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AESO/SE
2-21-03-F-0003

February 21, 2003

To: Regional Director, Fish and Wildlife Service, Albuquerque, New Mexico

From: Field Supervisor

Subject: Intra-Service Biological and Conference Opinion - Issuance of a Section 10(a)(1)(B) permit to Salt River Project for Operation of Roosevelt Lake

This biological opinion responds to your request for consultation with the Arizona Ecological Services Office pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). At issue are impacts that may result from issuance of an incidental take permit in accordance with section 10(a)(1)(B) of the Act for operation of Roosevelt Dam and Lake by Salt River Project (SRP) in Gila and Maricopa counties, Arizona. Issuance of the permit may affect the endangered southwestern willow flycatcher (*Empidonax traillii extimus*), the threatened bald eagle (*Haliaeetus leucocephalus*), the endangered Yuma clapper rail (*Rallus longirostris yumanensis*), and the candidate yellow-billed cuckoo (*Coccyzus americanus*). Consistent with our policies concerning intra-service consultations, for the purposes of this opinion, we consider the yellow-billed cuckoo herein as if it were proposed to be listed as threatened or endangered.

This biological opinion was prepared using information from the following sources: an October 2002 biological assessment for the project (Lehman 2002), the final habitat conservation plan (ERO 2002), final environmental impact statement (U.S. Fish and Wildlife Service 2002a), and information in our files. A complete administrative record of this consultation is on file in our office.

CONSULTATION HISTORY

Informal consultation on this project began with a January 11, 2001, meeting among staff from this office, SRP, and Bureau of Reclamation's Phoenix Area Office (Reclamation). Initial discussions focused on the likelihood of take from SRP's actions, and the relationship to previous section 7 consultations with Reclamation concerning modifications to Roosevelt Dam that allowed increased storage and flood control space in the reservoir. Those consultations are reviewed briefly here:

Biological opinion dated March 8, 1983 (2-21-83-F-10) on Plan 6 of the Central Arizona Water Control Study, which included construction of New Waddell Dam on the Agua Fria River, Cliff Dam on the Verde River, modifications to Roosevelt Dam to increase storage, and a new or modified Stewart Mountain Dam on the Salt River. The opinion found that the proposed action was likely to jeopardize the continued existence of the bald eagle, but not the Gila topminnow, peregrine falcon, or Yuma clapper rail. In regard to Roosevelt Dam and Lake, the proposed action was to raise the dam's crest height 77 feet to increase the structural integrity of the dam and to allow for additional storage capacity and emergency flood control. The opinion included a 5-part reasonable and prudent alternative for the eagle that included: 1) development of a memorandum of understanding among Reclamation, the Tonto National Forest, and us to implement strategies to avoid or minimize adverse effects to eagles, 2) research to gather information on bald eagle foraging, nest ecology, and prey base of the Stewart Mountain, Chalk Mountain, and Pinal Creek bald eagle pairs, 3) breaching of Horseshoe Dam at the Cliff nest site to promote stream and riparian woodland development, 4) limitations on borrow material excavation and stock-piling at Meddler Point of Roosevelt Lake to protect the Pinal breeding pair, and 5) seasonal restrictions on blasting at the Stewart Mountain Dam site.

Reinitiation of 1983 consultation, biological opinion dated March 30, 1990 (2-21-83-F-10). In this reinitiation, we addressed effects of the proposed modified Roosevelt Dam on the Pinal breeding area as well as new bald eagle breeding areas on Tonto Creek about 15 miles upstream of the mouth of Tonto Creek (Sheep breeding area), and the Pinto breeding area just west of Meddler Point, as well as bald eagle use of a cottonwood grove at the mouth of Tonto Creek for foraging. The opinion found that the proposed action was not likely to jeopardize the continued existence of the eagle, but take was anticipated and the opinion included reasonable and prudent measures and terms and conditions to construct a nesting platform in the Pinto breeding area at least 4 years before the predicted collapse of the nest tree, and closure of the Pinto breeding area to recreation, if and when the breeding area became active.

Reinitiation of 1983 consultation, biological opinion dated January 21, 1993 (2-21-92-F-285). In this reinitiation, we considered proposed improvements to A-Cross Road on Tonto Creek, developments at Indian Point Recreation Site, management of the Tonto Creek Riparian Unit, and modifications of Roosevelt Dam on the bald eagle. The opinion concluded the proposed action was not likely to jeopardize the continued existence of the bald eagle, but anticipated take of eagles. Reasonable and prudent measures and terms and conditions were included to implement a seasonal closure around the Tonto breeding area, monitor the Tonto breeding area via the Arizona Bald Eagle Nestwatch Program, and provide notification and rescue of eggs or nestlings at Roosevelt Lake in the event nests were inundated.

Biological opinion dated July 23, 1996 (2-21-95-F-462). This opinion considered effects of proposed modifications to Roosevelt Dam and operation of the resulting new conservation space on the southwestern willow flycatcher. Reclamation's action was to construct the modifications to the dam. Effects of that construction included the operation of the new conservation space, which was an effect reasonably likely to occur as a result of the construction (and thus the

effects thereof are among the effects of the action - 50 CFR 402.02). Although considered in the opinion, operation of the new conservation space was a non-Federal activity, and was not within the discretion of Reclamation's authorities. The opinion concluded the action was likely to jeopardize the continued existence of the flycatcher; it also anticipated that up to 90 birds would be taken annually. Included were a reasonable and prudent alternative to 1) not permit long-term storage in the new conservation space (elevation 2136-2151) until after September 1, 1996, 2) acquire and manage replacement habitat sufficient in size to support at least 45 flycatcher territories, 3) establish a \$1.25 million management fund to be used for additional habitat acquisition, protection, and management, 4) establish a full time conservation coordinator at Reclamation for 10 years to assist the Service in initiating recovery and conservation planning, and to carry out the RPAs, 5) monitor effects of the proposed action on the flycatcher and implementation of the RPAs and RPMs, as well as conduct research of various aspects of flycatcher biology, and 6) trap cowbirds at 3 sites plus the acquired properties for 10 years. The RPMs and terms and conditions were designed to minimize take by: 1) not inundating flycatcher habitat during the 1996 breeding season, 2) reducing incidence of cowbird parasitism, 3) requiring that all research and monitoring be conducted by qualified personnel, and 4) ensuring appropriate oversight of implementation of the RPAs and RPMs.

In 1995-'96, water levels were much higher at Roosevelt than they are today (Fig. 1). Flycatchers nested in the new conservation space at that time and were subject to take if water levels rose in that new space. However, due to below normal precipitation, water levels have gradually receded, habitat and flycatcher populations have expanded, and nesting has occurred lower in the reservoir.

In 2001-'02, all nests were in the old conservation space. Thus, if the waters had risen during this or the previous year, take of flycatchers would not have been as a result of Reclamation's action of raising the dam, but would have been due to SRP's operation of the old conservation space, below elevation 2136. During early meetings, we discussed whether this constituted new information requiring reinitiation of consultation by Reclamation in accordance with 50 CFR 402.16(a&b), and whether addressing effects to flycatchers (and other listed species) in the old conservation space should be addressed as a section 7 consultation or via an incidental take permit and the provisions of section 10(a)(1)(B) of the Act.

In a contract dated September 6, 1917, between the Salt River Valley Water Users' Association and the United States (43 U.S.C. § 499), the United States turned over to and vested in the Association the authority to care for, operate and maintain the Salt River Project, of which Roosevelt Dam is an integral component. SRP continues to operate the Project pursuant to that contract. After examination of the 1917 contract, and consultation with Department of Interior Solicitors, in a January 5, 2001, memorandum to this office, Reclamation's Phoenix Area Manager stated that operation of Roosevelt Dam in the original conservation space is not a discretionary Federal action; thus no Federal nexus exists and any coverage for potential taking of listed species in that space would be more appropriately addressed by section 10 permits,

rather than section 7 consultation. In a February 2, 2001, letter from Mr. John F. Sullivan, Manager, Water Group, SRP, to this office, SRP agreed with Reclamation's

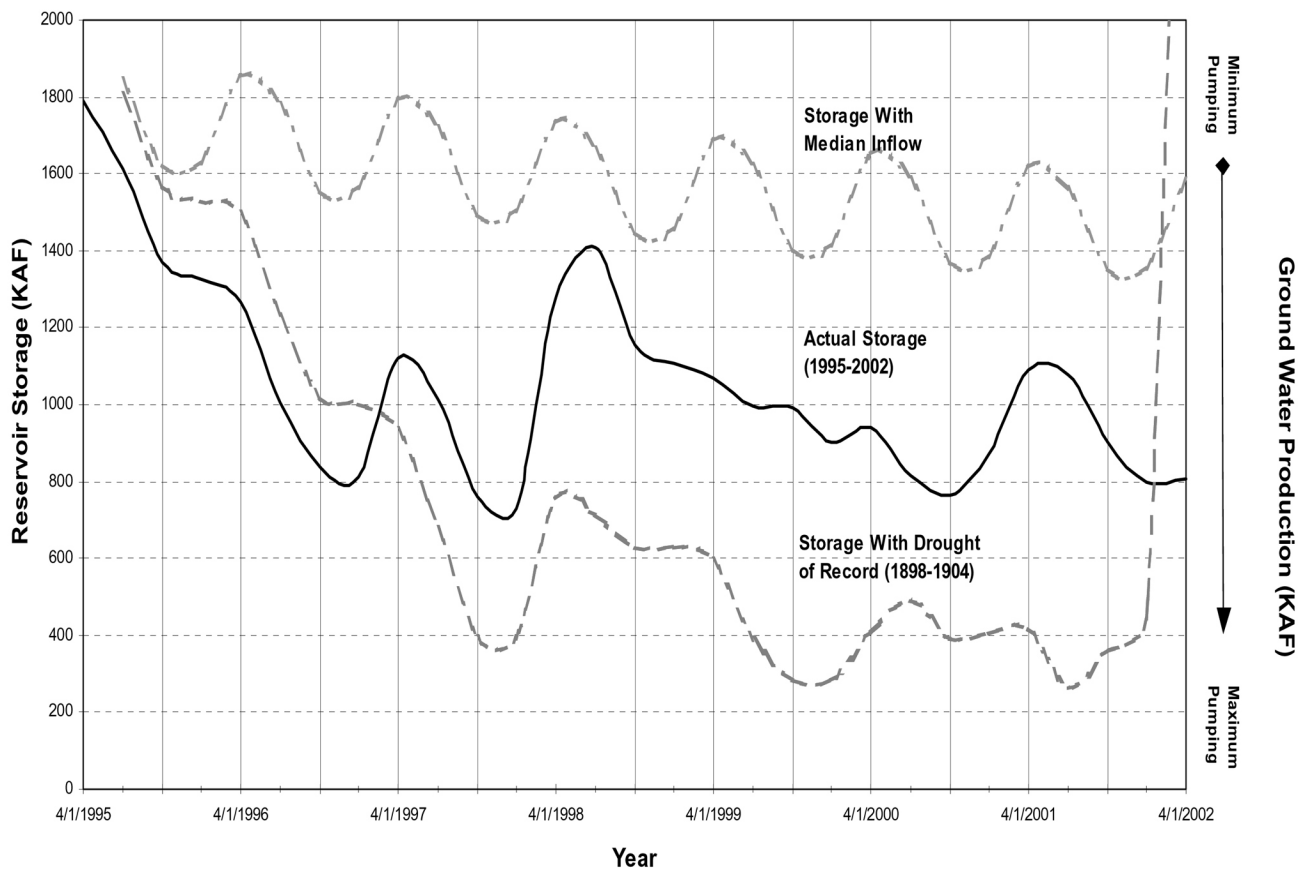


Fig. 1. Water storage in Roosevelt Lake, April 1995-April 2002 (adapted from ERO 2002).

analysis and proposed initiating a process to obtain section 10(a)(1)(B) incidental take permit for operation of Roosevelt Dam and Lake. In a March 2, 2001, letter from this office to Mr. Sullivan, we determined that a section 10(a)(1)(B) permit is the appropriate mechanism for addressing and authorizing incidental take of flycatchers as a result of SRP's operation of the original conservation space. In subsequent discussions with SRP and Reclamation, we agreed to approach incidental take permitting and RPAs/RPMs from section 7 consultation holistically in one habitat conservation plan for both the original and new conservation space (to elevation 2,151') in Roosevelt.

Numerous meetings were held among SRP and their contractor (ERO Resources Corporation), Reclamation, and us during 2001-'02 to develop the habitat conservation plan and the accompanying environmental impact statement. Public involvement in development of the plan was initiated with the establishment of an Advisory Group. In March 2001, invitations to

participate in the Advisory Group were sent to representatives of state and Federal agencies, Indian tribes, cities, recreational groups, and environmental groups. Meetings of the Advisory Group were held on April 20, August 21, and November 13, 2001, to solicit input on all aspects of the HCP and EIS. Additional meetings were held on January 15 and April 2, 2002, to review information to be submitted in the draft HCP and to solicit comment. A public scoping meeting was held on October 22, 2001, at SRP offices in Tempe, Arizona to solicit comments on the EIS and HCP. Approximately 25 people attended the public meeting. A total of 18 written comments were received from individuals, environmental organizations, and state and local governments. The HCP and DEIS were made available for public comment from July 19 to September 17, 2002. On August 27, 2002, a public hearing was held at the SRP offices. The hearing was attended by 48 people, 24 of which presented oral comment. In total, comments from 45 persons or entities were received on the draft documents.

BIOLOGICAL AND CONFERENCE OPINION

DESCRIPTION OF PROPOSED ACTION

The proposed action is issuance of a permit to SRP by Region 2 of the Fish and Wildlife Service, in accordance with section 10(a)(1)(B) of the Act, for incidental take of southwestern willow flycatcher, bald eagle, and Yuma clapper rail. The yellow-billed cuckoo would also be covered by the permit if it is listed in the future. The permit would be issued with mandatory conditions, which are also part of the proposed action. The action that would cause the take - continued operation of the dam and storage space to elevation 2151', and measures proposed to minimize, mitigate, and monitor the take - are not actions proposed by us or any other Federal agency. These non-Federal activities have effects that are reasonably certain to occur as a result of our issuance of an incidental take permit (ERO 2002, U.S. Fish and Wildlife Service 2002a). By definition (50 CFR 402.02), the effects of such activities are among the effects of the action and must be evaluated herein. Permit conditions; operation of Roosevelt Dam; and mitigation, minimization, and monitoring measures are described below. Additional details about the proposed action and related activities can be found in ERO (2002) and U.S. Fish and Wildlife Service (2002a).

Permit Conditions:

As of this writing, the permit conditions were still in draft form; however, key provisions will include:

- 1) the duration of the permit is 50 years,
- 2) the permit is in effect for listed species on the date the permit is signed and will be in effect for the yellow-billed cuckoo upon the date of listing (if listed),
- 3) take of listed species is permitted (generally indexed to loss of habitat) as follows for the life of the permit and for the permitted activity:

a. Flycatcher - incidental take of flycatchers occupying habitat at Roosevelt modified or degraded due to inundation or desiccation not to exceed 750 acres per year (or up to 1,250 acres per year with adaptive management), and nestlings and eggs as a result of nest tree fall or nestlings falling and drowning due to high reservoir levels at Roosevelt,

b. Bald eagle - incidental take of bald eagles using nest or perch trees at Roosevelt, and incidental take of no more than 18 fledgling bald eagles resulting from reduced productivity of bald eagles at Roosevelt during periods of declining water levels,

c. Yuma clapper rail - incidental take of Yuma clapper rails occupying habitat at Roosevelt modified or degraded by inundation in an amount not to exceed 5 acres per year (or up to 10 acres per year with adaptive management),

d. Yellow-billed cuckoo - incidental take of cuckoos occupying habitat at Roosevelt modified or degraded due to inundation or desiccation in an amount not to exceed 313 acres per year (or up to 1,113 acres per year with adaptive management), and cuckoo nestlings and eggs as a result of nest tree fall or nestlings falling and drowning due to high reservoir levels at Roosevelt.

4) the permit may be suspended if the permittee is not in compliance with the conditions of the permit or applicable Federal law or regulations,

5) the permit may be revoked in accordance with applicable regulations and policies,

6) changed circumstances are defined and measures are described that would be taken if such circumstances occur during the life of the permit,

7) required notifications and procedures in the event of unforeseen circumstances are defined, including the no surprises policy, and

8) procedures for amending and renewing the permit are set forth.

Continued Operation of Roosevelt Dam:

Roosevelt Dam would continue to be operated by SRP in a manner consistent with its purpose as a water storage and power generation facility. SRP would operate Roosevelt and other SRP reservoirs to minimize spills of water past Granite Reef Dam according to the Modified Roosevelt Dam Operating Agreement (see Appendix 1 of ERO 2002). The dam would be operated with the following objectives:

1) Maintain the safety and integrity of the dams.

2) Maintain sufficient storage to meet water delivery obligations.

3) Optimize reservoir storage within the reservoir system.

4) Maintain adequate carryover storage in case of low runoff.

5) Conjunctively manage ground water pumping given reservoir storage and projected runoff and demand.

6) Maximize hydrogeneration.

7) Operate to permit necessary facility maintenance

SRP also would continue to operate Roosevelt to control floods in accordance with criteria established in the Modified Roosevelt Water Control Manual (U.S. Bureau of Reclamation

1996). However, operation of the flood control space above elevation 2,151 feet in Roosevelt is not covered by the HCP and is not part of the action addressed herein. Any future changes in flood control operations that would affect listed species would be the subject of consultation under Section 7 of the ESA, because SRP does not have discretion over operation of that space.

SRP's operation of Roosevelt in future years may require periodic removal of dead trees that result from inundation. Clearing of dead vegetation may be required in order to permit effective operation of spillways and outlet works, or to minimize safety issues with recreational use of the lake by boaters. If these operational or safety concerns necessitate removal of dead trees, SRP would meet with us to agree on the specific method (e.g., controlled burns or mechanical clearing) and the specific areas for vegetation clearing (e.g., areas near occupied habitat would be avoided).

Mitigation, Minimization, and Monitoring Measures:

Southwestern Willow Flycatcher

SRP will implement a number of conservation measures as part of the HCP in order to minimize and mitigate the anticipated impact of 750 acres of occupied flycatcher habitat from continued full operation of Roosevelt. Mitigation measures for the estimated 750 acres of impact to flycatcher habitat include 1,500 acres of habitat acquisition and management and 750 acres of additional habitat conservation measures. If impacts to occupied habitat exceed 750 acres due to changed circumstances, adaptive management will be implemented to address up to an additional 500 acres of future impact under the permit. These measures, along with the schedule for implementation, and proposed adaptive management measures are described below.

Habitat Acquisition and Management. One component of the mitigation encompassed in the HCP is to permanently acquire and manage at least 1,500 acres of riparian habitat by fee title or conservation easements. This component also includes management of currently occupied flycatcher habitat or habitat that, through improved management, is expected to support flycatchers in the future.

SRP is seeking to protect the highest quality riparian habitat available near Roosevelt, or habitats that with appropriate management will attain high quality. SRP is pursuing properties on the Verde, San Pedro, Gila, and other rivers that create a synergism with other conservation efforts to provide a greater overall benefit to wildlife. The riparian habitat to be acquired and managed would have characteristics similar to the 750 acres to be lost at Roosevelt Lake. Patches of riparian habitat targeted for acquisition would be occupied by flycatchers or would have similar or greater proportions of tall, dense woodland as that lost, i.e., at least 60 percent on average, and would have moist soil or patches of surface water during the nesting season. SRP would acquire and restore habitat along several rivers where there are already flycatchers nesting, which would increase the area along those corridors for colonization and movement and avoid the problem of having so many flycatchers nesting in one area where a fire, flood or other

disaster could eliminate most or all of the habitat all at once.

The RPAs and RPMs in Reclamation's biological opinions for modifications to Roosevelt Lake minimize take and remove jeopardy for construction and operation of the reservoir between elevations 2,136' and 2,151'. SRP's mitigation and minimization measures are for operation of the reservoir up to elevation 2,151', so habitat acquisition by Reclamation in accordance with those opinions is subtracted from the total mitigation acreage. The San Pedro Preserve, which was purchased by Reclamation as mitigation for the construction of Modified Roosevelt, contains about 403 acres of riparian habitat suitable for flycatchers (ERO 2002), and Reclamation is pursuing an additional 200 acres of suitable habitat with the remainder of the management fund established under the RPA. Thus, the HCP includes 900 acres of newly created, protected or enhanced flycatcher habitat in addition to the 600 acres Reclamation would protect. Should Reclamation acquire less than 600 acres of flycatcher habitat, SRP would be responsible for acquiring the balance to attain a total of 1,500 acres. SRP may also receive habitat credit for funding the permanent management of flycatcher habitat acquired by state, Federal, or conservation organizations. Habitat credit would be in proportion to the total cost of land acquisition and management.

A manager for all acquired properties would be identified and a management plan would be developed, implemented, and permanently funded to ensure management or development of riparian habitat characteristics in perpetuity. SRP would develop a management plan for each property within one year of habitat acquisition in coordination with us and, where applicable, the management entity. The management plan would require our approval. The core elements of each management plan are as follows:

- Place a conservation easement on the mitigation property
- Collect baseline data on physical and biological attributes
- Establish management goals
- Develop and implement strategies to achieve the management goals
- Monitor flycatchers, cuckoos, riparian vegetation, and overall condition of the property
- Evaluate management success
- Review annually and amend the plan if necessary

Additional Habitat Conservation Measures. In addition to the habitat protection and management described above, the HCP provides for additional habitat conservation measures equivalent to 750 acres. These additional measures may take a variety of forms, including: 1) protection and management of riparian habitat at Roosevelt; 2) where feasible and appropriate, protection and management of upland buffers to minimize threats to protected habitats; 3) acquisition of water rights and reduced diversion or ground water pumping, with concomitant benefits to riparian habitat; and 4) other measures approved by FWS. The buffer and water right land acquired by Reclamation under the 1996 opinion is credited using the same methods described below.

SRP's funding of protection and management personnel at Roosevelt will be divided by the average cost per acre of acquisition and management of riparian land along the San Pedro River to determine the number of acres of long-term Roosevelt habitat to be credited under Additional Measures. The amount of credit for this measure is estimated to be 300 acres (Table 4 of U.S. Fish and Wildlife Service 2002a).

The need to acquire and manage upland buffers, as well as the determination of the size and credit for those buffers, will be agreed upon by us and SRP on a case-by-case basis. The primary purpose of buffers is to help insulate riparian habitat from impacts of adjacent land uses. It is anticipated that upland buffers will be less than 10 percent of the aggregate of acquired riparian habitat.

Mitigation credit for acquisition of water rights and reduced diversion or ground water pumping would be defined by the amount of historical water use retired. Water retirement measures would be implemented adjacent to or upstream of conserved habitat, which would benefit habitat from flow augmentation provided by the water rights acquisition or reduced pumping. The amount of water retired will be measured by the acre-feet of historical annual depletion of water by irrigation or other uses divided by 2 acre-feet per acre for the average annual depletion of moderate to dense riparian vegetation. As part of the mitigation for construction of modified Roosevelt Dam, Reclamation retired about 164 acres of irrigated land and ponds on the San Pedro Preserve, which consumed approximately 440 acre-feet per year (Arizona Department of Water Resources 1991). The equivalent mitigation credit for this action is 220 acres (440 /2). SRP may likewise retire irrigation lands as part of the additional habitat conservation measures.

The additional habitat conservation measures of habitat protection, acquisition and management of buffers, cessation/reduction of diversions or ground water pumping, and associated management would be provided in perpetuity. Permanent funding would be provided for management and monitoring.

Schedule for Conservation Measures. Prior to the effective date of the permit, at least 750 acres of mitigation would be in place in the form of habitat acquisition of fee title or easements and management of occupied or potentially occupied flycatcher habitat, or other actions needed to remove threats to or benefit riparian habitat. Within 1.5 years of permit issuance, if granted, another 750 acres of mitigation would be implemented. All land acquisitions and management or additional habitat conservation measures would be in place within 3 years of permit issuance unless otherwise agreed by us. A summary of the expected timing and location of habitat acquisition and additional habitat conservation measures is shown in Table 4 of U.S. Fish and Wildlife Service (2002a).

Adaptive Management. Adaptive management would be implemented if monitoring shows that acres of occupied flycatcher habitat modified or degraded due to inundation or dessication exceeds or will reach 750 acres per year. SRP would develop and implement additional mitigation within 3 years, to address impacts for up to an additional 500 acres of lost occupied habitat, for up to a total of 1,250 acres of impacts. Additional mitigation would be comprised of habitat acquisition and management (two-thirds of the additional mitigation or up to 1,000 acres) and additional habitat conservation measures (one-third of the additional mitigation or up to 500 acres). If more than 1,250 acres are impacted per year, a permit amendment would be necessary.

Bald Eagle

Habitat Protection, Establishment, and Rehabilitation.

A pilot project to establish riparian vegetation, including cottonwoods, would be implemented at the Rockhouse site on the Salt arm of Roosevelt.

After construction by Reclamation, SRP would maintain the Pinto nesting platform for the duration of the HCP.

Within 3 years of permit issuance, SRP would acquire mitigation habitat for flycatchers, much of which is comprised of cottonwoods and willows that may provide suitable habitat for bald eagles in some locations.

SRP would use its best efforts to assist in restoring habitat on the Fort McDowell Yavapai Reservation. SRP's potential role would be to provide funding for construction and maintenance of fencing to prevent livestock and recreation access to riparian habitat and to promote the re-establishment of riparian vegetation. Funding also may include planting of cottonwoods and willows, signs, educational materials, protection from beavers, or other efforts needed to protect and maintain the riparian habitat.

Bald Eagle Management. SRP will continue to assist with management activities to help manage and improve bald eagle populations in the Roosevelt area as part of the Southwest Bald Eagle Management Committee. The efforts described below would be assessed annually to ensure that the programs are productive.

SRP will develop a coordinated management and implementation plan with Arizona Game and Fish Department (AGFD) and the Service to rescue any eagles, eagle eggs, or nestlings at Roosevelt Lake. The plan would be completed within a year of permit issuance and implementation would begin within 2 years of permit issuance.

SRP will annually fund a pair of seasonal bald eagle nestwatchers, proportional program coordination through an existing Arizona Bald Eagle Nestwatch Program, and daily monitors throughout the breeding season to protect individual nest sites, nesting eagles, and educate the public.

Each year, SRP would assist with three monthly Occupancy and Reproduction Assessments and nest search helicopter events and provide funding for coordination and attendance by existing bald eagle management personnel.

SRP would provide a maximum of three annual helicopter flights and proportional

funding for rescue or other management efforts. SRP would continue the above measures for the life of the permit provided there is an Arizona bald eagle program in which SRP is able to participate. SRP shall not be required to create a bald eagle program if the current program is dismantled.

Adaptive Management. Adaptive management is not provided for bald eagles because the conservation measures described above address changed circumstances as a result of reservoir operations. Previously described habitat protection and management measures are believed to be adequate for mitigating potential impacts to bald eagles from the continued operation of Roosevelt. No adaptive management measures would be implemented. If take is anticipated to be exceeded, a permit amendment would be required.

Yuma Clapper Rail

Habitat mitigation for Yuma clapper rails would be incorporated into the mitigation measures for flycatchers. Specifically, 5 acres of the Rockhouse riparian vegetation establishment project on the Salt arm of Roosevelt will be dedicated to creation of cattail marshes. In addition to providing on-site mitigation for Yuma clapper rails, these marshes will benefit the flycatcher mitigation efforts at this location by providing surface water and moist soil beneath the willow and cottonwood overstory, helping to replicate conditions preferred by flycatchers. Conversely, Yuma clapper rails prefer marsh habitat that is bordered by dense, woody vegetation, which would be established at the Rockhouse site for the benefit of flycatchers and cuckoos.

Adaptive Management. If circumstances at Roosevelt change in the future, and more than 5 acres of occupied Yuma clapper rail habitat are lost per year due to inundation, SRP would establish or protect up to 5 acres of additional marsh habitat near Roosevelt to address up to 5 additional acres of occupied habitat loss, for a total of 10 acres affected. If feasible, this additional habitat would be created by expansion of the Rockhouse project. If not feasible at Rockhouse, private land along Tonto Creek or locations along the lower Salt or Gila rivers suitable for marsh protection and establishment would be acquired and placed under permanent management. If more than 10 acres of occupied habitat are affected per year, a permit amendment would be required.

Yellow-billed Cuckoo

Habitat Acquisition and Management. Separate habitat mitigation for the cuckoo is not anticipated, because onsite and offsite mitigation for flycatchers and bald eagles also would benefit cuckoos. Cuckoos would benefit from the habitat protection measures initiated by Reclamation as mitigation for the construction of Modified Roosevelt and additional habitat protection measures implemented by SRP for flycatchers. Habitat requirements for cuckoos, eagles, and flycatchers overlap to a large degree. Cuckoos and flycatchers are the most similar in their habitat use. Both require blocks of dense, tall riparian vegetation for foraging and nesting, and habitat must be relatively close to open water. Flycatchers tend to use nest sites that

are closer to water than cuckoos. Cuckoos appear to generally require larger blocks of mature riparian woodlands and do not nest as closely together as flycatchers. Cuckoos need at least 10-acre blocks of habitat for nesting and foraging, and generally do not use narrow strips of habitat. Cuckoo and eagle habitat requirements also overlap somewhat. Eagles typically use mature cottonwood trees for nesting and perching. Cuckoos also may use cottonwoods for nesting and foraging. Cuckoos also may benefit from closure of eagle nesting areas to recreational use during the breeding season implemented under the Reclamation opinions for construction of Modified Roosevelt Dam.

Because the mitigation measures for flycatchers and eagles are intended to support cuckoos as well, the following considerations were included in the selection of mitigation sites in the HCP:

Cuckoos benefit from the creation or protection of riparian areas composed of dense cottonwood/willow woodlands.

Some of the cottonwood/willow woodlands should be at least 10 acres in size.

Cottonwood/willow woodlands should be provided in blocks rather than in strips to the maximum extent possible.

To the degree feasible, riparian habitat should be located in areas that favor a natural succession of vegetation so that there will be periodic establishment of riparian vegetation patches.

Because comprehensive cuckoo surveys have not yet been completed at Roosevelt, the impact analysis in the HCP is based on potentially suitable cuckoo habitat currently present at Roosevelt Lake, i.e., 313 acres. Mitigation measures for the 313 acres would be 626 acres of habitat acquisition and management and 313 acres of additional habitat conservation measures. The additional habitat conservation measures for cuckoos would be satisfied by the same measures implemented for flycatchers. The 626 acres of acquisition and management would be determined by measuring the patches of cottonwood/willow, mixed riparian vegetation, or other suitable habitat on the mitigation properties purchased as part of the flycatcher program. If additional land is required to meet the 626-acre minimum, SRP would acquire that property and manage it in perpetuity. In the long term, an accounting of habitat actually occupied at Roosevelt and suitable and occupied habitat on mitigation properties would be conducted as part of the implementation of the HCP.

Adaptive Management. Over time, as surveys for cuckoos are completed and vegetation communities change at Roosevelt Lake, the acreage of cuckoo habitat affected is likely to change as well. Also, there is substantial uncertainty over the amount of currently occupied and suitable habitat at Roosevelt. Thus, adaptive management would be implemented if the acreage of occupied cuckoo habitat to be lost at Roosevelt exceeds the 313 acres mitigated initially. Within 3 years of the determination that more than 313 acres would be lost, SRP would implement additional mitigation for up to an additional 800 acres of lost occupied cuckoo habitat. The additional impact of up to 800 acres would be mitigated by acquiring and managing

in perpetuity up to 1,600 additional acres of riparian habitat and implementing up to 800 acres of additional habitat conservation measures. In summary, flycatcher mitigation measures would be credited toward cuckoo mitigation to the extent applicable. If more than 1,113 (313 + 800) acres of occupied cuckoo habitat are modified or degraded per year due to inundation or desiccation, a permit amendment would be required.

Monitoring

SRP would monitor compliance with the terms and conditions of the permit and the effectiveness of minimization and mitigation measures throughout the permit's 50-year duration. The goal for monitoring efforts is to assess the population status, trends, and habitat condition. Specific monitoring goals include:

Vegetation - At Roosevelt, the goal is to monitor the density and distribution of riparian vegetation to assist in determining the timing of flycatcher and cuckoo surveys. At mitigation sites, the goal is to monitor the status of riparian and other vegetation to determine if management measures need to be implemented or modified.

Flycatchers - At Roosevelt, the goal is to monitor habitat occupied by flycatchers to ensure compliance with the permit, including whether adaptive management is required, and to detect long-term trends in population. At mitigation sites, the goal is to monitor species status and population trends.

Yuma Clapper Rails - At Roosevelt, the goal is to monitor habitat occupied by Yuma clapper rails to ensure compliance with the permit, including whether adaptive management is required, and to detect long-term trends in populations. At mitigation sites, the goal is to monitor species status and population trends.

Cuckoos - At Roosevelt, the goal is to monitor habitat occupied by cuckoos to ensure compliance with the permit, including whether adaptive management is required, and to detect long-term trends in populations. At mitigation sites, the goal is to monitor species status and population trends.

Bald Eagles - The goal is to monitor population status by continuing the SRP contribution to the existing bald eagle monitoring program.

Table 6 of U.S. Fish and Wildlife Service (2002) details the timing and responsibilities for monitoring flycatchers, Yuma clapper rails, and cuckoos at Roosevelt, the conservation properties, and the Rockhouse Restoration Project. Bald eagle monitoring would be conducted annually by AGFD and us.

SRP Management, Coordination, and Reporting

SRP would establish a full-time staff position in its Environmental Services Department to manage and coordinate implementation of the HCP. The person filling this position would be required to have previous experience with management of biological resource issues. The primary responsibility for this staff position would be to ensure that the HCP is fully implemented, including all adaptive management, monitoring, and reporting measures. The following tasks would be included in the job description:

1. Manage vegetation monitoring and population surveys for flycatchers, Yuma clapper rails, and cuckoos at Roosevelt and on mitigation properties as specified in the HCP.
2. Manage the pilot project to establish and manage habitat near the Salt inlet to Roosevelt and expand if feasible, including acquisition of water rights if necessary.
3. Coordinate with Tonto National Forest personnel on enforcement and management efforts for listed species at Roosevelt.
4. Implement management measures as necessary, including adaptive management involving: 1) purchase or protection of additional lands; 2) managing the start-up activities on mitigation properties (e.g., managing environmental clean-up if needed, contracting for fence construction, and developing and initiating on-going management plans); and 3) providing for ongoing maintenance of all mitigation sites.
5. Coordinate implementation of conservation measures for bald eagles.
6. Prepare annual reports to be submitted to us.
7. Prepare budget recommendations and perform other administrative tasks related to the implementation of the HCP including tracking schedules of acquisition, monitoring, and management activities.

An annual meeting would be held in October or November of each year among us, SRP, Reclamation, the Tonto Basin Forest Service District, AGFD, and the mitigation property managers to review the past year's information and to make decisions for the upcoming year regarding monitoring and management. SRP would provide an annual report to us (Arizona Ecological Services Office and Region 2), Reclamation, and the Forest Service describing all HCP activities occurring during the past year including management activities, results, status reports and future action items on mitigation properties, and all other activities associated with implementation of the HCP. The draft annual report also would describe the past year's monitoring and management activities at mitigation sites, issues that have developed at the sites, adaptive management efforts that have been implemented, and proposed monitoring and management efforts for the next year. A more complete description of proposed monitoring and

reporting requirements is provided in Subchapter IV.E of the HCP.

