the southwestern willow flycatcher rangewide.

Action	Year	Federal Agency[1]	Incidental Take Anticipated
Arizona			
Eastern Roosevelt Lake Watershed Allotment (Maricopa Co.)	1995*	Tonto NF	Indeterminable
Tonto Creek Riparian Unit (Maricopa Co.)	1995*	Tonto NF	Indeterminable
Cedar Bench Allotment (Yavapai Co.)	1995	Tonto NF	Indeterminable
Tuzigoot Bridge (Yavapai Co.)	1995*	NPS	None
Verde Valley Ranch (Yavapai Co.)	1995*	Corps	Loss of 2 flycatcher territories
Windmill Allotment (Yavapai Co.)	1995	Coconino NF	Loss of 1 flycatcher nest annually
Romero Road Bridge (Pinal Co.)	1995*	FEMA	Consultation in process
Glen Canyon Spike Flow (Coconino Co.)	1996	USBR	Adverse modification of proposed critical habitat
Solomon Bridge (Graham Co.)	1996*	FHWA	Loss of 2 territories
Modified Roosevelt Dam (Gila/Maricopa Co.)	1996*	USBR	Loss of 45 territories; reduced productivity/survivorship 90 birds
U.S. Hwy 93 Wickenburg (Mohave Co.)	1996*	FHWA	Reduced productivity of 3 territories annually for 2 years
Grazing on 13 Allotments (Pinal Co.)	1996	BLM	Consultation in process
Lower Gila Resource Plan Amend. (Yuma Co.)	1996	BLM	Consultation in process
Lower Colorado River Operations	1996*	USBR	Consultation in process
U.S. Forest Service Region 3 Forest Plans	1996	USFS	Consultation in process
Safford District Grazing Allotments	1996	BLM	Consultation in process
Virgin River Diversion/Fill (Mohave Co.)	1997	EPA	None

Table 3. Agency actions that have undergone section 7 consultation and levels of incidental take permitted for the southwestern willow flycatcher rangewide (continued).

Action	Year	Federal Agency[1]	Incidental Take Anticipated
California			
Prado Basin, (Riverside/San Bernardino Co.)	1994	Corps	None
Orange County Water District (Orange Co.)	1995	Corps	None
Temescal Wash Bridge (Riverside Co.)	1995	Corps	Harm to 2 flycatchers
Camp Pendleton (San Diego Co.)	1995	DOD	Loss of 4 flycatcher territories
Lake Isabella Operations 1996 (Kern Co.)	1996*	Corps	Inundation 700 ac proposed critical habitat; reduced productivity 14 pairs
Lake Isabella Long-Term Operations (Kern Co.)	1997*	Corps	Consultation in process
Nevada			
Gold Properties Resort (Clark Co.)	1995	BIA	Harm to 1 flycatcher from habitat loss
New Mexico			
Corrales Unit, Rio Grande (Bernalillo Co.)	1995	Corps	None
Rio Puerco Resource Area	1996	BLM	Consultation in process
Farmington District Resource Management Plan	1996*	BLM	Consultation in process
Mimbres Resource Area Management Plan	1996*	BLM	Consultation in process

[1] BIA = Bureau of Indian Affairs; BLM = Bureau of Land Management; Corps = Army Corps of Engineers; DOD = Dept. of Defense; EPA = Environmental Protection Agency; FEMA = Federal Emergency Management Agency; FHWA = Federal Highway Administration; NF = National Forest; NPS = National Park Service; USBR = U.S. Bureau of Reclamation; USFS = U.S. Forest Service.

* Original proposed action determined to result in jeopardy to the flycatcher and/or adverse modification of proposed critical habitat.

extremely small; of the 39 sites where flycatchers have been documented, 74% (29) contain 5 or fewer territorial flycatchers. Moreover, 15% to 18% of all sites in Arizona are comprised of single, unmated territorial birds.

Permitted activities and stochastic events also continue to adversely affect the distribution and extent of occupied and potential breeding habitat throughout Arizona. For example, the Bureau would totally inundate the riparian stands occupied by Arizona's largest breeding group (Table 3). As a result of Reclamation's operations on the lower Colorado River, the 445-ha Goodding's willow stand at the inflow to Lake Mead has been partially inundated since September 1995. Despite partial inundation, approximately eight pairs of flycatchers were documented nesting at the inflow during the 1996 breeding season. As of April 1997, inundation of that habitat was nearly complete. The Bureau of Reclamation projected the mortality of that stand sometime during 1997 as a result of prolonged inundation of root crowns (i.e. > two growing seasons).

In June of 1996, a catastrophic fire destroyed approximately one km of occupied habitat on the San Pedro River in Pinal County. That fire resulted in the forced dispersal or loss of up to 8 pairs of flycatchers (Paxton *et al.*, 1996). In June, 1995, approximately three miles of occupied riparian habitat burned on the Gila River in Pinal County (Bureau of Land Management, *in litt.*). It is not known how many flycatchers occupied that location. Approximately two km of riparian habitat burned in Graham County in the vicinity of Safford during 1996. It is not known whether that area was occupied by southwestern willow flycatchers, however, it did lie just downstream of an occupied patch that was partially eliminated by Solomon Bridge (Table 3). The anticipated effect of construction of the Solomon Bridge was dispersal of flycatchers into adjacent habitat. The capability of adjacent habitat to absorb that dispersal was compromised by the fire near Safford.

New Mexico

Unitt (1987) considered New Mexico as the state with the greatest number of *extimus* remaining. After reviewing the historic status of the flycatcher and its riparian habitat in New Mexico, Hubbard (1987) concluded,

> [it] is virtually inescapable that a decrease has occurred in the population of breeding willow flycatchers in New Mexico over historic time. This is based on the fact that wooded sloughs and similar habitats have been widely eliminated along streams in New Mexico, largely as a result of the activities of man in the area.

Unitt (1987), Hubbard (1987), and more recent survey efforts have documented extirpation or virtual extirpation in New Mexico on the San Juan River (San Juan Co.), near Zuni (McKinley Co.), Blue Water Creek (Cibola Co.), Rio Grande (Dona Ana Co. and Socorro Co.). Survey and monitoring efforts since 1993 have documented 173 flycatcher territories on eight drainages (Table 2). Approximately 135 of these territories occur in remnant strips of riparian forest within a 20-mile

stretch of the Gila River in Grant Co (Skaggs, 1996). This area contains the largest known breeding group rangewide. In a letter responding to proposed critical habitat for the flycatcher, this part of the Gila River is characterized as being contained by flood-control levees that do not support the regeneration of riparian trees such as willow and cottonwood. Thus, under existing conditions, habitat suitable for the southwestern willow flycatcher is not regenerating and this largest population may be lost as a result. Outside of Grant County few flycatchers remain. Statewide, 84% (16) of the 19 sites with flycatchers contain 5 or fewer territorial birds. Six sites are comprised of single pairs or unmated territorial flycatchers, and six others are comprised of two pairs or two unmated territorial birds.

Texas

The Pecos and Rio Grande rivers in western Texas are considered the easternmost boundary for the southwestern willow flycatcher. Unitt (1987) found specimens from four locations in Brewster, Hudspeth, and Loving counties where the subspecies is no longer believed to be present. Landowner permission to survey riparian areas on private property has not been obtained, thus current, systematic survey data are not available for Texas. There have been no other recent reports, anecdotal or incidental, of southwestern willow flycatcher breeding attempts in the portion of western Texas where they occurred historically. Given that surveys in adjacent Dona Ana County, New Mexico, have failed to document breeding along historically-occupied portions of the Rio Grande, the Service believes it is likely that the southwestern willow flycatcher has been extirpated from Texas.

Colorado

The taxonomic status and the historic distribution and abundance of willow flycatchers in southwestern Colorado remains unclear due to a lack of specimen data and breeding records. Preliminary data on song dialects suggests that the few birds recently documented in southwestern Colorado may be *E.t. extimus*. These sightings have prompted State and Federal agencies to delineate provisional boundaries for southwestern willow flycatchers and sponsor statewide survey efforts. Survey efforts since 1993 have documented a total of six locations in Delta, Mesa, and San Miguel counties where southwestern willow flycatchers have been found (Table 2). Two locations have single, unmated males; two locations have single pairs, and the remaining two locations are comprised of four to seven territories each.

On March 9, 1997, a fire started by an adjacent landowner burned a 32-hectare portion of the Escalante Wildlife near Delta, Colorado. That location comprised one of the largest known breeding sites for southwestern willow flycatchers in Colorado with approximately seven pairs occupying the site in 1996.

Utah

Specimen data reveal that southwestern willow flycatcher historically occurred in southern Utah along the Colorado River, San Juan River, Kanab Creek, Virgin River, and Santa Clara River (Unitt, 1987). Their northern boundary in south-central Utah remains unclear due to a lack of specimen data from that region. The southwestern willow flycatcher no longer occurs along the Colorado River in Glen Canyon where Lake Powell inundated historically-occupied habitat, nor in unflooded portions of Glen Canyon near Lee's Ferry where southwestern willow flycatchers were documented nesting in 1938. Similarly, recent surveys on the Virgin River and tributaries and Kanab Creek have failed to document their presence (McDonald *et al.*, 1995). Single, territorial males and possibly a pair of southwestern willow flycatchers were documented at 2 locations on the San Juan River (San Juan Co.) in 1995, but breeding was not confirmed (Sogge, 1995b). The population totals for Utah are summarized in Table 2.

Nevada

Unitt (1987) documented 3 locations in Clark County from which southwestern willow flycatchers had been collected, but not found after 1970. Current survey efforts have documented a single location with 2 unmated males on the Virgin River in Clark County (Tomlinson *in litt.;* Table 2).

Rangewide, the current known population of southwestern willow flycatchers stands at approximately 454 territories (Table 2). These results indicate a critical population status; more than 75% of the locations where flycatchers have been found are comprised of 5 or fewer territorial birds and up to 20% of the locations are comprised of single, unmated individuals. The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances (e.g., approximately 88 kilometer straight-line distance between breeding flycatchers at Roosevelt Lake, Gila Co., Arizona, and the next closest breeding groups known on either the San Pedro River (Pinal Co.) or Verde River (Yavapai Co.)). Additional survey effort, particularly in southern California, may discover additional small breeding groups. However, rangewide survey efforts have yielded positive results in less than 10% of surveyed locations. Moreover, survey results reveal a consistent pattern rangewide: the southwestern willow flycatcher population as a whole is comprised of extremely small, widely-separated breeding groups or unmated individuals.

The data presented in Table 2 represents a composite of surveys conducted since 1992. Locations that had southwestern willow flycatchers for only one year were tabulated as if the location is still extant. Given that extirpation has been documented at several locations during the survey period, this method of analysis introduces a bias that may overestimate the number of breeding groups and overall population size. In addition, females have been documented singing as frequently as males. Because the established survey method relies on singing birds as the entity defining a territory (Tibbitts *et al.*, 1994), double-counting may be another source of sampling error that biases population estimates upward. The figure of 454 southwestern willow flycatcher territories is an approximation based on considerable survey effort, both extensive and intensive. Given sampling errors that may bias population estimates positively or negatively (e.g., incomplete survey effort,

double-counting males/females, composite tabulation methodology), natural population fluctuation, and random events, it is likely that the total population of southwestern willow flycatchers is fluctuating at between 300 and 500 territories with a substantial proportion of individuals remaining unmated. If all extant sites were fully protected, at such low population levels random demographic, environmental, and genetic events could lead to extirpation of breeding groups and eventually render this species extinct. The high proportion of unmated individuals documented during recent survey efforts suggests the southwestern willow flycatcher may already be subject to a combination of these factors (e.g., uneven sex ratios, low probability of finding mates in a highly fragmented landscape).