Changed and Unforeseen Circumstances

Contingencies for changed circumstances are described in Chapter 4.f.1. of ERO (2002). Unforeseen circumstances are those which could not reasonably have been anticipated by SRP and us, which result in a substantial and adverse change in the status of the covered species. In the event of unforeseen circumstances, we may work with SRP to modify their mitigation and minimization measures, but only if such measures are limited to modifications within the compensation lands conserved pursuant to the terms of the HCP or to the HCP's operating conservation program for the covered species, and maintain the original terms of the HCP to the maximum extent possible [see Chapter 4.f.2. of ERO (2002) for additional information].

Integration with Reclamation's Biological Opinions

The HCP is a comprehensive plan for mitigating and minimizing effects of operating Roosevelt Dam and Lake on listed species, including the new conservation space made possible by Reclamation's modifications to the dam. As such, the HCP includes Reclamation's on-going habitat and species protection measures for bald eagle and flycatcher resulting from consultations on modifications to Roosevelt Dam, as described in the consultation history. In regard to the bald eagle, Reclamation will rescue eaglets and eggs that may be subject to inundation in the new conservation space, construct a nest platform for the Pinto nest within 4 years of the collapse of the nest tree, implement seasonal closures around the Pinto and Tonto nests, and provide research and monitoring of bald eagles at Roosevelt. In regard to the flycatcher, the San Pedro Preserve, which was purchased by Reclamation as mitigation for the construction of Modified Roosevelt, contains about 403 acres of riparian habitat suitable for flycatchers (ERO 2002). Reclamation is pursuing acquisition of an additional 200 acres of suitable habitat with the remainder of the management fund established under the 1996 opinion. Reclamation also is conducting intensive monitoring of flycatchers and their habitat, as well as research through 2006. These and other minimization and monitoring measures conducted by Reclamation pursuant to their biological opinions are credited toward the total mitigation and minimization plan defined in the HCP to determine SRP's responsibilities under the HCP. Thus, SRP's responsibilities for the bald eagle include maintenance of the Pinto nest platform that Reclamation will construct, funding of 2 nestwatchers, helicopter flights for monitoring, and rescue of eaglets and eggs. For the flycatcher, the HCP includes acquisition and management by SRP of 900 acres of newly created, protected or enhanced flycatcher habitat in addition to the 600 acres Reclamation would protect. Should Reclamation acquire and manage less than 600 acres of flycatcher habitat, SRP would be responsible for acquiring the balance up to 1,500 acres. SRP may also receive habitat credit for funding the permanent management of flycatcher habitat acquired by state, Federal, or conservation organizations. Habitat credit would be in proportion to the total cost of land acquisition and management. Although Reclamation's conservation measures under their biological opinions target the flycatcher and the bald eagle, much of their mitigation on the San Pedro River also benefits the yellow-billed cuckoo. All

other conservation measures in the HCP, including all measures proposed for the Yuma clapper rail, will be funded and implemented by SRP.

STATUS OF THE SPECIES

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Description

The southwestern willow flycatcher is a small grayish-green passerine bird (Family Tyrannidae) measuring approximately 5.75 inches. 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 song is a sneezy fitz-bew or a fit-a-bew, the call is a repeated whitt.

The southwestern willow flycatcher is one of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993). It is a neotropical migrant 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 breeding 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).

Listing and critical habitat

The southwestern willow flycatcher was listed as endangered, without critical habitat on February 27, 1995 (U.S. Fish and Wildlife Service 1995a). Critical habitat was later designated on July 22, 1997 (U.S. Fish and Wildlife Service 1997a). A correction notice was published in the Federal Register on August 20, 1997 to clarify the lateral extent of the designation (U.S. Fish and Wildlife Service 1997b).

On May 11, 2001, the 10th Circuit Court of Appeals set aside designated critical habitat. The Service decided to set aside all critical habitat designated for the southwestern willow flycatcher, not just in the area where the 10th Circuit has jurisdiction, until it could re-assess the economic analysis. On May 2, 2002, the Service sent out a scoping letter to over 800 interested parties requesting information in order to develop a critical habitat proposal.

A final recovery plan for the southwestern willow flycatcher was signed by the U.S. Fish and Wildlife Service's Region 2 Director on August 30, 2002 (U.S. Fish and Wildlife Service 2002b). The Plan describes the current status of the flycatcher, addresses important recovery actions, includes detailed issue papers on management issues, and provides recovery goals.

Reasons for endangerment

Declining southwestern willow flycatcher numbers have been attributed to loss, modification,

and fragmentation of riparian breeding habitat, loss of wintering habitat, and brood parasitism by the brown-headed cowbird (*Molothrus ater*, Sogge *et al.* 1997, McCarthy *et al.* 1998). Habitat loss and degradation are caused by a variety of factors, including urban, recreational, and agricultural development, water diversion and groundwater pumping, channelization, dams, and livestock grazing. Southwestern rivers and streams are characterized by altered hydrographs due to dams and diversions, while catastrophic flood events occur with greater frequency on some systems as a result of degraded watershed conditions (Briggs 1996). As a result, stream channels are often highly degraded, and floodplains and riparian communities are reduced in extent and degraded in terms of potential to support flycatchers (U.S. Fish and Wildlife Service 2002b). Fire is an increasing threat to willow flycatcher habitat (Paxton *et al.* 1996), especially in monotypic saltcedar vegetation (DeLoach 1991) and where water diversions and/or groundwater pumping desiccates riparian vegetation (Sogge *et al.* 1997). Willow flycatcher nests are parasitized by brown-headed cowbirds, which lay their eggs in the host's nest. Feeding sites for cowbirds are enhanced by the presence of livestock and range improvements such as waters and corrals; agriculture; urban areas; golf courses; bird feeders; and trash areas. When these feeding areas are in close proximity to flycatcher breeding habitat, especially coupled with habitat fragmentation, cowbird parasitism of flycatcher nests may increase (Hanna 1928, Mayfield 1977a,b, Tibbitts *et al.* 1994).

Habitat

The southwestern willow flycatcher breeds in dense riparian habitats from sea level in California to approximately 8,500 feet in Arizona and southwestern Colorado. Historical egg/nest collections and species' descriptions throughout its range, describe the southwestern willow flycatcher's widespread use of willow (*Salix* spp.) for nesting (Phillips 1948, Phillips *et al.* 1964, Hubbard 1987, Unitt 1987, T. Huels *in litt.* 1993, San Diego Natural History Museum 1995). Currently, southwestern willow flycatchers primarily use Geyer willow, Goodding's willow, boxelder (*Acer negundo*), saltcedar (*Tamarix* sp.), Russian olive (*Elaeagnus angustifolia*) and live oak (*Quercus agrifolia*) for nesting. Other plant species less commonly used for nesting include: buttonbush (*Cephalanthus* sp.), black twinberry (*Lonicera involucrata*), cottonwood (*Populus* spp.), white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), and stinging nettle (*Urtica* spp.). 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: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge *et al.* 1997).

Saltcedar, an exotic from the Old World, is an important component of the flycatchers's nesting and foraging habitat in Arizona and other parts of the bird's range. In 2001 in Arizona, 323 of the 404 (80 percent) known flycatcher nests (in 346 territories) were built in a saltcedar (Smith *et al.* 2002). Saltcedar had been believed by some to be a habitat type of lesser quality for the southwestern willow flycatcher, however comparisons of reproductive performance (U.S. Fish and Wildlife Service 2002b) and physiological conditions (Owen and Sogge 2002) of flycatchers breeding in native and exotic vegetation have revealed no difference.

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 are 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 among 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).

Breeding biology

Throughout its range, the southwestern willow flycatcher arrives 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, 1997). 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 per clutch (range = 1 to 5). Eggs are laid at one-day intervals and are incubated by the female for approximately 12 days (Bent 1960, Walkinshaw 1966, McCabe 1991). Young fledge approximately 12 to 13 days after hatching (King 1955, Harrison 1979). Typically one brood is raised per year, but birds have been documented raising two broods during one season and renesting after a 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). The entire breeding cycle, from egg laying to fledging, is approximately 28 days.

Southwestern willow flycatcher nests are fairly small (3.2 inches tall and 3.2 inches wide) and their placement in a shrub or tree is highly variable (2.0 to 59.1 feet off the ground). Nests are open cup structures, and are typically placed in the fork of a branch. Nests have been found against the trunk of a shrub or tree (in monotypic saltcedar and mixed native broadleaf/saltcedar habitats) and on limbs as far away from the trunk as 10.8 feet (Spencer *et al.* 1996). Typical nest placement is in the fork of small-diameter (e.g., 0.4 in), vertical or nearly vertical branches (U.S. Fish and Wildlife Service 2002b). Occasionally, nests are placed in down-curving branches. Nest height varies considerably, from 2.0 to 59.1 feet, and may be related to height of nest plant, overall canopy height, and/or the height of the vegetation strata that contain small twigs and live growth (U.S. Fish and Wildlife Service 2002b). Most typically, nests are relatively low, 6.5 to 23 feet above ground (U.S. Fish and Wildlife Service 2002b). Flycatchers nesting in habitat dominated by box elder nest the highest (to almost 60 feet) (U.S. Fish and Wildlife Service 2002b).

The southwestern willow flycatcher is an insectivore, foraging in dense shrub and tree vegetation along rivers, streams, and other wetlands. The bird typically perches on a branch and makes short direct flights, or sallies to capture flying insects. Drost *et al.* (1998) found that the major

prey items of the southwestern willow flycatcher (in Arizona and Colorado), consisted of true flies (Diptera); ants, bees, and wasps (Hymenoptera); and true bugs (Hemiptera). Other insect prey taxa included leafhoppers (Homoptera: Cicadellidae); dragonflies and damselflies (Odonata); and caterpillars (Lepidoptera larvae). Non-insect prey included spiders (Araneae), sowbugs (Isopoda), and fragments of plant material.

Brown-headed cowbird parasitism of southwestern willow flycatcher broods has been documented throughout its range (Brown 1988a,b, Whitfield 1990, Muiznieks *et al.* 1994, Whitfield 1994, Hull and Parker 1995, Maynard 1995, Sferra *et al.* 1995, Sogge 1995b). Where studied, high rates of cowbird parasitism have coincided with southwestern willow flycatcher population declines (Whitfield 1994, Sogge 1995a,c, Whitfield and Strong 1995) or, at a minimum, resulted in reduced or complete nesting failure at a site for a particular year (Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995, Sferra *et al.* 1995, Sogge 1995a,c, Whitfield and Strong 1995). Cowbird eggs hatch earlier than those of many passerine hosts, thus giving cowbird nestlings a competitive advantage (Bent 1960, McGeen 1972, Mayfield 1977a,b, Brittingham and Temple 1983). Flycatchers can attempt to reneest, but it often results in reduced clutch sizes, delayed fledging, and reduced nest success (Whitfield 1994). Whitfield and Strong (1995) found that flycatcher nestlings fledged after July 20th had a significantly lower return rate and cowbird parasitism was often the cause of delayed fledging.

Territory size

Southwestern willow flycatcher territory size likely fluctuates with population density, habitat quality, and nesting stage. Estimated territory sizes are 0.59 to 3.21 acres for monogamous males and 2.72 to 5.68 acres for polygynous males at the Kern River (Whitfield and Enos 1996), 0.15 to 0.49 acres for birds in a 1.48 to 2.22 acre patch on the Colorado River (Sogge 1995c), and 0.49 to 1.24 acres in a 3.71 acre patch on the Verde River (Sogge 1995a). Territories are established within a larger patch of appropriate habitat sufficient to contain several nesting pairs of flycatchers. These birds appear to be semi-colonial nesters.

Movements

The site and patch fidelity, dispersal, and movement behavior of adult, nestling, breeding, non-breeding, and migratory southwestern willow flycatchers are just beginning to be understood (Kenwood and Paxton 2001, Koronkiewicz and Sogge 2001). From 1997 through 2000, 66 to 78 percent of flycatchers known to have survived from one breeding season to the next returned to the same breeding site; conversely, 22 to 34 percent of returning birds moved to different sites (Luff *et al.* 2000). A large percentage (75%) of known surviving 2000 adults returned in 2001 to their same breeding site (Kenwood and Paxton 2001). Just considering Roosevelt Lake in its entirety, all but three surviving birds (n=28) banded at Roosevelt Lake returned to Roosevelt Lake (Kenwood and Paxton 2001). Although most southwestern willow flycatchers return to former breeding areas, flycatchers can regularly move among sites within and between years (Kenwood and Paxton 2001). Within-drainage movements are more common than between-drainage movements (Kenwood and Paxton 2001). Kenwood and Paxton (2001) noted year to year movements of birds between the San Pedro/Gila river confluence and Roosevelt Lake, the

Verde River near Camp Verde and Roosevelt Lake, and the Little Colorado River near Greer and Roosevelt Lake. Typical distances moved range from 1.2 to 18 miles. However, long-distance movements of up to 137 miles have been observed on the lower Colorado River and Virgin River (McKernan and Braden 2001). In 2002, a Roosevelt flycatcher relocated to the Lake Mead Delta and a lower Colorado River bird moved to Roosevelt. Another lower Colorado River bird moved to the Kern River in California (E. Paxton, pers. comm. 2002).

Rangewide distribution and abundance

Unitt (1987) documented the loss of more than 70 southwestern willow flycatcher breeding locations rangewide (peripheral and core drainages within its range) estimating the rangewide population at 500 to 1,000 pairs. There are currently 221 known southwestern willow flycatcher breeding sites in California, Nevada, Arizona, Utah, New Mexico, and Colorado (all sites from 1993 to 2001 where a resident flycatcher has been detected) holding approximately 986 territories (Sogge et al. in prep., U.S. Fish and Wildlife Service 2002b). It is difficult to arrive at a grand total of flycatcher territories since not all sites are surveyed annually to determine the actual abundance of birds. Also, sampling errors 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), and it is likely that the total breeding population of southwestern willow flycatchers fluctuates. Numbers have increased since the bird was listed and some habitat remains unsurveyed; however, after nearly a decade of intense surveys, the existing numbers are consistent with the upper end of Unitt's 1987 estimate. About 40 to 50 percent of the 986 territories (Table 1) currently found throughout the subspecies' range are located at three locations (Cliff/Gila Valley - NM, Roosevelt Lake - AZ, San Pedro/Gila confluence - AZ).

Descriptions of flycatcher distribution can be difficult to understand due to the use of different terms. The territory is the most universal and least confusing term, because it represents a singing male during the breeding season (Sogge *et al.* 1997). However, the words breeding "site," "location," or "group" are not necessarily defined the same throughout the bird's range. In Arizona, sites tend to represent a discreet patch of vegetation that contains flycatcher territories. Therefore, a "location" like the Gila/San Pedro confluence at Winkelman, Arizona, is comprised of many "sites." "Breeding groups" tend to describe a general geographic location where flycatcher territories exist, similar to a "location." Other states may define "sites" a little differently, and a larger "location" may be more synonymous with a "site."

Rangewide, the population is comprised of extremely small, widely-separated breeding groups including unmated individuals. For example, in Arizona, 63 percent (29/46) of the sites where flycatchers were found in 2001 (Smith *et al.* 2002) were comprised of 5 or fewer territories. In Arizona during the 2001 season, all but "The Salt River Inflow" site at Roosevelt Lake had 20 pairs or less (Smith *et al.* 2002). Rangewide, 76 percent of all sites from 1993 to 2001 had 5 or less flycatcher territories present at the site (Sogge *et al.* in prep.). Conversely, across the bird's range, there are fewer than 6 sites with greater than 50 territories (Sogge *et al.* in prep.).

The distribution of breeding groups is highly fragmented, often separated by considerable distance. In Arizona, about a 55-mile straight-line distance exists between breeding flycatchers at Roosevelt Lake and the next closest territories on the San Pedro River, Pinal County or Verde River, Yavapai County.

The large distances between breeding groups and the small size of those populations reduces meta-population stability and increases the risks of local extirpation due to stochastic events, predation, cowbird parasitism, and other factors (U.S. Fish and Wildlife Service 2002b). Conversely, having 40 to 50 percent of the entire subspecies at just three locations can also create great instability should catastrophic events occur that would remove or significantly reduce habitat suitability at those places. Willow flycatchers no longer occur (based upon most recent years survey data) at 65 of the 221 sites located and/or tracked rangewide since 1993 (Sogge *et al.* in prep.). All but two of these 65 sites had less than 5 flycatcher territories present prior to extirpation. The two exceptions (PZ Ranch on the San Pedro River and Colorado River Delta at Lake Mead) were destroyed by fire and lake inundation, respectively. There needs to be

Table 1. Rangewide population status for the southwestern willow flycatcher based on 1993 to 2001 survey data for Arizona, California, Colorado, New Mexico, Nevada, Utah, and Texas ¹ .				
State	Number of sites with WIFL territories 1993-01 ²	Percentage of sites with WIFL territories 1993-01	Number of territories ³	Percentage of total territories
Arizona	95	43 %	359	36 %
California	77	35 %	256	26 %
Colorado	5	1 %	37	4 %
Nevada	10	5 %	73	7 %
New Mexico	32	15 %	258	26 %
Utah	2	1 %	3	0.3%
Texas	?	?	?	?
Total	221	100 %	986	100 %

¹Sogge et al. in prep..
²Site boundaries are not defined uniformly throughout the bird's range.
³ Total territory numbers recorded are based upon the most recent years survey information from that site between 1993 and 2001.

considerable progress to reach greater meta-population stability through developing numerous robust populations in close proximity to each other (U.S. Fish and Wildlife Service 2002b). Today, flycatchers are primarily found in small numbers with large distances between them, and nearly half of the entire sub-species can be found at three locations.

The survival and recovery of the flycatcher is not dependent on having a few locations with large numbers of birds, but rather properly distributed populations placed close together (U.S. Fish and Wildlife Service 2002b). Southwestern willow flycatchers are believed to function as a group of meta-populations (U.S. Fish and Wildlife Service 2002b). Esler (2000) describes Levins' meta-population theory as that which addresses the demography of distinct populations (specifically extinction probabilities), interactions among sub-populations (dispersal and recolonization), and ultimately persistence of the aggregate of sub-populations, or the meta-population. Meta-population theory has been applied increasingly to conservation problems, in particular those cases where species' ranges have been fragmented by habitat alteration by humans. An incidence function analysis completed for the southwestern willow flycatcher incorporated a spatial component to estimate probabilities of habitat patch extinction and colonization (Lamberson *et al.* 2000). Modeling indicated that persistence of flycatcher populations is reduced when populations are small and widely distributed. Conversely, meta-populations are more stable when sub-populations are large and close together. However, where populations exceed 25 pairs, it is best to colonize a new site, rather than risk the effects of catastrophic events (fire, disease, flood, etc.).

The flycatcher's habitat is dynamic and can change rapidly: nesting willow habitat can grow out of suitability; saltcedar habitat can develop from seeds to suitability in five years; heavy runoff can remove/reduce habitat suitability in a day; or river channels, floodplain width, location, and vegetation density may change over time. Because of those changes, flycatcher "habitat" is often defined as either suitable or potential (U.S. Fish and Wildlife Service 2002b). A subset of suitable habitats are actually occupied by breeding flycatchers. Together, these dynamic habitats are essential to the survival and recovery of the flycatcher (U.S. Fish and Wildlife Service 2002b). The development of flycatcher habitat is a dynamic process involving maintenance, recycling, and regeneration of habitat. Flycatcher habitat can quickly change and vary in suitability, location, and occupancy over time (Finch and Stoleson 2000).

Arizona distribution and abundance

Unitt (1987) concluded that "...probably the steepest decline in the population level of *E. t. extimus* has occurred in Arizona..." Historical 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).

Soon after listing and following the 1996 breeding season, 145 territories were known to exist in Arizona. In 2001, 346 territories were detected from 46 sites along 11 drainages in Arizona (Smith *et al.* 2001); a statewide increase of 201 territories. During this increase in statewide numbers, some sites became unoccupied or had reductions in number of territories, other new sites were detected, and some sites grew in numbers and better surveys provided more comprehensive information on actual abundance (Sogge *et al.* in prep.). Since 1995, the increase of 184 territories (75 to 259) at Roosevelt and at San Pedro/Gila River confluence represents almost 90 percent of the statewide growth. Survey effort was initially a factor in

detecting more birds at San Pedro/Gila river confluence (more recently, habitat growth has occurred), but the Roosevelt population grew as a result of increased habitat development and bird reproduction in the conservation pool of the reservoir.

While numbers have increased in Arizona and significantly at a few specific areas, distribution throughout the state has not changed much. Recovery and survival of the flycatcher depend not only on numbers of birds, but also territories/sites that are well distributed (U.S. Fish and Wildlife Service 2002b). Currently, the Arizona population is concentrated in two large populations (Roosevelt and San Pedro/Gila River confluence). Unmitigated losses in either of these significant populations could greatly change the status and survival of the bird in Arizona. Conversely, expansion into new habitats, discovery of other populations, or distribution of birds into additional areas would improve the stability and status of the flycatcher.

As reported by Smith *et al.* (2002), the largest concentrations or breeding locations of willow flycatchers in Arizona in 2001 were at the Salt River and Tonto Creek inflows to Roosevelt Lake (255 flycatchers, 141 territories); near the San Pedro/Gila river confluence (219 flycatchers, 118 territories); Gila River, Safford area (46 flycatchers, 21 territories); Alamo Lake on the Bill Williams River (includes lower Santa Maria and Big Sandy river sites) (39 flycatchers, 21 territories); Topock Marsh on the Lower Colorado River (26 flycatchers, 14 territories); Lower Grand Canyon on the Colorado River (21 flycatchers, 12 territories); Big Sandy River, Wikieup (14 flycatchers, 10 territories); and Alpine/Greer on the San Francisco River/Little Colorado River (5 flycatchers, 3 territories). The greatest numbers of flycatchers are found at two locations. Roosevelt Lake and the San Pedro/Gila confluence make up 259 (75%) of the 346 territories known in the state.

Some areas of Arizona have recently declined in known flycatcher abundance, specifically northern Arizona near/along the Colorado Plateau east through the White Mountains in central/eastern Arizona. Small populations have existed along the Colorado River in the Grand Canyon and upper Lake Mead (n=13), Little Colorado River (n=2), San Francisco River (n=1), and Verde River (no information in 2001). The known populations at these sites declined from a known high of 35 territories in 1996 to 16 territories in 2001 (Smith *et al.* 2002).

Only 68 (20%) of all known Arizona flycatcher territories in 2001 (40 on Gila River, 26 on Colorado River, 2 on Bill Williams River) were found below dams. Territories are primarily found on free-flowing streams or surrounding impoundments. At Roosevelt (n=141) and Alamo (n=21) reservoirs, 162 territories (47% of statewide total) are found in the reservoir bottom (Smith *et al.* 2002). Recorded for the first time in the 2002 season, 5 to 10 territories were discovered in the conservation space of Horseshoe Reservoir on the Verde River (M. Ross, Tonto National Forest, Phoenix, pers. comm. 2002). The lowest elevation where territorial pairs were detected was 459 feet at Topock Marsh on the Lower Colorado River; the highest elevation was at the Greer River Reservoir (8,202 feet).

Fire as a Threat

Evidence suggests that fire was not a primary disturbance factor in most southwestern riparian areas near larger streams (U.S. Fish and Wildlife Service 2002b). Yet, in recent time, fire size and frequency have increased on the lower Colorado, Gila, Bill Williams, and Rio Grande rivers. The increase has been attributed to increasing dry, fine fuels and ignition sources. The spread of the highly flammable exotic plant, saltcedar, and drying of river areas due to river flow regulation, water diversion, lowering of groundwater tables, and other land practices is largely responsible for these fuels. A catastrophic fire in June of 1996 destroyed approximately a half mile of occupied saltcedar flycatcher habitat on the San Pedro River. That fire resulted in the forced dispersal or loss of up to 8 pairs of flycatchers (Paxton *et al.* 1996). Recreationists cause over 95 percent of the fires on the lower Colorado River (U.S. Fish and Wildlife Service 2002b). Brothers (1984) attributed increased fire along the Owens River in California to increased use of the riparian zones by campers and fishermen in the past 30 years.

Mortality

It is likely most flycatchers live 1-3 years, with many living 4 years, and some individuals surviving 5 to at least 8 years (U.S. Fish and Wildlife Service 2002b). There are no extensive records for the actual cause of southwestern willow flycatcher mortality. Incidents associated with nest failures, human disturbance, and nestlings are typically the most often recorded due to the static location of nestlings, eggs, and nests. As a result, nestling predation and brood parasitism are the most commonly recorded causes of southwestern willow flycatcher mortality. Also, human destruction of nesting habitat through bulldozing, groundwater pumping, and aerial defoliant has been recorded in Arizona (T. McCarthey, AGFD, pers. comm. 2002). Human collision with nests and spilling the eggs or young onto the ground have been documented near high use recreational areas (U.S. Fish and Wildlife Service 2002b). A southwestern willow flycatcher from the Greer Town site, along the Little Colorado River in eastern Arizona, was found dead after being hit by a vehicle along SR 373. This route is adjacent to the breeding site (T. McCarthey, AGFD, pers. comm.).

Reproductive success

In 2001, a total of 426 nesting attempts were documented in Arizona at 40 sites (Smith *et al.* 2001). The outcome from 329 nesting attempts was determined (not every nesting attempt was monitored). Of the 329 nests monitored, 58 percent (n=191) were successful, 35 percent failed (n=114), and 7 percent (n=24) had an outcome which could not be determined. Causes of nest failure were predation (n=82), nest desertion (n=10), brood parasitism (n=6), infertile clutches (n=12), weather (n=2), and unknown causes (n=2). Cowbirds may have contributed to other abandoned nests, but no direct evidence was detected. Three parasitized nests fledged willow flycatchers along with cowbird young. Nine sites had cowbird trapping in 2001 (Alamo Lake, Greer/Alpine [Alpine Horse Pasture and Greer River Reservoir], Roosevelt [Lakeshore], and Winkelman [CB Crossing, Cook's Lake, Dudleyville Crossing, Indian Hills, and Kearny]).

Intensive nest monitoring efforts in California, Arizona, and New Mexico have shown that cowbird parasitism and/or predation can result in the following: failure of the nest; reduced

fecundity in subsequent nesting attempts; delayed fledging; and reduced survivorship of late-fledged young. Cowbirds have been documented at more than 90 percent of sites surveyed (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Camp Pendleton 1994, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, Whitfield 1994, Tomlinson 1997, Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, Maynard 1995, McDonald *et al.* 1995, Sferra *et al.* 1995, Sogge 1995a, b, San Diego Natural History Museum 1995, Stransky 1995, Whitfield and Strong 1995, Griffith and Griffith 1996, Skaggs 1996, Spencer *et al.* 1996, Whitfield and Enos 1996, Sferra *et al.* 1997, McCarthy *et al.* 1998). The probability of southwestern willow flycatchers successfully fledging their own young from a cowbird parasitized nest is low (i.e. <5%). Also, nest loss due to predation appears consistent from year to year and across sites, generally in the range of 30 to 50 percent. Documented predators of southwestern willow flycatcher nests identified to date include common king snake (*Lampropeltis getulus*), gopher snake (*Pituophis catenifer affinis*), Cooper's hawk (*Accipiter cooperii*), yellow-breasted chat (*Icteria virens*), and western screech owl (*Otus kennicottii*) (Paxton *et al.* 1997, McCarthy *et al.* 1998, Paradzick *et al.* 2000, Smith *et al.* 2002). Other likely willow flycatcher predators, including Clark's spiny lizard (*Sceloporus clarkii*) and spotted skunk (*Spilogale putorius*), were documented by video nest surveillance on other nesting surrogate passerines. These limited, but thorough observations of nests, demonstrate a wide variety of willow flycatcher nest predators. It is expected that other common predators of passerines, such as grackles and cowbirds, also eat flycatcher eggs and nestlings.

Cowbird trapping has been demonstrated to be an effective management strategy for increasing reproductive success of the southwestern willow flycatcher in certain areas 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 may have 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.

Past Consultations

Since listing in 1995, at least 80 Federal agency actions have undergone (or are currently under) formal section 7 consultation throughout the flycatcher's range. Six actions have resulted in jeopardy decisions. Many activities continue to adversely affect the distribution and extent of all stages of flycatcher habitat throughout its range (development, urbanization, grazing, recreation, native and non-native habitat removal, dam operations, river crossings, ground and surface water extraction, etc.). Stochastic events also continue to adversely affect the distribution and extent of flycatcher habitat.

We provided an RPA in a jeopardy opinion developed by us (U.S. Fish and Wildlife Service 1996a) for Phelps Dodge's Verde Valley Ranch development near Clarkdale, AZ. This development was adjacent to the only known one to two pairs of flycatchers on the Verde River

at that time. The land has not yet been developed, but the flycatcher site (Tuzigoot Bridge) has been unoccupied by flycatchers since 1996 (Paradzick *et al.* 2001). The RPA directed Phelps Dodge (in cooperation with State Parks, AGFD, and National Park Service) to manage a two-mile stretch of river at the Tuzigoot Bridge for the flycatcher (within the Verde Greenway). A management plan was completed by SWCA, Inc. (2000). However, since the development has not begun, any on-the-ground management will occur when the development breaks ground. Phelps Dodge believes that development of this site could occur in 2003 (D. Meidinger, Phelps Dodge, pers. comm.).

Anticipated or actual loss of occupied flycatcher habitat due to Federal or federally permitted projects (modification of Roosevelt Dam, operation of Lower Colorado River dams, etc.) has resulted in biological opinions that led to acquisition of otherwise unprotected property specifically for the southwestern willow flycatcher. A small portion of the lower San Pedro River was acquired by the Bureau of Reclamation as a result of raising Roosevelt Dam and is now currently under the management of The Nature Conservancy. In 2002, 17 flycatcher territories were detected on this property (Alex Smith, Arizona Game and Fish Department, pers. comm. 2003). Commitments to acquire and manage unprotected habitat specifically for breeding flycatchers have been made for loss of flycatcher habitat along the lower Colorado River (Operations of Colorado River dams and 4.4 Plan/Change in Points of Diversion), Big Sandy River (Hwy 93 Bridge), Verde River (Mingus Ave. Bridge), Tonto Creek and Salt River (raising of Roosevelt Dam) in AZ, and Lake Isabella, CA (operation of dams).

Summary

Historically, the southwestern willow flycatcher declined in extent of range occupied and population size as a result of habitat loss, modification, and fragmentation. The known number of flycatcher pairs throughout its range has increased since the bird was listed in 1995, but still remains within the 500 to 1,000 pairs estimated by Unitt (1987). Approximately half of all the known breeding pairs are found at three locations throughout the subspecies range (Cliff/Gila Valley, New Mexico; Roosevelt Lake and Gila/San Pedro river confluence, Arizona). Water diversions, agriculture return flows, flood control projects, development, livestock grazing, and changes in annual flows due to off stream uses of water have affected the ability of the aquatic habitats to support native fish, plants, and wildlife. Riparian habitats by nature are dynamic, with their distribution in time and space governed mostly by flood events and flow patterns. Current conditions along southwestern rivers and streams are such that normal flow patterns have been greatly modified, catastrophic flood events occur with greater frequency as a result of degraded watershed conditions, stream channels are highly degraded, floodplains and riparian communities are reduced in extent and quality, wildfires in riparian habitats are increasing, and the species composition of riparian communities are modified with exotic plant species. Habitat loss and fragmentation leads to increased brood parasitism and nest predation. These conditions have significantly diminished the potential for southwestern rivers and streams to develop suitable habitat for the southwestern willow flycatcher and for those habitats to remain intact and productive for nesting flycatchers. Recent habitat acquisition and protection and other conservation measures resulting from section 7 consultations have provided some limited

protection for flycatchers and their habitat. The recently completed recovery plan provides guidance to agencies, wildlife managers, and landowners as to how these trends can be reversed and, ultimately, how the species can be recovered.

ENVIRONMENTAL BASELINE

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

The “action area” means all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. Indirect effects are those that are caused by the action and are later in time, but are still reasonably certain to occur (50 CFR 402.02). The effects of the action result from: 1) continued operation of Roosevelt Dam, and 2) proposed mitigation and monitoring activities that are part of the HCP. The environmental baseline includes past and present continued operation of Roosevelt Dam and its associated impacts at and downstream of Roosevelt, as well as modifications to the dam which now allow somewhat different operational regimes. Due to low runoff, the new conservation space (elevation 2,136-2,151') has not been used to date. Construction and operation of that new space was analyzed in consultation with Reclamation in our 1996 biological opinion.

Operation of Horse Mesa, Mormon Flat and Stewart Mountain dams, constructed in the 1920s and 1930s on the Salt River below Roosevelt, are affected by the operation of the much larger Roosevelt Dam and Lake, which provide 71% of water storage capacity in SRP's system of reservoirs. Operation of these dams and Granite Reef Diversion Dam, at the confluence of the Salt and Verde rivers, affects downstream reaches of the Salt and Gila rivers. Effects attenuate with distance from Granite Reef Diversion Dam. As a result, the action area includes Roosevelt Dam and Lake, and reaches of the Salt and Gila rivers downstream of Roosevelt Dam.

Operation by SRP of the dams and reservoirs on the Verde River, including Bartlett Dam, constructed in the 1930s, and Horseshoe Dam, located upstream from Bartlett, and completed in 1945, is not as directly related to operation of the Salt River dams and reservoirs. The Verde reservoirs are operated primarily to meet downstream water demands during the winter months, whereas the Salt River reservoirs are operated to meet downstream demands primarily in the summer, when demands are much higher. Operation of power plants on the Salt River dams is also needed during the summer to meet demands in the Phoenix area; the Verde dams do not have hydroelectric generating capacity. The effects of past and present operation of Bartlett and Horseshoe dams are part of the environmental baseline because mitigation and minimization measures are proposed for the lower Verde for the bald eagle that may also benefit other covered species. Future effects to listed species of operating Bartlett and Horseshoe dams and reservoirs

are addressed as cumulative effects, herein, because they are effects of non-Federal activities reasonably certain to occur in the action area (50 CFR 402.02).

Mitigation sites outside of the lower Verde are also part of the action area, which will include lands along the lower San Pedro River as well as lands in the Verde Valley, Gila River in the Safford Valley, and potentially on the Gila River upstream from Safford, Arizona to Cliff, New Mexico; the middle San Pedro River Valley near Redington; the Salt River, Tonto Creek, and their tributaries above Roosevelt; the Hassayampa River near Wickenburg, Arizona; the lower Salt and Gila rivers near and downstream of their confluence, the Santa Cruz River between Tucson and Nogales, and possibly elsewhere in Arizona river systems.

The environmental baseline is described below by action area region:

Salt River - Roosevelt Lake to Gila River Confluence

In the late 1800s, Tonto Creek was described as timbered with local creek bottom trees from bluff to bluff; however, by the 1920s the creek was “little more than a gravel bar from bluff to bluff” (Croxen 1926). Severe overgrazing in the watershed followed by heavy rainfall and torrential flooding in the 1890s scoured out the riparian vegetation in what is now Roosevelt Lake. Croxen (1926) describes a flood in 1891 that scoured out agricultural lands in the reservoir bed and “filled the gorge where it entered Salt River at the present site of Roosevelt Dam.” As a result, we do not know what vegetation communities occurred in the bed of the reservoir prior to this period. Figure II-1 of ERO (2002) shows a portion of the reservoir bed in 1904; little riparian vegetation was present. A photo of the Roosevelt Dam site taken in 1898, shows the same lack of vegetation (Fig. 2).

Theodore Roosevelt Lake was created with the completion of Roosevelt Dam in 1911. As originally constructed, Roosevelt Dam was 280 feet high and had a water storage capacity of 1,284,205 acre-feet. Subsequently, capacity slightly increased and decreased over time as the spillway was modified and silt accumulated. From 1989 through early 1996, Roosevelt Dam was subjected to extensive modifications by Reclamation to provide additional conservation storage capacity (to 1,653,043 acre-feet) and to address safety concerns identified under the Reclamation Safety of Dams Act of 1978 (43 USC § 506 et seq.). The modified dam provides for additional water conservation storage space, dam safety, and for the first time, dedicated flood control space. The top of SRP’s original conservation storage space was at an elevation 2,136 feet. This elevation represents the existing storage capacity held by SRP in 1995 when modifications to the dam were completed to add additional conservation storage and flood control space to Roosevelt. The top of the new conservation space is at elevation 2,151 feet. The uppermost increment of storage behind Modified Roosevelt, from elevation 2,151 feet up to elevation 2,218 feet, is reserved for flood control and dam safety purposes. The rights to use water stored in the additional conservation capacity in Modified Roosevelt are vested in the six Salt River Valley cities of Chandler, Glendale, Mesa, Phoenix, Scottsdale, and Tempe (see Appendix 2 of the HCP). The Salt River Pima-Maricopa Indian Community is also entitled to

use a portion of the new conservation space pursuant to the Salt River Pima-Maricopa Indian Community Water Rights Settlement Act (102 Stat. 2549). The reservoir also is an important recreation site, and supports boating, camping, fishing, and other recreational pursuits.



Fig. 2. Roosevelt Dam site, 1898

The watershed above Roosevelt is approximately 5,793 square miles of land and forms at the confluence of the Salt River and Tonto Creek. The Roosevelt Lake watershed is managed primarily by the Tonto National Forest, White Mountain Apache Tribe, and the San Carlos Apache Tribe, and is characterized by a variety of biotic communities, including Arizona upland subdivision of Sonoran Desert scrub in the immediate vicinity of the reservoir, and semidesert grasslands, plains/Great Basin grassland, interior chaparral, madrean evergreen woodland, great basin conifer woodland, and montane conifer forests (Brown and Lowe 1980, Brown 1982). Roosevelt Lake supports the greatest acreage of riparian vegetation in the action area outside of the mitigation areas; we describe these riparian communities in greater detail below (beginning on page 31). Additional information about historical communities, effects of human uses in the watershed, management, and other information about the Roosevelt Lake watershed can be found in our 1996 biological opinion, and is included here by reference.

From Roosevelt Dam to Granite Reef Diversion Dam, the Salt River flows through canyons characterized by Sonoran Desert scrub and 3 dams that impound most of this reach. The reservoirs (Saguaro, Canyon, and Apache Lakes, from west to east) are heavily used by

recreationists from the Phoenix area. Canyons and Lakes along this reach provide little habitat for development of riparian vegetation. At Granite Reef Diversion Dam, the remaining flow of the Salt and Verde rivers is diverted into the Southern and Arizona canals for use in the Phoenix area. Surface water and associated riparian vegetation below Granite Reef are limited to a few relatively short reaches (e.g. under the 101 and 202 freeway interchange, Tempe Town Lake, and downstream of 23rd Avenue). The sewage treatment plants at 23rd and 91st avenues and return agricultural flow provide reaches of dependable surface flow, and in places, well-developed riparian woodlands, for the last several miles upstream of the Gila River confluence.

Gila River Downstream of Salt River Confluence

This 198-mile reach is the lower end of the Gila River basin, which drains about 58,200 mi². Two dams are in this reach. Gillespie Dam at river mile 164 was built in 1921 to divert flow into irrigation canals; however, during flooding in 1993 a 135+ foot section of the dam collapsed; the dam is no longer functional. Painted Rock Dam, constructed in 1959 at river mile 126, has a capacity of 2.5 million acre-feet, and was built as a flood control structure. Painted Rock Lake is typically dry or nearly dry except after flood events on the river (U.S. Army Corps of Engineers 1957, Ohmart 1982b, Arizona Department of Water Resources 2002).

The Gila River in this reach flows through broad valleys. Agriculture lies adjacent to the river from the Salt River confluence to Gillespie Dam, above Painted Rock Lake in the Gila Bend area, near Agua Caliente, and from Texas Hill (river mile 68.5) downstream to the Colorado River confluence. Where agriculture is absent, the river flows through the lower Colorado River subdivision of Sonoran Desert scrub (Turner and Brown 1982). University of Arizona (1970) describes upland plant communities in the reach downstream of Texas Hill.

Due to effluent and return agricultural flows, the Gila River is perennial from the Salt River confluence to about Gillespie Dam. The river is perennial to intermittent due to return agricultural flows from Texas Hill to the Colorado River confluence. In these reaches the river supports significant riparian vegetation, particularly stands of saltcedar, and less commonly, honey mesquite, screwbean mesquite (*Prosopis pubescens*), cottonwood, and willows (Ohmart 1982b).

Mitigation Sites

Verde Valley

The Verde River watershed encompasses about 6,600 mi² of central Arizona. The Verde River is the third largest river in central Arizona, is unregulated for about 75 percent of its length, is a historical location for breeding flycatchers, and is centrally located in the state and the subspecies range. The Verde River through the Verde Valley is characterized by a wide flood basin once dominated by Fremont cottonwoods with a dense understory. Although cottonwood stands and riparian vegetation still persist, they are now fragmented and dense understory is

largely absent (Paxton *et al.* 1997). The quality and quantity of suitable aquatic and riparian habitat for threatened and endangered wildlife in the Verde Valley has been affected through numerous past actions resulting in reduction of riparian habitat, altered species composition, decreased surface water availability, changes in stream morphology, and other factors. A significant portion of the adverse impacts to the Verde River and its aquatic and riparian ecosystem come from the additive effect of small actions that individually may not threaten the system, but cumulatively result in continuing deterioration of the ecosystem.

The Verde River ecosystem has undergone major changes in the past 150 years, with the Verde Valley area being the most highly modified (excluding the construction and operation of Horseshoe and Bartlett dams and lakes). Human populations in Yavapai County have increased dramatically. Eight incorporated cities (Camp Verde, Chino Valley, Clarkdale, Cottonwood, Jerome, Prescott, Prescott Valley, and Sedona) exist within the county. The population has increased over the last 50 years, especially since the 1970s. The human population was in the 100s in the 1870s, and grew to 24,991 in 1950, 37,005 in 1970, 68,145 in 1980, and 107,714 in 1990 (Office Assist Enterprises 1999). In the 1998 the population of Yavapai County was 148,500 people. Since 1998, the county has continued to grow in population. Camp Verde itself has a population of approximately 9,500 people. All of the incorporated communities in Yavapai County and some other adjacent counties and communities use the Verde River and/or its watershed for water, recreation, housing, industrial, agricultural, and commercial use. The volume and pattern of flow in the river, particularly within the Verde Valley, has been modified by human uses, including water diversion, groundwater pumping, and watershed alteration. The river channel has been modified by removal or use of riparian vegetation, flood control, construction of diversion dams, roads and bridges, gravel mining, livestock grazing, and agricultural/suburban development in and adjacent to the floodplain. Urbanization has also increased the demand for recreational use of remaining riparian areas for trails, campgrounds, and use of river areas for off-road vehicles, etc. Developments and recreation increase trash, lawns, bird feeders, and habitat fragmentation, and as a result, an increase in predators of passerines such as cowbirds, house cats, grackles, and ravens (Ehrlich *et al.* 1988, Rodriguez-Estrella *et al.* 1991, Knight *et al.* 1995, McCarthy *et al.* 1998, Finch and Stoleson, 2000, U.S. Fish and Wildlife Service 2002b).

The entire flow of the Verde River can be diverted between the Town of Cottonwood and Oak Creek for agricultural purposes, before water is returned to the riverbed. While surface water diversion of nearly 20,000 acre feet have occurred annually from 1970 to 1990, groundwater pumping has increased from about 35,000 acre feet per year to just over 50,000 acre feet per year (from 1985 to 1990) (Tellman *et al.* 1997). It is likely that pumping has increased over the last 13 years. Verde Valley is not in an Active Management Area. Towns such as Prescott have all but eliminated the flow of Granite Creek into the Verde River (Tellman *et al.* 1997). Developments in areas such as Chino Valley use groundwater, which appears to be affecting surface water supplies downstream (Tellman *et al.* 1997, Wirt and Hjalmarsen 2000).

Verde River - Horseshoe Lake to Salt River Confluence

Horseshoe Lake to the Salt River confluence encompasses 50 river miles of the Verde River, with Horseshoe Dam at river mile 45.5 and Bartlett Dam at river mile 24.3. The only significant impoundments on the river are Horseshoe Dam, completed in 1946 with a storage capacity of about 131,427 acre feet in a lake that, when full, extends about 5 miles behind the dam, and Bartlett Dam, completed in 1939 with a storage capacity of 178,186 acre feet in a 12-mile-long lake (when full; Ohmart 1982a, ERO 2002). The watershed is managed primarily by the Tonto, Coconino, and Prescott National Forests. From Horseshoe Lake downstream to river mile 13.5, the Verde River flows through the Tonto National Forest. Downstream of this point it flows through the lands of the Fort McDowell Yavapai and Salt River Pima-Maricopa Indian communities.

The river in this reach primarily flows through hilly terrain and canyons, which limit the width of the floodplain. The largest patches of riparian vegetation occur just below Horseshoe Dam and from the confluence with the Salt River upstream for approximately 18 miles to Needle Rock. Vegetation is dominated by honey mesquite (*Prosopis glandulosa*) and saltcedar, with occasional patches of Fremont cottonwood (*Populus fremontii*) and willow (Ohmart 1982a).

Operation of Horseshoe and Bartlett dams has reduced flows during the winter, increased summer flows, and increased the number of days per year with no flow on the lower Verde. Fine sediments are trapped behind the dams, resulting in sediment depletion below the dams and poor substrates for regeneration of riparian trees (Beauchamp and Stromberg 2001, U.S. Fish and Wildlife Service 2002b). Flood flows have been attenuated, both in terms of number and duration of high flow events, but the relatively small storage space in the 2 reservoirs means that very large flows cannot be captured behind the dams, causing downstream flooding, as occurred in 1978, 1980, and 1993 (Beauchamp and Stromberg 2001, Sommers *et al.* 2002). Beauchamp and Stromberg (2001) found that operation of the dams has likely affected riparian communities by decreasing recruitment of early successional riparian species (willows and cottonwoods) and expansion of later successional species (e.g. mesquites and saltcedar). McNatt *et al.* (1980) found that Horseshoe and Bartlett dams have led to the demise of cottonwoods on the lower Verde River. This is a common effect of dam construction and operation in the Southwest, and has been observed on numerous river systems (see review in Briggs 1996). Sommers *et al.* (2002) agree that flow alteration has reduced the frequency and density of cottonwood establishment, but they believe land use factors, particularly grazing and recreation, are even more important than dam construction and operation in limiting native riparian plant communities (also see U.S. Fish and Wildlife Service 2002a, pp. 86-89). However, Vanessa Beauchamp (graduate student, Arizona State University, pers. comm. 2002), believes the effects of the dams and their operation are the most important limiting factors in shaping the riparian plant community (pers. comm. 2002).

Lower San Pedro River

The lower San Pedro River is one of the most important sites for southwestern willow flycatchers and is also where Reclamation has focused mitigation efforts for modified Roosevelt Dam. The San Pedro River is unregulated from its origins in northern Sonora to the Gila confluence. The watershed drains approximately 4,330 mi². The lower San Pedro River is that reach of the river downstream of The Narrows, approximately 10 miles north of Benson. Aravaipa Creek, which enters from the east approximately 5 miles upstream of Dudleyville, is the only significant tributary in the lower river. The San Pedro River corridor is recognized internationally for its cottonwood-willow gallery forests, mesquite bosques, and other riparian woodland types, as well as associated fauna, many species of which use the river as a corridor between Mexico and central Arizona (Arizona State Parks 1995, San Pedro Expert Study Team 1999, Commission for Environmental Cooperation 1999). Most of the San Pedro River downstream from Benson is intermittent (ADWR 1991). The reach from near the Aravaipa confluence downstream to the Gila River, where the most important flycatcher habitat exists, is described as intermittent by ADWR (1991), but perennial pools and river segments occur in this reach in adequate numbers to support fish populations and significant riparian woodlands (The Nature Conservancy 1999). A perennial reach of about four miles in length occurs south of Redington where groundwater is forced to the surface by shallow hardrock. A perennial cienega habitat occurs at Cook's Lake approximately 1.5 miles downstream of the Aravaipa confluence (ADWR 1991).

Historically, the river probably supported more cienega or marsh conditions and fewer riparian woodlands than today (Etz 1938, Hendrickson and Minckley 1984). A series of large floods resulted in channel entrenchment and loss of cienega conditions on the upper San Pedro River between 1880 and 1908 (Hereford 1993), and possibly as late as 1926 (Jackson *et al.* 1987). Presumably similar events occurred on the lower river at that time. Currently, land ownership is a mix of private and public. Agriculture in the floodplain is a major land use and has resulted in clearing of riparian woodlands and pumping of groundwater. Livestock grazing occurs both in the riparian corridor and in adjacent uplands. Copper mining occurs near Mammoth and ASARCO pumps groundwater from wells at PZ Ranch and a site near Indian Hills and pipes it to its mines near Hayden. Pumping by ASARCO is the largest anthropogenic consumptive use of groundwater in the lower basin (The Nature Conservancy 1999).

The 820-acre site acquired by Reclamation and managed by The Nature Conservancy (TNC) is known as the San Pedro River Preserve, and lies in the middle of what TNC refers to as the Dudleyville Site. This 11.3 mile reach, from the Gila confluence to just upstream of the Aravaipa Creek confluence, has been targeted by TNC for comprehensive conservation planning (The Nature Conservancy 1999).

Gila River - Safford Valley

The Gila River flows through the Safford Valley from about Sanchez, where the river leaves

the Gila Box and lands managed by the Bureau of Land Management, downstream to the boundary with the San Carlos Apache Reservation. Although there are no major facilities that regulate flows upstream of San Carlos Lake, many canals and diversions are present in and upstream of the Safford Valley. Portions of the flow in Eagle Creek are diverted at a low-head dam to Morenci for domestic and industrial purposes. Flows are similarly diverted from Bonita Creek for use by the City of Safford. In the Safford Valley, groundwater pumping has lowered the water table along the Gila River up to 25 feet (Lilburn and Associates 1984). Mining is historically significant upstream of the Safford Valley, particularly in the Clifton-Morenci area (Arizona State University 1979). Downstream of San Jose the river bottom is largely privately-owned. Much of these lands are developed for agriculture and ranching, which together with groundwater pumping and livestock grazing are the primary threats to flycatcher habitat in this area. However, considerable flycatcher habitat still exists in this reach in the form of cottonwood-willow forests and saltcedar thickets. Smith *et al.* (2001) report significant breeding populations of flycatchers at the Fort Thomas-Geronimo and Pima East sites in the Safford Valley. Many potentially suitable habitats have not been surveyed for flycatchers because access has been denied by landowners.

Other Potential Mitigation Sites

If SRP is not able to acquire and protect enough habitat on the lower San Pedro River, Verde River in the Verde Valley, and Gila River in the Safford Valley, they would seek acquisitions of riparian habitat at Pinto Creek, Hassayampa River, Santa Cruz River, lower Salt River, and or middle or lower Gila River. At Pinto Creek, some opportunities may exist for acquisition and restoration of riparian habitats that have potential for flycatchers. An approximate 5-mile reach of the Hassayampa River is perennial through the Wickenburg area, and some opportunities exist to work with The Nature Conservancy and other partners to protect habitat there. A single pair of nesting flycatchers was detected at The Nature Conservancy's Hassayampa River Preserve in 1998 (Paradzick *et al.* 1999). The Santa Cruz River is perennial from roughly the Potrero (or Nogales) Wash/Santa Cruz River confluence to Chavez Siding north of Tubac. Perennial flows in this area are sustained by flows from Potrero Creek and effluent discharged from the International Waste Water Treatment Plant at the Potrero Wash/Santa Cruz River confluence. The river corridor, which includes extensive stands of cottonwood-willow forests, is mostly privately owned. Although there are numerous opportunities for acquiring properties, flycatchers have rarely been recorded on the Santa Cruz and may not be abundant due to lack of suitable riparian thickets. Some potential exists for developing or improving flycatcher habitats on the middle or lower reaches of the Gila River. Probably few opportunities exist on the Salt River; such opportunities are probably limited to reaches from downstream of Granite Reef Dam. The U.S. Army Corps of Engineers is in early planning for riparian and wetland restoration projects for this reach of the Salt River. For additional historical and other information about these rivers, see Hendrickson and Minckley (1984) and Ohmart (1982a&b).

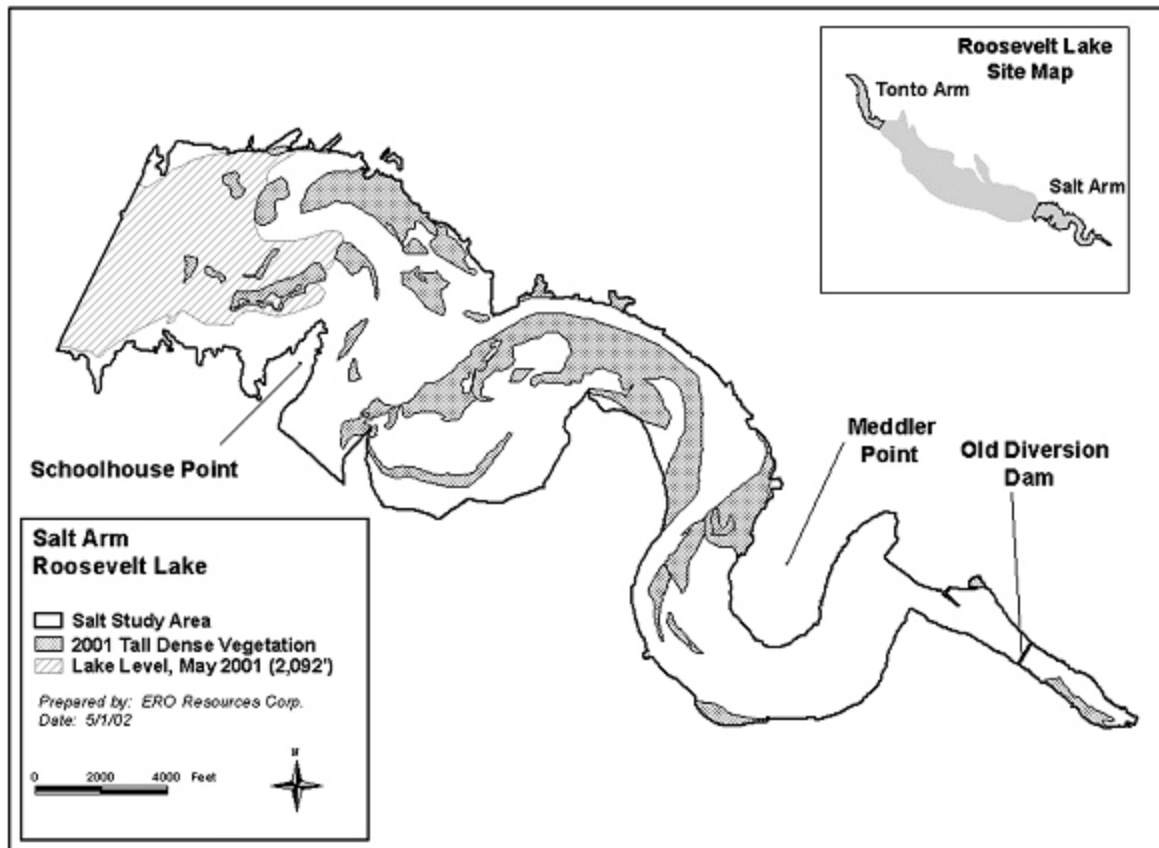


Fig. 3. Tall dense riparian vegetation on the Salt Arm of Roosevelt Lake (from U.S. Fish and Wildlife Service 2002).

Riparian Vegetation and Flycatcher Occupancy at Roosevelt Lake

Since reservoir creation, the amount of riparian vegetation has fluctuated with reservoir level and flood events. Currently, the riparian habitat at Roosevelt is a mixture of saltcedar, cottonwood, willow, seepwillow (*Baccharis salicifolia*), desert broom (*Baccharis sarothroides*), and arrowweed (*Pluchea sericea*). Similar to a natural system, riparian vegetation growth and loss is dynamic in the reservoir; however, the cycle occurs irregularly and is more extreme than on a natural system. Vegetation may be flooded or completely inundated for many months or years, resulting in complete kill of riparian vegetation. As the reservoir empties, groundwater drops below the rooting zone of many riparian plants, resulting in dessication and mortality. This is evident today on both the Salt River and Tonto Creek inlets to Roosevelt, where portions of the lakebed have not been inundated for several years. However, saturation of the lakebed can create conditions favorable for establishment of new vegetation or rejuvenation of existing vegetation. Establishment of new, suitable flycatcher habitat generally takes 3 to 5 years. Riparian vegetation grows within the reservoir bed, and along the reservoir margin and tributary

watercourses. Reservoir levels are primarily driven by the amount of precipitation in the watershed and reservoir releases. The changing water levels that accompany normal operation of the reservoir result in constantly changing amounts, types, and distribution of riparian vegetation. The dynamic cycle of disturbance and regeneration creates and then periodically inundates habitat used by flycatchers, Yuma clapper rails, bald eagles, and cuckoos.

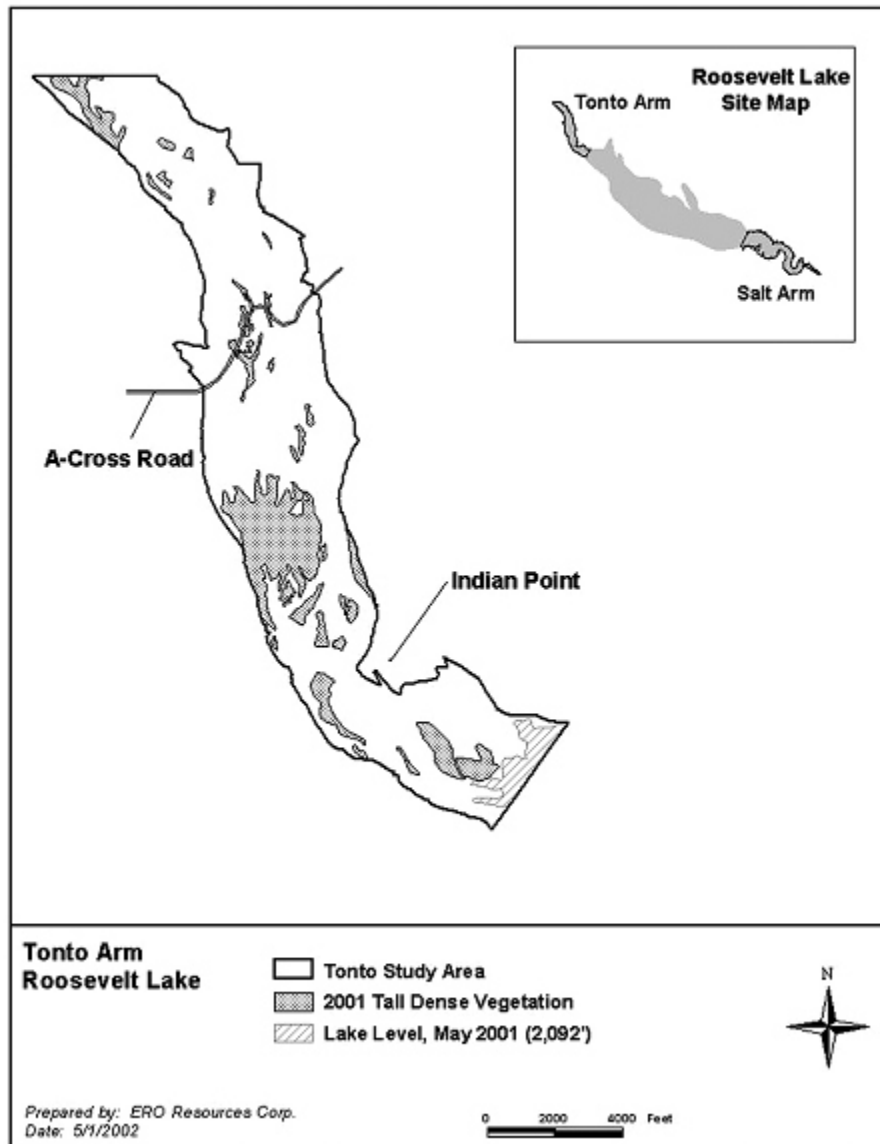


Fig. 4. Tall dense riparian vegetation on the Tonto Arm of Roosevelt Lake.

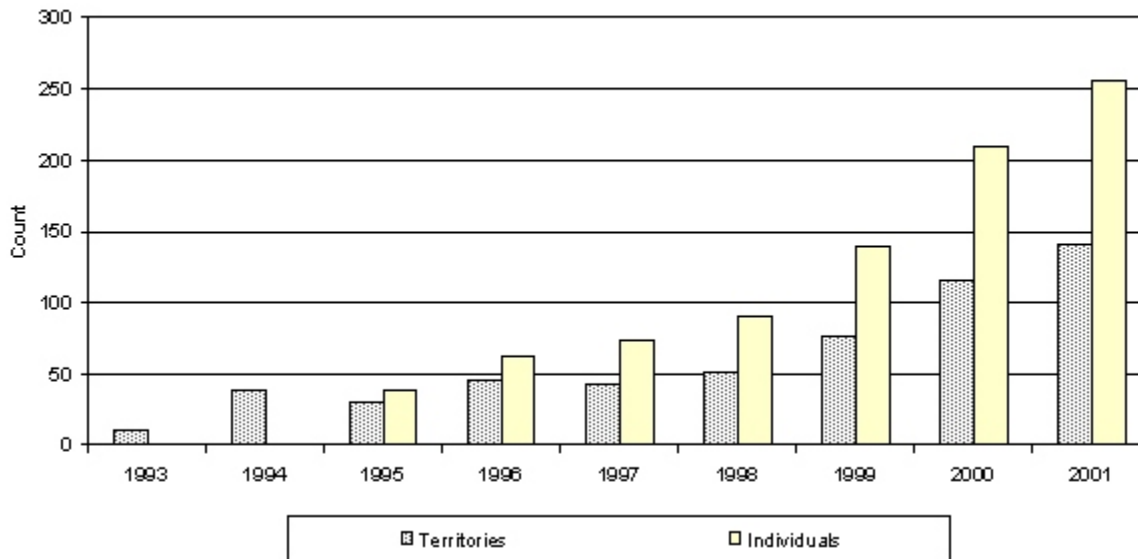


Fig 5. Numbers of southwestern willow flycatcher territories and individuals at Roosevelt Lake 1993-2001 (from U.S. Fish and Wildlife Service 2002). See text for 2002 data.

Riparian vegetation along much of the perimeter of Roosevelt Lake is extremely limited because of steep banks and seasonal and historical fluctuations in water levels that create a narrow margin of suitable conditions for that type of vegetation. Riparian vegetation is generally restricted to mouths of streams and the reservoir bed where slopes are gentle and there is available water from stream inflows, saturated soils, and the reservoir. At Roosevelt, the most extensive stands of riparian vegetation are present at the Tonto Creek and the Salt River inlets.

Several vegetation mapping efforts (SWCA 1999; ERO 2001; Ohmart 1982a) have been conducted to identify and characterize suitable habitat for the southwestern willow flycatcher.

Vegetation at the Salt River inflow varies from dense, predominately monotypic stands of saltcedar, willow, or saltcedar-dominated patches with an overstory of willows or cottonwoods. Additional stands of riparian habitat have become established on the reservoir bed as water levels in the lake have receded during the past 6 years (Smith *et al.* 2002), and an increasing number of mixed riparian patches have developed into suitable and occupied flycatcher breeding habitat. Riparian vegetation on the Tonto Creek inlet occurs in several distinct patches, some of which are mixed riparian with a cottonwood/willow overstory and saltcedar understory, while other areas are composed almost entirely of saltcedar.

Riparian vegetation at Roosevelt has been mapped recently into two principal categories: 1) tall dense vegetation, thought to be suitable for flycatcher nesting (Figs. 3 and 4), although only a portion is currently used as nesting habitat by flycatchers; and 2) other vegetation types that are not currently suitable for flycatcher nesting (ERO 2001). Vegetation mapping at Roosevelt was used to establish a basis for the analysis of impacts to existing and future changes in vegetation characteristics. Tall dense vegetation is composed of three vegetation types:

1) cottonwood/willow; 2) mixed riparian; and 3) saltcedar, all greater than 15 feet in height. A threshold height of 15 feet, as suitable nesting habitat, is based on data collected by AGFD at Roosevelt during several years of investigation (McCarthy *et al.* 1998, p. 73; Paradzick *et al.* 1999, p. 97; Paradzick *et al.* 2000, p. 92; Paradzick *et al.* 2001, p. 82). From these previous studies, the average nest height is about 23 feet with a standard deviation of about 6 feet. Thus, over 70 percent of nests are estimated to be located in trees and shrubs with a height greater than 15 feet. "Dense" indicates a predominately closed canopy as viewed from aerial photographs. The cumulative acreage of tall dense vegetation at Roosevelt suitable for flycatchers increases with elevation. A total of about 1,000 acres of tall dense riparian habitat was present at Roosevelt below an elevation of 2,151 feet in 2001. Lower portions of the reservoir bed contain less tall dense riparian habitat because these areas were recently inundated. At higher elevations the amount of tall dense vegetation also begins to decline because areas above an elevation of 2,136 feet historically did not have the hydrology to support large amounts of riparian vegetation growth.

Other vegetation types not typically used as breeding habitat by flycatchers were less than 15 feet tall, had sparse canopy cover, or were dying at the time the mapping was completed. This category includes mesquite bosques (woodlands) and herbaceous non-woody vegetation. Portions of these other vegetation types provide habitat for flycatchers to forage and disperse, and serve as an environmental buffer.

Roosevelt Lake was not surveyed for flycatchers until 1993. Their presence or absence until that time is uncertain; however, they probably occurred at the reservoir since suitable habitats developed there after dam construction, and may have been present before the dam was built, as well. The number of flycatcher territories and individuals at Roosevelt has grown steadily since 1993 (Figure 5). Although there was a slight decrease in the number of territories in 1995, the total number of territories detected increased over 10-fold from 1993 to 2001. In 2001, 255 individuals and 141 territories were identified at the Salt River and Tonto Creek inflows to Roosevelt Lake (Smith *et al.* 2002). This represents about 40 percent of flycatchers in Arizona, with 32 percent located at the Salt River inflow and 8 percent at the Tonto inflow. The status of the flycatcher at Roosevelt in 2002 changed in some important ways. Numbers of territories and individuals increased again to 147 and 274, respectively, but nest success declined to only 15% (as compared to 74% in 2001). The cause of reduced nest success is not entirely clear, but both predation and nest parasitism increased in 2002. Anticipated mortality of adult and juvenile birds before next year's breeding season (57 percent of banded flycatchers returned to Roosevelt in 1999-2000, Luff *et al.* 2000) combined with low nest success this year will likely result in fewer flycatchers at Roosevelt in 2003.

The elevation of the root crown of trees supporting flycatcher nests ranged from 2,090' to about 2,200' in 2000-2001 (nest tree elevation is not yet available for 2002). The largest number of nests at Roosevelt in both 2000 and 2001 were found at elevations 2,116'-2,130', in the old conservation space. Preliminary data suggest the elevation of the lowest nest tree root crown in 2002 was similar to 2000-2001. Nests in trees with root crowns in the new conservation space (>2,136') numbered 6 in 2000 and 3 in 2001. Nest trees were located at lower elevation in 2001 than 2000, which may be related to declining water levels and corresponding changes in the distribution of tall dense riparian vegetation.

Numbers of birds present in recent years is an indication of how many birds may be vulnerable to incidental take if waters rose in 2003; but because incidental take associated with operation of Roosevelt Dam is anticipated over a 50-year period, a predictive model is desirable to determine the maximum number of birds that is reasonably likely to be affected over the 50-year period of the permit. Numbers of flycatchers at Roosevelt since 1993 are correlated with increasing acreage of habitat as the reservoir level has declined. Thus, if acres of occupied habitat and density of flycatchers can be predicted from modeled reservoir levels, then numbers of flycatchers potentially affected in the future can be predicted. Our ability to predict acres of habitat is probably better than our ability to model future numbers of flycatchers (pg. 84, ERO 2002).

SRP's HCP uses 11.1-acre "neighborhoods" around nests as an estimate of presently occupied habitat and as an index to the number of breeding birds at Roosevelt. The neighborhood concept is derived from a multi-scaled model to map and rank potential flycatcher breeding habitat in Arizona in order to prioritize surveys and to detect changes in habitat over time ("AGFD model", Hatten and Paradzick, cited with permission, 2001). The habitat components of the AGFD model that were most highly correlated with breeding activity included: 1) the vegetation density immediately surrounding the nest (0.22 acre); 2) the vegetation density and characteristics within the broader 11.1-acre (394-foot radius) neighborhood of an observed breeding area; and 3) the amount of floodplain within an area of about 100 acres surrounding the site. The model was developed with data from Roosevelt.

Flycatchers defend territories 0.15-5.68 acres in size, with most territories ranging from 0.5-1.2 acres (see review in the Status of the Species, above). A team of biologists assembled to assist in the development of the HCP concluded that the amount of habitat used or occupied by flycatchers for nesting, foraging, dispersal and other behaviors was greater than the territory size. Several methods were considered to determine acreage of occupied habitat, and although not all biologists on the team agreed, most believed 11.1-acre neighborhoods provided a reasonable estimate of occupied habitat, and was the best of several methods considered. Other alternatives for quantifying and predicting take were rejected because they either were not thought to be closely correlated to flycatcher occupancy (e.g. acres of suitable or potential habitat; acres of riparian habitat; acreage in the reservoir below elevation 2,151; acreage of tall dense cottonwood, willow, and saltcedar habitats); or were not repeatable (expert panel and consensus of expert opinion). A discussion of the pros and cons of each method is outlined in "Methods

for Quantifying Effects of Roosevelt Dam Operations” (U.S. Fish and Wildlife Service 2001), also Appendix 5 of ERO (2002). Based on these analyses of alternative methods, we believe the 11.1-acre neighborhood model is the best technique available to estimate occupied habitat.

Using this method, neighborhoods were drawn around each nest site detected in 2001; total acreage within these neighborhoods was about 492 acres (Fig. 21 of U.S. Fish and Wildlife Service 2002). ERO then predicted the maximum probable occupied habitat affected by extrapolating trends in occupied habitat via two models for a period of 10 years from the last fill event (1995). Based on historical water levels, the reservoir has a very high probability of filling again in no more than 6-8 years following a fill event; therefore 10 years simulates a worst case in terms of time period between fill events (the models assume a correlation between acres of occupied habitat affected and time between fill events). The models predicted about 560-870 acres would be susceptible to flooding in 2004. There were no compelling reasons, based on these data and the assumptions of the models, to reject either model (see further discussion in “Assessing Uncertainty and the Likelihood of Mitigation Success” in the Effects of the Action.) As a result, a figure between the two (750 acres) was used as the maximum probable amount of habitat that could develop in the reservoir and be affected by a fill event.

Predictive models are based on assumptions that can be difficult to validate. Uncertainties associated with the model were addressed by: 1) applying adaptive management to the HCP, so that if additional acreage of occupied habitat, up to 1,250 acres per year were affected, additional mitigation would be developed to address that loss, 2) developing guidelines for appropriate levels of mitigation, which will be discussed further in the “Effects of the Action” herein, and 3) focusing mitigation on major river systems, such as the lower San Pedro River, which are characterized by large habitat patches. The latter 2 measures or criteria were adopted so that mitigation sites would be selected that have characteristics, in terms of likely occupancy by flycatchers, similar to Roosevelt. Furthermore, mitigation on the selected rivers will often complement habitat protection occurring by other agencies (Reclamation, Bureau of Land Management) and the Nature Conservancy, creating large contiguous patches of protected habitat that support substantial populations of flycatchers. Additional information about development of the models and how acreages of current and future occupied habitat were determined can be found in ERO (2002) and U.S. Fish and Wildlife Service (2002a). Uncertainty related to the model and how the HCP addresses that uncertainty is discussed further in the Effects of the Proposed Action, herein.