Southwestern willow flycatcher reproductive success

Intensive nest monitoring efforts in California, Arizona, and New Mexico have revealed that: (1) sites with both relatively large and small numbers of pairs have experienced extremely high rates of brood parasitism; (2) high levels of cowbird parasitism in combination with nest loss due to predation have resulted in low reproductive success and, in some cases, population declines; (3) at some sites, levels of cowbird parasitism remain high across years, while at others parasitism varies temporally with cowbirds absent in some years; (4) the probability of a southwestern willow flycatcher successfully fledging its own young from a nest that has been parasitized by cowbirds is low (i.e., <5%); (5) cowbird parasitism and/or nest loss due to predation often result in reduced fecundity in subsequent nesting attempts, delayed fledging, and reduced survivorship of late-fledged young, and; (6) nest loss due to predation appears more constant from year to year and across sites, generally in the range of 30 to 50%.

On the South Fork Kern River (Kern Co., CA), Whitfield (1993) documented a precipitous decline in the southwestern willow flycatcher breeding population from 1989 to 1993 (44 to 27 pairs). During that same period cowbird parasitism rates between 50 and 80 percent were also documented (Whitfield, 1993; Table 4). A cowbird trapping program initiated in 1993 reduced cowbird parasitism rates to < 20%. Southwestern willow flycatcher population numbers appear to have stabilized at 32 to 34 pairs in 1993, 1994, and 1995 (Whitfield, 1994; Whitfield and Strong, 1995). Predation rates have remained relatively constant in the range of 33 to 47% (Table 4). Southwestern willow flycatcher nest success increased from 26% prior to cowbird trapping to 48% after trapping was implemented (Whitfield and Strong, 1995). In addition, the number of young fledged also increased from 1.01 young/pair to 1.73 young/pair during the same period. Whitfield and Strong (1995) found that, besides lowering nest success, fecundity, and the number of young produced, cowbird parasitism may also lower survivorship of southwestern willow flycatcher young fledged late in the season. Southwestern willow flycatchers that abandon parasitized nests or renest after fledging cowbirds lay fewer eggs in subsequent clutches and, if successful, fledge young late in the

Table 4. Nest predation and brood parasitism rates documented for the southwestern willow flycatcher across its range[1].

Location	Pre-1993	1993	1994	1995
S. Fork Kern River (Kern Co., CA)				
% nests parasitized[2]	50 - 80	38*	16*	19*
% nests depredated	33 - 42	37	47	34
San Luis Rey River (San Diego Co. CA)				
% nests parasitized	-	-*	0*	0*
% nests depredated	-	-	28	5
Colorado River (Coconino Co., AZ)				
% nests parasitized	≥50	100	44	100
% nests depredated	-	30	78	0
Verde River (Yavapai Co., AZ)				
% nests parasitized	-	100	50	extirpated
% nests depredated	-	100	50	
Little Colorado River (Apache Co., AZ)				
% nests parasitized	-	-	22	0
% nests depredated	-	-	33	28
Rio Grande (Socorro Co., NM)				
% nests parasitized	-	-	20	66
% nests depredated	-	-	40	60
Gila River (Grant Co., NM)				
% nests parasitized	-	-	-	16 - 27
% nests depredated	-	-	-	45

[1] Sources: Sogge and Tibbitts (1992), Sogge *et al.* (1993), Brown (1994), Maynard 1995, Muiznieks *et al.*(1994), Sogge and Tibbitts (1994), Cooper (1996), Skaggs (1995), Sogge (1995a), Sogge *et al.* (1995), Spencer *et al.* (1996), Whitfield and Strong (1995).

[2] Proportion of nests containing at least one brown-headed cowbird egg.

* Brown-headed cowbird control program implemented.

season. Whitfield and Strong determined that cowbird parasitism delayed successful southwestern willow flycatcher nesting by at least 13 days and this delay resulted in significantly different return rates of juveniles. Only 6.4% of southwestern willow flycatcher young that came from late nests were recaptured in subsequent years, whereas 21.9% of young that came from early nests were recaptured. If these recapture rates mirror actual survivorship, then even though some parasitized southwestern willow flycatchers eventually parasitism or depredation may have the more insidious effect of reducing overall juvenile survivorship. Despite the cowbird trapping program and increased reproductive success, Whitfield has not observed a population increase at her study area. Whitfield and Strong (1995) speculate that other factors in addition to cowbird parasitism, such as habitat loss and pesticide use on wintering grounds and/or stochastic events such as storms resulting in mortality, may be keeping population numbers low.

The number of unmated, territorial, and paired southwestern willow flycatchers detected on the Colorado River in the Grand Canyon has remained low since monitoring began in 1982. Brown (1994) reported that at least 50% of the southwestern willow flycatcher nests monitored in the Grand Canyon between 1982 and 1987 were parasitized by brown-headed cowbirds. Brown (1994) did not report data on productivity. Given that the probability of successfully fledging a single chick is low when a nest is parasitized and the high proportion of nests parasitized during Brown's study, it is likely that southwestern willow flycatcher productivity during that period was also low. In 1992, when comprehensive nest monitoring was initiated, two pairs were present, with only one establishing a nest. That nest successfully fledged three chicks (Sogge and Tibbitts, 1992).

In 1993, one breeding pair, one male with two females, and six unpaired males were detected. Three nests were found, all of which were parasitized by brown-headed cowbirds (Table 4). No southwestern willow flycatchers were successfully reared in Grand Canyon in 1993 (Sogge *et al.*, 1993). Four pairs and one unpaired male occupied Grand Canyon in 1994. Nine nests were attempted, at least four of which were parasitized by cowbirds. All nesting attempts eventually failed due to predation or abandonment (Sogge and Tibbitts, 1994). In 1995, one breeding pair and three unpaired males were detected (Sogge *et al.*, 1995). One nest was found with a single cowbird egg on May 23. On June 4, three southwestern willow flycatcher eggs were present, but the cowbird egg was missing. That nest successfully fledged one chick. In summary, since 1992, 10 known pairs of southwestern willow flycatchers have made 14 nesting attempts in the Grand Canyon, 2 of which successfully fledged a total of 4 chicks. This low rate of reproduction indicates that, even with the protections provided annually by the National Park Service (i.e., camping and other activities are prohibited at southwestern willow flycatcher breeding sites), this area is a population sink (Pulliam, 1988) where reproduction is not adequate to replace adults and population persistence requires emigration from other breeding areas.

On the Verde River in Yavapai Co., Arizona, Ohmart (pers. comm.) discovered four pairs of southwestern willow flycatchers in 1992 at Clarkdale. The breeding status and reproductive success of those birds was not determined. In 1993, two pairs were present and one nest was documented.

The nest contained a single cowbird nestling and eventually failed (Muiznieks *et al.*, 1994; Table 4). In 1994, two pairs and one unpaired male were present. Two nests were found, one of which successfully fledged two chicks, the other fledged a single cowbird (Sferra *et al.*, 1995). Data from a more limited monitoring effort in 1995 indicate that two unpaired males occupied the Clarkdale site (Sogge, 1995a). Surveys during the 1996 breeding season failed to detect any southwestern willow flycatchers at the Clarkdale site. However, one nesting pair was discovered at Tavasci Marsh approximately 2.4 km east of the Clarkdale site. Thus, although since its discovery the Clarkdale site has had only several pairs, cowbird parasitism and nest loss due to depredation resulted in poor reproductive success and may have been responsible for abandonment or extirpation at this site.

Elsewhere in Arizona, population loss or undetected dispersal of breeding groups has been documented since 1993. For example, surveys in 1993 estimated five territorial males at Dudleyville Crossing on the San Pedro River (Pinal Co.). However, surveys in 1994 and 1995 failed to detect any southwestern willow flycatchers at that location (Muiznieks *et al.*, 1994; Sferra *et al.*, 1995; Spencer *et al.*, 1996). Southwestern willow flycatchers detected in 1993 at Soza Wash on the San Pedro River were not detected in follow-up surveys in 1995, and an individual observed at Ister Flat on the Verde River was not detected in follow-up surveys during 1994. It is not known whether these events represent mortality of southwestern willow flycatchers, changes in habitat quality, or simply a vagile tendency inherent to this species. At other locations on the San Pedro River in Pinal Co., such as Cook's Lake and PZ Ranch, southwestern willow flycatcher breeding group size has remained stable. However, in 1996 a catastrophic fire destroyed much of the breeding habitat at PZ Ranch resulting in nest loss, abandonment of that site and, perhaps, mortality of adults (Paxton *et al.*, 1996).

On the Little Colorado River in Apache Co., Arizona, a cowbird parasitism rate of 22% was documented in 1994 (Table 4). In 1995 the parasitism rate was zero. Nest loss due to depredation, however, remained relatively constant (Table 4). On the Rio Grande in Socorro Co., New Mexico, parasitism rates increased from 20% in 1994 to 66% in 1995. In 1996, water was diverted above that breeding location and no southwestern willow flycatchers were present (D. Leal, pers. comm.). It is not known whether those birds dispersed elsewhere or if that breeding group was extirpated. Finally, on the Gila River in Grant Co., NM, Skaggs (1995) monitored 46 nests from a breeding group of approximately 135 pairs. From a subset of 25 nests whose contents were checked directly or inferred through observation, Skaggs estimated a cowbird parasitism rate of between 16 and 27% for 1995 (Table 4).

The data presented above and in Table 4 demonstrate that cowbird parasitism and nest depredation are affecting southwestern willow flycatchers throughout their range. Cowbirds have been documented at more than 90% of sites surveyed (Sogge and Tibbitts, 1992; Sogge *et al.*, 1993; Camp Pendleton, 1994; Muiznieks *et al.*, 1994; Sogge and Tibbitts, 1994; T. Ireland, 1994 *in litt.*; Whitfield, 1994; C. Tomlinson, 1995 *in litt.*; Griffith and Griffith, 1995; Holmgren and Collins, 1995; Kus, 1995; Maynard, 1995; McDonald *et al.*, 1995; Sferra *et al.*, 1995; Sogge 1995, 1996, San

Diego Natural History Museum,1995; Stransky,1995; Whitfield and Strong,1995; Griffith and Griffith,1996 *in litt.*;Skaggs,1995; Spencer *et al.*,1996). Thus, the potential for cowbirds to be a persistent and widespread threat remains high. Cowbird trapping has been demonstrated to be an effective management strategy for increasing reproductive success for the southwestern willow flycatcher as well as for other endangered Passerines (e.g., least Bell's vireo [*Vireo bellii pusillus*], black-capped vireo [*V. atricapillus*], golden-cheeked warbler [*Dendroica chrysoparia*]). It may also benefit juvenile survivorship by increasing the probability that parents fledge birds early in the season. Expansion of cowbird management programs has the potential to not only increase reproductive output and juvenile survivorship at source populations, but also to potentially convert small, sink populations into breeding groups that contribute to population growth and expansion.

Nest loss due to predation is common among small Passerines. The rates documented for southwestern willow flycatchers are also typical for small Passerines (i.e., rates < 50%). However, even at these "typical" levels nest loss due to predation is a significant factor contributing to low reproductive success. Nest predation presents a difficult management challenge because of the variety of taxa involved and the difficulty in developing an effective management plan for more than one taxon. Until specific predators on southwestern willow flycatcher nests are identified, measures to reduce potential predator populations should focus on reducing human activities that attract predators, such as camping, picnicking, etc. where pets are loose and refuse is concentrated.