Banding studies at Roosevelt and the San Pedro/Gila confluence areas estimated that survivorship from 1999 to 2000 was 57 percent for returning banded flycatchers (Luff *et al.* 2000). Site fidelity for returning banded birds was 70 percent. Of the surviving flycatchers that did not return to the previous nesting site, several relocated within 15.5 miles, and one flycatcher moved about 43 miles. In 2002, a Roosevelt flycatcher relocated to the Lake Mead Delta and a lower Colorado River bird moved to Roosevelt. Another lower Colorado River bird moved to the Kern River in California. These observations suggest genetic connectiveness among these and probably other breeding populations (E. Paxton, pers. comm. 2002).

Flycatcher Habitat and Occupancy Elsewhere in the Action Area

Table 2 summarizes the most recent breeding flycatcher data in the action area outside of Roosevelt. Areas that would be affected by dam operations (lower Gila River, Salt River downstream of Roosevelt, and Verde River from Horseshoe Reservoir to the Salt River confluence) support relatively few flycatchers, although flycatchers were found for the first time at 5 sites (Horseshoe Reservoir, Mesquite campground on the Verde, and Tres Rios, Dysart Road, and Arlington on the Gila) in 2002, suggesting habitat is improving in these reaches. Areas being considered for mitigation support many more territories and individual flycatchers, particularly on the lower San Pedro River, which together with the middle Gila River from Winkelman to Kearny and Roosevelt Lake, support about 75% of nesting flycatchers in Arizona (Smith *et al.* 2002).

Table 2. Numbers of flycatcher territories and adult individuals in the action area outside of Roosevelt Lake. For each site, data are summarized for the last year breeding flycatchers were found (2002 data are preliminary, T. McCarthey, S. Sferra, D. Parker, pers. comm.). Numbers of adult individuals not available yet for most sites in 2002, thus 2001 data are presented.

Site	Most Recent Observation Year	#Territories	#adults (date of most recent available data)
<u>Verde River</u>			
Camp Verde	2001	5	9
Horseshoe Reservoir	2002	6	8
Mesquite Campground, downstream of Horseshoe Dam	2002	5	9
<u>Gila River</u>			
Tres Rios (~91 st Ave)	2002	1-2	?
Dysart Rd	2002	2	2
Fort Thomas	2002	10	11
Pima East	2002	9	17
Guthrie	2002	3	3
Duncan	2002	2	3
<u>Lower San Pedro River</u>			
CB Crossing Southeast	2002	1	2
Indian Hills	2002	1	2
Dudleyville Preserve	2002	17	33
Dudleyville Crossing	2002	26	51
Malpais Hill	2002	8	16
PZ Ranch	1999	1	1
Cook's Lake Cienega	2002	15	26
Aravaipa Inflow, North	2002	37	72
Aravaipa confluence	2002	7	14

Aravaipa South	2002	4	8
Wheatfields	2002	13	26
Cavage Wash	2002	2	4
San Manuel Crossing	2002	7	11
Catalina Wash	2002	3	5
Bingham Cienega	2002	2	3
Soza Wash	2002	1	2
<u>Hassayampa River</u>			
Hassayampa River Preserve	2002	3	4

EFFECTS OF THE ACTION

Effects of the action are described here by region (Roosevelt Lake, areas downstream but affected by operation of Roosevelt Dam, and mitigation areas).

Effects of Activities at Roosevelt Lake

The southwestern willow flycatcher population at Roosevelt may be affected by proposed full operation of the dam, and reservoir level fluctuations associated with that operation, in two ways: (1) injury to or mortality of flycatcher eggs or nestlings; and (2) harm as a result of periodic, temporary modification or degradation of the species’ riparian habitat.

Injury or mortality of eggs or nestlings

Injury or mortality of flycatchers at Roosevelt would occur primarily in the event that a nest tree, which has been undermined as a result of being inundated or dried out, actually falls when an active nest is in it. Such an event would be relatively unlikely to kill or injure adults, since adults in such cases would likely escape the tree prior to its impact with the ground or water surface, or would have vacated the tree in advance. However, eggs or nestlings would almost certainly be killed on impact or would drown. The most likely circumstance in which this might occur would be where a living tree is felled suddenly by high winds. Nestlings could also fall from the nest, and if the ground is inundated under the nest tree, the fledgling would likely drown. These birds might die regardless, but nestlings sometimes fall from nests and are fed on the ground by their parents until they fledge. The likelihood of death or injury of flycatchers in these ways is probably relatively small; however, they cannot be ruled out. The possibility of direct inundation of active flycatcher nests is not anticipated, as Roosevelt Lake levels invariably recede in spring and early summer as a result of water deliveries and therefore are going down rather than up when flycatchers begin their nesting cycle.

Harm as a result of habitat modification or degradation

Riparian habitat at Roosevelt will be periodically created and destroyed as a result of fluctuating water levels resulting from runoff and dam operation. Generally, riparian vegetation will be created when relatively high reservoir levels recede and then remain relatively low for a period of years. In these circumstances, riparian vegetation will tend to establish and grow around the margins of the reservoir (especially at the Tonto Creek and Salt River inlets), aided by delta formation at these inlets when water levels are high and relatively moist conditions in those deltas when water levels recede. On the other hand, riparian vegetation will be significantly affected when: (1) reservoir levels previously supporting that vegetation recede below the point where soil moisture is sufficient to maintain it (killing the vegetation by dehydration); and (2) when reservoir levels rise after a period of being relatively low and flood any riparian vegetation that became established during that period (killing the vegetation by inundation). Depending on reservoir levels, riparian habitat suitable for flycatcher nesting can be created at Roosevelt within 3-5 years and can be destroyed in as little as one year.

To determine effects at Roosevelt, we must calculate the maximum likely numbers of flycatchers and acreages of occupied habitat that will be present during the 50-year permit duration, and then determine the percentage of those birds and occupied habitat that are at risk. Two approaches can be taken to estimate maximum numbers of flycatchers and acreage of occupied habitat: 1) examine historical data to determine the greatest numbers of flycatchers and acreage of habitat ever recorded at Roosevelt, or 2) predict the maximums based on modeling of occupied habitat extent and flycatcher densities at Roosevelt. The first method assumes that historical flycatcher numbers and acreage will be representative of future conditions. However, this may not be true, because we have only monitored flycatchers and habitat since 1993, and greater acreages or numbers of flycatchers could occur during the 50-year term of the permit. The second method is conceptually better, but our ability to predict future conditions is dependent on the quality of the model and whether model assumptions are met.

In regard to the first method, flycatcher populations at Roosevelt were at the maximum recorded in 2002 (274 individuals and 147 territories), and extent of habitat was probably at a maximum in 2001 (about 1,000 acres of tall dense vegetation potentially suitable as nesting habitat, and 492 acres of occupied habitat; ERO 2002) or 2002 (although habitat acreages are not available for 2002). To determine the percentage of those flycatchers and habitats that are at risk of inundation, we can examine location of nest trees in the reservoir. The root crowns of all but one of the nest trees located in 2001 would be under water if the reservoir filled to elevation 2151' (see Fig. 18 of ERO 2002). Most of the nest trees would be completely under water and not available for nesting. Thus, most of the flycatchers (274 individuals and 147 territories) and habitat (estimated at 492 acres of occupied habitat) currently found at Roosevelt would be at risk. As just discussed, this is a conservative estimate because it only represents maximum occupied habitat present since 1993, and may not reflect maximum occupied habitat during the 50-year term of the permit.

ERO (2002) evaluated potential effects to flycatcher habitat by developing predictive models, which are described in the Environmental Baseline. These models predict a maximum of about 750 acres of occupied habitat could occur at Roosevelt during the 50-year life of the permit (see Fig. III-6 of ERO 2002). If we assume flycatcher densities based on 2002 flycatcher data and 2001 habitat data, roughly 418 adult flycatchers and 225 territories would occupy the 750 acres of habitat. Taking into account hydrological cycles, historical lake levels, inundation tolerances of riparian woodland trees, and regeneration times, ERO (2002) estimated that 100-200 acres of tall dense vegetation potentially suitable for nesting would likely still persist, even during the worst case fill event. In 2001, the ratio of tall dense vegetation to occupied habitat was about 2:1 (1,000 acres of tall dense vegetation, 492 of occupied habitat). Assuming a similar ratio, about 50-100 acres of occupied habitat would occur under this scenario. As a result, 650-700 acres of occupied habitat would be lost at Roosevelt during a worst case fill event. Using 2002 flycatcher data and 2001 acreage of occupied habitat, 362-390 individual adult flycatchers and 195-210 territories would be lost or displaced. The HCP includes adaptive management for loss of occupied habitat up to 1,250 acres. Under such a scenario, numbers of flycatchers and territories displaced or lost would be approximately 1.6 times greater than the figures just given; however, we believe such a scenario to be unlikely. As with any predictive modeling effort, the accuracy of these estimates is unclear due to varying degrees of uncertainty about underlying assumptions and our ability to predict future conditions from historical events. These uncertainties are discussed in the Environmental Baseline and ERO (2002).

The fate of flycatchers that are unable to breed at Roosevelt because of nest tree inundation or dessication of habitat is unknown. Willow flycatchers migrate to and from Costa Rica and other distant sites twice a year (U.S. Fish and Wildlife Service 2002b), and thus are capable of long-distance flights. In 2002, a flycatcher banded at Roosevelt in a previous year moved to the Lake Mead delta, and birds banded on the lower Colorado River moved to Roosevelt and to the Kern River in California. Flycatchers have even made considerable movements within the same breeding season. In 2001, one female flycatcher nested on the Tonto Creek arm of Roosevelt, and then moved to the Winkelman study area of the middle Gila River and nested again. These movements suggest that at least some of the flycatchers displaced by high waters at Roosevelt are likely to relocate and may nest successfully. Birds dispersing from Roosevelt may colonize unoccupied suitable habitats, resulting in new or increased populations outside of Roosevelt. However, large blocks of suitable habitat are probably not currently available to accommodate over 200-400 adult flycatchers; birds moving to other habitats may compete with resident flycatchers, reducing nest success; and many birds forced to relocate may be lost due to predation or accidents that are increasingly likely when birds fly long distances. If flycatchers remain at Roosevelt and attempt to nest in suboptimal habitats, nest success is likely to be low. Following a fill event, restoration of habitat will require that waters recede, and then the trees take 3-5 years to germinate and grow into flycatcher habitat.

As shown in hydrological records (see Fig. 7 of U.S. Fish and Wildlife Service 2002), in time, reservoir levels at Roosevelt will decline and habitats will once again improve and expand for flycatchers. The flycatcher population is expected to increase in response to expanding habitats, as occurred over the last 7 years. Based on historical hydrology, predicted frequency of

inundation following extended dry periods (during which considerable flycatcher habitat could develop) includes near or complete fill twice in 50 years (ERO 2002). In a worst case, the reservoir would fill in a single season and inundate most of the available habitat. Partial fill events or filling after shorter dry periods are also likely to occur, but would inundate and destroy lesser acreages of habitat. Filling of the reservoir and inundation of habitat could also occur over two or more years, rather than in a single season. During partial fills, flycatchers will have greater opportunity to relocate to unoccupied, but suitable habitats (about half of the “suitable” habitats were unoccupied in 2001), at Roosevelt, possibly mitigating some of the habitat loss. Under current conditions, which include considerable habitat development, particularly in the old conservation space, if a significant fill event occurred in 2003 or 2004, it could inundate and destroy most occupied habitat.

Loss of habitat and decreasing flycatcher populations could also result from extended low flows into the reservoir coupled with continued releases from the dam. In this case, habitats would dry out as groundwater elevation dropped below the rooting zone of riparian trees. ERO (2002) found that about 70 acres of habitat occupied by flycatchers during 1993-2000 were not occupied in 2001, probably due to drying. They estimate 310 acres of tall dense vegetation at Roosevelt suitable for nesting has dried out due to declining reservoir levels since 1997. Drying habitats have been replaced by new habitats that have developed lower in the reservoir, but presumably, at some point, or if reservoir levels stayed consistently low for several years, most occupied or suitable habitat could be lost due to dessication. Presence of dead and dry vegetation would also increase fire risk. If a fire started, it could burn into and destroy occupied habitat as well as dessicated stands. Less information is available in regard to the acreage of habitat that could be lost due to dessication; however, it is no greater than that which could be lost due to inundation.

In the event of dessication or inundation that kills large acreages of riparian woodlands, SRP may propose, for safety and operational considerations, to clear or burn the dead vegetation from the bed of the reservoir. They would coordinate with us before taking any action to ensure that occupied habitats were not affected. Conducted in this manner, clearing or burning would benefit flycatchers by removing dead vegetation in a controlled manner. Large acreages of dead trees pose a significant fire risk, that if allowed to persist, could result in a wildfire that not only removes dead trees, but live trees and flycatcher habitat, as well.

Effects: Gila and Salt Rivers Downstream of Roosevelt

As described in the Environmental Baseline (Table 2), few flycatchers are known to nest on the Salt and Gila rivers downstream of Granite Reef Dam, and suitable habitats there are apparently maintained by sewage effluent and agricultural return flows rather than releases from Roosevelt or the other Salt/Verde dams. Any significant releases past Granite Reef Dam would flow into Painted Rock Reservoir, attenuating any effects below Painted Rock. Continued future operation may preclude development of flycatcher habitats in these reaches. However, ongoing operation of Roosevelt is not expected to change existing baseline conditions on the Salt and Gila rivers.

To summarize, on the Gila and Salt rivers, effects of continued full operation of Roosevelt would likely occur above Painted Rock Dam and would likely be limited to precluding development of riparian habitat, rather than adversely affecting extant riparian communities, which are maintained by sewage effluent or return agricultural flows. The overall net effect is difficult to assess, but is not expected to be great because changes in river flows would not be dramatically different from the environmental baseline and few flycatchers nest on the Salt and Gila rivers below Roosevelt Dam.

Effects of Mitigation and Minimization Measures

Mitigation and minimization measures were designed to offset, to the maximum extent practicable, the effects just described above. To offset these effects, the HCP proposes a comprehensive mitigation program consisting of riparian land acquisition and restoration, riparian vegetation creation, and riparian land management. These mitigation measures address the loss of 750 acres of occupied habitat, with a total mitigation acreage of 2,250 acres. Two-thirds of this (1,500 acres) consist of riparian land acquisition, restoration, creation, and management and one-third (750 acres) consists of other conservation measures (which may include, but are not limited to, management of existing riparian vegetation at or near Roosevelt Lake, acquisition of upland buffers to protect habitat at Roosevelt and/or acquired mitigation sites, and acquisition of water rights). Under the 1996 BO, Reclamation has or is expected to provide 603 acres of acquisition and management and 220 acres of other conservation measures, leaving implementation of the remainder (897 acres of acquisition and management, and 530 acres of other mitigation) to SRP. Habitat creation will consist, at a minimum, of establishment of riparian vegetation at the 20-acre Rockhouse site along the Salt River near its inlet to Roosevelt Lake. Habitat acquisition will occur in the Verde River valley (up to 160 acres), the lower San Pedro or Safford River valleys (up to 950 acres), and other locations as necessary to meet the balance of the 1,500-acre total and subject to our approval. Habitat protection and management will occur on 300 acres of existing riparian habitat at Roosevelt (which are part of the 750-acres of other conservation measures). Habitat restored and acquired (part of the 1,500-acre total), including associated upland buffer lands (part of the 750-acre requirement) will be managed for the covered species in perpetuity. All mitigation and minimization measures will be in place within 3 years of HCP approval and permit issuance.

SRP also proposes to work with the Fort McDowell Yavapai Nation to enhance riparian vegetation on the lower Verde River. This will probably take the form of cottonwood pole plantings. If successful, they are expected to benefit primarily bald eagles. Flycatchers are currently not known from the Verde River on lands of the Nation. However, if present, or if flycatchers colonize this reach of the Verde, cottonwood plantings could enhance flycatcher habitat.

The HCP's mitigation program has been designed to be consistent with the Southwestern Willow Flycatcher Recovery Plan (U.S. Fish and Wildlife Service 2002b) and the standards and criteria recommended therein. These include: 1) that maintaining or augmenting existing populations is a greater priority than allowing habitat loss and replacement (p. 75); 2) that any

replacement habitat acquired (i.e., when existing habitat cannot be preserved) should be situated close to existing flycatcher breeding sites to increase the chance of colonization of that habitat (p. 75); 3) that replacement habitat should be located within the same Management Unit as that where the original habitat was lost (p. 82); and 4) that replacement habitat should be acquired based on the following descending priority order—a) occupied, unprotected, habitat; b) unoccupied, suitable but currently unprotected habitat; and c) unprotected, potential habitat (p.83).

The HCP satisfies these recommendations in the following ways. First, habitat supporting southwestern willow flycatcher populations will continue to be maintained at Roosevelt as part of ongoing reservoir operations (at a minimum, estimated at 50-100 acres of occupied habitat). Second, all currently proposed mitigation sites under the HCP (e.g., the Rockhouse site, the Verde River and lower San Pedro River Valley sites, and existing habitat at Roosevelt which will be protected by enhanced management) are all within or near existing flycatcher populations, and two of them (the Rockhouse site and existing habitat at Roosevelt) are at Roosevelt and contiguous with its existing flycatcher populations. Third, while many of these sites are not within the Roosevelt Management Unit (because mitigation opportunities on within the unit are limited), the highest priority sites are all within the same Recovery Unit as Roosevelt Lake (the Gila Unit). Fourth, in most years, Roosevelt should support the minimum number of territories in the Roosevelt Management Unit of the Gila Recovery Unit needed for reclassification of the species to threatened (see Summary of the Effects of the Action: the Long- and Short-term Perspectives, page 50). And finally, all mitigation habitats targeted by the HCP have been (or will be) selected on the basis of current occupancy by flycatchers or, if unoccupied, of suitability for flycatchers (ERO 2002, p. 116). HCP-targeted mitigation sites are also generally consistent with the habitat focus areas recommended in Table 10 of the Recovery Plan (U.S. Fish and Wildlife Service 2002b, p. 91).

Although mitigation on the whole is beneficial, implementation of mitigation measures has some potential to harm or harass flycatchers. Surveys involving playback recordings have potential to harass flycatchers, but such activities are regulated by Federal and State permitting processes to remove and reduce effects to the bird. Activities such as fence construction, driving cattle out of a riparian area, removal of brush piles that pose a fire threat, removal of unneeded structures, and other management activities may remove or damage small amounts of habitat, or could harass nearby flycatchers. Protocols for reducing these effects, to the extent possible, will be built into the management plans for acquired properties.

Assessing Uncertainty and the Likelihood of Mitigation Success

As discussed in the Environmental Baseline, the estimated maximum amount of occupied habitat that may be at risk in the future (650-700 acres) is dependent upon a number of assumptions that are difficult to validate. For example, some of the experts on the flycatcher were concerned that the 11.1-acre neighborhood, upon which calculations of occupied habitat were based, did not represent all of the habitats used by nesting flycatchers or fledglings until independent or migrating. Mark Sogge, USGS-BRD, in a February 27, 2002, letter found that a

394-ft radius buffer (11.1 acres) around nests “seems reasonable based on the AGFD model.” However, he cautioned that this represents habitat actually defended and used by territorial breeding flycatchers. He made clear that this is different than the amount of habitat which may develop in the reservoir. However, because the purpose of the model was to determine occupied habitat (an index to numbers of birds that may be taken), rather than suitable habitat, or acres of riparian habitat in the reservoir, we believe the neighborhood is the appropriate measure. Dr. Sogge also believed the “2nd order” equation was likely the best estimator of future maximum likely impact (the 2nd order model estimated a maximum of 870 acres of occupied habitat); however, he agreed that acreage of occupied habitat will level off at some point (the 2nd order equation assumed exponential growth in habitat acreage). Eben Paxton, USGS-BRD, in a March 5, 2002, letter, found that the 11.1-acre neighborhood may not encompass areas used by fledglings until independent or migrating, and that the 2nd order equation may be the best estimator of maximum occupied habitat. Scott Mills, a consulting avian ecologist, was not entirely comfortable with use of the 11.1 acre neighborhood, but concluded that its use for quantifying effects at Roosevelt was not unreasonable (February 27, 2002 email). In a February 20, 2002 email, Tracy McCarthey, the AGFD flycatcher coordinator, supported the neighborhood method for estimating occupied habitat. Inundation tolerance and predicted rates of habitat regrowth may also vary from those used in the model. As a result, the accuracy of our worst case habitat loss estimate is uncertain. To accommodate this uncertainty, SRP has proposed to mitigate the loss of 750 acres, rather than 650 or 700 (the worse-case scenario as determined by modeling). SRP will also monitor habitats at Roosevelt and implement adaptive management if acreage impacted or predicted to be impacted exceeds 750. SRP will provide mitigation and minimization measures for up to an additional 500 acres of occupied habitat affected (up to 1,250 acres impacted, and 3,750 acres of mitigation). Thus, even if we have calculated maximum occupied habitat incorrectly, proposed mitigation for 750 acres plus adaptive management by SRP provide an ample buffer to cover any reasonable errors. If acreage of occupied habitat exceeds 1,250 acres, a permit amendment would be needed. None of the models suggest 1,250 acres of occupied habitat could be lost, and we have no other reason to believe this level of habitat loss would be likely to occur.

Jim Hatten, the senior author of the paper describing the AGFD model, found “Thus, 120 m (394 ft) radius circles (4.5 ha [11.1 acres]) represent a bare-bones minimum concerning habitat conservation and may not provide enough habitat for long-term persistence” (February 22, 2002 email). Hatten was concerned that the method did not take into account larger-scale habitat patch characteristics, particularly since nesting flycatchers tend to cluster into patches. Patch size may be very important in addition to neighborhoods within that patch. We believe the importance of this is not so much in determining extent of occupied habitat, but in determining characteristics of habitats proposed for mitigation. In so far as patch size is important in nest site selection by flycatchers, if mitigation lands are selected in areas of patch characteristics similar to what occurs at Roosevelt, this concern should be addressed. Mitigation will be targeted at parcels of riparian habitat on large river systems with extensive, contiguous reaches of suitable or potentially suitable habitat, such as the lower San Pedro River, the Verde River, and the upper Gila River in the Safford Valley. Thus, the patches into which SRP will invest

mitigation resources will have similar patch size characteristics as those found at Roosevelt. In addition, SRP's mitigation is likely to complement and add to riparian conservation efforts by other entities, particularly on the San Pedro River (Reclamation, Bureau of Land Management, and The Nature Conservancy), and on the Verde River (The Nature Conservancy).

In a February 15, 2002, memo, Susan Sferra, Bureau of Reclamation, noted that if occupied habitat is the currency for determining effects, then it should also be the currency for mitigation lands, and that the mitigation lands should become occupied at some "time certain" date in the future. Riparian habitat acquired will have, or will have the potential to develop with management, characteristics similar to occupied habitat at risk at Roosevelt. Target criteria for acquired lands are listed at pages 130-131 of ERO (2002). Based on what we know of available properties when we acquire them, many sites will not be occupied or will support few nesting flycatchers. However, removal of cattle grazing and management of other human uses that reduce habitat suitability (incompatible forms of recreation, ground water pumping, etc.) are expected to improve habitat conditions, allowing future occupancy by nesting flycatchers. The rate at which we expect these potentially occupied habitats to actually be used by flycatchers will depend on the level of human impact and the time needed to reverse the effects of that impact. Removal of livestock grazing is a relatively easy management option that can restore riparian habitat within 5 years (Krueper 1995, also see review in Valentine *et al.* 2002 - Appendix G of U.S. Fish and Wildlife Service 2002b). But in some cases, potentially suitable habitat may not become suitable for extended periods. The criteria for acquired lands include floodplain lands that are within 5 feet of groundwater. If such lands do not currently support riparian woodlands, a flood event may be necessary to allow germination and establishment of riparian trees. Such an event may not occur for several or many years, after which 3-5 years would be needed for those trees to grow into habitat. Our contention that acquired habitats will be at least potentially suitable breeding habitats is based on our understanding of not only what constitutes suitable nesting habitat, but our prediction of whether currently unsuitable habitat can be managed in a way that will produce suitable and occupied nesting habitat. Our knowledge of flycatcher habitat and habitat potential is probably not good enough to accurately predict a site's suitability in every case. Thus, we expect that some acquired sites may never support flycatchers, or may support fewer birds than we would have predicted based on densities at Roosevelt or elsewhere. Nevertheless, our experience with habitat acquisition and management under the 1996 Reclamation biological opinion provides some assurance that in time SRP's mitigation will be successful. Under that opinion, Reclamation's riparian acquisitions and management on the lower San Pedro were designed to provide habitat for 45 territories. To date, the acquisitions have only supported 17 territories (Table 2), but the flycatcher population is increasing, habitat continues to improve, and Reclamation is expected to acquire another 200 acres of suitable or potentially suitable nesting habitat. Thus, we expect that Reclamation's acquisitions will likely support 45 territories in the future. Similar success is expected in regard to SRP's mitigation (for additional discussion on this topic, see response to comments 3-2, 3-4, and 3-17 in U.S. Fish and Wildlife Service 2002d). Also, considerably more habitat will be conserved for the flycatcher (2,250 acres) than what we expect will be lost (750 acres).

Mitigation will be distributed across several sites and probably three or more river systems. As discussed in the Recovery Plan and earlier herein, there is value in establishing several robust populations in different locales as opposed to having most or all birds and habitat at one site. In the latter scenario, a single catastrophe, such as a flood or fire, can destroy all of the habitat and recovery potential for the species in a region. Currently, all the “eggs” are in one basket at Roosevelt. Bolstering flycatcher populations at the lower San Pedro River, Verde Valley, Safford Valley, and perhaps elsewhere would significantly reduce the impact to the status and recovery potential of the species during periodic large-scale habitat loss at Roosevelt. Habitats at the mitigation sites should also be more stable than at Roosevelt. Habitat loss at the mitigation sites due to flooding and dessication is expected to occur less frequently and with less loss of habitat than at Roosevelt, because the proposed mitigation sites are on largely unregulated river systems with relatively natural hydrographs.

SRP has proposed riparian restoration at the Rockhouse site on the Salt Arm of Roosevelt Lake. Riparian restoration projects have a poor track record of success in Arizona; however, some have been very successful, and many others are partially successful (see Briggs 1996). The likelihood of success at Rockhouse is perhaps greater than most due to the wealth of experience we now have to develop successful riparian restoration, and because the Rockhouse site can be extensively managed. A canal that provides water to the site, dedicated monitoring and maintenance, and protection from long-term flooding and scouring due to its location in the flood control space of the reservoir, the likelihood of success better than most. In any case, if the effort fails, SRP will restore or acquire habitat elsewhere.

Summary of the Effects of the Action: the Long- and Short-term Perspectives

Taking a long-term perspective in regard to effects, and measuring from the baseline conditions, the flycatcher should benefit from implementation of the HCP and continued operation of Roosevelt Dam. In the long-term, Roosevelt will continue to be operated at full capacity, and the extent and quality of flycatcher habitat will continue to vary with water levels, as in the past. A total of 2,250 acres of mitigation credit already are, or will be put in place over the next 3 years and will be maintained in perpetuity. These mitigation measures will remove threats to and ensure continued availability of extant occupied habitats, and provide management in perpetuity for potentially suitable habitats to become suitable and ultimately occupied. Included among the mitigation measures are enhanced management and riparian restoration at Roosevelt, which will improve baseline conditions there. Protection and management of suitable and potentially suitable habitats on the lower San Pedro and Verde rivers, in the Safford Valley, or elsewhere will significantly improve the status of the flycatcher in those areas. Mitigation will address the maximum acreage of habitat expected to be lost at Roosevelt in any inundation event in the next 50 years. If we have underestimated the extent of occupied habitat that may be lost at Roosevelt, the HCP includes adaptive management for additional mitigation up to a loss of 1,250 acres of occupied habitat. Thus, the HCP and continued operation of Roosevelt will provide significant benefits to the status of the flycatcher over the long-term.

In the short term, roughly 492 acres of occupied habitat and as many as 274 adult flycatchers and 147 territories are at risk of inundation if the lake fills in 2003. Probably only 1/3 to a half of the mitigation acquisitions would be in place when the birds return in 2003, and much habitat would not yet be suitable for nesting. Thus, many of these birds could be lost before the mitigation is in place. This could reduce the Arizona population substantially (40% of Arizona's flycatchers resided at Roosevelt in 2001, Smith *et al.* 2002). However, the recovery plan recognized that habitat at Roosevelt is ephemeral, and set minimum number of territories in the Roosevelt Management Unit of the Gila Recovery Unit needed for reclassification of the species to threatened at 50 (the Roosevelt Unit includes the Salt and Black river drainages, Tonto Creek, and associated tributaries to the confluence with the Verde River). The plan goes on to say that for a recovery goal of 50 territories, protection of 272 acres of suitable habitat should be assured. A minimum of 50-100 acres of occupied habitat and 100-200 acres of suitable habitat are expected to occur at Roosevelt, even during a worst case fill event. Fifty to 100 acres of occupied habitat should support 15-30 territories based on 2002 numbers of flycatchers and 2001 habitat acreage, and in most years, Roosevelt would support considerably more habitat and flycatchers. ERO (2002) estimated that an average of 300-400 acres of suitable habitat (thus about 150-200 acres of occupied habitat) would be present during the life of the permit. Again, using 2002 flycatcher numbers and 2001 habitat acreage, these 150-300 acres would support 45-90 territories. Furthermore, there is some potential for additional flycatcher territories to exist or become established in the Roosevelt Unit outside of Roosevelt Lake (although none are known to exist at present). In summary, although short-term impacts could be severe if the lake fills in 2003, the flycatcher recovery team believed that such events were compatible with recovery, and the recovery target number of territories and acres of suitable habitat needed for reclassification could still be achieved in most years despite continued full operation of Roosevelt Dam.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, or local private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Effects of past Federal and private actions are considered in the Environmental Baseline.

Lands in and near Roosevelt downstream to the Verde River confluence are owned and/or managed primarily by Federal agencies, including the Forest Service, Reclamation, and the Army Corps of Engineers. Thus, most activities in this area will have a Federal nexus and will be or have been subject to section 7, and thus the effects of these activities are not considered cumulative. The Verde River from Horseshoe Reservoir to the Salt River confluence is managed primarily by the Tonto National Forest and the Fort McDowell Yavapai Indian and Salt River Pima-Maricopa Indian communities. Activities on the Tonto National Forest and Federally funded or authorized projects on the tribal lands are subject to section 7, and thus effects of these activities are not considered cumulative.

Inundation of habitat at Roosevelt may provide boaters, water skiers, or jet skiers access to flycatcher nesting habitat. Noise, wave action, and the presence of people and water craft may cause flycatchers to temporarily or permanently abandon nests, or birds searching for nest sites may opt to not nest in such areas (see review in Appendix M of U.S. Fish and Wildlife Service 2002b). SRP does not authorize these activities, but they may occur near nests. Effects to flycatchers, including any incidental take, is most appropriately addressed in consultation or section 10(a)(1)(B) permits with agencies that authorize or license these recreational activities. Illegal camping, off-highway vehicle use, camp fires, and other recreational activities near nests at Roosevelt could also result in harassment of, or harm to, flycatchers.

Horseshoe and Bartlett reservoirs on the Verde River have relatively small storage space (12% of SRP's Salt-Verde River storage space) and can only store about a 2/3rds of the annual average flow of the Verde (C. Ester, pers. comm. 2003). From October 1 through April 30, a period when downstream water demands are relatively low, water is delivered from the Verde River dams while Roosevelt and the other Salt River reservoirs are allowed to fill. Keeping reservoir levels low on the Verde at this time also reduces the likelihood of spills past Granite Reef Dam. A minimum flow of 100 cfs is maintained below Bartlett Dam year round, except in extreme drought or emergency, which helps maintain downstream riparian habitat.

As discussed in the Environmental Baseline, operation of lower Verde river dams has altered the hydrologic regime of the lower Verde river by reducing the magnitude, frequency, timing, and duration of high flow events. Grazing, recreation, and other land uses have combined with the effects of dam operations to impede natural regeneration of riparian communities (Briggs 1996, Beauchamp and Stromberg 2001, Sommers *et al.* 2002) and limit opportunities for flycatcher recovery (U.S. Fish and Wildlife Service 2002b). These effects are expected to continue into the foreseeable future. The recovery team highlighted the Verde River below the Sycamore Canyon confluence as an area where potential or suitable flycatcher habitat exists and/or where greater metapopulation stability can be achieved by establishing or enhancing populations (U.S. Fish and Wildlife Service 2002b).

Recent changes in the reach below Bartlett Dam are likely to reduce, to some degree, effects of dam operations and recreation. In 1993, a minimum flow of 100 cfs flow was implemented below Bartlett Dam. Also, the Fort McDowell Yavapai Nation closed the Verde River area through their lands to non-tribal members and hired their own Police Department in 1997. This helped reduce recreational activities that have contributed to poor regeneration of riparian trees. If SRP is successful in working with the Fort McDowell Yavapai Nation in riparian restoration efforts, as proposed, this effort could offset some of the effects that have caused deterioration of riparian woodlands below Bartlett Dam. We are also committed to using our authorities to begin working with the tribes and the Tonto National Forest to pursue improved riparian conditions below Horseshoe Dam.

The only flycatchers known to occur on the lower Verde River have been at or near Horseshoe Dam, although only the area at and near Horseshoe Dam has been surveyed. Flycatchers nested at Horseshoe Reservoir (6 territories) and just below Horseshoe Dam at Mesquite Campground

(4 territories) in 2002. Water levels behind Horseshoe Dam could rise during the winter months and inundate the trees in which nesting occurred in 2002. But, because the Verde reservoirs are operated to supply water downstream from October through April, water levels are likely to be low, and the trees would most likely be out of the water when the flycatchers arrive in late April or May (C. Ester, pers. comm. 2002). Nevertheless, regular operation of Horseshoe Dam can result in high water well into May (see page B-233 of Hunt 1992). SRP has committed to lowering reservoir levels in 2003 if needed to negate any adverse effects to flycatcher habitat, and discussions will be initiated in 2003 regarding a section 10 mechanism to address future potential take at Horseshoe (Craig Sommers, pers. comm. 2002). Habitat at Mesquite Campground may be limited by low flows during the summer months. Flood flows below Horseshoe Dam could scour habitat at Mesquite Campground, but they are most likely to occur in the spring or late winter during a period when water is being released, thus making room for greater flood water storage. Flood flows at this time are critical for establishing seed beds and for regeneration of native riparian species (Briggs 1996).

Downstream of the confluence with the Verde River, the Salt River flows through the lands of the Salt River Pima-Maricopa Indian Community and then through private and a few parcels of State lands to the confluence with the Gila River. From the confluence to Painted Rock Dam, the Gila River flows through primarily private lands, but also considerable lands managed by the Arizona State Land Department, Bureau of Land Management, and Gila Bend Indian Reservation. Downstream of Painted Rock Dam, the Gila River flows through a mix of private, State, and Bureau of Land Management lands. In these areas, development will frequently require a section 404 Clean Water Act permit from the Army Corps of Engineers, and other Federal permits may be needed as well. Reclamation has provided funds for channelization and bankline stabilization through the Wellton-Mohawk Irrigation District (downstream of Texas Hill). In cases where Federal permits or authorization are needed, even on non-Federal lands, the section 7 requirement is triggered. Activities likely to occur on non-Federal lands not requiring a Federal authorization or funding include clearing of land and construction of farms or housing, livestock grazing, groundwater pumping, and continued agricultural activities, including use of pesticides and fertilizers that may be toxic to birds or insects upon which the birds feed. State lands could be leased for sand and gravel mining, which currently occurs in several areas along the Salt and Gila rivers, or could be sold for housing or industrial purposes.

Areas targeted for land acquisition, including the lower San Pedro River, Verde River in the Verde Valley, and Gila River in the Safford Valley were selected because many private parcels exist and thus provide opportunity for acquisition and management. All three areas have considerable agricultural development, rural housing development, dispersed recreation, roads, livestock grazing, sand and gravel mining, and other activities on private or State lands that threaten flycatcher habitat. State lands could be sold or leased with associated subsequent development. Some activities, such as recreation, have a potential to increase fire frequency in riparian habitats (e.g. fire at PZ Ranch on the San Pedro River). Agricultural overspray of herbicides at PZ Ranch recently killed and damaged riparian stands previously used by flycatchers. On the San Pedro River from the Aravaipa confluence downstream to the Gila

River, the mining company, ASARCO Inc. is the primary owner of river bottomlands. ASARCO leases much of their land for agriculture, and they pump ground water from wells at PZ Ranch and a site near Indian Hills and pipe it to their mines near Hayden, which has dewatered miles of the San Pedro.

Private activities are in some cases contributing to the conservation of riparian habitats in areas targeted for mitigation. The Nature Conservancy recently purchased the 2,156-acre Three Links Farm near Mammoth (Tobin 2002). Cessation of ground water pumping on the ranch is anticipated to restore flow to 15 miles of the San Pedro (D. Harris, pers. comm. 2002). The Nature Conservancy has purchased other lands as well on the lower San Pedro River, and cooperates with Reclamation in the acquisition and management of riparian parcels pursuant to the 1996 biological opinion. Careful management by the Skeen family on their private lands on the lower San Pedro has resulted in habitat improvement and recent colonization by flycatchers. The Nature Conservancy also has an active riparian conservation program on the Verde River in the Verde Valley (Verde Watershed Project). The Verde River Citizens Alliance works with TNC and local governments to protect the Verde River.

Non-federal activities that may result in incidental take of flycatchers can be addressed through the section 10(a)(1)(B) permitting process.

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 proposed action is not likely to jeopardize the continued existence of the southwestern willow flycatcher. No critical habitat is currently designated for the flycatcher, thus none will be affected. We present our no-jeopardy conclusion for the following reasons:

1. Although issuance of an incidental take permit and associated effects of operating Roosevelt Dam and implementing a mitigation and minimization program could have short-term severe effects to the flycatcher, in the long-term the species is expected to benefit significantly, because the baseline condition at Roosevelt will improve due to more intensive management of existing habitats and habitat restoration, and conservation in mitigation areas on the San Pedro, Verde, Gila and/or other rivers will be much enhanced.

2. The anticipated remaining flycatcher population at Roosevelt after temporary and periodic short-term effects due to a worst case inundation event (15-30 territories) is about half of the recovery target for the Roosevelt Management Unit of the Gila Recovery Unit (50 territories) needed for reclassification of the species to threatened, but on average 45-90 territories are expected at Roosevelt over the term of the permit. In addition, flycatchers may nest elsewhere in the Roosevelt Unit in the future, contributing to the recovery target.

3. Proposed land acquisition and management for the flycatcher (2,250 acres) would occur primarily within large river systems and large habitat patches, and will be complemented by other ongoing riparian conservation efforts in the same areas. Habitat acquired or restored as mitigation will be managed in perpetuity for the benefit of the flycatcher.

4. SRP proposes mitigation for 750 acres of occupied habitat, when we estimate that no more than 700 acres will be affected in a worst case inundation event. If we have underestimated the potential impacts of reservoir operation on occupied flycatcher habitat, SRP has proposed adaptive management to mitigate loss of up to an additional 500 acres of occupied habitat.

5. Mitigation proposed in the HCP is consistent with the flycatcher recovery plan.

6. Minimum 100 cfs releases from Bartlett Dam are expected to offset some cumulative effects on the lower Verde River. SRP's proposed riparian restoration efforts on the lower Verde may also benefit flycatchers. Within the action area, we are working with our partners to address cumulative effects consistent with the flycatcher recovery plan.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Section 3 of the Act defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." Harm and harass were both further defined in 50 CFR 17.3. Harm is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The HCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the HCP, together with the terms and conditions described in the Implementing Agreement and any section 10(a)(1)(B) permit or permits issued with respect to the HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14 (i). Such terms and conditions are nondiscretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the Applicant fails to adhere to these terms and conditions, the protective coverage of the

section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the Roosevelt HCP, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the HCP and its accompanying section 10(a)(1)(B) permit.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

We use maximum acres of occupied habitat anticipated to be lost as a result of the proposed action over the term of the permit (50 years) as a surrogate to quantify take of flycatchers. An estimate of numbers of flycatchers taken by loss of this habitat is presented in the Effects of the Proposed Action.

We anticipate that flycatchers occupying up to 1,250 acres of habitat may be taken in a year due to operation of Roosevelt Dam. We anticipate such an event would occur 2-3 times during the 50-year life of the permit. Within the affected acreage, flycatchers may be harmed as a result of modification or degradation of habitat due to inundation or dessication of habitat and associated effects, eggs or nestlings could be injured or killed if trees undermined by high reservoir levels topple over, or nestlings fall from nests into water, as described below.

Harm. Harmed flycatchers may attempt to nest in suboptimal habitats at Roosevelt, may relocate, or may die. Nest productivity is expected to decline significantly when the reservoir fills and would stay low until reservoir levels decline and habitats recover. Releases from Roosevelt Dam that lower reservoir levels may cause dessication of flycatcher habitat. Dessication will occur over a longer time period than an inundation event, thus birds may have more time to adjust and relocate to other habitats.

Flycatcher eggs and nestlings could also be injured or killed by high reservoir levels that inundate and undermine the base of nest trees. These trees may fall during storms or high winds, causing eggs and nestlings to drown. Nestlings could also fall out of nests and drown in water at the base of nest trees.

No incidental take as a result of the proposed action is anticipated in the action area outside of Roosevelt Lake.

If, during the term of the permit, the level of anticipated incidental take as described here is exceeded, such incidental take represents new information requiring reinitiation of consultation.

EFFECT OF THE TAKE

In this biological opinion, the Service finds that the level of take anticipated is not likely to jeopardize the continued existence of the southwestern willow flycatcher. The reasons for this conclusion are the same as described under the Conclusion, above.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation measures provided for in the HCP and the terms and conditions in the Implementing Agreement are incorporated here by reference as reasonable and prudent measures and terms and conditions. We find they fully offset the impacts of the incidental taking of the southwestern willow flycatcher resulting from the continued operation of Roosevelt Dam. No additional reasonable and prudent measures or terms and conditions are needed to minimize anticipated incidental take.

MIGRATORY BIRD TREATY ACT

The Incidental Take Permit that is the subject of this opinion shall constitute a Special Purpose Permit under 50 C.F.R. § 21.27 for take of the southwestern willow flycatcher in the amount and subject to the terms and conditions specified in the permit, the Implementing Agreement, and the habitat conservation plan. Any such take will not be in violation of the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712).

STATUS OF THE SPECIES

Bald eagle (*Haliaeetus leucocephalus*)

The bald eagle south of the 40th parallel was listed as endangered under the Endangered Species Preservation Act of 1966, on March 11, 1967 (U.S. Fish and Wildlife Service 1967), and was reclassified to threatened status on July 12, 1995 (U.S. Fish and Wildlife Service 1995b). No critical habitat has been designated for this species. The bald eagle was proposed for delisting on July 6, 1999 (U.S. Fish and Wildlife Service 1999).

Population dynamics

The bald eagle is a large bird of prey that historically ranged and nested throughout North America except extreme northern Alaska and Canada, and central and southern Mexico. It occurs in association with aquatic ecosystems, frequenting estuaries, lakes, reservoirs, major rivers systems, and some seacoast habitats. Generally, suitable habitat for bald eagles includes those areas which provide an adequate food base of fish, waterfowl, and/or carrion, with large trees for perches and nest sites. In winter, bald eagles often congregate at specific wintering sites that are generally close to open water and offer good perch trees and night roosts (U.S. Fish and Wildlife Service 1995b).

Initial eagle 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). This Act accomplished significant protection and slowed the 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 shells led to reproductive failure, which is considered a primary cause of declines in the bald eagle population. DDT was banned in the United States in 1972 (U.S. Fish and Wildlife Service 1995b).

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 additional recovery efforts. Surveys in 1963 indicated 417 active nests in the lower 48 states with an average of 0.59 young produced per nest. Surveys in 1974 resulted in a population estimate of 791 occupied breeding areas in the lower 48 states (USFWS 1999). In 1994, 4,450 occupied breeding areas were reported with an estimated average of 1.16 young produced per occupied nest (U.S. Fish and Wildlife Service 1995b). The Service estimates that the breeding population exceeded 5,748 occupied breeding areas in 1998 (U.S. Fish and Wildlife Service 1999).

Status of bald eagles in the Southwestern United States, including Arizona

Hunt *et al.* (1992) summarized the earliest records from the literature for bald eagles in 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 (which surrounded and included Roosevelt Lake from 1909 to 1961) 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.

Currently, bald eagle breeding areas in Arizona are predominantly located in the upper and lower Sonoran life zones. The Luna Lake breeding area is one of the few territories in Arizona that is found in coniferous forests, as opposed to the majority which occur 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 had both beneficial and detrimental affects 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 (often nonnative species) on which bald eagles prey.

In addition to breeding bald eagles, Arizona provides habitat for wintering bald eagles, which migrate through the state between October and April each year. In 1997, the standardized statewide Arizona winter count totaled 343 bald eagles, including 193 adults, 134 subadults, and 16 of unknown age; in 1998, 183 adults, 103 subadults, and 4 of unknown age were recorded.

The highest numbers of bald eagles, in both years, occurred on the Verde River and San Carlos Reservoir (Beatty and Driscoll 1999).

Although not considered a separate subspecies, bald eagles in the southwestern United States have been considered as a distinct population for the purposes of consultation and recovery efforts under the Act. A recovery plan was developed in 1982 for bald eagles in the Southwest recovery region. However, new information has indicated that the bald eagles in Arizona and the Southwest recovery region are not a distinct, reproductively isolated population as was previously believed. In 1994, a male bald eagle that originated from eastern Texas was discovered nesting at Luna Lake in east-central Arizona. The origin of the unbanded female was not determinable. The Service has determined that bald eagles in the Southwest recovery region are part of the same bald eagle population found in the remaining lower 48 states (U.S. Fish and Wildlife Service 1995b). The Service proposed delisting of the bald eagle in the lower 48 states including Arizona, stating that the number of breeding pairs in the Southwestern Recovery Unit has more than doubled in the last 15 years (U.S. Fish and Wildlife Service 1999).

However, the Arizona Game and Fish Department (*in prep.*) concluded that “evidence from the banding and identification of breeding adults defends the theory that Arizona’s breeding population is not supported or maintained by immigration from other states or regions. Because adults return to the vicinity of their natal origin to breed, the large distance between small populations in the Southwest decreases the chance for movement between neighboring populations. Probably most convincing are the results from banding 256 nestlings over 20 years and identifying 372 breeding adults over 8 years. Only one individual from out-of-state entered the breeding population and one left. Additionally, the proportion of breeding adults with color bands (placed on as nestlings in Arizona) has steadily increased, while the presence of unmarked eagles has decreased. Thus, continued attention to the survivorship of all Arizona bald eagles is vital to the maintenance of our breeding population. We can not depend on immigration to Arizona from nearby states to make up for poor management in Arizona.”

Arizona bald eagles demonstrate unique behavioral characteristics in contrast to bald eagles in the remaining lower 48 states. Eagles in the Southwest frequently construct nests on cliffs. By 1992, of the 111 nest sites known, 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 slightly more successful in raising young to fledgling though the difference was not significant. Bald eagles in the Southwest are additionally unique in that they establish their breeding territory in December or January and lay eggs in January or February, which is early compared with bald eagles in more northerly areas. It is believed that this is a behavioral adaptation so chicks can avoid the extreme desert heat of midsummer. Young eagles will remain in the vicinity of the nest until June (Hunt *et al.* 1992).

Bald eagle diets in Arizona

While eagles will eat mammals, amphibians, invertebrates, and birds, fish are their primary food item (Stalmaster 1987, Hunt *et al.* 1992). Fish 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).

Bald eagles depend upon particular prey and ways in which to acquire food. Eagles will defend territories, including foraging areas (primarily from other bald eagles, Stalmaster 1987). Eagles will scavenge, steal, or actively hunt to acquire food. Eagles are primarily a perch and wait hunter in order to detect carrion or passively detect available live prey. Birds will actively search out live prey or carrion, but energetically, this method is the most costly (Stalmaster 1987).

Productivity of Arizona bald eagles

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 2000, there were 41 known breeding areas, with 37 of those being occupied. Within those breeding areas, 27 nests were active, and ten nests failed. Thirteen of the 27 nests were successful in producing young, and a total of 36+ young hatched. Twenty-two of these young survived to fledged (Driscoll *et al.* 1999). In 1999, 40 breeding areas were known in Arizona (Arizona Game and Fish Department *in prep.*). In 2002, 47 breeding areas were known, and 41 were occupied by a pair of birds. The 2002 breeding season produced the most fledglings ever recorded in one year (n=37) (J. Driscoll, Arizona Game and Fish Department, pers. comm.).

Productivity rates are lower in Arizona than the rest of the United States. There were 0.92 average young per occupied breeding area in Arizona before 1984 when there were less than 20 breeding areas, and 0.78 average young per occupied breeding area since 1984, as opposed to 0.96 average young per breeding in Alaska, Wisconsin, Florida, and Wisconsin (Arizona Game and Fish Department *in prep.*, Sprunt *et al.* 1973, McAllister *et al.* 1986, Kozie and Anderson 1991). The average productivity rate from 1971 to 2002 on the Verde River was 0.92; the average productivity rate for the rest of Arizona was 0.72.

Threats

Even though the bald eagle has been reclassified to threatened, and the status of the birds in the Southwest is on an upward trend, the Arizona population remains small and under threat from a variety of factors. Human disturbance of bald eagles is a continuing threat which may increase as numbers of bald eagles increase and human development continues to expand into rural areas (U.S. Fish and Wildlife Service 1999). The bald eagle population in Arizona is exposed to increasing hazards from the regionally increasing human population. These include extensive loss and modification of riparian breeding and foraging habitat through clearing of vegetation, changes in groundwater levels, and changes in water quality. Threats persist in Arizona largely

due to the proximity of bald eagle breeding areas to major human population centers and recreation areas. Additionally, because water is a scarce resource in the Southwest, recreation is concentrated along available water courses. Some of the continuing threats and disturbances to bald eagles include entanglement in monofilament fish line and fish tackle; overgrazing and related degradation of riparian vegetation; malicious and accidental harassment, including shooting, off-road vehicles, recreational activities (especially watercraft), and low-level aircraft overflights; alteration of aquatic and riparian systems for water distribution systems and maintenance of existing water development features such as dams or diversion structures; collisions with transmission lines; poisoning; and electrocution (Beatty *et al.* 1999; Stalmaster 1987). In Arizona, the use of breeding area closures and close monitoring of nest sites through the ABENWP has been and will continue to be essential to the recovery of the species. Ensuring the longevity of the ABENWP is of primary concern to the Service (U.S. Fish and Wildlife Service 1999).

It is not known if the population of bald eagles in Arizona declined as a result of DDT contamination because records were not consistently kept during that 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). Concentrations of heavy metals in bald eagle eggs are a concern in Arizona. Thirteen Arizona bald eagle eggs collected from 1994 to 1997 contained from 1.01 to 8.02 ppm dry weight mercury (Beatty *et al.* unpubl. data). Concentrations in the egg are highly correlated with risk to reproduction. Adverse effects of mercury on bald eagle reproduction might be expected when eggs contain about 2.2 ppm mercury or more. Five of 10 eggs approached or exceeded the 2.2 ppm threshold concentration. Mercury concentrations in addled eggs appears to be increasing over time. Addled bald eagle eggs collected in Arizona in 1995-97 contained more than two- to six-times higher concentrations of mercury than eggs collected in 1982-84 (appx. 0.39-1.26 ppm) (K. King pers. comm.).

Management in the Southwest

The establishment of the Southwestern Bald Eagle Management Committee (SWBEMC) and Arizona Bald Eagle Nestwatch Program (ABENWP) has been essential to the success of recovery efforts for eagles in the Southwest. The SWBEMC includes a number of Federal, State, Tribal, and quasi-governmental agencies and partners, and has been effective at implementing breeding area closures to reduce the threat of harassment to nesting eagles. The ABENWP coordinates banding of eagles, documents disturbances at nest sites, provides on-site protection, and intervenes as necessary to reduce harassment or as otherwise needed for the benefit of the eagles. This intervention has proven to be very effective in maintaining the southwestern bald eagle population. The ABENWP has "rescued" up to 50 percent of the fledglings produced in a year. These rescue operations include removing fishline and tackle from nestlings and adults, and returning nestlings to their nests after they fell or jumped out of the nest in response to disturbance or to escape extreme heat. Since the 1980's, the ABENWP

has rescued 48 eagles and eggs, and documented 52 cases of fishing line or tackle posing a threat to the nesting eagles and eaglets. At least 15 percent of the bald eagle production is due to assistance provided by the Nestwatch program (U.S. Fish and Wildlife Service 1999).

ENVIRONMENTAL BASELINE

A description of past and present vegetation communities, river flow, dam construction and operation, and other topics can be found in the Environmental Baseline for the southwestern willow flycatcher. Below we focus on bald eagle distribution and biology in the action, with an emphasis on ecological characteristics that will be important to determining the effects of the action.

Roosevelt Lake bald eagle breeding areas

Six bald eagle breeding areas (Tonto, Pinto, Dupont, Rock Creek, Pinal, and Sheep) surround Roosevelt Lake. The Tonto and Pinto cottonwood tree nest areas are found within the conservation pool of Roosevelt Lake on each end of the lake along the Tonto Creek and Salt River inflow, respectively. Both the Tonto and Pinto nest trees are old and demonstrated considerable stress in 2001 and 2002, and appear to be dying quickly (G. Beatty, U.S. Fish and Wildlife Service, pers. observ., J. Driscoll, Arizona Game and Fish Department, pers. comm.). The Dupont and Rock Creek nest areas can be found in ponderosa pines miles away in the Sierra Ancha and Four Peaks wilderness. The Pinal nest area is located on cliff ledges and pinnacles upstream of Roosevelt Lake along the Salt River and Pinal Creek. The Sheep cottonwood nest tree area is found upstream of the Tonto Breeding Area along Tonto Creek near Punkin Center. Cottonwood trees began to show considerable stress along Tonto Creek near Punkin Center in 2002 as a result of drought and reduced stream flow; reduced stream flow is exacerbated by ground water pumping, diversions, and other activities.

History of bald eagle breeding areas at and near Roosevelt

Eagles are believed to have used central Arizona, including the Roosevelt Lake area, for approximately the last 100 years and possibly for as long as 500 years (Hunt *et al.* 1992). Government agencies did not begin tracking bald eagle distribution and abundance until 1971 (Hunt *et al.* 1992, Arizona Game and Fish Department *in prep.*), and did not have comprehensive knowledge of the location of all Roosevelt Lake nesting eagles until the 1990s. However, historically eagles likely nested on rivers throughout the Southwest. Numbers of nesting pairs were likely greater than in recent times, due to overall improved nesting and foraging locations (Hunt *et al.* 1992). The first bald eagle nest in the Roosevelt area was described by Bent (1937), who observed eagles nesting on the Salt River Bird Reservation in what is now Roosevelt Lake, prior to its inundation in 1911. This may have been the Pinto Breeding Area. The Rock Creek Breeding Area was first reported in 1951, when the University of Arizona collected one or both adults for their museum (Hunt *et al.* 1992). The Rock Creek cottonwood nest tree burned in a 1959 fire (Hunt *et al.* 1992). The Pinal Breeding Area was discovered in 1978 and the Pinto Breeding Area was found in 1986 (Hunt *et al.* 1992). Throughout the late 1980s and 1990s (Hunt *et al.* 1992, J. Driscoll, Arizona Game and Fish Department, pers. comm.) eagles were detected at Salome Creek and at Roosevelt Dam that

were eventually determined to be from the Dupont and Rock Creek breeding areas. The reports of nesting eagles prior to inundation in 1911, combined with data from Roosevelt Lake from the 1950s to present indicate that bald eagles have consistently used this area for nesting through significant landscape changes (dam construction, fish population), climatic changes (dry and wet cycles), and uses (recreation).

Bald eagles from the Tonto, Pinto, Dupont, and Rock Creek breeding areas primarily use Roosevelt Lake for food, while eagles from the Sheep and Pinal breeding areas are believed to use Roosevelt Lake infrequently. Eagles from the Tonto and Pinto breeding areas primarily forage from Roosevelt Lake, but may occasionally use Tonto Creek and the Salt River above the lake's current high water mark. Not all of the places the Dupont eagles forage are known, however the detection of a pair of eagles during the breeding season by Hunt *et al.* (1992) at Salome Bay (along Roosevelt Lake) and the presence of catfish bones and fishing line in and under its nest, indicates a dependency on Roosevelt Lake (J. Driscoll, Arizona Game and Fish Department, pers. comm.). We know less about the foraging habits of the Rock Creek eagles, also because of the nest area's great distance from Roosevelt. But similar to Dupont, we expect them to use the nearby bodies of water as a primary foraging area. Sightings of bald eagles near Roosevelt Dam (Service files) indicate that this pair likely acquires food from Roosevelt and possibly upper Apache Lake. Pinal eagles used to acquire food almost exclusively at Roosevelt (Hunt *et al.* 1992). However, after the Pinto eagles established a dedicated pair and nest area between the Pinal nest area and Roosevelt Lake, they are believed to defend Roosevelt Lake, leaving Pinal to forage primarily along the Salt River upstream of the lake. The Sheep eagles are believed to forage primarily along Tonto Creek. However, both the Sheep and Pinal eagles may acquire food at Roosevelt during high water years or possibly during the winter when territories are not as vigorously defended. Pinal eagles, from their previous dependence and proximity to Roosevelt, are believed to more likely exploit resources from Roosevelt Lake. Eagles from the Sheep Breeding Area have never been detected at Roosevelt Lake.

Relationship of reservoir operations to bald eagle behavior and productivity

Reservoirs in Arizona, including Roosevelt, are critically important as bald eagle foraging areas. Prey accessibility and availability in reservoirs can be affected by reservoir operations as well as many other factors, such as flooding, other predator populations, and/or human activities (Stalmaster 1987). The way in which reservoirs are operated can affect interactions among nesting pairs of eagles, as well. In order for bald eagles to forage successfully, and subsequently have productive breeding areas, there are necessary requirements (Stalmaster 1987). Prey must be plentiful and of quality to meet energy requirements (Stalmaster 1987). Prey must also be accessible or available to bald eagles (Stalmaster 1987). Regardless of how much prey exists for eagles, they must be able to capture it. Food must also be continuously available (Stalmaster 1987). Disruptions in prey availability or abundance may cause nestling or egg mortality, increase disease, and/or reduce the bird's health (Stalmaster 1987). Year-round food prey availability is especially important in Arizona, where eagles mostly stay in the breeding areas throughout the year (Hunt *et al.* 1992). Finally, prey must be free of contamination (Stalmaster 1987).

All reservoirs have similarities that attract bald eagles and affect their behavior and productivity; however, operational regimes and the physical characteristics of reservoirs can be critical to the way in which eagles are affected. A review of reservoir types and operations in Arizona and responses of bald eagle populations using those reservoirs can be instructive in developing a baseline summary of how eagles have been affected by operation of Roosevelt, and ultimately how they are anticipated to be affected in the future under continued full operation of Roosevelt Dam. In Arizona, Roosevelt and San Carlos lakes (San Carlos, Coolidge, and Suicide breeding areas) are most similar with respect to size, operations, and use by nesting bald eagles. Both lakes have large storage capacity, are the first reservoir on the river, have two large streams entering the lake, have three or more pairs of nesting eagles using the lake as its primary food source, and the lake's surface area can fluctuate greatly over a long period of time. Both lakes were at or near 100 percent capacity from 1993 to 1995. Following the winter and spring of 1995, the surface area of both lakes began to decrease as lake levels progressively dropped. From 1999 to 2002, the lakes dropped to near or at record lows in storage capacity and surface area (elevation 2050 at Roosevelt Lake). At the end of 2002, both lakes were near 10 percent capacity. When Roosevelt and San Carlos lakes are fuller, miles of the shoreline are adjacent to cliffs, hillsides, and steep banks used by eagles to perch and forage. As water capacity and surface area drops, the water recedes further from the shoreline and reduces the benefits of important shoreline foraging, loafing, feeding, display, and sentry perches (Stalmaster 1987).

Pleasant (Pleasant Breeding Area), Apache (Horse Mesa Breeding Area), and Saguaro (Blue Point Breeding Area) lakes can be considered the opposite of Roosevelt and San Carlos lakes with respect to dam operations, nesting eagles, and their foraging environment. They have relatively smaller storage capacity (other than Pleasant), are known to have one pair of nesting eagles using each lake, the surface area does not fluctuate as greatly, and perches remain close to water. These lakes are often maintained at the upper end of capacity, and when the water volume of the lake does change, the surface area of the lake does not fluctuate as much as Roosevelt or San Carlos. Lake Pleasant can change in surface area and volume more than the other two, but the water elevation is augmented seasonally from the Central Arizona Project, and perches remain close to the shoreline even as capacity drops to near 40 percent. These lakes are set more in a basin or in canyons, and as a result, the lake's water moves largely up and down, rather than in and out. Because of this, cliffs, hillsides, and steep banks used by eagles for perching and foraging remain adjacent to water. From the 1993 to 2002, these lakes fluctuated between 100 percent and 37 percent capacity.

Other lakes where eagles nest in Arizona, such as Bartlett, Horseshoe, and Alamo are not as easily categorized. While Bartlett Lake is smaller in size and has only one pair of eagles (Bartlett Breeding Area), the amount of water can fluctuate, changing the available surface area at the upper end of the lake. Bartlett has fluctuated from being at capacity from 1993 to 1995 to dropping to below 40 percent since 1998. Horseshoe also has one pair of eagles (Horseshoe Breeding Area) using the lake for food. The eagles using Horseshoe Lake also acquire food from extensive riverine habitat upstream of the lake. As a result of Horseshoe being shallow, it can fluctuate greatly within and between years. Horseshoe can sometimes go from being near 5 percent capacity to near 100 percent capacity in a few days. From 1993 to 1995, Horseshoe

Lake was at or near capacity, and since 1999 has been primarily a river running through the lake bottom (C. Ester, Salt River Project, pers. comm.). Alamo Lake has two pairs of eagles (Alamo and Ive's Wash breeding areas). The lake's size can change dramatically, but the lake is usually kept at low capacity (<10 percent) due to the dam's primary purpose of flood control. Alamo Lake has been maintained below 10 percent capacity from 1996 to present.

The continuous drop in lake levels at Roosevelt Lake from about 100 percent capacity to only near 10 percent, over a 10 year period, has never before been observed while concurrently having thorough information on bald eagle abundance, distribution, and reproductive performance. Roosevelt Lake has been lower over the last six years than in previous years back to 1978 when eagles were first monitored at Roosevelt. Eagles nesting closer to Roosevelt Lake (Tonto and Pinto) have fared better than those farther away (Dupont, Rock Creek, and Pinal). Comparing the 1993-1995 seasons (when Roosevelt Lake was its highest) to the 1999-2001 seasons (when it was near its lowest), the reproductive rate (1.01 in '93-'95 to 0.58 in '99-'01) and nest success (0.78 in '93-'95 to 0.33 in '99-'01) of bald eagle territories using Roosevelt Lake consistently declined as lake size declined (Table 1 and 2). A plausible explanation for this correlation is that reduced surface area of the lake and the eagle's foraging area may have resulted in increased energetic costs. More energy may have been spent competing with other neighboring eagles and finding food as a result of increasing the distance food resources were from perch sites and decreasing food availability. As a result, fewer nesting attempts occurred, more failures occurred, and more breeding areas were recorded as unoccupied.

The effects of decreasing the surface area of Roosevelt Lake on bald eagle productivity from 1993 to 2001, were subtle, but clear and consistent (Table 1 and 2). Eagles from the Pinal Breeding Area laid eggs annually and raised 2 eaglets from 1993 to 1997, however eggs were laid only twice and only one eaglet was reared over the next 5 year period. The Pinto Breeding Area produced 6 eaglets, laid eggs 5 times, and failed twice from 1993 to 1997. Yet from 1998 to 2002, the Pinto eagles only laid eggs 3 times and raised 4 eaglets. Since 1990, these were the first 2 years (1998 and 2000) the Pinto eagles had not laid eggs. The Dupont Breeding Area has been a poor performer, but has performed worse as the years progressed. In 1997 and 1998, eagles laid eggs twice and produced one eaglet. Over the next 4 years, eggs were only laid once, no eaglets were produced, and the breeding area was reported as unoccupied in 2002. The drop in reproductive performance is not that of a complete crash in eagle occupancy or reproduction (like those territories at San Carlos Lake in 2002). But the effects were consistent from 1993 to 2001: eagles with dependency on Roosevelt Lake for food reproductively were less productive as the lake's surface area declined.

While small sample sizes and environmental factors can sometimes influence bald eagle reproductive performance at a single location, comparing productivity at two lakes with similar dam operations, lake size, and number of eagle pairs over the same time period helps to more clearly understand the effects of reducing Roosevelt Lake's surface area. San Carlos Lake is most similar to Roosevelt Lake with respect to size, operations, and use by nesting bald eagles. Comparing the 1993-1995 reproductive performance at San Carlos Lake (when it was its highest) to the 1999-2001 seasons (when it was near its lowest), the reproductive rate (1.5 in '93-

'95 to 0.77 in '99-'01) and nest success (0.75 in '93-'95 to 0.33 in '99-'01) decreased as lake area declined (Table 1 and 3). The Coolidge and San Carlos eagles annually failed or did not lay eggs as the lake became smaller and the Suicide eagles monopolized food resources (Table 1). From 1998 to 2001, the reduced conservation pool only supported reproduction from one pair of eagles, not two or three. In 2002, it was notable that six eaglets were in all nests at territories supported by San Carlos Lake. However, all eaglets died when they reached advanced age in the nest (> 6 weeks old), causing nest success and reproductive rate to be zero. These were the only eaglets that died in the nest in all of Arizona in 2002. Similar to Roosevelt Lake, except more dramatic, reproductive performance of eagles using San Carlos Lake paralleled the consistent and progressive decrease in the lake's surface area, as a result of increased energetic costs, competition, and reduced prey availability. For clarification, San Carlos Lake and Coolidge Dam are not a part of the HCP and are not operated by Salt River Project. Data for San Carlos Lake are provided for comparison purposes only.

Table 1. Bald eagle 1993 to 2002 reproductive performance at San Carlos and Roosevelt reservoirs, Arizona.											
Breeding area	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Young fledged
Coolidge	2	F ¹	2	F	2	F	F	F	F	F	6
San Carlos	- ¹	-	2	1	1	2	O ¹	F	O	F	6
Suicide	-	-	-	-	-	-	2	3	2	F	7
Dupont	-	-	-	-	F	1	O	F	O	U ¹	1
Pinal	1	1	F	F	F	O	O	F	U	1	3
Rock Creek	-	-	-	-	-	-	-	-	O	1	1
Pinto	1	F	2	3	F	O	2	O	2	F	10
Tonto	2	1	1	2	2	1	2	F	1	2	14
Totals	6	2	7	6	5	4	6	3	5	4	48

¹ Breeding status definitions from Postapulsky (1974)

"-" = Breeding area unknown, U = Unoccupied, no birds detected at breeding area, O = Occupied, eagles present, no eggs laid
 F = Failed, eggs laid, no young fledged, 1,2...= number of young fledged

Table 2. Bald eagle 1993 to 2002 productivity summary for pairs using Roosevelt Lake, Arizona.				
Productivity summaries	1993-95	1996-98	1999-2001	2002
Total nest years	9	11	13	5
Total occupied nest years	9	11	12	4
Total active nest years	9	9	7	4
Total failed nest years	2	4	3	1
Total successful nest years	7	5	4	3
Total occupied nest years, no eggs laid	0	2	5	0

Total unoccupied nests	0	0	1	1
Total number of fledglings	9	9	7	4
Mean brood size (young per successful nest)	9/7 = 1.3	9/5 = 1.8	7/4 = 1.75	4/3 = 1.33
Young per active nest	9/9 = 1	9/9 = 1	7/7 = 1	4/4 = 1
Nest Success (% occupied nest successful)	7/9 = .78	5/11 = .45	4/12 = .33	3/4 = 0.75
Productivity or Reproductive rate (mean brood size x nest success)	1.01	0.81	0.58	0.99

Table 3. Bald eagle 1993 to 2002 productivity summary for pairs using San Carlos Lake, Arizona.				
Productivity summaries	1993-95	1996-98	1999-2001	2002
Total nest years	4	6	9	3
Total occupied nest years	4	6	9	3
Total active nest years	4	6	7	3
Total failed nest years	1	2	4	3
Total successful nest years	3	4	3	0
Total occupied nest years, no eggs laid	0	0	2	0
Total unoccupied nests	0	0	0	0
Total number of fledglings	6	6	7	0
Mean brood size (young per successful nest)	6/3 = 2.0	6/4 = 1.5	7/3 = 2.33	0/0 = 0
Young per active nest	6/4 = 1.5	6/6 = 1.00	7/7 = 1.00	0/3 = 0
Nest Success (% occupied nest successful)	3/4 = 0.75	4/6 = 0.66	3/9 = 0.33	0/3 = 0
Productivity or Reproductive rate (mean brood size x nest success)	1.50	0.99	0.77	0.00

Table 4. Bald eagle 1993 to 2002 productivity summaries at Apache, Saguaro, and Pleasant lakes, Arizona.				
Productivity summaries	1993-95	1996-98	1999-2001	2002
Total nest years	9	9	9	3
Total occupied nest years	9	9	9	3
Total active nest years	9	9	9	3
Total failed nest years	1	3	1	0
Total successful nest years	8	6	8	3
Total occupied nest years, no eggs laid	0	0	0	0
Total unoccupied nests	0	0	0	0
Total number of fledglings	13	11	10	4

Mean brood size (young per successful nest)	13/8 = 1.6	11/6 = 1.8	10/8 = 1.3	4/3 = 1.3
Young per active nest	13/9 = 1.4	11/9 = 1.2	10/9 = 1.1	4/3 = 1.3
Nest Success (% occupied nests successful)	8/9 = 0.89	6/9 = 0.67	8/9 = 0.89	3/3 = 1.0
Productivity or Reproductive rate (mean brood size x nest success)	1.42	1.21	1.16	1.33

Also helpful to understanding the effects of reduced lake surface area, is contrasting the reproductive performance of bald eagles over the same time period where dam operations maintained the lake’s surface area closer to the upper end of capacity. Reproductive performance at Saguaro, Apache, and Pleasant reservoirs was consistently successful over the past 10 years. From 1993 to 2001 (grouped in three year increments), nest success stayed consistently high (0.89 in ‘93-‘95, to 0.69 in ‘96-‘98, to 0.89 in ‘99-‘01) and reproductive rate only dropped a little over two-tenths (1.42 in ‘93-‘95 to 1.21 in ‘96-‘98 to 1.16 in ‘99-‘01; Table 4). Every year from 1993 to present, each breeding area was occupied and eggs were laid. This is in comparison to Roosevelt Lake breeding areas where nest success and reproductive rate dropped by nearly 50 percent from 1993 to 2001 (Table 2).