Arizona Cliffrose Description and Status

Arizona cliffrose was listed as endangered under the Endangered Species Act on May 29, 1984 (USFWS, 1984). Critical habitat has not been designated. The Arizona Cliffrose Recovery Plan was completed in 1994 (USFWS, 1994b). This species has narrow habitat requirements and occurs in four widely separated areas in central Arizona: near Bylas (Graham County), the Horseshoe Lake vicinity (Maricopa County), near Burro Creek (Mohave County), and near Cottonwood in the Verde Valley (Yavapai County) (Rutman, 1992a). These sites differ slightly in elevation and associated vegetation, but all sites have limestone soils (generally white but also reddish in color) derived from Tertiary lakebed deposits, and at each site Arizona cliffrose is part of a locally unique vegetative community (Anderson, 1993).

Each of the four populations of Arizona cliffrose are genetically variable (Mount and Logan, 1992). The prevalence of certain morphological characteristics, especially the frequency and degree of leaf lobing and the density of leaf and flower stipitate glands, differ among the populations (Reichenbacher, 1992). As leaf lobing and gladularity increases, distinguishing Arizona cliffrose from the commonly occurring *Purshia stansburiana* may present some difficulty (Schaack and Morefield, 1985; Phillips and Phillips, 1987; Reichenbacher, 1987 and 1989). Problems concerning the definition and morphological separation of Arizona cliffrose from *P. stansburiana* have been attributed to putative hybridization between these two species (Schaack and Morefield, 1985). Studies have been conducted on Arizona cliffrose morphometrics by Reichenbacher (Southwestern Field Biologists, Tucson) and an analysis of the Arizona cliffrose DNA using the RAPD marker

method was undertaken by Mount (University of Arizona, Tucson). These studies (Reichenbacher, 1992; Mount and Logan, 1992) are consistent with the observations of others (Denham, 1992; Reichenbacher, 1987 and 1989; J. Hendrickson, California State University in Rutman, 1992b) and demonstrate that species in the genus *Purshia* tend to be phenotypically plastic, and can respond to long-term and seasonal changes in climate by producing leaves and shoots that have adapted to local or seasonal climatic conditions. This type of phenotypic plasticity does not mean that the plants are hybrids or of hybrid origin (Reichenbacher, 1987; Rutman, 1992b; USFWS, 1994b).

The longest known population of Arizona cliffrose and the type locality is at Burro Creek, which occurs on Bureau of Land Management (BLM) administered lands. The draft Kingman Resource Management Plan (USBLM, 1990) included within the preferred management alternative the establishment of the 1,113 acre Clay Hills Area of Critical Environmental Concern (ACEC). This proposed ACEC contains the largest subpopulation of Arizona cliffrose in the Burro Creek area, but not two smaller, more recently discovered subpopulations. In 1989, BLM constructed a fence that excludes cattle and burros from approximately 700 acres of the ACEC. Approximately 310 acres of the exclosure includes occupied Arizona cliffrose habitat and encompasses the larger subpopulation.

Little is know of the Arizona cliffrose population near Bylas on the San Carlos Apache Reservation. However, based on the presumed extent of appropriate habitat, this population may be rather large. The Horseshoe Lake population includes several subpopulations and is found on the Tonto National Forest. No special land management designations or other special protections are afforded either the Bylas or Horseshoe Lake populations. No section 7 consultation has been conducted concerning either of these populations.

All Arizona cliffrose populations have experienced declines due to human-caused actions. Grazing by livestock, feral animals, and wildlife threatens the long-term survival of Arizona cliffrose (Phillips, 1986; Phillips *et al.*, 1980; Rutman, 1992a; USFWS, 1984; USFWS, 1994b). This relatively palatable shrub often receives moderate to heavy grazing pressure when exposed to ungulate herbivores, particularly in the vicinity of water sources and frequently used trails (Bingham, 1976; Phillips *et al.*, 1980; Reichenbacher, 1987). Tender seedlings, new growth, and branches with flowers and developing fruit are preferentially selected (Bingham, 1976; Denham, 1992). Observations and preliminary data analysis of BLM exclosure studies on the Burro Creek population indicate that consistent yearly browsing pressure may have reduced the vigor and/or form-size class of the remaining plants. Reduced vigor may result in less than optimal reproductive success. The extent to which browsing has altered successful reproduction in any Arizona cliffrose population has never been quantified.

Mining and mining-related activities are a serious threat to the long-term survival of this species, particularly in the Burro Creek area. Arizona cliffrose habitat at Burro Creek has a high potential to contain bentonite (USBLM, 1990), a type of clay used for cosmetics and pharmaceuticals. Mining and exploration activities have reduced the number of cliffrose plants and the amount of occupied,

available, and undisturbed habitat. The BLM estimates that 14% of the Arizona cliffrose habitat in the Burro Creek area has been lost due to mining. Evidence from past small-scale mining activities can be found within the Verde Valley population of Arizona cliffrose. Other than at Burro Creek, no known mining activities are presently occurring or have been proposed.

Construction of roads and utility corridors has caused losses across the range of Arizona cliffrose (Phillips *et al.*, 1980). All Arizona cliffrose populations have roads and/or utility right-of-ways within or near them. The Burro Creek population is divided by a graded dirt road paralleled by the Southern Union Gas Company pipeline and Arizona Electric Power Cooperative Inc. high voltage power line (Butterwick, 1979). No estimate of the amount of habitat lost to these developments in the Burro Creek area has been made. Arizona Highway SR70 bisects the Bylas population and has impacted Arizona cliffrose plants and habitat, as demonstrated by Arizona cliffrose occurring on both sides of the road within the highway right-of-way.

The Arizona cliffrose site near Burro Creek is a well-known destination for rock collecting enthusiasts. Increased recreational activity may occur within the Clay Hills ACEC when the Burro Creek campground is developed (USBLM, 1990). These visitors may affect Arizona cliffrose by turning over rocks and disturbing seedling establishment microsites. They may also occasionally drive short distances across country to reach collecting sites, and thus crush plants and increase soil compaction. The amount or proportion of Arizona cliffrose habitat lost to recreational activities throughout the range of the species has not been estimated.

ENVIRONMENTAL BASELINE

General Environmental Baseline

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

In most Southwestern river systems, the headwaters, or beginning of perennial flow, are located in the uppermost parts of the watershed, generally in hill or mountain areas that have little upstream human development. However, the Verde River has an unusual watershed configuration an unusual hydrograph. About 30% of the watershed of the Verde River lies upstream from the beginning of perennial flow in the river and there is major urban development within that portion of the watershed. Although perennial flow occurs in headwaters tributaries, perennial flow in the Verde River itself originates from mildly thermal, relatively constant flow springs near the mouth of

Granite Creek. Because of its spring origin, the headwaters of the Verde River are well downstream from the upper reaches of the watershed and are also downstream from major human activity.

Land uses in the Verde River watershed that have had effects to the riparian corridor include mining (including sand and gravel), livestock grazing, irrigated agriculture, recreational activities and urban development (Sullivan and Richardson, 1993). Some land uses alter the characteristics of the watershed through changes in vegetation cover and community components, compaction of soils, and the resultant changes to runoff and retention patterns for rainfall or snowmelt events. Changes to sediment loads off the watershed are also expected from these uses. Once these altered flows reach the river, changes to the hydrograph, especially in regard to flood events and minimum flows, are observed. Increased runoff over a shortened period translates to higher flow velocities that affect patterns of erosion and deposition of substrate materials, movements of the active channel, and establishment of riparian vegetation along the banks and terraces (Sullivan and Richardson, 1993). Activities in the riparian area, such as recreation, residential use, agriculture, and livestock grazing, that reduce the vigor of the riparian plant species, contribute to bank instability and increase the risk of damage from a high flow event (Arizona Department of Water Resources, 1994).

These activities have a wide variety of direct, indirect, and cumulative adverse effects on the Verde River. Substantial areas of the watershed have been subject to vegetation reduction or removal, soil disturbance or compaction, or covering with impermeable surfaces, which alter runoff, infiltration, and groundwater recharge patterns (Esposito *et al.*, 1979; Platts, 1990; Naiman, 1992; Ewing *et al.*, 1994). Development of irrigated agriculture and municipal/industrial water supplies from the river flows has a significant effect on the historic hydrograph. Creation of diversion dams alter aquatic habitats both upstream and downstream of the structure. It is estimated that during the growing season over half of the flow of the Verde River is diverted into irrigation ditches, and in some reaches, the river loses all surface flow (Sullivan and Richardson, 1993).

The Verde Valley is among the fastest growing urban areas in Arizona. The combined population of Cottonwood and Clarkdale in 1995 was 9,145 and is expected to reach 16,470 by the year 2010 (CVWS, CWW submittal, June 12, 1996). The population of Camp Verde in 1995 was 7,465 and is expected to reach 11,483 by the year 2010 (CVWS, CWW Submittal, June 12, 1996). Arizona Department of Economic Security (1994) projected growth to increase in Cottonwood by 143% and to increase in Camp Verde by 158% between 1994 and 2040. These growing towns rely on the water resources of the Verde River Basin.

The regional aquifer in the study area includes the alluvium along the Verde River, the underlying Verde Formation, and a thick sequence of sandstone and limestone rock units below the Verde Formation. The aquifer is hydraulically interconnected. Owen-Joyce, in 1984, said that the water-bearing alluvium (mainly the channel, flood-plain, and terrace deposits of the Verde River) is hydraulically connected to the river; and the alluvium is hydraulically connected to the Verde Formation (Owen-Joyce, 1984). Groundwater in the regional aquifer is derived mostly from the

infiltration of precipitation. The main area of recharge is in the Plateau upland areas where the greatest amount of precipitation occurs and where permeable rocks crop out at the surface (Owen-Joyce and Bell, 1983). Groundwater, discharged along the Verde River and its tributaries, maintains the base flow of the streams. Base flow is at a maximum in January and February and at a minimum in July and August (Owen-Joyce and Bell, 1983).

Currently, groundwater use is mainly for domestic, municipal, and industrial purposes. The Verde Valley groundwater basin contains over 1,200 wells at present (Arizona Department of Water Resources, 1994). The estimated groundwater pumpage for 1986 was 10,000 acre-feet (USGS, 1992). CWW has eleven wells and CVWS has six wells which draw from the alluvium along the Verde River to provide water to Cottonwood and Clarkdale and Camp Verde, respectively. Extensive groundwater pumping is also occurring upstream from the proposed project area, particularly in the Chino Valley and Williamson Wash areas.

Extensive groundwater pumping results in depletion of streamflow by inducing infiltration of surface water through the streambed or interception of groundwater that would have discharged into the stream. If the volume of water pumped exceeds the amount of natural recharge and eliminates groundwater discharge to a stream, a deficit in aquifer storage will occur, resulting in declining water levels. A continuous trend of declining water levels indicates overdevelopment of groundwater resources (Arizona Department of Water Resources, 1994).

Riparian vegetation abundance in the Verde River watershed and other watersheds in Arizona varies significantly with the flow rate of a stream, and is highly sensitive to changes (increases or decreases) in growing season flow rates. Increased water demands during the summer season correspond with the lowest monthly streamflows of the year. Thus, groundwater pumping and surface water diversions occurring during the summer months have the greatest impact on the riparian ecosystem (Arizona Department of Water Resources, 1994). Based on projected future water demands for the Verde River area, models predict that some measure of riparian abundance may decline 10-15% within 20 years. This is assuming no changes in use occur such as converting agricultural water uses to municipal or industrial (Arizona Department of Water Resources, 1994).

It is extremely difficult to quantify the changes to the Verde River that have resulted from past and ongoing activities on the watershed and in the river itself. Sufficient information for a quantitative pre-effect analysis is lacking. The large size of the watershed area also means that there are many on the ground actions taking place, and while the effects of one may not appear to be significant, the combined effects often are. Segregating out one effect, in one area, from the background of combined effects is not possible within the scope of this biological opinion. That should not be construed to say that the effects of any individual action are not important, merely that it is difficult to isolate the specific effects.

Razorback Sucker Environmental Baseline and Status in the Action Area

Razorback sucker was historically found in the Verde River at least as far upstream as Perkinsville (Minckley and Alger, 1968). Due to habitat alterations and losses and the introduction and spread of nonnative species, razorback sucker was extirpated from the Verde River, with the last record at Peck's Lake in 1954 (Wagner, 1954; Minckley, 1973). Beginning in 1981, razorback sucker was reintroduced into the Verde River using hatchery stock originating from Lake Mohave (Hendrickson, 1993). Predation by nonnative species was thought to be a major cause of stocked fish loss (Minckley, 1983; Marsh and Brooks, 1989). Therefore, recent stockings have been of larger fish that are more immune to predation, which appears to increase post-stocking survival (Clarkson *et al.*, 1993; Arizona Game and Fish Department, 1995). Monitoring studies have shown that reintroduced razorback sucker in the Verde River uses pools, glides, and backwaters with some use of runs and eddies (Creef *et al.*, 1992; Hendrickson, 1993). The Verde River in the area of the proposed action is within the designated critical habitat for razorback sucker.

The habitat for razorback sucker in the Verde River has undergone major changes in the past 150 years, with the Verde Valley being the most highly modified (excluding the Horseshoe and Bartlett impoundments). The volume and pattern of flow within the river, particularly in the Verde Valley has been highly modified by water diversion, groundwater pumping, and watershed alteration. The river channel has been highly modified by removal or use of riparian vegetation, flood control, construction of diversion dams, roads and bridges, gravel mining, and agriculture and urban/suburban development of the floodplain.

In addition to habitat alterations, various nonnative aquatic species have been introduced by humans into the Verde River system and have adversely affected razorback sucker and other native fish through predation and competition (Marsh and Brooks, 1989; Minckley *et al.*, 1991; Ruppert *et al.*, 1993; Hendrickson, 1993). Nonnative species found in the Verde River include threadfin shad (*Dorosoma petenense*), rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*O. clarki*), brown trout (*Salmo trutta*), northern pike (*Esox lucius*), carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), red shiner (*Cyprinella lutrensis*), golden shiner (*Notemigonus chrysoleucus*), fathead minnow (*Pimephales promelas*), flathead catfish (*Pylodictis olivaris*), channel catfish (*Ictalurus punctatus*), black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), mosquitofish (*Gambusia affinis*), smallmouth bass (*Micropterus dolomieui*), largemouth bass (*Micropterus salmoides*), spotted bass (*Micropterus punctulatus*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), walleye (*Stizostedion vitreum*), yellow perch (*Perca flavescens*), and tilapia (*Tilapia mossambica*) (Wagner, 1954; U.S. Fish and Wildlife Service, 1976; Barrett *et al.*, 1985; Bestgen, 1986; U.S. Fish and Wildlife Service, 1988; U.S. Fish and Wildlife Service, 1989b; Hendrickson, 1989; Marsh, 1990; Arizona Game and Fish Department, 1993; Minckley, 1993; Arizona Game and Fish Department, 1997). While native species form the majority of the fish community in the Verde River above Sycamore Creek (above the Verde Valley), nonnative fish now predominate downstream from Sycamore Creek. Upstream from Sycamore Creek, the Verde River is less disturbed and retains enough of its natural condition and hydrograph to prevent or delay significant displacement of the native fish community by nonnatives. The long-term trend in the native/nonnative species balance

is toward more nonnatives and less natives; however, available data are too limited to determine the present rate of the trend.

The razorback sucker population in the Verde River is the most successful of the three main reintroduced Gila River basin populations of the species (Hendrickson, 1993). Loss or serious impairment of this population would substantially reduce the probability of successful reestablishment of the species in the Gila River basin. Downward trends in the species in all other portions of its range and the lack of recruitment in mainstem Colorado River populations in Arizona make reintroduction efforts an important key to the survival and recovery of this species.

Bald Eagle Environmental Baseline and Status in the Action Area

There are 12 known bald eagle nests along the Verde River. One of those is at the upper end (north) of the Verde Valley (Tower nest), one is just downstream from Camp Verde (Camp Verde nest), and a third is at the lower end (south) of the Verde Valley (Ladders nest). All three of those are within the action area of the proposed project and may be affected by the proposed action. Nest watch data for the Camp Verde breeding area are available only from 1992 to 1995 (SRP, 1996). The site was occupied in 1992 but failed to fledge any young eagles. The Camp Verde cottonwood tree nest fell during flooding in 1993 and the site has been unoccupied since then. Although it has been known to exist for about 26 years, nest watch data for the Tower breeding area are available only from 1993-1996 during which period three young have fledged (SRP, 1996; Beatty *et al.*, 1997). As with many nest sites, the actual nest may move from year to year within the breeding area along a short stretch of the Verde River. Nests in the Tower breeding area have been constructed primarily in cliff sites, but has also occupied a cottonwood tree. The Ladders breeding area has been successful in most of the years it has been included in the nest watch program (1972-1996), often producing two young (SRP, 1996; Beatty *et al.*, 1997). The bald eagle at the Ladders breeding nest on cliffs. A seasonal closure of Forest Service lands is in place for the breeding season at the Ladders breeding area. In addition to nesting bald eagles, the Verde River is habitat for wintering bald eagles that nest elsewhere. Beatty and Driscoll (1996) estimate 32 wintering bald eagles during the 1996 winter count.

Southwestern Willow Flycatcher Environmental Baseline and Status in the Action Area

Approximately ninety miles of the Verde River from Sob Canyon to its inflow at Horseshoe Reservoir, including Tavasci Marsh and Ister Flat is designated as critical habitat for the southwestern willow flycatcher. The lateral extent of designated critical habitat is within 100 meters of the edge of areas with surface water during the May to September breeding season and within 100 meters of areas where such surface water no longer exists owing to habitat degradation but may be recovered with habitat rehabilitation. This includes areas with thickets, riparian trees and shrubs, and areas where such riparian vegetation does not currently exist, but may become established with natural regeneration or habitat rehabilitation.

The Verde River Valley between the towns of Cottonwood and Camp Verde is characterized by a wide flood basin once filled with Fremont cottonwoods, although cottonwood stands are now highly fragmented (Paxton *et al.*, 1997). A total of 34 sites have been surveyed for flycatchers in the Verde River system since 1993 (Muiznieks *et al.*, 1994; Sferra *et al.*, 1995). Three willow flycatcher breeding sites are known on the Verde River; Tuzigoot Bridge, Tavasci Marsh and Camp Verde. The Tuzigoot Bridge site was active from 1992 to 1995 (Sogge, 1995a), but the number of breeding flycatchers declined over the past several years and none were present in 1996 or 1997. However, there was a single flycatcher detected in 1996.

The Tavasci Marsh site is a grove of mature Goodding willows (about 15 m high) in which flycatchers nested. The site is in a marshy area about 200 m away from the Verde River at an elevation of 1006 m. In 1996, four flycatchers were detected (2 territories, 2 pairs), however, none was detected in 1997. The mature willow trees have been heavily girdled by beavers which may have compromised the site (Paxton and Sogge, 1996).

The largest flycatcher breeding site along the Verde River, the Camp Verde site, (elevation 942 m) is a mature Fremont cottonwood and Goodding willow gallery forest with adjacent patches of dense tamarisk. With several exceptions, the flycatchers nested in the dense tamarisk patches, although they would sing and perch in native trees (Paxton *et al.*, 1997). In 1997, twenty flycatchers were detected (10 territories, 10 pairs) at the Camp Verde site. Of the nineteen nesting attempts during 1997, there was 58% nest success, with 22 young fledged. Also at this site, 5% of nests were abandoned, 21% of nests were predated, and 16% of nests were parasitized by brown-headed cowbirds (McCarthey *et al.*, 1997). In 1997, five flycatchers (71%) returned to their 1996 breeding site, and one flycatcher banded at Tuzigoot Bridge defended a territory at Camp Verde (Paxton *et al.*, 1997).

Flycatchers have also been detected at two sites along the Verde River; Mescal Gulch and Ister Flat. Mescal Gulch had a single flycatcher detected in 1993. Ister Flat, had a single flycatcher was detected in 1993 and were not detected again until 1997, when three flycatchers were detected (2 territories, 1 pair). No nests were confirmed at either of these sites.

Arizona Cliffrose Environmental Baseline and Status in the Action Area

The largest population of Arizona cliffrose occurs in the Verde Valley (Anderson, 1986; Denham, 1992, qualifying Schaack and Morefield, 1985; and Phillips *et al.*, 1987). Arizona cliffrose habitat in the Verde Valley is restricted to an area of approximately three miles long by one mile wide (Denham, 1992; Phillips *et al.*, 1987). This population includes the largest and most robust individuals of Arizona cliffrose currently known (Denham, 1992). Reproductive output has successfully produced seedlings and young plants of various age cohorts. This is the only Arizona cliffrose population where successful seedling establishment leading to population recruitment is currently known. Land ownership includes the U.S. Forest Service, Arizona State Parks, Arizona

State Trust, and numerous private parcels. There are hybrid swarms of *Purshia subintegra* and *Purshia stansburiana* in the Verde Valley. The Service considers these plants to be outside the definitions of *Purshia subintegra.*

Current land management practices in the Verde Valley often conflict with long-term conservation goals for Arizona cliffrose. The Coconino National Forest established the 472-acre Verde Valley Botanical Area (VVBA) in 1987 (U.S. Forest Service, 1987) to emphasize management practices needed to protect and preserve the unique desert community which includes Arizona cliffrose. The VVBA includes an estimated 50% to 60% of the Arizona cliffrose plants in the Verde Valley (Denham, 1992, modifying Phillips *et al.*, 1987). Seasonal livestock grazing occurred within the VVBA in 1994 and 1995 which was not in compliance with direction in the Recovery Plan. An additional 10% to 20% of Arizona cliffrose plants in the Verde Valley are found on Forest Service lands not included in the VVBA. The remaining 20 to 40% are on private and State lands that may be subject to urban and suburban development facilitated by this proposed action.

A draft management plan has been developed for the VVBA (Ward n.d.). The draft VVBA management guidelines preclude certain land management actions within the VVBA, including road development, ORV driving, mining, and land exchanges. The Forest is currently evaluating Arizona cliffrose habitat that was not included in the VVBA for possible inclusion. Part of this evaluation consists of the identification and survey of potential Arizona cliffrose habitat. Forest soil scientists are studying the unique soils which support Arizona cliffrose to better understand the distribution of potential habitat in the Verde Valley. Surveys were conducted in 1994 and 1995 and located additional plants. Additional land management planning is underway by the Forest. However, the VVBA management plan remains to be completed. Management of the VVBA would be affected by the population and development increases that would be facilitated by the proposed action. Increased recreational use, particularly ORV use could diminish the ability to protect and recover Arizona cliffrose on the VVBA.