The encouraging aspect of what was observed at Roosevelt Lake is the flexibility of the bald eagle as a predator. Even with the considerable drop in lake size, occupancy of territories was still relatively high. So while reproduction was hampered, adult eagles were still persisting in these territories ready to breed successfully when conditions are more favorable. Also, there was no indication of an unusually high mortality and replacement rate of adults holding territories at Roosevelt Lake, indicating that breeding birds are surviving (J. Driscoll, Arizona Game and Fish Department, pers. comm.).

While observing and describing long-term and subtle declines in bald eagle productivity, there may be periodic seasons where eagles are more successful than the overall trend. Occurrences at Roosevelt and San Carlos lakes in 2002 may provide some evidence of how seasonal or within season increases in food abundance, availability, or continuity may affect eagle productivity. Having six eaglets produced and then suddenly die at San Carlos Lake suggests that adequate resources were available to create the eaglets, but later in the season may have been interrupted, not adequate, or unavailable. However, productivity at Roosevelt Lake in 2002 was comparable to the successful 1993-1995 seasons (Table 2) suggesting increased food availability. Changes in the fish population and/or fish availability to foraging eagles are expected to occur as the lake changes size and shape. As the lake continued to drop in size, it is possible that eagles were able to partition and/or exploit a previously unavailable food source. It is also possible that vegetation grew large enough along the Salt and Tonto creek arms and lakeshore to provide new foraging perches and opportunities for eagles.

Inundation of nests from rising reservoir levels

The great fluctuations in water levels at Roosevelt Lake, large storage capacity, and often long time before the lake fills, allows vegetation to grow and become suitable for bald eagle nest

placement within or adjacent to the conservation space. Nests in trees or structures in the conservation space are vulnerable to inundation. At the Tonto and Pinto breeding areas at Roosevelt Lake, Reclamation consulted with us and received an incidental take statement for the expected inundation of these nest trees as a result of raising Roosevelt Dam (U.S. Fish and Wildlife Service 1990, 1993; see Consultation History for a detailed discussion of previous consultations on bald eagles in and near Roosevelt Lake). In those opinions, we anticipated that cottonwood nest trees at Tonto and Pinto would be killed, damaged, and/or inundated as a result of the increased water storage from raising Roosevelt Dam (U.S. Fish and Wildlife Service 1990, 1993).

Bald eagle breeding areas on Salt River below Roosevelt Dam

Distribution and habitat use

Four pairs of bald eagles nest along or near the Salt River from Roosevelt Dam downstream to Granite Reef Dam (lower Salt River). Water is perennial between the two structures, and the Salt River is regulated by Roosevelt, Horse Mesa, Mormon Flat, and Stewart Mountain dams. The river is diverted at Granite Reef Dam, only allowing water to go downstream into the dry riverbed during flood events. Eagles at Apache Lake (Horse Mesa Breeding Area) and Saguaro Lake (Blue Point Breeding Area) nest on cliff ledges and pinnacles. No eagles are known to nest at Canyon Lake. The Orme and Granite Reef breeding areas are located below Stewart Mountain Dam. Orme eagles nest on cliff ledges, pinnacles, and trees near the Verde/Salt River confluence, and Granite Reef eagles are dependent on trees for nesting between the confluence and Granite Reef Dam. No eagles nest downstream of Granite Reef Dam on the Salt, Gila, or Colorado rivers. Diversion of the Salt River at Granite Reef Dam removed any bald eagle nesting habitat that may have historically existed, and likely limits any eagle re-colonization on the Salt River downstream of Granite Reef Dam. Diversion of flow at Granite Reef Dam also reduced river flow further downstream on the Gila River.

Lower Salt River nesting eagles use the lakes and regulated river for prey. Horse Mesa eagles are believed to primarily use Apache Lake and portions of Canyon Lake for food, while the Blue Point eagles use Saguaro Lake and the regulated river below Stewart Mountain Dam (Hunt *et al.* 1992). Because these regulated lakes are maintained toward the upper end of capacity, the foraging environment stays fairly constant. Even when the lake elevation drops, the surface area remains fairly constant due to occurrence of the lakes in canyon-walled basins. The Orme eagles use the regulated Salt and Verde river confluence area and the Granite Reef eagles are believed to depend solely on the regulated Salt River between its confluence with the Verde River and Granite Reef Dam.

Occupancy and productivity of breeding areas

Occupancy and productivity (Postapulsky 1974) of all bald eagle territories below Roosevelt Dam along the Salt River to Granite Reef Dam has been consistently good since their discovery (Table 5). Blue Point has been occupied all but one year since 1979, while Horse Mesa, Orme, and Granite Reef have been occupied annually since their discovery in 1983, 1987, and 2002, respectively. Horse Mesa failed its first 3 years after discovery, but since 1986, has been

successful 13 times (producing 19 eaglets) and failed 4 times. After having little success from 1971 to 1978, Blue Point has been one of the most successful breeding areas in Arizona. Blue Point eagles were successful 17 times from 1979 to 2002, fledging 37 eaglets. Orme eagles have been successful in 13 of 16 seasons, fledging 20 eaglets. Granite Reef produced two eaglets in 2002; its first known season of existence. Dam construction and operations have maintained a relatively stable foraging environment from Roosevelt Dam to Granite Reef Dam, which in turn has led to constant eagle productivity. There is no information to compare eagle abundance and productivity pre and post dam construction between these two locations to know whether bald eagle distribution, abundance, or reproductive performance was ever affected. While dam construction and operations have maintained a relatively stable foraging environment at the Salt River reservoirs; it eliminated many miles of habitat that were probably available for bald eagle nesting and foraging below Granite Reef Dam and further downstream along the Gila River below the Salt River confluence.

Threats

Human activity, including recreation and continued development exert pressure on nesting eagles and eagle habitat along the lower Salt River (Hunt *et al.* 1992, Arizona Game and Fish Department *in prep.*). To date, however, nesting eagles have withstood these pressures and been successful. Eagles at Horse Mesa and Blue Point have moved their nesting areas away from human activity to more remote areas about a mile from each lake (Hunt *et al.* 1992, J. Driscoll, Arizona Game and Fish Department, pers. comm.). While these areas provide more security from human disturbance, the nests are more exposed to heat and are farther away from feeding areas (energetically more costly). All three fledglings from the Blue Point Breeding Area died from exposure to heat in 1988 (Hunt *et al.* 1992). Fishing line has entangled and killed adult and nestling eagles in Arizona, and persistent monitoring and removal of fishing line (Arizona Game and Fish Department *in prep.*) from nests has reduced the adverse effects. Thirteen percent (n=8) of all fishing line detected in eagle nests from 1986 to 1999 occurred at these lower Salt River breeding areas (Arizona Game and Fish Department *in prep.*). On Forest Service land, tubing, boating, camping, hiking, picnicking, fishing, campground development, roads, and other recreational activities are present and continue to increase as a result of the proximity and growth of the Phoenix metropolitan area. These activities disturb foraging and nesting eagles and help to degrade their habitat (Hunt *et al.* 1992, U.S. Fish and Wildlife Service 2000b). Hunt *et al.* (1992) described human activity on the lower Salt River as a “serious problem.” The closure of lands of the Salt River Pima Maricopa Indian Community to non-tribal activities in 1997 has reduced the amount of human activity near the Salt/Verde confluence and downstream near Granite Reef Dam. Reduced human activity may have led to increased use of tree nests along the river by the Granite Reef and Orme eagles. Agency management actions, such as seasonal closures, nest surveys, nest monitoring, education, and rescues coordinated by the Arizona Game and Fish Department have helped reduce some of the impacts of human activity on breeding success (Arizona Game and Fish Department *in prep.*); however, these actions do little to improve or retard habitat degradation.

While the lower Salt River between Roosevelt and Granite Reef dams may produce consistent foraging opportunities, dam construction and operations in this reach have affected the dynamic

natural hydrological regime that creates conditions for germination and replacement of eagle nesting and perching trees (Hunt *et al.* 1992, Briggs 1996, U.S. Fish and Wildlife Service 2002b). Regardless of how prevalent food is or how human activity is managed, nesting structures and foraging perches are needed to maintain reproductive performance and territories. Development and operation of dams have altered water and sediment flow, river landforms, and their associated riparian communities important for eagle use (U.S. Fish and Wildlife Service 2002b).

Table 5. Bald eagle productivity summary for pairs using Salt River below Roosevelt Dam, Arizona.				
Productivity summaries	1971-79	1980-89	1990-99	2000-02
Total nest years	9	20	30	10
Total occupied nest years	3	19	30	10
Total active nest years	2	17	29	10
Total failed nest years	1	5	5	2
Total successful nest years	1	12	24	8
Total occupied nest years, no eggs laid	1	2	1	0
Total unoccupied nests	6	1	0	0
Total number of fledglings	2	26	39	11
Mean brood size (young per successful nest)	2/1 = 2.0	26/12 = 2.2	39/24 = 1.6	11/8 = 1.4
Young per active nest	2/2 = 1.00	26/17 = 1.53	39/29 = 1.34	11/10 = 1.10
Nest Success (% occupied nest successful)	1/3 = 0.33	12/17 = 0.71	24/30 = 0.80	8/10 = 0.80
Productivity or Reproductive rate (mean brood size x nest success)	0.66	1.56	1.28	1.12

Operation of dams has generally led to a restriction of riparian habitat by channel shrinkage and reduced hydro- and geo-complexity. Reduced peak flows and reduced variability of flows of all magnitudes and frequency leads to channel shrinkage and simplification of the riparian system (U.S. Fish and Wildlife Service 2002b). This process has slowly occurred since the Salt River dams were built between 1903-'30 and today, and continues to slowly degrade the quality of riparian habitat, which in turn has limited perching, foraging, and nesting trees between Stewart Mountain and Granite Reef dams. Near complete loss of river flow downstream of Granite Reef Dam has removed any historical downstream use on the Salt River that may have existed. Hunt *et al.* (1992) described that existing riparian trees below Stewart Mountain Dam are decaying and falling apart, affecting perching and foraging opportunities. They recommended a flow regime to ensure the persistence of foraging habitat.

Salt River dam construction and operations, and continued development and recreation have, to date, likely prevented growth of the known bald eagle population below Stewart Mountain Dam. Presently three bald eagle breeding areas exist below Stewart Mountain Dam, and only one of these breeding areas was established over the last 30 years. The first records of the Blue Point Breeding Area are from the 1930s, but annual tracking of success began in 1971 (Hunt *et al.* 1992). Only two bald eagle breeding areas (Orme and Granite Reef) have been discovered on the lower Salt River below Stewart Mountain Dam since 1971. Similar to the Blue Point Breeding Area, there is good anecdotal information that the Orme Breeding Area existed in the 1970s, long before it was “officially” discovered in 1987 (Hunt *et al.* 1992). No previous information existed for the Granite Reef Breeding Area, therefore it appears to be new. The Granite Reef nest area and territory were established in an area after human activity was reduced. In contrast, since 1994, five breeding areas have been established or re-occupied below Bartlett Dam where more riparian habitat exists and, overall, less human activity occurs (compared to lower Salt River below Stewart Mountain Dam).

Status of bald eagles in mitigation areas

Bald eagle breeding areas and habitat use on the Verde River from Horseshoe Lake to the Salt River

Nine nesting pairs of bald eagles nest along the Verde River from Horseshoe Lake downstream to its confluence with the Salt River (lower Verde River). A tenth pair, the Orme eagles, forage on the Verde River, but nest and also forage on the Salt River. Water is in this reach of the Verde, but is regulated by Horseshoe and Bartlett dams and is altered by various diversions at K/A Ranch and the Fort McDowell Yavapai Nation. Eagles at Horseshoe Lake (Horseshoe Breeding Area) have nested on cliff ledges and cottonwood trees. At the Cliff Breeding Area, eagles have used rock pinnacles and cliff ledges. At the Bartlett Breeding Area, trees and cliff ledges have supported nests, but now only cliff nesting persists. All remaining breeding areas on the lower Verde River (Needle Rock, Box Bar, Fort McDowell, Doke, Sycamore, and Rodeo) are dependent on cottonwood and a few sycamore trees for nesting and perching.

The lower Verde River nesting eagles use a variety of unregulated, lake, and regulated river habitat for foraging. Horseshoe eagles use the Verde River upstream of Horseshoe Lake and the conservation space of Horseshoe Lake for prey (Hunt *et al.* 1992). The Cliff eagles primarily use the regulated river between Horseshoe Dam and Bartlett Lake (Hunt *et al.* 1992). The Bartlett eagles exploit resources at Bartlett Lake and below Bartlett Dam on the Verde River (Hunt *et al.* 1992). More recently, Bartlett eagles have not been detected using the regulated river as often, but are more often observed returning from the lake with food (J. Driscoll, Arizona Game and Fish Department, pers. comm.). All the other eagles are dependent on the regulated Verde River below Bartlett Dam for food.

Over the last 8 years in Arizona, the greatest increase in the number of breeding areas has occurred along the lower Verde River below Bartlett Dam. Almost 25 percent (5 of 21) of all new breeding areas discovered since 1994 occurred on this 24.5 mile stretch of river. While two sites are re-occupied historical sites (Hunt *et al.* 1992), the other three are new. From 1970 to

1994 only one to three breeding areas were known below Bartlett Dam. Now seven breeding areas (eight if the Orme Breeding Area is included) can be found using this portion of the river. This has changed the previous belief in Arizona that eagles required about 10 river miles for a territory (Hunt *et al.* 1992).

The increase in numbers of territories on the lower Verde River below Needle Rock is likely due to current availability of nesting structures, perches, food, past productivity, management of human activity, and possibly recent establishment of a 100 cfs minimum flow below Bartlett Dam. Large mature cottonwood trees are presently distributed throughout the lower Verde River from Needle Rock downstream to the Salt River providing nesting and foraging opportunities. Some of the most productive sites in Arizona (Blue Point and Fort McDowell breeding areas) exist on or near the lower Verde River (J. Driscoll, Arizona Game and Fish Department, pers. comm.). Since 1991, 70 percent of all known identity breeding eagles returned within 62 miles of where they hatched to breed (J. Driscoll, Arizona Game and Fish Department, pers. comm.). Native suckers and river riffles, important components to successful breeding areas, are abundant below Bartlett Dam (Hunt *et al.* 1992). The cold water released from Bartlett Dam promotes maintenance of a native sucker population (Hunt *et al.* 1992). Trout stocking on tribal land near the time eagles lay eggs may have helped provide a surge in food availability during critical times early in the nesting cycle. Also a contributing factor, the Fort McDowell Yavapai Nation closed the river area to non-tribal members and hired their own Police Department in 1997. This helped reduce human activity, recreation, and camping on tribal land that could have prevented establishment of eagle territories. Additional monitoring and education from Arizona Bald Eagle Nestwatchers helped protect nesting attempts and rescued eagles in life threatening situations (Arizona Game and Fish Department *in prep.*). The 100 cfs minimum flow below Bartlett Dam may provide eagles with a better foraging environment, including more riffles to capture fish (S. Bryan, Arizona Game and Fish Department, pers. comm.). The combination of available nesting structures, perches, food availability, nearby productivity, and management likely promoted the increase of territories below Bartlett Dam and Needle Rock on the lower Verde River.

Bald eagle occupancy and productivity

Occupancy of bald eagle territories on the lower Verde River has been almost 100 percent since each territory was discovered, but productivity has been variable. Of the 134 nest years tracked since 1971, 133 have been recorded as occupied (Horseshoe-28, Cliff-19, Bartlett-32, Needle Rock-1, Box Bar-8, Fort McDowell-31, Doka-5, Sycamore-6, Rodeo-3). Productivity (1.40) and nest success (0.61) peaked in the 1980s, but declined significantly (productivity = 0.53, nest success = 0.40) in the 1990s (Table 6). Since 2000, reproductive performance has surged (productivity = 1.12, nest success = 0.64) (Table 6). The annual number of fledglings from the lower Verde River ranged from 0 to 4 during the 1970s (mean = 2.2), 1 to 8 in the 1980s (mean = 5.1), 1 to 8 in the 1990s (mean = 3), and 8 to 10 (mean = 9.3) in the 2000s.

There is not likely a single primary factor that led to the decline in bald eagle productivity on the lower Verde River in the 1990s, but rather a combination of human and eagle related factors. The Cliff Breeding Area is the poorest reproductive performer on the lower Verde River. The

Cliff Breeding Area fledged only 4 eaglets in its 19 year history (none since 1988) and has not laid eggs since 1994. Constant nest failures and observation of the Cliff male stealing food from the nest, being chased away by the adult female, and eventually eating the nestling (G. Beatty, personal observation) is indicative of a territory missing a steady food component. Warm water releases favor proliferation of exotic fish in the Cliff Breeding Area (Hunt *et al.* 1992) that may be difficult for eagles to access year-round or often enough. At the Horseshoe Breeding Area, inundation of a nesting attempt in 1991, the shooting death of an adult bird in October 1991, and continued mate replacement may have led to five years of lowered productivity (Beatty and Driscoll 1996, G. Beatty, personal observation; J. Driscoll, Arizona Game and Fish Department,

Table 6. Bald eagle productivity summary for pairs using lower Verde River from Horseshoe Lake, Arizona.				
Productivity summaries	1971-79	1980-89	1990-99	2000-02
Total nest years	23	36	50	25
Total occupied nest years	22	36	50	25
Total active nest years	22	34	39	22
Total failed nest years	7	12	19	6
Total successful nest years	15	22	20	16
Total occupied nest years, no eggs laid	0	2	11	3
Total unoccupied nests	1	0	0	0
Total number of fledglings	22	51	30	28
Mean brood size (young per successful nest)	22/15 = 1.5	51/22 = 2.3	30/20 = 1.33	28/16 = 1.75
Young per active nest	22/22 = 1.0	51/34 = 1.5	39/30 = 1.30	28/22 = 1.27
Nest Success (% occupied nest successful)	15/22 = 0.68	22/36 = 0.61	20/50 = 0.40	16/25 = 0.64
Productivity or Reproductive rate (mean brood size x nest success)	1.02	1.40	0.53	1.12

pers. comm.). Human disturbance, fishing line entanglement, nestlings falling or being blown from nests, nestlings disappearing, predation, nest trees falling over, shooting, contaminants, and birth defects all reduced reproductive performance on the lower Verde River in the 1990s (Hunt *et al.* 1992, Arizona Game and Fish Department *in prep*, G. Beatty, personal observation, J. Driscoll, Arizona Game and Fish Department, pers. comm.). The increase in territory establishment and competition, combined with first time breeding attempts, may have also contributed to a temporary reduction in reproductive performance.

Compared to what occurred in the 1990s, bald eagle productivity rebounded since 2000 on the lower Verde River. Twenty-eight fledglings were produced in 3 seasons compared to 30 for the entire 1990s (Table 6). The increase was a result of more territories, increased breeding pair experience, and possibly increased food availability from stocking of rainbow trout prior to egg laying on the Fort McDowell Yavapai Nation (J. Driscoll, Arizona Game and Fish Department,

pers. comm.) and 100 cfs minimum flows from Bartlett Dam. Management actions by agencies and tribes such as seasonal closures, nest surveys, nest monitoring, education, and rescues coordinated by the Arizona Game and Fish Department, and assisted by us, Reclamation, SRP, and other managing agencies, have helped reduced some of the impacts to nesting eagles and helped productivity (Arizona Game and Fish Department *in prep.*).

Bald eagle productivity, nest trees, and nesting attempts at the Horseshoe Breeding Area have been affected by operation of Horseshoe Dam. Within the conservation space of Horseshoe Lake, active bald eagle nests were inundated in 1979, 1980, 1982, 1986, and 1991 (Hunt *et al.* 1992). Nests were placed in cottonwood and willow trees, snags, and in artificial structures located within the conservation space. All previously used nest trees have been lost due to inundation and degradation, as a result, no nest trees are currently known to exist within the conservation space at Horseshoe Lake (J. Driscoll, Arizona Game and Fish Department, pers. comm.). However, willow trees, established after the 1995 storms are growing in the conservation space that could become future nest trees. These trees range from about 20 feet to 60 feet tall (S. Sferra, U.S. Bureau of Reclamation, pers. comm. 2002).

Trends in nest tree availability

Eight of 9 bald eagle breeding areas on the Verde have used trees for nesting sites. Six of these only have trees available for nesting (as opposed to cliff nesting sites). The number of nest trees available for each pair of eagles below Bartlett Dam has been reduced through the increase in territories, degradation of existing trees, and lack of riparian recruitment (McNatt *et al.* 1980, Hunt *et al.* 1992, Briggs 1996, Beauchamp and Stromberg 2001, U.S. Fish and Wildlife Service 2002). Bartlett cottonwood nest tree #3 was found in 1973, used in 1977 and 1980, and supporting limbs broke underneath the nests in 1978 and 1985 (Hunt *et al.* 1992). No nests were ever again built in the tree and the nest tree fell prior to 1989 (G. Beatty, U.S. Fish and Wildlife Service, personal observation). A few large cottonwood trees exist at the campground below Bartlett Dam (Hunt *et al.* 1992); however, there are none left through the Bartlett nest area downstream to Needle Rock and no regeneration is occurring (J. Driscoll, AGFD, pers. comm., G. Beatty, U.S. Fish and Wildlife Service, pers. obser.). It is believed that only two to three nest trees are available for the Needle Rock eagles (J. Driscoll, Arizona Game and Fish Department, pers. comm., G. Beatty, U.S. Fish and Wildlife Service, personal observation). The Box Bar Breeding Area has primarily one cottonwood grove for eagles to use for nesting (J. Driscoll, Arizona Game and Fish Department, pers. comm., G. Beatty, U.S. Fish and Wildlife Service, personal observation). The supporting branch for the Box Bar tree nest #2 fell in 1998. In the past, the Fort McDowell eagles nested and perched in trees along most of the lower Verde River from the Forest/Tribal boundary to Highway 87 bridge, but establishment of the Doka and Sycamore breeding areas has reduced the size of Fort McDowell's territory. Fort McDowell has had a total of 17 known nest trees used since the 1970s; currently, nests (#15, #16, and #17) are known to exist in three trees (Hunt *et al.* 1992, J. Driscoll, Arizona Game and Fish Department, pers. comm.). Many of the supporting branches or trees have fallen as the trees have degraded or died (Hunt *et al.* 1992, J. Driscoll, Arizona Game and Fish Department, pers. comm.). The Doka nest snag #1, previously a live cottonwood used by the Fort McDowell eagles, fell after the 2001 breeding season. Sycamore nest tree #1 supporting branches also have fallen.

Similar to the lower Salt River, Verde River dams and dam operations degrade existing eagle tree nesting and perching habitat, and retard riparian regeneration that could replace aging and dying trees (Arizona Game and Fish Department *in prep.*, McNatt *et al.* 1980, Hunt *et al.* 1992, Briggs 1996, Beauchamp and Stromberg 2001, U.S. Fish and Wildlife Service 2002b).

Operation of Bartlett Dam has altered the hydrological regime of the lower Verde River by reducing the magnitude, frequency and duration of high flow events (Briggs 1996, Beauchamp and Stromberg 2001, U.S. Fish and Wildlife Service 2002b). A consequence of this change is a decrease in the size and complexity of the active channel below Bartlett Dam (Beauchamp and Stromberg 2001, U.S. Fish and Wildlife Service 2002b). A reduction in high flows is concomitant with a reduction in stream power and the ability to re-work sediment (Gordon *et al.* 1992). Periodic high flows on the lower Verde have not been sufficient to maintain or continue these processes as smaller flood flows are restricted (U.S. Fish and Wildlife Service 2002b). Dams are restricting the flow of sediment, and operations are restricting the dynamic hydrological regime that allows sediment to move past the dam and help maintain and regenerate riparian habitat (U.S. Fish and Wildlife Service 2002b).

Other land use activities, such as cattle grazing and vehicles also contribute to degradation of existing eagle nesting, perching, and foraging habitat and retard nest tree regeneration on the lower Verde River (Arizona Game and Fish Department *in prep.*, J. Stromberg, Arizona State University, pers. comm., V. Beauchamp, Arizona State University, pers. comm., Hunt *et al.* 1992, Sommers *et al.* 2002, U.S. Fish and Wildlife Service 2002b). Below Horseshoe Dam on the Tonto National Forest, automobiles access the floodplain at the ford area near K/A ranch and at the old gauging station/cable cross. Below Bartlett Dam, automobile and recreational use in the floodplain occurs at three areas (about a mile downstream from the dam, at Needle Rock, and at Box Bar). Further downstream on the Fort McDowell Yavapai Nation and Salt River Pima Maricopa Indian Community, recreational activity, including vehicles, occurs in the floodplain. These recreational activities, all-terrain vehicles, etc. adversely affect the establishment and maintenance of tree development (Cole and Landres 1995, Flather and Cordell 1995). Additionally, livestock grazing in the Verde River floodplain on the Fort McDowell Yavapai Nation and Salt River Pima Maricopa Indian Community retard the establishment of riparian trees (U.S. Fish and Wildlife Service 2002b). In addition to dam operations (Stromberg 1993), scouring, off-road vehicles, development, grazing, woodcutting, and agriculture threaten existing lower Verde River riparian habitat (Hunt *et al.* 1992, Arizona Game and Fish Department *in prep.*), and inhibit its regeneration.

Hunt *et al.* (1992) described the lower Verde River below Bartlett Dam as “cottonwood trees and mesquite bosques in various stages of decay and thinning.” Arizona Game and Fish Department (*in prep.*) found that cottonwood trees on the lower Verde River have “become overmature, are dying, and are not being replaced.” Many of the large trees present were there prior to construction of the dam (J. Stromberg, Arizona State University, pers. comm.). Directly below Bartlett Dam, the floodplain has been scoured by high flows, leaving rock cobble. Further downstream beginning near Needle Rock, riparian vegetation and larger nesting trees are primarily found on terraces further away from the active channel (U.S. Fish and Wildlife Service 2002b). Some mature cottonwoods on the lands of the Fort McDowell Yavapai Nation can be

found perched at least 10 feet above the river bottom atop exposed banks. These banks, unprotected by vegetation, are subjected to infrequent, but heavy floods, causing the banks to erode and the trees to fall. In 1995, the Fort McDowell nest tree, nest, and young were toppled into the river as a result of exposed banks and high flows (G. Beatty, U.S. Fish and Wildlife Service, pers. comm.). Old trees along the entire lower Verde river closer to the active channel that pre-date the dam, have significant root scouring, and as a result of decreased sediment deposition, are not protected and may be more easily toppled during large flood events (J. Stromberg, Arizona State University, pers. comm.). Below Sycamore Creek, salt cedar is flourishing as a result of the interrupted hydrologic regime (U.S. Fish and Wildlife Service 2002b). This creates a significant fire risk to existing nest trees, not previously known to exist along southwestern rivers (U.S. Fish and Wildlife Service 2002b). Hunt *et al.* (1992) made protecting and improving riparian habitat along the lower Verde River their first habitat management recommendation and suggested that losing the Fort McDowell eagles (as result of the loss of nest trees) might be significant to the population.

Cottonwood pole planting projects have occurred along the lower Verde River below Bartlett Dam without much overall success in contributing to quality wildlife habitat. Briggs (1996) described a failed U.S. Forest Service effort from 1979. Over 600 cottonwood and willow poles were planted, but 11 years later only 7 trees appeared healthy with the long-term potential of survival. Lowered groundwater levels and water deprivation were believed to be contributing factors in the project's failure. Agencies participating in the Southwestern Bald Eagle Management Committee planted cottonwoods on at least two occasions at the Fort McDowell Yavapai Nation (1988 and 2001). Some cottonwoods from 1988 survived that were located near sources of water (C. Sommers, ERO, pers. comm.), but nearly all that were planted in the floodplain near existing eagle nesting areas died from beavers or lack of groundwater. Hundreds of riparian trees were planted in the floodplain along the Verde River on Salt River Pima Maricopa Indian Community in the mid-1990s, but all trees died (G. Beatty, U.S. Fish and Wildlife Service, pers. comm.).

We are unable to attribute a percentage or degree to which activity (dam construction/operation or land uses) has caused more damage to bald eagle habitat on the lower Verde River. Beauchamp and Stromberg (2001) found that operation of the dams has likely affected riparian communities by decreasing recruitment of early successional riparian species (willows and cottonwoods) and expansion of later successional species (e.g. mesquites and saltcedar). McNatt *et al.* (1980) found that Horseshoe and Bartlett dams have led to the demise of cottonwoods on the lower Verde River. This is a common effect of dam construction and operation in the Southwest, and has been observed on numerous river systems (see review in Briggs 1996). Sommers *et al.* (2002) agree that flow alteration has reduced the frequency and density of cottonwood establishment, but they believe land use factors, particularly grazing and recreation, are even more important than dam construction and operation in limiting native riparian plant communities (also see U.S. Fish and Wildlife Service 2002a, pp. 86-89). However, Vanessa Beauchamp (graduate student, Arizona State University, pers. comm. 2002), believes the effects of the dams and their operation are the most important limiting factors in shaping the riparian plant community. What appears to be clear from examples of land and

river management activities throughout Arizona and the Southwest (U.S. Fish and Wildlife Service 2002b) is that each activity by itself, and certainly in combination with each other, are capable of degrading existing bald eagle habitat and affecting the development of habitat to maintain existing territories.

Status of bald eagles at other mitigation sites

Extensive discussion of the mitigation areas (lower San Pedro River, Verde River in the Verde Valley, and Gila River in the Safford Valley) is found in the Environmental Baseline for southwestern willow flycatcher in this biological opinion. Because nesting bald eagles and southwestern willow flycatchers both depend on riparian habitat and live along river courses, the discussion in the flycatcher Environmental Baseline also accurately describes the condition of the environment for the bald eagle. While the Verde Valley contains adequate resources for nesting bald eagles, such as nest trees, fish, and the processes to establish, maintain, and regenerate nesting habitat, the large amount of human residences, activity, and recreation are believed to limit the opportunities. Successful pairs of nesting eagles exist upstream (Tower Breeding Area) and downstream (Ladders Breeding Area) of the Verde Valley. A new nesting pair of bald eagles (Oak Creek Breeding Area) was discovered upstream of the Verde River along Oak Creek in 2002. While the Oak Creek eagles likely use the Verde River in the Verde Valley for foraging, nothing is known yet about where or how often they use the Verde. The San Pedro River provides many nest tree opportunities, but it is believed that inadequate fish populations are present to support a nesting pair of eagles. It is unknown why the Gila River in the Safford Valley does not support any nesting eagles. Large trees are present and the river seems large enough to possess adequate food supplies year round. Possibly, human activities and inadequate food supplies are affecting their presence in this portion of Arizona.

No known successful bald eagle nesting has occurred along the San Pedro River, Verde River in the Verde Valley, and Gila River in the Safford Valley; however, territories were briefly established on the lower San Pedro River (Winkelman Breeding Area 1996 and 1997) and on the Verde River near West Clear Creek (Camp Verde Breeding Area 1992 and 1993). These two breeding areas were pioneered and occupied for only two years each and have been unoccupied ever since. Eagles laid eggs and failed in Camp Verde in 1992 and laid eggs and failed at Winkelman in 1996 and 1997. Eagles abandoned the Winkelman Breeding Area and the pair bond, subsequently entering breeding areas at Roosevelt Lake (Pinto Breeding Area) and on the Verde River near Childs (Coldwater Breeding Area). This is the only time we have recorded the concurrent “abandonment” of a territory and “break-up” of an established pair, and detected those birds breeding elsewhere in other breeding areas (J. Driscoll, Arizona Game and Fish Department, pers. comm.). It is unknown specifically why these territories were abandoned, but it is believed the causes were poor habitat quality and possibly high levels of human activity. Establishment, followed by rapid abandonment of bald eagle territories in Arizona, is a relatively rare occurrence (G. Beatty, U.S. Fish and Wildlife Service, pers. comm.).

If SRP is not able to acquire and protect enough habitat on the lower San Pedro River, Verde River in the Verde Valley, and Gila River in the Safford, they would seek acquisitions of riparian habitat at Pinto Creek, Hassayampa River, Santa Cruz River, lower Salt River (below

Granite Reef Dam), middle or lower Gila River, or possibly other sites in Arizona. The sites named are not believed to have nesting bald eagles present, nor are they expected to. Pinto Creek, and the Hassayampa and Santa Cruz rivers are small streams that do not have the size, abundance, or species of fish available for nesting bald eagles. The lower Salt River is largely dry as a result of Granite Reef Dam, thus it does not have the habitat present to support nesting eagles. The extent of habitat on the middle and lower Gila River does not appear to be enough to support nesting bald eagles. Because bald eagles can be found statewide during the winter, all of these areas are expected to be used by wintering bald eagles to some degree.

Comparison and importance of lower Salt and Verde river bald eagle breeding areas to the rest of Arizona

The lower Salt (below Roosevelt Dam) and lower Verde rivers have been and remain key areas for the recovery and survival of the Arizona and southwestern population of breeding bald eagles. From 1993 to 1999, 40 percent of all known Arizona fledglings were produced from the lower Salt and Verde rivers and, since 2000, 53 percent of the state's productivity originated there (Table 7). Overall, 46 percent of all the Arizona fledglings produced since 1993 hatched from the lower Salt and Verde rivers. Most recently, the lower Verde River has been responsible for 33 percent of all fledglings since 1999. This is an overwhelmingly large proportion of productivity originating from a relatively small portion of the eagle's Arizona range. The lower Verde and Salt rivers in this analysis represent about 140 river miles (Hunt *et al.* 1992), or 40 percent of the combined length of just the Salt and Verde rivers (350 river miles). Eagles also have breeding areas on the Agua Fria, Bill Williams, Little Colorado, San Francisco, San Pedro, and Gila rivers, along Lynx, Tonto, Cibecue, Canyon, and Oak creeks, and forage from tributaries such as the East Verde River, Fossil, West Clear, Carrizo, and Cherry creeks.

EFFECTS OF THE PROPOSED ACTION

Effects of Roosevelt Dam operations on the establishment and inundation/degradation of vegetation used by bald eagles for nesting, foraging, and territory maintenance at Roosevelt Lake

Bald eagles are expected to build nests and depend on perches in close proximity to food at Roosevelt (Stalmaster 1987). At Roosevelt Lake, both the Pinto (Hunt *et al.* 1992) and Tonto eagles (Beatty and Driscoll 1992) have established nest areas in large cottonwood trees along the Tonto Creek and Salt River inflows to Roosevelt Lake. Inundation of eagle nests and nest trees has occurred at other reservoirs [Horseshoe Lake (Hunt *et al.* 1992) and Alamo Lake (U.S. Fish and Wildlife Service 1999)], and is expected to occur at Roosevelt Lake. Reclamation consulted with us on the effects of modifications to Roosevelt Dam; in the resulting biological opinion we concluded that existing bald eagle nest trees in the Tonto and Pinto breeding areas would be inundated and lost as a result of dam and associated reservoir operations (U.S. Fish and Wildlife Service 1990, 1993; see Consultation History). As a result, it is reasonable to expect that trees currently existing, or that in the future develop, within the Roosevelt Lake bottom (below elevation of 2,151') and are used for nesting, as well as for foraging, loafing, feeding, display, and/or sentry perches, will be lost to inundation when reservoir levels rise. We also expect that

during periods of low runoff and low water levels, nesting and perching trees will dessicate and die. Inundation and dessication as a result of full operation of Roosevelt is expected to result in the loss of the nest, nest contents (eggs and nestlings), and perch trees.