Arizona State Parks at Dead Horse Ranch State Park manages a relatively small area of Arizona cliffrose habitat contiguous with populations on the Coconino National Forest and within the VVBA. A proposed campground at Dead Horse Ranch is immediately adjacent to this population. State Parks has coordinated the planning of this campground with the Forest Service and Service so as not to affect Arizona cliffrose. Dead Horse State Park also is working with the Forest Service regarding trail development and use in this area (pers. comm. Barbara Phillips, botanist, Coconino National Forest). Arizona State Trust manages on section of land within Arizona cliffrose habitat in the Verde Valley (T.15N., R.3E., section 36). This section includes high density and robust plants and is immediately south of the designated VVBA. With private lands to the west of section 36 and no Arizona cliffrose habitat extending east of the section, the management of contiguous Arizona cliffrose habitat on Forest Service lands is precluded. The management of section 36 for the conservation of Arizona cliffrose is crucially important to maintain the ecological integrity of this Arizona cliffrose population and to provide for the recovery of the species. As with the VVBA, the

increased human use in the area, facilitated by this proposed project, would diminish the ability to protect Arizona cliffrose on State Park lands.

Arizona cliffrose individuals and their habitat have been lost from the Verde Valley population and additional destruction of habitat may result from road construction, roadway expansions, and land exchanges which are currently under evaluation. Expanding urbanization within the Verde Valley has led to direct loss of habitat and plants. No estimates of the amount or proportion of total habitat lost to these threats is available.

Recreational activities and off-road vehicle (ORV) use has contributed to significant habitat loss and degradation in all but the Bylas population (Bingham, 1976; Phillips *et al.*, 1980; U.S. Fish and Wildlife Service, 1994b). The importance of these threats to the continuing survival of the Arizona cliffrose, especially in the Verde Valley, is likely to increase as human populations increase and the nearby urban areas expand. Within the Verde Valley population there have been numerous "party" sites, and the development of mountain bike trails. The Coconino National Forest has initiated several protective measures for the Arizona cliffrose population in the Verde Valley. Fencing to delineate the parking area at the intersection of US 89A and Rocking Chair Road has been completed. Additional barrier fences have been constructed by the Forest Service along part of Rocking Chair Road to restrict off-road vehicle activities. Several two-track roads crossing Arizona cliffrose habitat have been closed and rehabilitated by the Forest Service, and the shooting range has been relocated out of Arizona cliffrose habitat.

Section 7 Consultation Environmental Baseline in the Action Area

Twenty-one formal section 7 consultations and eight informal concurrences with findings of "is not likely to adversely affect" have previously been completed addressing effects of Federal actions to razorback sucker, bald eagle, Arizona cliffrose, and southwestern willow flycatcher in this portion of the Verde River basin. These are summarized in Table 1.

TABLE 1. PREVIOUS SECTION 7 CONSULTATIONS IN ACTION AREA

Project, Agency[1]	*Date of Opinion or Concurrence*	*Species*[2]	*Finding*
FORMAL CONSULTATIONS			
Central Arizona Project, Cliff Dam element of Plan 6, USBR	Mar. 8, 1983 Aug. 15, 1985	bald eagle	jeopardy
Prescott National Forest Plan, USFS	March 4, 1986	bald eagle	nonjeopardy
Coconino National Forest Plan, USFS	April 1, 1986	bald eagle AZ cliffrose	nonjeopardy nonjeopardy
Central Arizona Project, Cliff Dam element of Plan 6, USBR	March 10, 1987	AZ cliffrose	nonjeopardy
Federal Loan Application, Ft. McDowell Indian Reservation, USBR	Feb. 28, 1992	bald eagle	jeopardy
Windmill Allotment, USFS	Dec. 30, 1992	AZ cliffrose	nonjeopardy
Emergency Watershed Protection, Yard Property, NRCS	Dec. 27, 1993	razorback sucker & critical habitat bald eagle SW willow flycatcher[2]	nonjeopardy no adverse modification nonjeopardy nonjeopardy
Central Arizona Project Nonnative Species Introduction and Spread, USBR	April 20, 1994	razorback sucker & critical habitat bald eagle	jeopardy adverse modification nonjeopardy
Verde Valley Ranch Development, COE	Nov. 9, 1994	razorback sucker & critical habitat bald eagle	nonjeopardy no adverse modification nonjeopardy

[1]Agency abbreviations include: UBSR, Bureau of Reclamation; USFS, Forest Service; NRCS, Natural Resource Conservation Service; COE, Army Corp of Engineers; FEMA, FHA, Federal Highway Administration; Federal Emergency Management Agency; USNPS, National Park Service; EPA, Environmental Protection Agency; ADOT, Arizona Department of Transportation; USFWS, Fish and Wildlife Service.

[2]Only species also in this biological opinion are listed here.

Apache Maid Allotment, USFS	Feb. 3, 1995	AZ cliffrose SW willow flycatcher[3]	nonjeopardy nonjeopardy
Sycamore Canyon Road Stabilization, FEMA	March 29, 1995	razorback sucker & critical habitat	nonjeopardy no adverse modification
Gonzales Watershed Project, NRCS	July 27, 1995	razorback sucker & critical habitat	nonjeopardy no adverse modification
Cedar Bench Allotment, USFS	Sept. 8, 1995	razorback sucker & critical habitat	nonjeopardy no adverse modification
West Bear/Del Rio Allotments, USFS	Sept. 19, 1995 (Draft)	razorback sucker	nonjeopardy
Tuzigoot bridge repair, USNPS	Sept. 25, 1995	razorback sucker & critical habitat SW willow flycatcher & proposed critical habitat	nonjeopardy no adverse modification nonjeopardy no adverse modification
Eureka Ditch, NRCS	Dec. 4, 1995	razorback sucker & critical habitat	nonjeopardy no adverse modification
Verde Valley Ranch Development, COE	Feb. 23, 1996	razorback sucker & critical habitat bald eagle AZ cliffrose SW willow flycatcher & proposed critical habitat	nonjeopardy no adverse modification nonjeopardy nonjeopardy jeopardy adverse modification
State Route 89A, Cottonwood to Sedona, FHA	July 8, 1996	AZ cliffrose	nonjeopardy
Skeleton Ridge/Ike's Backbone Allotments, USFS	June 25, 1997	SW willow flycatcher & proposed critical habitat	nonjeopardy no adverse modification
Verde Valley Ranch Development, EPA	Oct. 7, 1997	razorback sucker & critical habitat bald eagle SW willow flycatcher & critical habitat	nonjeopardy no adverse modification nonjeopardy nonjeopardy no adverse modification
Windmill Allotment, USFS	Oct. 28, 1997	razorback sucker & critical habitat AZ cliffrose	nonjeopardy no adverse modification nonjeopardy
INFORMAL CONSULTATIONS - IS NOT LIKELY TO ADVERSELY AFFECT CONCURRENCES			

[3]Proposed at time of consultation.

Apache Maid Allotment, USFS	June 6, 1995	razorback sucker	concurrence
Emergency flood repair, Interstate 17 bridge, ADOT	Sept. 13, 1995	razorback sucker	concurrence
Brown Springs Allotment, USFS	Nov. 30, 1995	razorback sucker	concurrence
Fishery Resources Fish Stocking, USFWS	Dec. 15, 1995	razorback sucker	concurrence
Jerome wastewater treatment plan Bitter Creek, EPA	Feb. 23, 1996	razorback sucker bald eagle SW willow flycatcher	concurrence concurrence concurrence
Windmill Allotment, USFS	Oct. 28, 1997	SW willow flycatcher	concurrence
Programmatic for grazing permits, USFS (number and location unknown)	1995-1998	razorback sucker bald eagle SW willow flycatcher	programmatic concurrence without site-specific Service involvement

DIRECT AND INDIRECT EFFECTS OF THE ACTION

Effects of Groundwater Pumping and Verde River Surface Flow Depletion

It is difficult to estimate actual depletion of surface flows that might result from groundwater pumping of deep wells drawing from the Verde Formation. As recognized by the BA and SBA, there is a hydrologic connection between the Verde Formation, the Quaternary alluvial deposits along the river corridor, and the surface flows of the Verde River (Owen-Joyce, 1984). Approximately 1,000 af/year moves from the Verde Formation to the Quaternary alluvium, while approximately 20 af/year moves from the alluvium to the Verde Formation (Owen-Joyce, 1984). The Verde River base flow is provided by groundwater discharge from the alluvium and Verde Formation (ADWR, 1994). Thus, any withdrawal from either of those portions of the aquifer is expected to eventually deplete Verde River base flows.

Pumping from groundwater aquifers can deplete surface flows in both direct and indirect ways (ADWR, 1994; Glennon, 1995). It can directly deplete surface flow by creating a cone of depression spreading outward from the well that causes surface water to infiltrate the alluvium to fill the resulting dewatered area. It can indirectly deplete surface flow by intercepting groundwater that would have flowed into the stream. Effects of groundwater pumping may be increased by use of several wells in close proximity. There is a time lag between the groundwater removal and the

effects to surface flows. The length of that lag depends upon proximity, geology, recharge, and other factors.

Groundwater pumping in Arizona has been repeatedly demonstrated to result in depletion of surface flows, degradation and loss of riparian habitats, and adverse impacts and local extirpation of aquatic and riparian flora and fauna (Miller, 1961; Hendrickson and Minckley, 1984; Stromberg, 1993; Glennon and Maddock, 1994; Tellman *et al.*, 1997). Although no depletion of surface flows has yet been observed in the Verde River due to groundwater pumping, various studies predict that the accelerating amount of groundwater removal will begin to deplete Verde River flows in the near future (Owen-Joyce and Bell, 1983; ADWR, 1994; Ewing *et al.*, 1994; McGavock, 1996).

The maximum potential depletion of Verde River surface flows for the proposed project is estimated by Reclamation to be 3% of the annual base flow, as estimated by Owen-Joyce and Bell (1983) at 111,000 af/year at the lower end of the Verde Valley. This annual base flow figure, however, includes the input of Fossil Springs (31,150 af/year), which occurs about 25 miles downstream from Camp Verde. The annual base flow estimated by Owen-Joyce and Bell at the Camp Verde U.S. Geological Survey (USGS) stream gage, 9 miles downstream from Camp Verde, is 80,000 af/year. Thus, the maximum depletion of the annual base flow is 4% upstream from the Fossil Creek inflow and 3% below that. Reclamation also estimates a 65% return rate of project water through percolation and sewage return flows, yielding a 1% net depletion, as measured below the confluence with Fossil Creek. At the lower end of the Verde Valley, the net depletion would be 1.5% . The depletion would not be manifested immediately, but may take many years, possibly decades to be seen (ADWR, 1994). Conversely, cessation of groundwater withdrawals would also not result in immediate restoration of surface flows. Restoration of the depletion would similarly take years or decades to occur.

While the maximum depletion would only be a small portion of the annual base flow of the Verde River, effects to riparian vegetation and wildlife may occur through depletion effects during critical periods. Flood flows are not dependent upon groundwater discharge and would not be affected by the proposed action. Median flows (190 cfs at the Camp Verde gage) would likely show depletions close to that for the annual base flow -- 1 to 1.5%, which is probably not a meaningful change for wildlife and riparian species and their habitats. It is during the critical low flow periods when the potential depletion of surface flows from the proposed project may have the most significant effects. The historic instantaneous low flow at the Camp Verde gage is 40 cfs. A depletion of 1.56 cfs (the net anticipated depletion of 1,130 af/year) would be 4% of the low flow. The existing Camp Verde gage is located below the confluence of West Clear Creek where low flows are ameliorated by input from the tributary . Flow data from immediately below Camp Verde are provided by a discontinued USGS gage that operated from 1971-1978. The historic low flow at that gage was 13 cfs. A depletion of 1.56 cfs at that point would result in a loss of 12% of the low flow.

Flow depletion expected from this proposed action is partially mitigated by actions to which the CWW and CVWS have committed via the Trust Fund agreement and via the cooperative agreements

with AGFD and ADA. The most important commitment is that wells acquired or drilled under the proposed action will withdraw only deep groundwater from the Verde Formation. This may or may not reduce the eventual depletion, but because the Verde Formation is less directly connected to the Verde River than the alluvial aquifer it will allow depletion impact to the river to be delayed by years or decades and will cause the depletion to occur more gradually.

Both water companies have agreed, under certain circumstances, to reduce their water withdrawals from shallow groundwater wells in the Quaternary alluvium of the Verde Valley. Shallow groundwater pumping has a much more direct and immediate adverse impact on Verde River surface flow; therefore, reduction of shallow well withdrawals is desirable for mitigation of adverse impacts to listed species. When, and how much, shallow well withdrawal reduction would occur is dependent upon the general water rights adjudication that has been ongoing since 1979. Both companies have agreed to the reductions within 5 years after certain decisions under that adjudication. The amount of reduction for CWW is unspecified and for CVWS is 50%. However, the court's adjudication decision may grandfather in water rights for all or a portion of the water currently being withdrawn from the shallow wells. In that case, any withdrawal covered by those grandfathered rights would continue and mitigation of the proposed new deep withdrawals would be reduced by the grandfathered amount. The shallow well withdrawal reductions may also not occur if water recharge credits have been earned by either company that would cover the amount of water withdrawn by the shallow wells that would otherwise be shut down. In that case, withdrawals from those wells would continue, but would be replaced by water reentering the aquifer from the recharge operations. Under this scenario, recharged water would be used to mitigate shallow well withdrawals and the proposed use of shallow well pumping reductions as mitigation for the deep well pumping would not occur.

In a more informal commitment with Reclamation, CWW and CVWS agreed to attempt to acquire agricultural surface water rights in the Verde Valley, which they would then retire and transfer to municipal and industrial uses. If they do acquire such rights, the water formerly diverted from the Verde River for irrigation would be left in the river to flow downstream. The water rights themselves would be used to cover the withdrawals from the shallow groundwater wells. With such coverage, the shallow groundwater withdrawals would not be reduced as specified in the cooperative agreements. However, the loss of the shallow well withdrawal reductions as mitigation for the deep wells would be more than offset by leaving the formerly diverted agricultural water in the Verde River. Such restoration of Verde River flows would be highly beneficial to all listed species in the area.

Based on the above information, the Service believes the proposed action would adversely affect the flows of the Verde River and the listed species dependent on those flows. These effects would be negligible for flood flows, very small for median (basically "normal") flows, and small, but significant for low flows. The effects would not occur immediately, but would build up over years or decades to those levels. Mitigation may partially offset adverse effects, although there are substantial uncertainties regarding the extent and type of mitigation that will actually occur.

For razorback sucker, the flow depletions may adversely affect the fish and its designated critical habitat through direct habitat reduction and indirectly through alteration of habitat parameters and stream channel morphology. The already highly depleted flows in the Verde Valley are a significant adverse impact on razorback sucker and would may already preclude any long-term recovery potential for the species in that stretch of the river. The existing irrigation diversions already divert over half of the flow of the river during the growing season and many of those diversions take all river flow except leakage from the diversion structure. Thus, portions of the river in the Verde Valley are essentially dry during parts of the year. Documented groundwater withdrawal from the over 1200 wells in the Verde Valley area is estimated at 10,000 acre feet annually and substantial undocumented withdrawal is believed to occur (ADWR, 1994). Because the water supply in the river is already substantially depleted any additional depletions are of greater importance to the survival and recovery of razorback sucker. Downstream from the Verde Valley, water depletion is less of an existing adverse impact to razorback sucker because of the return of large amounts of the diverted agricultural water and because of tributary inputs.

Flow depletions from the proposed action would primarily affect razorback sucker during low flow periods. In the Verde River, the low flows usually occur in the late spring and early summer. The naturally low flows during this period also coincide with the highest demand for irrigation water, thus exacerbating the adverse effects. Flow depletions during low flows may adversely affect razorback sucker spawning and recruitment, which occur in late winter through early summer. Spawning occurs in shallow water areas, which may be reduced in size and distribution by low flow depletions. Similarly, larval habitat, which consists of shallow backwaters and littoral zones would be reduced in size by low flow depletions. Low flow depletions could also adversely affect razorback sucker through changes in water temperatures, reduction in vigor of riparian vegetation, reduction in volume and abundance of adult habitat, and reduction of food production. These adverse effects are expected to be significant and may further reduce the long-term survival and recovery of razorback sucker. While the depletion effects would be felt throughout the Verde River from the Valley to Horseshoe Reservoir, they would be most significant in the Verde Valley itself.

For bald eagle, effects of flow depletions would come from alteration of the prey base, particularly fish. As with the razorback sucker, other fish would be affected, and possibly depleted, by the reduction of low flows. Because of the catholic nature of bald eagle feeding habits, changes in the species composition of the fish community is probably not important to bald eagle. Adverse effects to the bald eagle from reduction of food base due to proposed flow depletions are expected to be adverse, but not major.

The southwestern willow flycatcher's current status is characterized by extremely small, widely scattered sites containing an estimated five or few territories; many locations contain single, unmated males. The small, fragmented nature of flycatcher populations makes this species vulnerable to stochastic processes alone, and the Service anticipates continued extirpation at sites containing few birds. Continued losses of suitable habitat, or temporary impacts that negatively affect flycatcher

reproduction and survivorship can significantly reduce the reproduction, numbers, and distribution of the southwestern willow flycatcher.

Therefore, actions that disturb, remove, or modify flycatcher habitat characteristics may adversely affect the southwestern willow flycatcher in the action area. By lowering the Verde River base flow, especially during the low flow period, the riparian habitat as well as the prey base of flycatchers will be affected. Riparian vegetation abundance in the Verde River watershed and other watersheds in Arizona varies significantly with the flow rate of a stream, and is highly sensitive to changes (increases or decreases) in growing season flow rates. Groundwater pumping and surface water diversions occurring during the summer months have the greatest impact on the riparian ecosystem (Arizona Department of Water Resources, 1994). Therefore, seedling riparian vegetation survival and persistence in the low flow season will be lower due to the proposed action.

By lowering base flows, the prey base of the flycatchers may be adversely affected. The southwestern willow flycatcher is an insectivore, foraging within and above dense vegetation, taking insects on the wing or gleaning them from foliage (Wheelock, 1912; Bent, 1960). Willow flycatcher diet includes odonate, ephemeropteran, trichopteran, neuropteran, hemipteran, hymenopteran and dipteran insect species (Drost *et al.*, 1997; Paxton per. comm.). These insects are aquatic in their larval stage, therefore, a decrease in water may limit prey production.

The proposed action may result in riparian habitat degradation and loss, reduced productivity of adults, and reduced survivorship of adults and young. Nest loss/abandonment is anticipated to result from increased development and recreational activities in the project area as well as from further habitat fragmentation which may increase cowbird parasitism. The proposed action may preclude or reduce the development and persistence of large, contiguous tracts of cottonwood-willow habitat in large floodplain areas that historically contained such habitat. Habitat loss and degradation caused by fire, dessication, and encroachment by saltcedar is anticipated to result in displacement of adults, reduced productivity, and reduced survivorship of adults and young. The extent and magnitude of these effects are uncertain and will depend upon the actual depletions which occur and the time period over which they are manifested.

Arizona cliffrose is not expected to be affected by the groundwater or surface flow depletions. The Arizona cliffrose is an upland species that does not depend upon the groundwater supplies which would be impacted by this project.

Effects analysis for southwestern willow flycatcher critical habitat must determine if the proposed action would destroy or adversely modify critical habitat. "Destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for

determining the habitat to be critical (50 CFR 402.02). The primary constituent elements identified as necessary for the survival of the southwestern willow flycatcher in the final critical habitat rule are:

1. Space for individual and population growth
2. Food, water (seasonal wetland), air, light, minerals, and other nutrients or physiological requirements
3. Cover or shelter
4. Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal, and
5. Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of the species

Among the activities identified in the final rule that may adversely modify critical habitat are: 1) activities that remove, thin, or destroy riparian vegetation by mechanical, chemical (herbicides or burning), or biological (grazing) means, 2) any activities which alter the quantity or quality of surface or subsurface water flow, 3) destruction/alteration of the species' habitat by discharge of fill material, draining, ditching, tilling, pond construction, and stream channelization, 4) excessive use of riparian areas and uplands for livestock use, and 5) development of recreational facilities and off-road vehicle operation. The rule finds that excessive use of riparian areas and uplands by livestock may affect the volume and composition of riparian vegetation, may physically disturb nests, may alter floodplain dynamics such that regeneration of riparian habitat is impaired or precluded, and may facilitate brood parasitism by brown-headed cowbirds.

Adverse effects on constituent elements or segments of critical habitat generally do not result in adverse modification determination unless that loss, when added to the environmental baseline, is likely to result in significant adverse effects throughout the species' range, or appreciably lower the capacity of the critical habitat to support the species.

Based on the magnitude of effects to the critical habitat for the southwestern willow flycatcher including the Verde River from the proposed action, such an action is not likely to destroy or adversely modify the critical habitat.

Effects of Infrastructure Development and Operation

Well sites, access roads, powerlines, water mains, processing stations and other infrastructure associated with development of groundwater wells and delivery of water to the service areas of CWW and CVWS would have impacts on natural resources and listed species. The location of future infrastructure is not known. The six well sites are expected to occupy less than 5 acres land. The CWW and CVWS have committed to using existing rights-of-way wherever possible. No riparian areas are expected to be directly affected by infrastructure development.

Effects to razorback sucker from infrastructure construction and operation would occur as an indirect result of watershed alteration. This may take the form of increased erosion, increased sediment reaching the river, and increased pollutants in runoff. It would also occur through increased soil compaction, accompanying decreased infiltration, and resulting changes in the hydrologic regime including increased flashiness of flooding. These effects are expected to have long-term adverse impacts to the habitat of razorback sucker within the Verde Valley and possibly downstream. They would be somewhat mitigated by the provisions of the cooperative agreement in which CWW and CVWS committed to working with AGFD to pursue alternatives or mitigation for any proposed activities that AGFD believes would adversely affect "protected species or habitat." The extent to which this agreement will result in mitigation of impacts cannot be estimated, but is expected to be significant. Given that expected mitigation and that the amount of infrastructure required for the proposed action is relatively small, the effects to the river channel and razorback sucker and its critical habitat are expected to be minor.

At present, no infrastructure construction or operation is planned near bald eagle breeding areas. Potential impacts to bald eagle could come from powerlines. If additional powerlines are installed in or near the river, collisions of bald eagles with powerlines could occur.

Infrastructure development and operation are expected to affect southwestern willow flycatcher through many of the same mechanisms discussed earlier for razorback sucker. Those changes in drainage, sediment, erosion, channel morphology, pollution levels, and hydrologic regime, would likely cause substantial changes in the riparian vegetation that forms the habitat of southwestern willow flycatcher. It is difficult to quantify the riparian community changes that would occur as a result of the infrastructure for the proposed action. They will be a part of a much larger adverse modification of the riparian community that is already underway as a result of the increasing human use of the watershed and floodplain.