Riparian trees, primarily cottonwood and willow, can grow at different rates, sometimes very quickly, depending on local conditions, which then influences how soon they can become useful for breeding bald eagles. Since Roosevelt Lake began receding in 1995, many Gooddings willow trees have grown to about 25 feet tall, some with trunks over a foot in diameter (G. Beatty, U.S.

Table 7. Bald eagle 1993 to 2002 reproductive performance on lower Salt and Verde rivers (Roosevelt Lake and Horseshoe Lake to Granite Reef Dam) compared to statewide total, Arizona.											
Breeding area	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Verde River											
Horseshoe	O ¹	F ¹	F	1	2	F	2	2	2	2	9
Cliff	O	F	O	O	O	O	O	O	O	O	0
Bartlett	1	1	2	2	F	2	1	F	F	F	9
Needle Rock	- ¹	-	-	-	-	-	-	-	-	1	1
Box Bar	-	-	O	F	F	2	F	2	2	1	7
Fort McDowell	2	F	F	O	1	F	1	2	2	2	10
Doka	-	-	-	-	-	1	2	2	2	2	9
Sycamore	-	-	-	-	F	1	2	F	2	1	6
Rodeo	-	-	-	-	-	-	-	F	F	1	1
Lower Salt River											
Tonto	1	F	F	2	1	2	2	????	1	2	12
Dupont	-	-	-	-	F	1	O	F	O	U ¹	1
Pinal	1	1	F	F	F	O	O	F	U	1	3
Pinto	1	F	2	3	F	O	2	O	2	F	10
Rock Creek	-	-	-	-	-	-	-	-	O	1	1
Horse Mesa	1	F	1	2	1	F	1	1	1	1	9
Blue Point	2	2	2	2	3	F	1	F	1	2	15
Orme	1	2	2	F	2	1	1	F	1	2	12
Lower Verde River Total ²	3	1	2	3	3	4	4	8	10	10	52
Lower Salt River Total	7	5	7	9	7	4	7	3	6	9	63
Lower Verde and Salt River Total	10	6	9	12	10	8	11	11	16	19	115
Statewide Total	22	18	25	25	23	21	31	22	28	37	252

Percentage of Lower Verde River to Statewide Total	14%	5%	8%	12%	13%	19%	13%	36%	36%	27%	21%
Percentage of Lower Salt River to Statewide Total	32%	28%	28%	36%	30%	19%	23%	14%	21%	24%	25%
Percentage of Lower Verde and Salt River to Statewide Total	46%	33%	36%	48%	43%	38%	35%	50%	57%	51%	46%

1 Breeding status definitions from Postapulsky (1974)

“-“ = Breeding area unknown

U = Unoccupied, no birds detected at breeding area

O = Occupied, eagles present, no eggs laid

F = Failed, eggs laid, no young fledged

2 Verde River total does not include Orme BA, eagles use both Salt and Verde rivers

Fish and Wildlife Service, pers. obser.; S. Sferra, U.S. Bureau of Reclamation, pers. comm.; ERO 2002). Some willow trees at Roosevelt Lake, established after 1995, were measured at 60 feet tall (T. McCarthy, Arizona Game and Fish Department, pers. comm.). At the end of 1990, measured tree nests in Arizona averaged 52 feet above ground (Hunt *et al.* 1992). However, eagles have used nests in live and dead cottonwood and willow trees at the Alamo, Sheep, Sycamore and Horseshoe breeding areas that were about 25 feet above the ground (J. Driscoll, Arizona Game and Fish Department, pers. comm.). Branches less than 4 inches in diameter supported nests at the Sycamore and San Carlos breeding areas. These supporting branches were so small that eagle banders were unable to climb into the nest; bucket trucks were required to reach nestlings (J. Driscoll, Arizona Game and Fish Department, pers. comm.). Based on the above discussion, we believe some trees in the old conservation space (below 2,136') are suitable as bald eagle perches or nest trees and would be inundated if the reservoir filled.

Not since 1978 when tracking of eagle location and productivity was initiated at Roosevelt has the water level remained this low for so many consecutive years and allowed woody riparian vegetation to continue to grow. Willow trees are capable of withstanding considerable inundation (1-2 years) (ERO 2002), and could persist after inundation and continue to provide nesting opportunities as live trees or snags for existing or new pairs of bald eagles at Roosevelt Lake. Future extended lake draw downs over the next 50 years, similar to what occurred from 1995 to present, could also allow new vegetation to grow within the conservation space and hold bald eagle nests. However, extended periods of drought and low water could result in mortality of larger trees higher in the reservoir due to dessication.

Considerable growth of trees to heights that could be used by nesting, foraging, and perching eagles has occurred recently within the Roosevelt Lake bottom (below 2,151' elevation). It is likely that existing eagle pairs (or possibly new territories) will use these trees for perching or as nest sites in the near future. Some Arizona eagles are believed to have moved their nest areas and forage locations considerable distances as a result of changing food availability. The Horseshoe, Alamo, Ive's Wash, and San Carlos eagles have all moved nest locations 1 to 6 miles away from previous known locations. Therefore, we might anticipate that existing pairs at

Roosevelt (Tonto, Pinto, Rock Creek or Dupont) could exploit new trees for nesting, perching, and foraging that are closer to receding shorelines and food resources. Also, similar to the establishment of the Pinto (Hunt *et al.* 1992) and Suicide breeding areas (J. Driscoll, pers. comm. 2002), we might find new territories established between known nesting sites and food resources dependent on the new riparian trees for nesting, foraging, perching, and reproductive success.

Existing and new vegetation could also be used for foraging, loafing, feeding, display, and sentry perches by bald eagles. Perches are an integral component to the existence and success of nesting bald eagles, not only providing them access to food, but also localities from which to defend and maintain territories (Stalmaster 1987). The use of snags and trees in and around Alamo Lake was important for the Alamo and Ive's Wash eagles to partition territories, acquire food, and nest successfully (Hunt et al. 1992, U.S. Fish and Wildlife Service files, Arizona Game and Fish Department *in prep.*). The progressive loss of cottonwood and willow snags at Alamo Lake as a result of inundation in 1993 and 1995 is believed to have led to loss of productivity at the Ive's Wash Breeding Area (J. Driscoll, Arizona Game and Fish Department, pers. comm.). If the area of Roosevelt Lake continues to decline or is maintained at its current low level, existing willow (possibly cottonwood trees) and salt cedar low in the reservoir bed are expected to continue to grow and be of use for perching eagles. Future lake fills and extended draw downs should create new vegetation in the lake bottom, possibly large enough for use by perching eagles. As the lake recedes from its shoreline, banks, hills, and cliffs, development and maintenance of lakeside perches could be a significant factor in the existence and/or reproductive success of known or new eagle pairs.

As a result of lake elevation fluctuations over the life of the permit, we expect bald eagle nests, nest trees, perch trees, and nest contents (eggs and nestlings) below 2,151' to be lost or rendered useless as result of inundation or near inundation during fill events. Any nests, nest or perch trees, and nest contents could also be lost at Roosevelt due to declining water levels and dessication. Any tree species growing in the lake bottom would not be strong or resistant enough to withstand long-term inundation or periodic degradation from filling and lowering the lake (ERO 2002). Lake levels typically rise as a result of storms in January, February and March, reaching maximum height in May. It is during these months when eagles lay and incubate eggs and have nestlings. Any tree nest within the lake bottom is vulnerable via inundation of the roots and killing of the tree, or inundation of the nest, which would likely occur when eggs or nestlings were present. Dead tree snags can also be used by eagles for nesting and perching until they degrade and fall over from age or inundation. Therefore, we would expect any eagle eggs and nestlings to be taken, via drowning or degradation of nest structures due to inundation or near inundation. Similarly, if lake levels remain low for long periods, nest trees that are established in the margins of the lake, more than about 10 feet above the lake level, could dry out and eventually die due to dessication, unless maintained by flows in Tonto Creek or the Salt River.

The frequency of which development and inundation/dessication of riparian trees would occur over the 50 years of this permit is predicated upon weather patterns and water demands.

Roosevelt Lake has the largest storage capacity in SRP's system of reservoirs to capture run-off, but it is also the lake from which the most water is drawn. As a result, Roosevelt has the greatest fluctuations of any lake on the Salt River system. ERO (2002) estimates there will be 2 to 3 times over the next 50 years when significant acreage of habitat will be inundated following extended periods of low lake levels. These same events are likely to result in dessication of nest trees towards the end of dry periods.

In the event of dessication or inundation that kills large acreages of riparian woodlands, SRP may propose, for safety and operational considerations, to clear or burn the dead vegetation from the bed of the reservoir. They would coordinate with us before taking any action to ensure that perch and nest trees were not affected. Conducted in this manner, clearing or burning would benefit eagles by removing dead vegetation in a controlled manner. Large acreages of dead trees pose a significant fire risk, that if allowed to persist, could result in a wildfire that not only removes dead trees, but live trees that provide bald eagle nests and perches, as well.

While it is difficult to predict the actual events that will transpire over the next 50 years, we can estimate that nests, nest trees, and perches below 2,151' lake elevation will be lost over the next 50 years due to inundation or dessication and loss of nest and perch trees. As a result, we anticipate that the proposed action will periodically result in incidental take, in the form of harm, of bald eagles using nest or perch trees at Roosevelt Lake, in conjunction with the permitted activity and over the life of the permit. We also conclude that loss of foraging perches, as a result of inundation and dessication, is expected to occur 2-3 times over the next 50 years.

Effects to bald eagles from changing lake size

The period of 1993-2002 was the first opportunity to monitor bald eagle reproductive performance at Roosevelt Lake during a period of sustained water level decline. Productivity dropped a high in 1993-1995, when lake elevation was at or near full (2,125' elevation) to near record lows from 1998 to present when lake levels were low (about 2,050' elevation) (see Environmental Baseline). From 1996 to 2002, Roosevelt Lake eagle breeding areas remained occupied, but declined in nest success and productivity in all years but 2002. We expect this pattern to continue under proposed full operation of Roosevelt Dam. In the future, declining water levels will reduce the eagle's foraging area, and likely increase the eagle's energetic costs. More energy will likely be spent competing with neighboring eagles and finding food as a result of increasing the distance food resources are from perch sites, coupled with decreasing food availability and distance between territories. As a result, fewer nesting attempts will occur, more failures are expected, and possibly more breeding areas will be recorded as unoccupied. Eagles could mitigate some of the additional energy expenditure due to flight distance by relocating nests closer to the water, but such relocation would not change decreasing food availability or competition with neighboring eagle pairs. Nests closer to the water would also be more vulnerable to inundation. Based upon what was observed from 1993 to 2001 (Table 2), future nest success and productivity (Postapulsky 1974) are expected to be reduced by 20 percent near elevation 2,075', and an additional 20 percent at elevation near 2,050' due to low reservoir levels and associated increased energetic costs (Table 8). ERO (2002) estimates that

extended draw downs like what was observed from 1996 to 2002 could occur 2 to 3 times over the 50 year life of the permit. As a result, a conservative estimate of two events similar to what occurred between 1996 and 2001, would reduce productivity from 30 to 21 eagles each time; for a total of 18 eagles. ERO (2002) presents a similar model and also concludes that 18 eagles would be lost due to reduced productivity over the life of the permit. As a result, we consider this a fairly robust prediction regarding the effects of operating Roosevelt Dam on bald eagle productivity. Because full operation of Roosevelt as proposed maximizes average lake size over time, and bald eagle productivity is correlated with lake size, reservoir operations under the proposed action are expected to minimize effects to eagle productivity compared to other alternatives (both of which would have smaller average lake size) evaluated in the EIS (U.S. Fish and Wildlife Service 2002a).

Dramatic increases in lake elevation following lengthy draw downs could briefly affect fish availability and hamper eagle reproduction until fish productivity rebounds, but we are not reasonably certain that this will occur. Fish populations that have adjusted to decreased lake levels may take a season or two of reproduction and growth to allow eagles to reproduce successfully (Aggus 1979, Jenkins 1979, L. Fitzpatrick, U.S. Fish and Wildlife Service, pers. comm.). Vegetation in the exposed lake bottom will provide, once inundated, excellent habitat and nutrients for fish reproduction and growth (Aggus 1979, Jenkins 1979). Soon after the explosion in fish populations, a small decrease will occur when inundated habitat degrades and disappears (Aggus 1979, Jenkins 1979). However, we do not expect these changes in fish populations to significantly affect eagle forage opportunities. Both Alamo Lake bald eagle pairs were successful in raising and fledging young following an extreme fill event during incubation and right after hatching in 1993 and 1995 (Beatty and Driscoll 1994, Beatty *et al.* 1995).

Table 8. Possible change in Roosevelt Lake bald eagle productivity as lake elevation decreases.			
Productivity summaries	elevation 2125	elevation 2075	elevation 2050
Total nest years	5	5	5
Total occupied nests	5	5	5
Total active nests	5	4	3
Total failed nests	1	1	1
Total successful nests	4	3	2
Total occupied nests, no eggs laid	0	1	2
Total unoccupied nests	0	0	0
Total number of fledglings	5	4	3
Mean brood size (young per successful nest)	5/4 = 1.25	4/3 = 1.33	3/2 = 1.5
Young per active nest	5/5 = 1	4/4 = 1	3/3 = 1
Nest Success (% occupied nest successful)	4/5 = .80	3/5 = .60	2/5 = .40
Productivity or Reproductive rate (mean brood size x nest success)	1.00	0.80	0.60

Effectiveness of Mitigation

SRP has committed to implement a combination of activities intended to minimize and mitigate the effects of operating Roosevelt Dam and Lake on the bald eagle. SRP will:

1. Initiate a pilot project to grow riparian vegetation as a possible replacement nest area for the Pinto or other eagles at the Rockhouse site.
2. Maintain an artificial nesting platform for the Pinto eagles for the duration of the permit, if constructed by Reclamation.
3. Acquire riparian habitat for flycatchers that may be suitable for bald eagles.
4. Develop a management plan with the U.S. Fish and Wildlife Service and Arizona Game and Fish Department to rescue bald eagles, nestlings, fledglings, or eggs at Roosevelt Lake for the duration of the permit
5. Continue to participate in interagency bald eagle management activities for as long as an Arizona bald eagle program exists, which includes:
 - a. Annually fund a pair of seasonal Arizona Bald Eagle Nestwatchers and proportional program coordination.
 - b. Three annual Occupancy and Reproduction Assessment and nest search helicopter flights and proportional funding for coordination and attendance by bald eagle management personnel.
 - c. A maximum of three annual helicopter flights for rescue or other management efforts where helicopters are necessary and proportional funding for personnel.

Benefits of SRP's mitigation efforts will be generated from continuing bald eagle management. The Arizona Bald Eagle Management Program (including the Arizona Bald Eagle Nestwatch Program, Annual Nest Search, Occupancy and Reproduction Assessment Flights) has proven to be successful in improving the success of nesting Arizona bald eagles (Arizona Game and Fish Department *in prep.*). From 1983 to 1998, 50 eaglets in life threatening situations (i.e. falling from nest, inundation, tangled in fishing line, etc.) were rescued through monitoring and intervention (Arizona Game and Fish Department *in prep.*). Rescued eaglets are fostered into other nests, and typically successfully fledge. During most of the 1983-1998 seasons, there was annual bald eagle management oversight with approximately 10 teams of nestwatchers. Using the past effort to predict the effectiveness of the proposed mitigation, management and teams of nestwatchers should provide the opportunity to rescue on average 0.3 eaglet per team every year (50 eaglets/10 teams x16 years). More difficult to quantify is how productivity will benefit from site specific education and nest protection. Due to the high amount of recreation at many of these sites (the reason monitoring is needed), this could be a number similar to rescue operations. Additionally, the annual Occupancy and Reproduction Assessment, Nest Search, and management/rescue flights can result in improved productivity. When nests are found active, and locations of new nests and/or territories are detected, it provides the opportunity to protect, manage, and monitor the site. Similar to education, it is difficult to quantify how this effort annually results in more productivity. All together, it is reasonable to expect that proposed management actions will result in an increase of about 0.60 nestlings per year. If the nestwatch program is funded and continues for the term of the permit (50 years), an estimated 30 additional

nestlings would result (50X0.60), which is more than the estimated 18 fledgling bald eagles anticipated to be lost due to operation of Roosevelt.

There are no adverse effects expected from SRP's mitigation efforts, but some may not be successful. Riparian restoration has a poor track record in Arizona (Briggs 1996). Therefore, the Rockhouse site may not be successful in producing eagle nest trees (but see Effects of the Proposed Action for the flycatcher for reasons why we believe this effort has a greater chance of success than most others). Similarly, targeted areas for flycatcher habitat acquisition are not expected to become occupied eagle territories, because eagles require much larger areas of land. The San Pedro River has never supported a successful bald eagle nest, nor has the Gila River in the Safford Valley. While the Verde River is occupied by nesting eagles for almost its entire length, the largest gap in breeding areas is through the Verde Valley (near Camp Verde) where human activity and development is greatest and is largely believed to prevent eagles from nesting successfully. We are supportive of the SRP proposing to work with the Fort McDowell Yavapai Nation on improved riparian management on the lower Verde River. However implementation of riparian restoration on the Verde River was not made a condition of this permit due to the uncertainty of whether a long-term agreement could be reached with the Nation and has largely failed in the past. Also, as discussed in the Environmental Baseline, past riparian restoration efforts on the lower Verde River have not been very successful. Nevertheless, if SRP is able to work with the Nation, significant benefits could accrue if restoration efforts are successful. If SRP can work with the Nation, we believe we can learn from past unsuccessful or marginally successful restoration efforts on the Verde, and recent successes elsewhere, to design a restoration effort that has a high likelihood of establishing trees that will be used for perching and nesting by bald eagles.

Cumulative Effects

See "Cumulative Effects" for the southwestern willow flycatcher, which provides a review for the action area. Here we provide additional information relevant to the recreational activities at Roosevelt Lake and non-Federal future activities on the lower Verde River.

Recreational Activities at Roosevelt Lake

When water levels rise at Roosevelt and surround a nest tree or important perching/hunting tree, boating activity is expected to occur in close proximity to a nest or perch. Repeated disturbance to nesting and foraging eagles either by flushing or by preventing the use of important foraging perches can result in nest abandonment, failure, and/or reduced productivity. McGarigal *et al.* (1991) found that a single, stationary boat could displace eagles from 70 to 124 acres of available foraging habitat, and that a few strategically placed boats would sufficient to effectively disturb a pair's entire high-use forage area. In Arizona, repeated disturbance by boaters to eagles nesting or perching in snags surrounded by lake water has been recorded at Alamo Lake at the Alamo and Ive's Wash breeding areas (G. Beatty, U.S. Fish and Wildlife Service, pers. obser., J. Driscoll, Arizona Game and Fish Department, pers. comm.). These disturbance events at Alamo Lake were reduced by the presence of official Arizona Game and Fish Department buoyed closures surrounding the nests and Arizona Bald Eagle Nestwatchers along shore and in boats, but were not eliminated (G. Beatty, U.S. Fish and Wildlife Service,

pers. obser.). Some boaters purposefully entered closed areas in order to fish, take pictures, and harass the eagles, other boaters that disturbed eagles appeared to be entirely ignorant of the closure and the eagles (G. Beatty, U.S. Fish and Wildlife Service, pers. obser., J. Driscoll, Arizona Game and Fish Department, pers. comm.).

SRP does not authorize recreational activities, but such activities may occur near nests. Effects to bald eagles, including any incidental take, is most appropriately addressed in ESA section 7 or 10 discussions with agencies that authorize or license these recreational activities. Illegal camping, off-highway vehicle use, camp fires, and other recreational activities near nests at Roosevelt could also result in harassment of, or harm to, nesting bald eagles.

Verde River, Horseshoe Reservoir to Salt River confluence, and Salt River downstream of Roosevelt Dam

Operations of the lower Verde and Salt river dams, in conjunction with the presence of the dam structures, will continue to degrade existing bald eagle nesting habitat (including important trees needed for nesting foraging, loafing, feeding, display, and/or sentry perches) and prevent habitat development, maintenance, and regeneration of trees suitable for nesting and perching in the Needle Rock, Box Bar, Fort McDowell, Doka, Sycamore, and Rodeo breeding areas below Bartlett Dam and the Granite Reef Breeding Area below Stewart Mountain Dam (McNatt *et al.* 1980, Briggs 1996, Beauchamp and Stromberg 2001, U.S. Fish and Wildlife Service 2002b, Arizona Game and Fish Department *in prep.*; see the Environmental Baseline). Operation of lower Verde and Salt river dams will continue to alter the hydrological regime of the lower Verde and Salt rivers by reducing the magnitude, frequency, timing, and duration of high flow events (Briggs 1996, Beauchamp and Stromberg 2001, U.S. Fish and Wildlife Service 2002b). As a result, the size and complexity of the active channel below Bartlett and Stewart Mountain dams are likely to continue to decline (Beauchamp and Stromberg 2001, U.S. Fish and Wildlife Service 2002b). Attenuation of high flows is concomitant with a reduction in stream power and the ability to re-work sediment (Gordon *et al.* 1992). The dams will continue to trap sediment, which will further limit opportunities for natural regeneration or managed restoration of riparian habitat (U.S. Fish and Wildlife Service 2002b). Reducing the magnitude, frequency, and duration of high flow events will prevent the establishment of germination sites for cottonwood and willow tree seedlings that require recently deposited, moist, bare sediment (Braatne *et al.* 1996). Continued high summer flows below Bartlett Dam may scour away seedlings that germinated in the spring (Patten 1998), and reduce the longevity of existing trees (J. Stromberg, Arizona State University, pers. comm.). Continued operation of the Verde dams is expected to result in further establishment of salt cedar, which significantly increases the risk of catastrophic fire (J. Stromberg, Arizona State University, pers. comm., U.S. Fish and Wildlife Service 2002b). Reducing the overall amount of riparian vegetation, coupled with periodic scouring floods, accelerates the loss of established trees (J. Stromberg, Arizona State University, pers. comm.). The loss of the dynamic nature of the Verde River below Bartlett Dam and Salt River below Stewart Mountain Dam will continue to cause degradation of the structure and function of the riparian area.

Continued grazing along the lower Verde and Salt rivers is expected to exacerbate adverse effects to riparian vegetation through browsing and trampling of seedling and sapling riparian

trees (USFWS 2002b). Continued recreation will result in cutting of trees, destruction of seedling beds by campers and off-highway vehicles, and increased risk of fire due to camp fires and other human activities.

The Arizona Game and Fish Department's (*in prep.*) draft Bald Eagle Conservation Assessment and Strategy provided a description of what is expected to occur in the future under the current management. They wrote, "it is reasonable to expect in the next two decades, the pairs (below Bartlett Dam) will have fewer trees in which to nest, roost, loaf, preen, and/or hunt. The (lower Verde River) breeding areas currently nest in overmature live trees, dying trees, or snags below dams with little regeneration. Poorly timed water releases, scouring, off-road vehicles, development, grazing, woodcutting, and agriculture threaten the riparian area. Managing agencies must minimize the factors impairing riparian vegetation to maintain the current distribution and abundance of eagles on the lower Verde River..." This document has been reviewed twice by the representatives of the Southwestern Bald Eagle Management Committee, including the U.S. Fish and Wildlife Service, Arizona Game and Fish Department, Reclamation, and SRP (J. Driscoll, Arizona Game and Fish Department, pers. comm.).

In the absence of concerted efforts to reverse habitat trends, we expect over the next 50 years that 5 of the lower Verde bald eagle breeding areas dependent on trees for nesting and perching will be lost due to continued riparian habitat degradation, prevention of habitat regeneration, and catastrophic fire. Because the Needle Rock, Box Bar, Fort McDowell, Doka, Sycamore, Rodeo, and Granite Reef breeding areas are in such close proximity, each pair is highly dependent on the existing over-mature trees in each breeding area for nesting and foraging, loafing, feeding, display, and/or sentry perches. As these trees continue to die and fall over, territories will be lost because there is little regeneration or growth of younger trees for replacement and as a result, there are not enough trees for nesting and foraging. Some multi-storied vegetation is developing along the Verde River between Sycamore Creek and the Fort McDowell Yavapai Nation/Salt River Pima Maricopa Indian Community boundary in the Sycamore and Rodeo breeding areas, possibly as a result of the introduction of sediment and nutrients from Sycamore Creek (W. Graf, University of South Carolina, pers. comm., J. Stromberg, Arizona State University, pers. comm.). Unfortunately, due to the proximity of Highway 87 and the growth of salt cedar, fire is a great risk to the longevity of this vegetation (J. Stromberg, Arizona State University, pers. comm., U.S. Fish and Wildlife Service 2002b).

Recent changes and anticipated projects in the reach below Bartlett Dam are likely to reduce or offset, to some degree, effects of dam operations and recreation. In 1993, a minimum flow of 100 cfs flow was implemented below Bartlett Dam. Also, the Fort McDowell Yavapai Nation and Salt River Pima Maricopa Indian Community closed the Verde and Salt river area through their lands to non-tribal members and hired their own Police Departments in 1997. This helped reduce recreational activities that have contributed to disturbance of eagles, and to a lesser degree, poor regeneration and survival of riparian trees. While these efforts are positive, they are not likely to entirely reverse current trends in riparian habitat degradation. If SRP successfully works with the Fort McDowell Yavapai Nation in riparian restoration efforts, as proposed, this effort is expected to further offset, at least temporarily, some of the effects that have caused deterioration of riparian woodlands below Bartlett Dam. If successful, the planted

trees may not be naturally replaced if effects of recreation, grazing and the dams continue. We are also committed to using our authorities to begin working with the tribes and the Tonto National Forest to pursue improved riparian conditions below Horseshoe Dam for bald eagles and other riparian species.

CONCLUSION

After reviewing the current status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the bald eagle. No critical habitat has been designated for the bald eagle, thus none will be affected. Our conclusion of no-jeopardy is based on the following:

1. Although issuance of an incidental take permit and associated effects of operating Roosevelt Dam is expected to result in loss of 18 fledgling bald eagles and loss of nest and perch trees and associated harm of eagles at Roosevelt over the life of the permit, proposed measures would minimize and mitigate these effects to the maximum extent practicable.
2. At Roosevelt Lake, the future with the proposed action is an improvement over the baseline, because of the mitigation proposed.
3. SRP will make a good faith effort to work with the Fort McDowell Yavapai Nation to implement riparian restoration and replace dying trees on the lower Verde River that are currently being used by eagles for nesting and perching.
4. Operating Roosevelt at full capacity, so the reservoir is as large as possible during wet cycles, is beneficial to eagle productivity.
5. SRP's proposed riparian restoration efforts and minimum 100 cfs releases from Bartlett Dam are expected to offset some cumulative effects on the lower Verde River. Within the action area, we are working with our partners to address cumulative effects.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Section 3 of the Act defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." Harm and harass were both further defined in 50 CFR 17.3. Harm is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The HCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the HCP, together with the terms and conditions described in the Implementing Agreement and any section 10(a)(1)(B) permit or permits issued with respect to the HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14 (i). Such terms and conditions are nondiscretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the Applicant fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the Roosevelt HCP, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the HCP and its accompanying section 10(a)(1)(B) permit.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

We anticipate that the proposed action will result in incidental take, in the form of harm, of bald eagles using nest or perch trees at Roosevelt Lake in conjunction with the permitted activity and over the life of the permit. Harm is expected due to modification or degradation of habitat due to loss of nest and perch trees from inundation or dessication, and associated effects.

Additionally, we anticipate incidental take of no more than 18 fledgling bald eagles over the life of the permit in conjunction with the permitted activity, resulting from reduced productivity of bald eagles that use Roosevelt Lake for foraging during periods of declining water levels over the life of the Permit.

Fill and dessication events that result in incidental take of bald eagles would occur several times during the term of the permit (50 years). No incidental take is anticipated in the action area outside of Roosevelt Lake.

EFFECT OF THE TAKE

In this biological opinion, the Service finds that the level of take anticipated is not likely to jeopardize the continued existence of the bald eagle. The reasons for this conclusion are the same as described under the conclusion, above.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation measures provided for in the HCP and the terms and conditions in the Implementing Agreement are incorporated here by reference as reasonable and prudent measures and terms and conditions. We find they fully offset the impacts of the incidental taking of the

bald eagle resulting from the continued operation of Roosevelt Dam. No additional reasonable and prudent measures or terms and conditions are needed to minimize anticipated incidental take.

MIGRATORY BIRD TREATY ACT, BALD AND GOLDEN EAGLE PROTECTION ACT

The Fish and Wildlife Service will not refer the incidental take of any bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-712) or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. 668-668d) if such take is in compliance with all conservation measures described in the proposed HCP, together with the terms and conditions described in the associated Implementing Agreement and section 10(a)(1)(B) permit.

STATUS OF THE SPECIES

Yuma Clapper Rail (*Rallus longirostris yumanensis*)

Listing History

The Yuma clapper rail was listed as an endangered species on March 11, 1967, under endangered species legislation enacted in 1966 (Public Law 89-669). Only populations found in the United States were listed as endangered; those in Mexico were not listed under the 1966 law or the subsequent Endangered Species Act of 1973 (as amended). Critical habitat has not been designated for the Yuma clapper rail. The Yuma Clapper Rail Recovery Plan was issued in 1983 (U.S. Fish and Wildlife Service 1983).

Species Description

The Yuma clapper rail is a 14-16 inch long marsh bird with a long, down-curved beak. Both sexes are slate brown above, with light cinnamon underparts and barred flanks. The Yuma clapper rail is distinguished from other clapper rail subspecies using distributional data, plumage color, and wing configurations (Banks and Tomlinson 1974). The Yuma clapper rail is a secretive species and is not often seen in the wild. It does have a series of distinctive calls that are used to identify birds in the field. Frequency of calls or responsiveness to taped calls varies seasonally.

Habitat for the Yuma clapper rail is freshwater and brackish marshes with dense vegetation, dominated by cattails (*Typha spp.*) that includes both mats of old material and more open stands. The most productive areas consist of uneven-aged stands of cattails interspersed with open water of variable depths (Conway *et al.* 1993). Other important factors in the suitability of habitat include the presence of vegetated edges between marshes and shrubby riparian vegetation, such as saltcedar or willow thickets (Eddleman 1989), and the amount and rate of water level fluctuations within the habitat. Water flow in the open channels within the marsh is desirable (Todd 1971, Tomlinson and Todd 1973). Yuma clapper rails will use quiet water backwater ponds, flowing streams or riversides, irrigation canals and drainage ditches, reservoirs and small lakes, or other small marshlands where cattail habitat is available. Natural and artificially constructed marshes can provide suitable habitat.

The breeding season for the Yuma clapper rail runs from February through early July (Eddleman 1989). Nests are constructed in marsh vegetation or low growing riparian plants at the edge of the water. Non-native (introduced) crayfish (*Procamberus clarki*) form the primary prey base for Yuma clapper rails today (Todd 1986). Prior to the introduction of crayfish, isopods, aquatic and terrestrial insects, clams, plant seeds and small fish dominated the diet. Once believed to be highly migratory (with most birds thought to spend the winter in Mexico), telemetry data showed most rails do not migrate (Eddleman 1989). Very little is known about the dispersal of adult or juvenile birds, but evidence of populations expanding northward along the lower Colorado River, and into the wetlands of the Salton Sea and central Arizona over the last 80 years indicates that Yuma clapper rails can effectively disperse to new habitats provided that habitat corridors exist between the old and new sites (Rosenberg *et al.* 1991). Additional life history information is found in the Recovery Plan (U.S. Fish and Wildlife Service 1983), Todd (1986), Eddleman (1989) and Rosenberg *et al.* (1991).

Distribution, Abundance and Status (Rangewide)

The Yuma clapper rail has two major population centers in the United States; the Salton Sea and surrounding wetlands in California, and the lower Colorado River marshes from the border with Mexico to Havasu National Wildlife Refuge. Smaller numbers of rails are found along the lower Gila River in Yuma County, the Phoenix metropolitan area (including portions of the Gila, Salt and Verde rivers) in Maricopa County, Picacho Reservoir in Pinal County, and the Bill Williams River in La Paz County, Arizona (U.S. Fish and Wildlife Service, annual survey data). Yuma clapper rails have also been documented from southern Nevada in Clark County (McKernan and Braden 2000; Tomlinson and Micone 2000) and the Virgin River in Washington County, Utah and Mohave County, Arizona (McKernan and Braden 2000).

Annual survey data compiled by the Fish and Wildlife Service for the period 1990 through 2002 documented from 464-1076 rails (detected via calls or visual observation) at surveyed sites. Surveys in 2002 documented 610 birds. These figures are of actual birds and are not extrapolated to provide a population estimate. The unlisted Yuma clapper rail population in Mexico was estimated to contain 6,300 birds (Hinojosa-Huerta *et al.* 2000); the amount of movement between the two populations is unknown.

Declines in actual numbers heard or seen on survey transects since the early 1990's have not been positively connected to any event on the lower Colorado River or Salton Sea; however, changes in habitat quality caused by overgrown marsh vegetation is suspected of influencing rail numbers in those areas. Habitat restoration through mowing or burning over-age cattail stands is under evaluation in several locations to determine future management needs.

New information that may affect the life history of the Yuma clapper rail involves selenium levels in crayfish, the primary prey species. Levels of selenium in crayfish from Yuma clapper rail habitats were high enough to cause concern for potential reproductive effects (Roberts 1996, King *et al.* 2000). No adverse effects from selenium have been observed; however, due to the clapper rail's secretive nature, nests are very difficult to find, and young birds are hard to observe. Additional monitoring is under consideration at this time.

Effects of Federal Actions on the Species

Federal actions that may adversely affect the Yuma clapper rail undergo section 7 consultation. These actions include issuance of Clean Water Act section 404 permits for dredging or filling in wetlands, and placement of seawalls or other shoreline modifications on all rivers and streams within the U.S. range of the species. The number of such actions varies from river to river system.

Actions by Reclamation in managing the lower Colorado River have the greatest potential to destroy large marsh habitats or disturb individual birds during dredging, bank stabilization and other channel maintenance activities. Past Federal actions to construct dams, diversion structures and other management actions have increased the amount and longevity of marsh habitats in several locations on the lower Colorado River. These same actions eliminate the variable physical conditions that provide for marsh regeneration, and habitat quality is reduced over time. Measures are in place under biological opinions issued for Reclamation's maintenance activities to reduce or eliminate adverse effects of current management on remaining marshes. Changes to water releases in the lower Colorado River are in part subject to Reclamation oversight and are also addressed for reduction of effects and replacement of lost habitat. Effects to the Salton Sea Yuma clapper rail habitats from changes in water flow to the Sea that have a Federal nexus are being addressed under section 7.

Habitat conservation planning requires that we consult under section 7 prior to issuing a section 10 permit allowing take of species by non-Federal parties. Conservation of Yuma clapper rails at the Salton Sea and on the lower Colorado River is part of ongoing HCP efforts in those areas.

ENVIRONMENTAL BASELINE

A Yuma clapper rail was reported for the first time at Roosevelt Lake in May 2002. A single bird was heard and observed in a strip of cattails along the main channel of Tonto Creek near Orange Peel Campground. This is the eastern-most detection of this subspecies. No clapper rails were detected in a subsequent visit about 2 weeks later (H. Messing pers. comm. 2002). The habitat patch consisted of cattails approximately 20-60 feet in width and 3,000 feet long (roughly 2.75 acres). The only other potential habitat identified at Roosevelt during a helicopter reconnaissance in June 2002 was a patch of cattails about 20-30 feet in width and 2,100 feet long (roughly 1.2 acres), upstream of the first patch on Tonto Creek. ERO (2002) believed the marshes were supported by subflow brought to the surface by underground geological barriers. Because of these conditions, the marshes probably would not completely dry out during extended drought.