Arizona cliffrose has the potential to suffer extensive adverse impacts if wells and other infrastructure were placed within the habitat of the species. Roads and utility construction and maintenance have been documented to have adversely impacted Arizona cliffrose through direct plant destruction, soil compaction, changes in erosion rates and patterns, and changes in runoff patterns and water availability (USFWS, 1995c). To avoid and mitigate those effects, CWW (CVWS service area has no Arizona cliffrose habitat) has entered into a cooperative agreement with ADA that would restrict the construction and development of infrastructure with Trust Fund monies within the Arizona cliffrose "recovery area." Although "recovery area" is undefined, the SBA uses a map of the "recovery unit" for the Cottonwood area as defined in the Arizona cliffrose recovery plan (USFWS, 1995c). We have assumed "recovery area" is equivalent to "recovery unit." Infrastructure developed within the recovery area would also be restricted, regardless of the funding source, if its function were to serve customers outside of the recovery area. In addition, if infrastructure were to be developed in the recovery area with non-Trust Fund monies for the purposes of serving customers in the recovery area, CWW and ADA would conduct site-specific surveys and if ADA believes the proposed activity would negatively affect Arizona cliffrose, CWW

and ADA would consult with the Service to develop ways to avoid or minimize adverse effects. These mitigative measures would not remove all adverse effects, but the Service believes they would reduce the adverse impacts to Arizona cliffrose from infrastructure development to a relatively low level.

Effects from Municipal and Industrial Development

There are no quantitative data available on the amount of development or acceleration of development that would occur as a result of the use of Trust Fund monies received from the CAP allocation. Development within the Verde Valley and elsewhere along the Verde River and within the watershed is extensive and rapidly increasing (see Environmental Baseline and Cumulative Effects sections of this opinion). The CWW and CVWS service areas are a substantial portion of the development area of the Verde Valley, particularly the areas bordering the Verde River itself. Direct and indirect effects of development of urban and suburban areas within the Verde Valley have the potential to have serious adverse impacts to all listed species within the Valley and downstream in the river (Sullivan and Richardson, 1993). The approximately 150% expected population increase in the next 50 years (ADWR, 1994) within the communities along the Verde River in the Verde Valley are expected to convert most valley wildlands into urban and suburban settings. Effects to listed species, including razorback sucker, bald eagle, Arizona cliffrose, and southwestern willow flycatcher, will result in habitat and population losses up to and perhaps including extirpation of populations within the Verde Valley and possibly downstream in the Verde River. Given the paucity of information available, we have assumed that the increment of development contributed by the CAP allocation would be relatively small in the context of all development within the valley. Therefore, although the proposed action would contribute to a very serious threat to the four listed species, the increment added by this project is small enough to avoid jeopardizing the listed species.

Effects of increasing urban, suburban, and industrial development occur through a wide variety of mechanisms and have been well documented (Dunne and Leopold, 1978; Murphy and Phillips, 1989; Horak, 1989; Matthews and Gelwick, 1990; Medina, 1990; Leopold, 1994; Waters, 1995; Leopold, 1997; Tellman *et al.*, 1997; Wang *et al.*, 1997). Effects include water quality deterioration, increased floodplain or river channel gravel mining, altered hydrographs, increased channelization, increased erosion, increased sedimentation, decreased infiltration of precipitation, increased recreational impacts, loss of or damage to riparian vegetation, streambank trampling, increased water and air temperatures, altered drainage patterns, fragmentation of natural habitats, and many others.

Razorback sucker would experience adverse effects from increased urban/suburban development primarily through alterations in drainage and hydrographic patterns. This would occur as a result of the modification of the floodplain and watershed and would result in adverse effects to critical habiat. During construction of various human structures and facilities, drainages are frequently rerouted, channelized, or blocked. This alters the pattern by which water flows across the floodplain and enters the river. This may change (usually increase) the amount of sediment and pollutants which enter the river via these drainages. It may also accelerate or retard the rate with which the

water flows into the river thus altering channel morphology and the availability and distribution of aquatic habitats. If drainage elevations are changed, erosion is likely to occur, with consequent erosion of riverbanks of the Verde River itself and increased sediment loading in the Verde River. Roads, buildings, parking lots, and other areas of impermeable surfaces change the rate and pattern in which precipitation moves through the watershed. Flood volumes become higher and flood duration lengthens, while the volume of low flows decreases and their duration increases (Leopold *et al.*, 1964). Sediment movement patterns are also changed. The reduction or loss of vegetation on large portions of the watershed and floodplain increases sheet erosion and decreases uptake of precipitation.

These changes to the floodplain, watershed, and hydrologic and sediment regimes affect razorback sucker habitat in many ways. While razorback sucker are not inordinately sensitive to moderate amounts of sediment, excess sediment fills the pool habitat favored by adult razorback sucker and the shallow backwater habitats needed by larval and juvenile razorback sucker. Excess sediment may also bury gravel habitats needed by razorback sucker for spawning and reduce the reproductive success of the species. Increased flood volumes alter the river channel in many ways, some of which may decrease razorback sucker habitat. As the river channel readjusts to the changing hydrologic regime, erosion occurs and bank instability increases. Some of the characteristics already exhibited on the Verde River that are indicative of channel instability and excess sediment are large areas of wide, shallow, sometimes braided flow, eroded banks, and loss of backwater habitats. These areas do not provide suitable habitat for razorback sucker.

Another important and far-reaching result of increased urban/suburban development will be increased channelization of Verde River and its tributaries. Channelization within developed or developing areas is already increasing. This is illustrated by the five formal consultations that have been completed since 1993 on various flood and erosion repair and protection projects. As the number of human structures within the floodplain increases, the demand for "control" of the river to protect those structures also increases. As the floodplain, river channel, and tributary channels develop increased instability and erosion, more structures are at risk and therefore more "control" is necessary. This spiraling pattern has been well documented in other areas (Pearthree and Baker, 1987). Channelization has many adverse effects to razorback sucker, including direct habitat reduction by shortening of the river channel, loss of backwater larval and juvenile habitats, increased velocities, disruption of food base, and many others.

For bald eagles, adverse effects of development may occur through depletion of fish fauna due to watershed degradation. It may also occur as a result of increased recreation and other human activities in the breeding areas. While the Ladders breeding area is protected by a seasonal closure, the Tower and Camp Verde breeding areas are not. Disturbance around nests during the breeding season can cause reproductive failure (Hunt *et al.*, 1992) and nonbreeding bald eagles may flush from perches (roosting or foraging) in response to approach by humans. Bald eagles are also known to avoid potential foraging areas in close proximity to human developments (Hunt *et al.*, 1992).

Bald eagles may also be adversely affected by increased pollutants created by additional urban/suburban and industrial development. King *et al.* (1991) report that fish used by bald eagles collected in the Verde River contained elevated levels of copper, chromium, mercury, nickel, selenium, and zinc. Washing of pavement areas, leakage from vehicles, pesticides, fertilizers, and other hazardous substances may enter the Verde River during runoff from urbanized areas. Pollutants, such as antifreeze, waste oil containing heavy metals, and construction materials may enter storm water runoff and accumulate over time so that exceedances of ambient water quality standards may occur in the water column or bioaccumulate in fish which make up the bald eagle prey base.

Effects to southwestern willow flycatcher from increased urban/suburban development are addressed in the Cumulative Effects section of this biological opinion, following this section. As discussed earlier for razorback sucker and bald eagle, a portion of those effects can be attributed to the proposed action. Although the magnitude of that portion is not quantifiable, it is expected to be quite small.

Effects of development on Arizona cliffrose are quite similar to those already discussed under the earlier section regarding effects of infrastructure.

CUMULATIVE EFFECTS

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities on endangered or threatened species or critical habitat that are reasonably certain to occur during the course of the Federal activity subject to consultation. Future Federal actions are subject to the consultation requirements established in section 7 and, therefore, are not considered cumulative in the proposed action.

Cumulative Effects of Human Population Growth

Growth is projected in Cottonwood to increase by 148 % and in Camp Verde to increase by 158% between 1994 and 2040 (Arizona Department of Economic Security 1994). This dynamic growth would lead to increased development, increased visitation/recreation (including fishing, boating and other water-related activities), increased contamination, increased wildfires, and increased alteration of the watershed and hydrologic regime .

Cumulative Effects of Economic Development

The growth projected for this region will be manifested through economic development, including housing, golf courses, businesses, industry, roads, schools, and other facilities for the population. These facilities will replace natural vegetation and cover large expanses of the floodplain and watershed with impermeable surfaces. A primary result will be the alteration of the watershed characteristics and changes in the hydrologic and sediment patterns, sources, and volumes. These

impacts have already been discussed for razorback sucker, bald eagle, and Arizona cliffrose in the Direct and Indirect Effects of the Action section of this opinion. Those earlier discussions related to development that would occur as a result of the increment of growth that resulted from or was facilitated by the proposed action; however, the effects are the same in type, although different in level, as those which would occur as the result of all reasonably foreseeable growth in the Verde Valley.

Localized impacts on southwestern willow flycatchers and their habitats from further clearing, human disturbance, and predatory pets, especially domestic cats, likely will continue. Also, cowbird parasitism of southwestern willow flycatcher nests is expected to increase with habitat fragmentation. Increased development in the Verde Valley will mean more infrastructure (i.e. roads). Sogge (1995c) noted that the population decline and changes in the distribution of willow flycatcher territories on the Verde River were consistent with other studies documenting adverse effects of roads that bisect habitat. In addition, a willow flycatcher was killed by an automobile on a rural road that bisects flycatcher habitat (Sferra *et al.*, 1995). These effects indicate that in addition to destabilizing local and regional population dynamics, habitat fragmentation can have direct effects including mortality and overall changes in habitat suitability that can further reduce the carrying capacity of a particular habitat patch.

Cumulative Effects of Future Visitation/Recreation

If all urban./suburban areas in Arizona continue to grow at the existing and anticipated rate, the Verde Valley and the Verde watershed will continue to experience rapid increases in recreational use of both private and public lands. The increase will be particularly focused on the Verde River and its riparian corridor. Bank compaction and erosion, channel morphology changes, riparian vegetation suppression and loss, increased pollution and trash, construction of picnicking and other recreational facilities within the riparian corridor, and many other adverse impacts will destroy or adversely alter razorback sucker habitat and habitat for bald eagle prey species. Bald eagle will be subjected to increasing disturbance effects and may have increased problems with entanglement in monofilament fishing line. Arizona cliffrose habitat, both on private and public lands is likely to experience substantial adverse effects from increased recreational activity, particularly ORV use. As visitation and recreation use increase, more disturbance of southwestern willow flycatchers will result. The increase in number of people fishing, swimming, skiing, hunting and boating on the river. Preservation of the regions riparian areas has been identified as one of the most difficult obstacles to overcome as recreational use of the watershed increases as the population grows (Arizona State Parks, 1991). This will impact many of the habitat areas used by the southwestern willow flycatcher.

Cumulative Effects of Environmental Contaminants

Eight willow flycatchers with bill deformities have been observed at seven sites throughout the southwestern willow flycatcher range (Paxton *et al.*, 1997). The deformities included five crossed

bills and two unaligned bills. Also, in Arizona two flycatchers were found that were each missing an eye. In 1997, an adult female flycatcher was observed in Camp Verde that had a unaligned bill (the upper mandible was shorter than the lower). As has already been discussed in the Direct and Indirect Effects of the Action section earlier in this opinion, bald eagle prey species in the Verde corridor have already been documented to have elevated levels of several serious toxic materials.

Increased development in the project area will increase the amount of storm water runoff. Wetlands can slow water flows and remove pollutants. These flows may alter existing wetland ecosystems used by the southwestern willow flycatcher. Persistent toxins may accumulate in sediments, vegetation, and the food chain. Oil and grease discharged into areas used by the southwestern willow flycatcher may also affect the species and its prey. Birds can be affected by petroleum through external oiling, ingestion, and habitat changes. Petroleum can be ingested through feather preening, drinking, consumption of contaminated food, or evaporating oil. Ingestion of oil is seldom lethal, but can cause debilitating sublethal effects.

Food resources for the bald eagle and willow flycatcher may also be altered by polluted waters. In some areas, waters grossly polluted with organic matter have a restricted invertebrate fauna including only those species capable of thriving in areas of very low concentrations of oxygen and high concentrations of dissolved and particulate organic matter (Pennak, 1978). This not only directly depletes willow flycatcher food base, but also depletes the food supply of bald eagle prey. Any habitat deterioration reduces areas for a species to carry out its life cycle and increases the probability of extinction of local breeding areas.

Flycatchers often nest in riparian areas that are adjacent to agricultural and mining operations, both of which use or produce potentially toxic chemicals. Bill deformities due to environmental contaminants have been reported by several researchers (Hays and Risebrough, 1972, Gilbertson *et al.*, 1976, Fox *et al.*, 1991, Ludwig *et al.*, 1996). Willow flycatcher diet includes insects that are aquatic in their larval stage (Drost *et al.*, 1997), and therefore may be exposed to polychlorinated biphenyls (PCBs) (Paxton *et al.*, 1997). Birth defects are representative of developmental asymmetry; although developmental asymmetry can be caused by other factors (such as inbreeding), it has been linked to toxicants in the environment (Valentine *et al.*, 1973, Valentine and Soule, 1973, Zakharov and Yablokov, 1990).

Cumulative Effects of Wildfires

As human activity in the riparian zones along the Verde River increases, fire frequency is also likely to increase (Busch, 1995). As fire frequency increases, and as saltcedar and arrowweed continue to dominate post-fire recovery, more disturbance of southwestern willow flycatcher and adverse effects to their habitats likely will occur. Busch and Smith (1993) argue that fire was a relatively infrequent phenomenon in native riparian habitats and that the advent of saltcedar brought about episodic burning events which create favorable conditions for recolonization by saltcedar

In 1996, three southwestern willow flycatcher sites experienced fires that burned large patches of occupied habitat (San Pedro River, AZ; Colorado; and Zuni, NM). Long-term response of flycatchers to loss of habitat by fire has not been well documented. Use of habitat and site fidelity in the 1997 breeding season differed at all three sites (Langridge and Sogge, 1997).

SUMMARY OF EFFECTS

In combination with the deteriorated existing environmental baseline, the proposed project is expected to have moderately adverse effects, due to various aspects of the project, on the razorback sucker, bald eagle, southwestern willow flycatcher, and Arizona cliffrose. Cumulative effects from foreseeable future actions add to those adverse effects in a manner that is uncertain and extremely difficult to effectively analyze. Overall, the proposed project is a very small part of the ongoing and expected adverse impacts to listed species in the Verde River and Verde Valley. The proposed project is well planned and contains some degree of built-in mitigation for adverse impacts. Therefore, although cumulative impacts to these listed species in the action area may be severe in the long-term, the increment added by this proposed project is small and is not expected to reach the level of jeopardy to listed species or adverse modification of their critical habitat.

CONCLUSION

After reviewing the current status of the southwestern willow flycatcher, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the razorback sucker, bald eagle, southwestern willow flycatcher, or Arizona cliffrose and is not likely to destroy or adversely modify the critical habitat of razorback sucker or southwestern willow flycatcher.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, as amended, prohibits any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish and wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered a prohibited taking provided that such taking is in compliance with the incidental take statement. **The measures described below are nondiscretionary, and must be undertaken by**

the agency or made a binding condition of any grant or permit issued to the applicant, as appropriate.

ANTICIPATED LEVEL OF INCIDENTAL TAKE

If, during the course of the action, the amount or extent of the incidental take limit is exceeded, Reclamation must reinitiate consultation with the Service immediately to avoid violation of section 9. Operations must be stopped in the interim period between the initiation and completion of the new consultation if it is determined that the impact of the additional taking will cause an irreversible and adverse impact on the species. Reclamation should provide an explanation of the causes of the taking.

Razorback Sucker Anticipated Incidental Take

The Service anticipates that the proposed action will result in incidental take of razorback sucker through indirect mortality resulting from habitat loss or alteration. This may occur as a result of low flow depletion, changes in river channel morphology and hydrologic regime due to watershed alteration by development, or through increased input of pollutants. Take will not occur immediately, but will occur gradually as water depletions and development impacts build.

The anticipated level of incidental take of razorback sucker cannot be directly quantified due to the lack of information on the razorback sucker population in the area, the time lag inherent in flow depletion by groundwater withdrawal, and to the many unknown variables in interdependent and interrelated actions. No surrogate measures for take have been identified. Greater than anticipated incidental take will be considered to occur only if the proposed action is not implemented as planned.

Bald Eagle Anticipated Incidental Take

The Service does not anticipate that the proposed action would result in any incidental take of bald eagles. Accordingly, no incidental take is authorized. Should any take occur, Reclamation must reinitiate formal consultation with the Service and provide a description of the circumstances surrounding the take.

Southwestern Willow Flycatcher Anticipated Incidental Take

The Service anticipates that incidental take of the southwestern willow flycatcher could occur as a result of this proposed action. Take, in the form of harm, injury or death to flycatchers resulting from the loss of a nesting site, loss or disturbance of a nest, loss or modification of adjacent habitat that could accommodate population expansion, and nest parasitism by cowbirds is anticipated in the long-term (e.g., after 10 years). The proposed action will result in some riparian habitat degradation and loss and reduced productivity of adults. Habitat loss and degradation is anticipated to result in

displacement of adults, reduced productivity, and reduced survivorship of adults and young in the long-term.

The extent of take for this proposed action is difficult to measure due to a high level of uncertainty about project effects and difficulties in detectability of taken flycatcher. No surrogate measures for take have been identified The Service concludes that incidental take from the proposed action will be considered to be exceeded if the proposed action is not implemented as planned.

Arizona Cliffrose Anticipated Incidental Take

The Endangered Species Act does not prohibit incidental take of plants. Therefore, no take statement is included here for Arizona cliffrose.

EFFECT OF INCIDENTAL TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the razorback sucker or southwestern willow flycatcher nor destruction or adverse modification of their critical habitats.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the incidental taking of razorback sucker and southwestern willow flycatcher authorized by this biological opinion. The measures described below are non-discretionary, and must be implemented by Reclamation, so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7 (o)(2) to apply. Reclamation has a continuing duty to regulate the activity covered by this incidental take statement. If the Bureau of Reclamation (1) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7 (o)(2) may lapse.

1. Reclamation shall conduct all proposed actions in a manner that will minimize loss and alteration of razorback sucker habitat.

2. Reclamation shall monitor the proposed action to document activities that would result in incidental take of razorback sucker.

3. Reclamation shall maintain complete and accurate records of actions which may result in take of razorback sucker.

4. Reclamation shall protect and enhance southwestern willow flycatcher habitat on the Verde River.

5. Reclamation shall develop methods of public education and shall promote voluntary water conservation practices in the Verde Valley.

TERMS AND CONDITIONS FOR IMPLEMENTATION

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau of Reclamation is responsible for compliance with the following terms and conditions, which implement the reasonable and prudent measures described above.

The following term and condition is necessary to implement reasonable and prudent measure 1:

1a. Reclamation shall provide CWW and CVWS with technical advice and biological information on ways to minimize adverse modification of razorback sucker habitat.

The following term and condition is necessary to implement reasonable and prudent measure 2:

2a. Reclamation will provide the Service with annual reports on CWW and CVWS progress in attempts to acquire and retire agricultural surface water rights and return those flows to the Verde River.

The following terms and conditions are necessary to implement reasonable and prudent measure 3:

3a. Reclamation will provide the Service with information on the actual location and depth of wells acquired or drilled by CWW and CVWS to implement the proposed action, and with periodic updates on implementation of the cooperative agreements between the water companies and AGFD and ADA.

3b. Reclamation will provide the Service with information on any recharge project planned by CWW or CVWS.

The following terms and conditions are necessary to implement reasonable and prudent measure 4:

4a. Construction, maintenance or operation of wells, pipelines and other water delivery facilities associated with developing deep aquifer water resources shall occur outside of the riparian zone of suitable or occupied flycatcher habitat.

4b. Reclamation shall work with landowners and conservation groups along the Verde River as part of a coordinated effort for the management of riparian habitat in the Verde Valley with the goal of supporting multiple populations of southwestern willow flycatchers in the project area.

4c. Reclamation shall participate in the Verde Watershed Association and pro-actively seek to coordinate monitoring of southwestern willow flycatcher habitat and breeding territories on the Verde River.

4d. Reclamation will explore use of a portion of the southwestern willow flycatcher management funds set aside from the Roosevelt Lake biological opinion to be used specifically for Verde River southwestern willow flycatcher territories.

The following term and condition is necessary to implement reasonable and prudent measure 5:

5a. Reclamation shall have CWW and CVWS set aside one percent (approximately $20,000) of the Trust Fund (after all Cental Arizona Water Conservation District charges are paid) to be used solely for public information and educational materials and programs which address the significant cumulative effects of economic development and population growth on riparian habitat, threatened and endangered species, and water resources in the Verde Valley.

5b. Reclamation shall determine and promote methods to encourage voluntary water conservation measures including but not limited to promotion of, and rebate programs for, installing water saving devices and low-water-use landscape or xeriscape for residents and businesses in the Verde Valley.

DISPOSITION OF DEAD, INJURED, OR SICK INDIVIDUALS OF A LISTED SPECIES

If a dead, injured, or sick individual of a listed species is found in the action area, initial notification must be made to Service Law Enforcement, Federal Building, Room 105, 26 North McDonald, Mesa, Arizona, 85201 (Telephone: 602/261-6443) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the finding, a photograph of the animal, and any other pertinent information. The notification shall be sent to Law Enforcement with a copy to the Arizona Ecological Services Field Office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. If possible, the remains shall be placed with educational or research institutions holding appropriate State and Federal permits. If such institutions are not available, the information noted above shall be obtained and the carcass left in place. Arrangements regarding proper disposition of potential museum specimens shall be made with the institution prior to implementation of the action. Injured animals should be transported to a qualified veterinarian by an authorized biologist. Should any treated animals survive, the Service shall be contacted regarding the final disposition of the animals.

NOTICE: To the extent that this statement concludes that take of any threatened or endangered species of migratory bird will result from the agency action for which consultation is being made, the Service will not refer the incidental take of any such migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-712), or the Bald Eagle Protection Act of 1940, as amended (16 U.S. C. 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The term conservation recommendations has been defined as Service suggestions regarding **discretionary agency activities** to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's 7(a)(1) responsibility for these species.

1. Reclamation should reestablish and operate the discontinued USGS stream gage (09505550) 2.2 miles downstream from Beaver Creek.

2. Reclamation should consider conducting/or providing funding for additional surveying and monitoring of southwestern willow flycatcher habitat on the Verde River.

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

REINITIATION NOTICE

This concludes formal consultation on implementation of the proposed water assignment of CAP allocations from Camp Verde and Cottonwood to Scottsdale. As required by 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintain (or is authorized by law) and if: (1) the amount of the incidental take statement 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 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 is 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.

We appreciate the efforts of the Bureau of Reclamation in conserving the Verde River ecosystem. Any questions or comments should be directed to Sally Stefferud, Jackie Record or Ted Cordery of my staff.

Sincerely,

Jennifer Fowler-Propst

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (AES)
Project Leader, U.S. Fish and Wildlife Service, Pinetop, AZ
Director, Fish and Wildlife Service, Washington, D.C. (DES)

Director, Arizona Game and Fish Department, Phoenix, AZ

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