The closest known clapper rail populations to Roosevelt are in the Phoenix metropolitan area and Picacho Reservoir near Casa Grande. In the Phoenix area, the closest record is from the confluence of the Salt and Verde rivers in 1985, approximately 30 miles to the WSW. Surveys in the same area in 1991-93, 1995-96, and 2001 did not locate any birds. Potential habitat for Yuma clapper rail is found in Saguaro Lake and possibly the other Salt River lakes, but no surveys have been conducted in these areas. Potential habitat on the Verde River exists up to at least Tavaschi Marsh near Camp Verde. An undocumented report of a Yuma clapper rail at

Tavasci Marsh was forwarded to us in 1998. Surveys of the area failed to elicit any response to taped calls. Yuma clapper rails have not been detected at Picacho Reservoir during recent surveys, likely due to the drying of the reservoir since 2000. However, cattail habitats in canals and drains in the surrounding San Carlos Irrigation and Drainage District and Gila River Indian Reservation may provide suitable clapper rail habitats and access to the Gila River below San Carlos Dam. No surveys have been done in these areas.

The Phoenix area population is concentrated along the Salt and Gila rivers from 99th Avenue downstream to Gillespie Dam. Numbers of clapper rails found have increased from 7 in 1998 to 57 in 2002. This increase is due in part to changes in habitat after floods and more focused survey efforts since 2000, but numbers of birds over the last two years (44 to 57) using the same effort in the same locations may indicate an expanding population. Surveys of the Salt and Verde rivers upstream of Granite Reef Dam may be expanded in 2003 if resources are available. Below Gillespie Dam, Yuma clapper rails have been detected in the Citrus Valley (0-4), Dendora Valley (4-5), Wellton-Mohawk area (0-13), and North Gila Valley (0-7) during 1992-2002. Surveys have been incomplete on the lower Gila River in recent years.

The status of the Yuma clapper rail that was found at Roosevelt in May 2002 is unknown. We do not know if it may have bred there, but Yuma clapper rails are typically breeding in May. Dispersal and other seasonal movements typically do not occur at this time of year. The most common movements by telemetered Yuma clapper rails on the lower Colorado River were post-breeding shifts in home range or possibly premigratory movements during June-October (Eddleman 1989). The bird may have moved to Roosevelt from the Gila River population or elsewhere. A substantial and likely increasing population on the Gila River from Avenue 99 to Gillespie Dam makes it likely that dispersing rails will show up at Roosevelt and other areas in the region with increasing frequency.

For additional information about past and present activities in the action area, see the Environmental Baseline for the flycatcher.

EFFECTS OF THE ACTION

Effects at Roosevelt Lake

Cattails and clapper rails are tolerant of water level fluctuations, so long as waters do not rise rapidly during the nesting season (the birds can adjust nest height if waters rise slowly and not to a height above the tops of emergent vegetation or so high that nest height cannot be adjusted), or cattail habitats are not dried out completely, leaving nests and the habitat high and dry (see review in Eddleman 1989). The currently extant habitat on Tonto Creek lies adjacent to the channel and is apparently being maintained by subflow and geological barriers. Thus, the marsh will probably not dry out if reservoir levels continue to recede. However, when the reservoir refills, these habitats, which are at 2,100-2,120 feet elevation, will be under water and unavailable for use by rails. Cattail marshes could also be scoured out by high flows on Tonto Creek.

Areas where Yuma clapper rails are consistently found in high numbers, such as Topock Marsh, Laguna Division of the Colorado River, and the Wister Unit of the Imperial Wildlife Area, California, have managed water levels or are behind dams that maintain much more constant water levels than what occurs at Roosevelt Lake. Ohmart and Smith (1973) found that dams on the lower Colorado River slowed the river, and allowed precipitation of sediments and sandbars where emergent marshlands developed. Yuma clapper rails then apparently colonized these marshes. Reservoirs where clapper rails are found on the lower Colorado have relatively stable water levels. In contrast, water level fluctuations at Roosevelt can be dramatic, particularly during winter and spring filling of the reservoir, in which waters can rise rapidly and as much as 100 or more feet. Reservoir levels are also consistently drawn down every year during the summer when SRP's water users in the Phoenix metropolitan area depend upon Roosevelt for water deliveries. This operational regime does not provide good conditions for emergent marsh development or occupation by Yuma clapper rails.

Cattail and other emergent marsh communities are not common at Roosevelt. The only currently suitable clapper rail habitats are in 2 areas of unusual subsurface geology and hydrology that are 2.75 and 1.2 acres in size. Eddleman (1989) quantified seasonal home ranges of male and female Yuma clapper rails on the lower Colorado River. Mean seasonal home range for 6 seasons varied from 5.4-59.3 acres. In areas surveyed for rails on the lower Colorado River and in the Imperial Valley, California, Gould (1975) found Yuma clapper rails primarily (57% of detections) in emergent marsh patches of greater than 20 acres. On the other hand, Yuma clapper rails were found in marshes as small as 0.5 acre. Todd (1986) found clapper rails in marsh patches as small as 0.3 acre. Thus, the size of the two cattail stands on Tonto Creek are probably marginally large enough to support one or more Yuma clapper rails. Mean density of Yuma clapper rails on the lower Colorado during the breeding season was 0.1 per acre, but ranged as high as 0.32 per acre (Anderson and Ohmart 1975). Based on these data, conceivably, up to a single pair of rails might occupy each of the habitat patches on Tonto Creek. ERO (2002) estimated that up to 10 acres of occupied rail habitat could occur at Roosevelt during the term of the permit, and proposed mitigation for loss of up to 10 acres under an adaptive management plan. Ten acres is still a small habitat patch for clapper rails and may not support more than 2 pairs of rails based on the lower Colorado River data cited above. We believe fluctuating water levels and lack of extensive suitable habitat make it unlikely that Roosevelt will ever support more than a few Yuma clapper rails.

The habitat patches are relatively low in the reservoir (well into the old conservation space), and would likely be inundated completely several times during the 50-year life of the permit. Because of the small size of these cattail marshes, inundation would probably occur in a single season.

SRP proposes to mitigate the loss of Yuma clapper rail habitat by constructing 5 acres of cattail marsh at the Rockhouse site on the Salt Arm of Roosevelt. Based on restoration projects on the lower Colorado River, creation of cattail marsh is fairly easy to accomplish and habitat forms rapidly once the hydrology is in place. The Rockhouse site is located above the conservation storage space of the reservoir, but within the flood control space. Flood control operations are governed by the U.S. Army Corps of Engineer's Water Control Manual for Roosevelt (U.S.

Bureau of Reclamation 1996). Under the Manual, we expect that the Rockhouse site would be inundated no more than 20 days during any one flood event. Under such a scenario, the cattails are likely to survive. The site is about 20 feet above the channel of the Salt River, thus it is unlikely to be scoured out, and for the same reason large amounts of sediment are not likely to be deposited there. The site was successfully farmed and irrigated for many years, suggesting flood damage would be minimal and infrequent.

If waters rose in the conservation storage space and flooded occupied habitat on the Tonto Arm of Roosevelt during the nesting season, nests could be destroyed, and eggs or very young nestlings would drown or could be washed away (but young clapper rails are very precocial and leave the nest within 48 hours of hatching [Rosenberg *et al.* 1991] and thus are not as susceptible to drowning as other birds). Adult rails may relocate to other suitable habitats, including the Rockhouse site. However, displaced rails may fail to nest, some birds may not find suitable habitats and may die, they may be killed by predators, or rails could meet with an accident while searching for habitat. The Rockhouse site would provide a safe haven and stable habitat conditions for rails during reservoir filling. The 5 acres of marsh habitat created at Rockhouse would more than replace the roughly 4 acres that would be inundated.

If we have underestimated the amount of occupied habitat that may be affected at Roosevelt, SRP proposes to mitigate for loss of up to an additional 5 acres, for a total of 10 acres of occupied rail habitat. Habitat would be monitored, and if more than 5 acres were lost or predicted to be lost, an equivalent acreage, of up to 10 acres of habitat, would be created at the Rockhouse site.

In the event of a dessication or inundation event that kills large acreage of riparian woodlands, SRP may propose, for safety and operational considerations, to clear or burn the dead vegetation from the bed of the reservoir. They would coordinate with us before taking any action to ensure clapper rails would not be adversely affected. Conducted in this manner, clearing or burning would benefit rails by removing dead vegetation in a controlled manner. Large acreages of dead trees pose a significant fire risk, that if allowed to persist, could result in a wildfire that not only removes dead trees, but may burn into cattail marshes occupied by clapper rails, as well.

Effects at Sites Downstream of Roosevelt

No Yuma clapper rails have been found at Saguaro, Apache, or Canyon lakes; however, as noted in the Environmental Baseline, potential rail habitat exists at Saguaro Lake, and these lakes have not been surveyed for rails. Continued operation of Roosevelt will not change the way the downstream Salt River reservoirs are managed, but operation of the new conservation space and dedicated flood control space should decrease the frequency of flood releases from Roosevelt, and thus decrease the incidence of scouring in any habitats that may occur in the downstream reservoirs.

Below Granite Reef Dam, substantial Yuma clapper rail populations occur from 99th Ave to Gillespie Dam on the Salt and Gila rivers. As discussed in the Effects of the Action for the flycatcher, these areas are watered by sewage effluent and return agricultural flow. Continued

operation of Roosevelt in a way that precludes releases most of the time below Granite Reef Dam will not affect these extant habitats. However, continued operation in this manner may preclude development of habitat in reaches of the Salt River channel that are now dry. Any releases could conceivably be salvaged by water users, reducing or eliminating any benefits that could accrue from operating Roosevelt differently. The operation of modified Roosevelt Dam will provide greater flood water storage most of the time, so marshes below Granite Reef Dam may be protected from flooding and scouring to a greater degree as compared to before the dam was modified. Below Gillespie Dam, few Yuma clapper rails or habitat are found. Operation of Painted Rock Dam and Reservoir act to attenuate or eliminate any effects that continued operation of Roosevelt might have downstream of Painted Rock.

Effects at Mitigation Sites outside of Roosevelt

The highest priority mitigation sites are outside of the current range of Yuma clapper rail (Verde Valley, lower San Pedro River, and Safford Valley) and thus proposed acquisitions and habitat management in these areas will not affect the rail. As described in the Environmental Baseline, no Yuma clapper rails are known on the Verde River in the action area (where SRP proposes riparian restoration), with the exception of a bird found at the Salt River confluence in 1985. Fluctuating water levels in Horseshoe and Bartlett reservoirs and narrow channels and floodplains below Horseshoe Dam provide little opportunity for extensive marshes to develop. It is unlikely that any mitigation will occur in areas occupied by Yuma clapper rails now or in the future. However, if Yuma clapper rails were found at or colonized mitigation sites, they would benefit from protection of habitats in perpetuity.

Cumulative Effects

The southwestern willow flycatcher cumulative effects section, which includes a thorough discussion of cumulative effects in the action area, is included here by reference. Most activities at Roosevelt unrelated to dam operations will be Federal actions, and thus are not considered cumulative. Of the effects described in the flycatcher writeup, the most important for the Yuma clapper rail are cumulative effects downstream of Granite Reef Dam on the Salt and Gila rivers. In this area, lands are primarily privately-owned, but considerable acreage is also managed by the State Land Department, Bureau of Land Management, and Gila Bend Indian Reservation. In these areas, development will frequently require a section 404 Clean Water Act permit from the Army Corps of Engineers, and other Federal permits or authorizations. Activities likely to occur on non-Federal lands not requiring a Federal authorization or funding include clearing of land and construction of farms or housing, livestock grazing, ground water pumping, and continued agricultural activities, including use of pesticides and fertilizers that may be toxic to birds or invertebrates that birds, including rails, feed upon. State lands could be leased for sand and gravel mining, which currently occurs in several areas along the Salt and Gila rivers, or could be sold for housing or industrial purposes.

Non-federal activities that may result in incidental take of Yuma clapper rails can be addressed through the section 10(a)(1)(B) permitting process.

CONCLUSION

After reviewing the current status of the Yuma clapper rail, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Yuma clapper rail. No critical habitat is currently designated for the rail, thus none will be affected. We present our no-jeopardy conclusion for the following reasons:

1. Only a single Yuma clapper rail has ever been detected at Roosevelt Lake, and prior to its discovery in 2002, the nearest record for the species was approximately 30 miles to the WSW.
2. Yuma clapper rails downstream of Roosevelt Dam occupy habitats that are supported by sewage effluent and return agricultural flow, rather than water released from Roosevelt Dam. Operation of Roosevelt Dam may provide some protection from flooding to downstream rail habitats.
3. Issuance of an incidental take permit and associated effects of operating Roosevelt Dam could result in take of any Yuma clapper rails inhabiting cattail marshes on Tonto Creek, or elsewhere in the reservoir, but conditions at Roosevelt are not conducive to creating and maintaining rail habitat. We do not expect that more than 2 pairs of rails will ever inhabit Roosevelt Lake.
4. SRP's mitigation and minimization program will create 5 acres of rail habitat that will not be subject to drying or long-term inundation. This habitat will serve as a safe haven for rails in the area, and mitigates the periodic loss of 4 acres of rail habitat on Tonto Creek or elsewhere in the reservoir.
5. If we have underestimated the potential impacts of reservoir operation on Yuma clapper rails, SRP has proposed adaptive management to provide up to 10 acres of rail habitat to mitigate loss of up to 10 acres of occupied habitat.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Section 3 of the Act defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." Harm and harass were both further defined in 50 CFR 17.3. Harm is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of

an otherwise lawful activity. 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The HCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the HCP, together with the terms and conditions described in the Implementing Agreement and any section 10(a)(1)(B) permit or permits issued with respect to the HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14 (i). Such terms and conditions are nondiscretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the Applicant fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the Roosevelt HCP, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the HCP and its accompanying section 10(a)(1)(B) permit.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

We use maximum acres of occupied habitat anticipated to be lost in an inundation event as a result of the proposed action over the term of the permit (50 years) as a surrogate to quantify take of Yuma clapper rails. An estimate of numbers of rails taken by loss of this habitat is presented in the Effects of the Proposed Action.

We anticipate that Yuma clapper rails occupying up to 10 acres of habitat may be taken in a year as a result of the Operation of Roosevelt Dam. Within this acreage, Yuma clapper rails could be harmed, injured or killed as a result of inundation of habitat. Waters could rise during the nesting season, at which time any eggs or very young nestlings would drown. Adult and older juvenile clapper rails may relocate to created habitat at the Rockhouse site or elsewhere, but they may also be preyed upon or die in attempts to find other suitable habitat, and adults may fail to nest that year.

Fill events that inundate habitat and result in incidental take of clapper rails would occur several times during the term of the permit (50 years). No incidental take is anticipated in the action area outside of Roosevelt Lake as a result of the proposed action.

EFFECT OF THE TAKE

In this biological opinion, the Service finds that the level of take anticipated is not likely to jeopardize the continued existence of the Yuma clapper rail. The reasons for this conclusion are the same as described under the conclusion, above.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation measures provided for in the HCP and the terms and conditions in the Implementing Agreement are incorporated here by reference as reasonable and prudent measures and terms and conditions. We find they fully offset the impacts of the incidental taking of the Yuma clapper rail resulting from the continued operation of Roosevelt Dam. No additional reasonable and prudent measures or terms and conditions are needed to minimize anticipated incidental take.

MIGRATORY BIRD TREATY ACT

The Incidental Take Permit that is the subject of this opinion shall constitute a Special Purpose Permit under 50 C.F.R. § 21.27 for take of the Yuma clapper rail in the amount and subject to the terms and conditions specified in the permit, the Implementing Agreement, and the habitat conservation plan. Any such take will not be in violation of the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712).

CONFERENCE OPINION

STATUS OF THE SPECIES

Yellow-billed cuckoo (*Coccyzus americanus occidentalis*)

The western continental United States distinct population segment of the yellow-billed cuckoo (western yellow-billed cuckoo) is a candidate species under the ESA (U.S. Fish and Wildlife Service 2002c). In response to a petition to list the species submitted in February 1998, the Fish and Wildlife Service issued a 12-month “warranted but precluded” finding (meaning that listing of the species is warranted but precluded by higher priority listing actions) for the western yellow-billed cuckoo on July 25, 2001 (66 FR 38611).

The yellow-billed cuckoo is a medium-sized, slender bird (about 12 inches in length and weighing about 2 ounces) of the Family Cuculidae, whose members are characterized in part by zygodactyl feet (with two toes pointing forward and two backward). The species has a slender, long-tailed profile, with a fairly stout and slightly down-curved bill which is blue-black with yellow on the base of the lower mandible. Plumage is grayish-brown above and white below, with rufous primary flight feathers. The tail feathers are boldly patterned with black and white below. The legs are short and bluish-gray, and adults have a narrow, yellow eye ring. Juveniles resemble adults, except the tail patterning is less distinct, and the lower bill may have little or no yellow. Males and females differ slightly, as males tend to have a slightly larger bill.

The western yellow-billed cuckoo is associated primarily with cottonwood-willow dominated riparian habitats (Hamilton and Hamilton 1965, Gaines 1974, Gaines and Laymon 1984, Laymon and Halterman 1986, 1987, 1989; Halterman 1991; Halterman and Laymon 1994, 1995). Cottonwood-willow is the predominant and preferred habitat, but very tall screwbean-honey mesquite stands are also used. In addition, yellow-billed cuckoos have been found to use a mixture of saltcedar and cottonwood/willows (Corman and Magill, 2000). Gaines (1974) found

that vegetation density, distance to water, and the length and width of the habitat area were important characteristics when surveying for cuckoos. Western yellow billed cuckoos breed in large blocks of riparian habitats (particularly woodlands with cottonwoods and willows). Dense understory foliage appears to be an important factor in nest site selection, and cottonwood trees are an important element of foraging habitat in areas where the species has been studied in California (Halterman 1991).

The yellow-billed cuckoo arrives on the breeding grounds beginning in mid- to late May (Franzreb and Laymon 1993). Nesting activities usually take place between late June and late July, but may begin as early as late May, and continue to late August, depending on the season. Nest building takes 2-4 days. Nests are typically built in willow or mesquite thickets 4 to 10 feet (but as high as 35 feet) above the ground, are usually well-hidden by foliage, and are almost always near water. Incubation begins as soon as the first egg is laid, and lasts 11 days. Clutch size is usually two or three eggs, and development of the young are very rapid, with a breeding cycle of 17 days from egg-laying to fledging young. The young are fed large food items such as green caterpillars, tree frogs, katydids, and grasshoppers for the 6-7 day nesting period. After fledging, the young are dependent on the adults for at least 2 weeks.

Detection of the species is often made by vocalization. Mated males have a distinctive “kowlp” call which is a loud, nonmusical series of notes about 2-3 seconds long which slows down and slurs toward the end. Unmated males use a separate call which is an indeterminate series of soft notes “coo-coo-coo-coo.” Both members of a pair may give the “knocker” call, which is harsh, rattled, series of notes (Hughes 1999).

Historically, the western yellow-billed cuckoo occupied and bred in riparian zones from western Washington (possibly southwestern British Columbia) to northern Mexico, including Oregon, Washington, southwestern Idaho, California, Nevada, Utah, western Colorado, Arizona, New Mexico, and western Texas (American Ornithologists’ Union 1998). Today, the species is absent from Washington, Oregon, and most of California, is likely extirpated in Nevada, is rare in Idaho and Colorado, and occurs in the balance of its range in riparian habitats that are much reduced from their previous extent and are heavily affected by human use (U.S. Fish and Wildlife Service 2002c, 2001b).

Principal causes of riparian habitat losses are conversion to agricultural and other uses, dams and river flow management, stream channelization and stabilization, and livestock grazing. Available breeding habitats for yellow-billed cuckoos have also been substantially reduced in area and quality by groundwater pumping, and the replacement of native riparian habitats by invasive non-native plants (particularly saltcedar) (Groschupf 1987; Rosenberg *et al* 1991). Estimates of riparian habitat losses in the west as a result of the factors described above range from 90 to 99 percent in California, 90 percent in New Mexico, and 90 to 95 percent in Arizona (U.S. Fish and Wildlife Service 2001b). In Arizona, the greatest losses of riparian habitat have occurred along the lower Colorado River valley and its major tributaries at elevations below about 3,000 feet (U.S. Fish and Wildlife Service 2001b). Cuckoo numbers appear to have declined substantially in Arizona. In 1976 an estimated 846 yellow-billed cuckoo pairs occupied the lower Colorado River and five of its major tributaries (U.S. Fish and Wildlife Service

2001b), while in 1999, just 172 cuckoo pairs and 81 unmated adults were located during surveys of 221 miles of riparian habitat (Corman and Magill 2000). Specific declines in cuckoo numbers in Arizona have been documented along the lower Colorado River and the Bill Williams River delta (Rosenberg *et al.* 1991).

Nevertheless, Arizona is thought to contain the largest remaining cuckoo population in the western states (U.S. Fish and Wildlife Service 2002c). Currently in Arizona, cuckoos occur in a scattered fashion throughout the central, east-central, west central, and southeastern parts of the state, with the majority of known populations occurring along the San Pedro, Verde, and Agua Fria rivers and Cienega Creek in Pima, Pinal, Cochise, and Yavapai counties, and Sonoita Creek in Santa Cruz County (Corman and Magill 2000).

ENVIRONMENTAL BASELINE

Unlike the southwestern willow flycatcher, which has been extensively studied and surveyed at Roosevelt since its discovery there in 1993, no comprehensive surveys for the yellow-billed cuckoo have been conducted at Roosevelt. Corman and Magill (2000) conducted “look-see” surveys for cuckoos throughout Arizona in 1998-99, including surveys at selected sites at Roosevelt. During these surveys, no yellow-billed cuckoos were found at the Tonto Creek inlet in 1998, but two pairs were detected in 1999. At the Salt River inlet (which was not surveyed in 1998) one pair and one unmated adult were detected in 1999. In other years, incidental sightings of yellow-billed cuckoos occurred at the Salt Creek inlet in 2001 and at the Tonto Creek inlet in 1995 and 1996 (ERO 2002). A search of museum specimens and other sources did not reveal additional records from Roosevelt (Corman and Magill 2000).

USGS researcher Eben Paxton had planned to capture and radio-track cuckoos at Roosevelt in 2002, but only 3 cuckoos were observed. Two of the birds showed up very early, but were not observed again. The third cuckoo arrived in late June at Lakeshore (Salt Arm), but was gone the next day. The bird banding crew was watching and listening for cuckoos, but no others were detected. In an October 22, 2002 email, Paxton said “Although we didn’t systematically survey all of Roosevelt, I am pretty sure that the cuckoos didn’t breed this year (2002), at least in the areas that WIFLs [flycatchers] breed. Last year we had a tremendous amount of cuckoos, with some of the highest densities I have ever seen at the younger patches [of riparian woodland]. Cuckoos are known to be irruptive breeders, and presumably they will act in the opposite manner if the conditions are poor.” Conditions were poor for flycatchers in 2002; nest success was the worst ever recorded at Roosevelt. Presumably conditions were equally poor for cuckoos, and the low numbers detected in 2002 likely reflect those conditions. Paxton’s observation that densities were high in 2001 cannot be quantified (Paxton pers. comm. 2003); however, based on Paxton’s experience with this species in Arizona and the Southwest, cuckoo densities in young patches of riparian vegetation at Roosevelt were probably at the high end of densities elsewhere in Arizona and the southwestern States.

During its vegetation mapping, ERO mapped habitat suitable for western yellow-billed cuckoos at Roosevelt Lake. Based on the mapping categories described above, and on what is known about cuckoo habitat preferences, ERO defined cuckoo habitat at Roosevelt as patches of

cottonwood/willow habitat or mixed riparian habitat greater than 15 feet in height and at least 5 acres in size. Based on these criteria, ERO estimated that 167 acres of yellow-billed cuckoo habitat currently occur at the Salt River arm of Roosevelt Lake and 187 acres occur at the Tonto Creek arm, for a total of 354 acres (Table III-8 of ERO 2002).

As discussed in the Environmental Baseline for the flycatcher, the action area includes areas downstream of Roosevelt Dam and the mitigation sites, as well as the Roosevelt Lake itself. No records of cuckoos exist for the Verde River from Horseshoe Reservoir to the Salt River confluence (Corman and Magill 2000); however, cottonwood groves at the Highway 87 crossing on the Fort McDowell Yavapai Nation may be suitable for the species. Downstream of Roosevelt Dam, Corman and Magill (2000) report numerous historical records and specimens along the Salt River from Roosevelt to the Gila River confluence, and then downstream on the Gila River to Painted Rock Reservoir. Other historical records exist near the Colorado River confluence. Today, suitable habitats are limited to reaches of the Salt and Gila rivers from 23rd Avenue on the Salt River to Gillespie Dam, an area that is watered by sewage effluent and return agricultural flow. In this area, 2 pairs and 3 individual cuckoos were found from the 83rd Avenue to 115th Avenue crossings of the Gila River in 1998, and in 1999, a single bird was found at the 107th Avenue crossing, and a pair and a single bird were found at the Highway 85 crossing on the Gila River (Corman and Magill 2000).

Potential mitigation sites, including the lower San Pedro River, Verde River in the Verde Valley, and Safford Valley, Gila River, all have historical as well as recent records for cuckoos. The Verde Valley and lower San Pedro River are especially important for the species in Arizona (see Figs. 3 and 4 of Corman and Magill 2000).

EFFECTS OF THE PROPOSED ACTION

Effects of Activities at Roosevelt Lake

Injury or mortality of cuckoos at Roosevelt would occur primarily in the event that a nest tree, which has been undermined as a result of being inundated or dried out as a result of dam operation, actually falls when an active nest is in it. Such an event would be relatively unlikely to kill or injure adults, since adults in such cases would likely escape the tree prior to its impact with the ground or water surface, or would have vacated the tree in advance. However, eggs or nestlings in such a case would almost certainly be killed on impact or would drown. The most likely circumstance in which this might occur would be where a living tree is felled suddenly by high winds. Nestlings could also fall from the nest, and if the ground is inundated under the nest tree, the fledgling would likely drown. These birds might die regardless, but nestlings sometimes fall from nests and are fed on the ground by their parents until they fledge. The likelihood of death or injury of cuckoos in these ways is relatively small; however, they cannot be ruled out. The possibility of direct inundation of active cuckoo nests is not expected to occur, as Roosevelt Lake levels invariably recede in spring and early summer as a result of water deliveries and therefore are going down rather than up when cuckoos begin their nesting cycle.

The most significant effects to the cuckoo will result from operations of Roosevelt Dam that either create or destroy cuckoo habitat. As described for the flycatcher, during periods when

releases exceed inflows, Roosevelt Lake will decline in size, and riparian vegetation will develop where waters have receded. When significant runoff into the reservoir occurs, habitat will be lost to inundation. ERO estimated that the maximum occupied cuckoo habitat likely to be present at Roosevelt Lake within any one year of the plan and susceptible to loss due to a fill event is 313 acres. This represents the 354 acres of western yellow-billed cuckoo habitat currently identified at the lake minus 41 acres that are above 2,136 feet in elevation and are expected to survive inundation (since lake levels in late spring and early summer always decline by a minimum of 15 feet). This assumes that the maximum acreage we can expect over the next 50 years was present in 2001. It also assumes that we can accurately identify suitable cuckoo habitat. Both of these assumptions are untested, and our knowledge of cuckoo habitat use in Arizona is at a rudimentary level compared to what we know of flycatchers. Because of these potentially very important uncertainties, ERO (2002) included a much more robust adaptive management plan for the cuckoo. Under that plan, up to 800 additional acres of habitat could be lost, and would be mitigated. The 800-acre figure is based on the maximum total of tall dense vegetation that would be expected to develop at any one time at Roosevelt based on the vegetation modeling—or 1,113 acres (see Figure III-2 of the ERO 2002). Based on this analysis, up to 1,113 acres of habitat could develop at Roosevelt and be occupied by the yellow-billed cuckoo. This is probably an overestimate because, in regard to the flycatcher, ERO (2002) estimated that 100-200 acres of tall dense vegetation would likely still persist at Roosevelt, even during the worst case fill event. Nevertheless, we base our analysis of maximum effects on potential loss of 1,113 acres of cuckoo habitat.

Based on the observations of Paxton in 2001-'02, we can expect cuckoo populations to fluctuate dramatically, even in the absence of gross changes in habitats. Paxton's comment that in 2001 Roosevelt supported "a tremendous amount of cuckoos, with some of the highest densities I have ever seen at the younger patches", suggests that in some years relatively high densities of cuckoos can occur at Roosevelt in some habitat types. Also based on Paxton's observations, in other years (e.g. 2002), few or no cuckoos may breed.

Assuming an average cuckoo territory of 50 acres (from ERO 2002), approximately six breeding cuckoo pairs could occupy the estimated 313 acres of suitable habitat currently present at Roosevelt, and approximately 22 breeding pairs could occupy the maximum total of 1,113 acres of suitable cuckoo habitat that could be inundated in the future. Corman and Magill (2000) reported finding 172 pairs and 81 unmated adult cuckoos along approximately 220 miles of river and 6,585 acres of riparian habitat in Arizona. In the 313 acres of habitat susceptible to inundation and loss in 2001, an equivalent density of cuckoos would be 8 pairs and about 4 unmated adults. In 1,113 acres, density would equate to about 29 pairs and 14 unmated adults. Anderson and Ohmart (1977), based on four years of data on the lower Colorado River, reported mean cuckoo densities during May-July as 6 (range of 3-9) per 100 acres of mature cottonwood-willow forest. Assuming similar mean densities at Roosevelt, approximately 19 birds would occupy the 313 acres currently susceptible to loss, and 68 birds would occupy the 1,113 acres potentially occurring at Roosevelt (these densities are very similar to those reported by Corman and Magill 2000). Taken together, in most years, or on average, 12-20 cuckoos are expected to occupy the 313 acres, and 43-68 cuckoos would occupy the 1,113 acres potentially susceptible to loss. Based on Paxton's observations, cuckoo densities in some years may be higher than this in

some habitat patches or much lower, depending on conditions. Our estimates of numbers of cuckoos expected to occur at Roosevelt should be considered rough estimates, at best.

If waters rose and inundated cuckoo habitat, birds arriving in May or early June could select tall dense vegetation higher in the reservoir, they could relocate to other areas, or birds could die attempting to find alternate breeding habitat. If they selected the first alternative, they may compete with the cuckoos that normally nest in these habitats, possibly resulting in reduced nest productivity. If forced to move to other regions, they may not find suitable breeding habitats, they also would likely compete with the resident birds, or may breed in marginal habitats, again with reduced nest productivity. Cuckoos are known to breed in mesquite bosques in Arizona (Corman and Magill 2000). As waters rise at Roosevelt, mesquite thickets that may now be too far from water to support cuckoos could become suitable habitat, mitigating some of the loss of tall dense habitat lower in the reservoir.

Based on historical hydrology, predicted frequency of inundation following extended dry periods (during which considerable cuckoo habitat could develop) includes near or complete fill twice in 50 years (ERO 2002). Partial fill events or filling after shorter dry periods are also likely to occur, but would inundate and destroy lesser acreages of habitat. Current conditions, which include presence of considerable tall dense habitat, particularly in the old conservation space, are poised for a fill event in 2003 or 2004 that could inundate and destroy most of the currently extant 313 acres of habitat below elevation 2,136. Following a fill event, restoration of habitat will require that waters recede to provide room for trees, and then the trees take at least 3-5 years to germinate and grow into cuckoo habitat. In the interim, production of cuckoos at Roosevelt will be low.

Loss of habitat and decreasing cuckoo populations could also result from extended periods of low flows into the reservoir coupled with continued releases from the dam. In this case, habitats would dry out as groundwater elevation dropped below the rooting zone of riparian trees. ERO (2002) estimated 310 acres of tall dense vegetation at Roosevelt has dried out due to declining reservoir levels since 1997. Drying vegetation is being replaced by new habitat that has developed lower in the reservoir, but presumably, at some point, or if reservoir levels stayed consistently low for several years, most tall dense vegetation suitable for cuckoos could be lost due to dessication. Presence of dead and dry vegetation would also increase fire risk. If a fire started, it could burn into and destroy occupied habitat as well as dessicated stands. Less information is available in regard to the acreage of habitat that could be lost due to dessication; however, it is probably similar to that which could be lost due to inundation.

In the event of a dessication or inundation event that kills large acreage of riparian woodlands, SRP may propose, for safety and operational considerations, to clear or burn the dead vegetation from the bed of the reservoir. They would coordinate with us before taking any action to ensure that occupied habitats were not affected. Conducted in this manner, clearing or burning would benefit cuckoos by removing dead vegetation in a controlled manner. Large acreages of dead trees pose a significant fire risk, that if allowed to persist, could result in a wildfire that not only removes dead trees, but live trees and cuckoo habitat, as well.

Rough estimates of the numbers of cuckoos at risk at Roosevelt (12-20 in 313 acres, and 43-68 in 1,113 acres) are a relatively small percentage of cuckoos in Arizona. A total of 299-309 cuckoos were detected along 14 drainages in 1998, and 514-516 were detected along 20 drainages in 1999. Using the totals from 1999 (a more complete survey), numbers of cuckoos in the 313 acres of currently extant habitat at risk at Roosevelt, represents 2.3-3.9% of Arizona cuckoos. Cuckoos at risk in the 1,113 acres of habitat expected in the future represents 8.3-11.3% of Arizona cuckoos. These percentages may be inflated because the 1999 survey was not a complete inventory of all cuckoos in Arizona. No rangewide population estimate is available to quantitatively assess potential effects on the western yellow-billed cuckoo. Although Arizona may have the largest remaining cuckoo population of any state west of the Rocky Mountains, the western yellow-billed cuckoo has an extensive range that includes most of the western States and northern Mexico (U.S. Fish and Wildlife Service 2001b).

Effects Downstream of Roosevelt

Cuckoo habitats on the Salt and Gila rivers below Roosevelt Dam are maintained by sewage effluent and return agricultural flow, rather than water released from Roosevelt. Thus, dam operational regimes that aim to minimize flows below Granite Reef Dam probably do not affect these habitats or the cuckoos that inhabit them. If more water was released from Granite Reef Dam, habitats may not benefit because the width of the Salt and Gila river floodplains, and therefore the potential width of the riparian forests, is limited by flood control levees and agricultural development. Downstream users are also likely to make use of any regular releases from Granite Reef Dam, reducing potential benefits to cuckoos and riparian habitats. Flood control space at Roosevelt and the other Salt River reservoirs reduce the potential for flooding on the Salt and Gila rivers. Protection from scouring probably facilitates development of the mature riparian forests preferred by the cuckoo. On the other hand, these same communities are regenerated by flooding. However, as long as periodic flooding still occurs on the Salt and Gila rivers (such as occurred in 1993), these riparian communities will continue to renew themselves.

From Gillespie Dam to Painted Rock Dam, the Gila River is intermittent with less riparian woodland development. Below Painted Rock Dam, any effects of operation of Roosevelt or the other Salt and Verde dams are attenuated by operation of Painted Rock Dam (see Effects of the Proposed Action for the flycatcher).

Effects at Mitigation Areas

In the HCP, a comprehensive mitigation program consisting of riparian land acquisition and restoration, riparian vegetation creation, and riparian land management is proposed for loss of habitat at Roosevelt. These mitigation measures address mitigation of 313 acres of occupied habitat, for a total mitigation acreage of 939 acres, with two-thirds of this (626 acres) consisting of riparian land acquisition, restoration, and management and one-third (313 acres) consisting of other conservation measures (which may include, but are not limited to, management of existing riparian vegetation at or near Roosevelt Lake, acquisition of upland buffers to protect habitat at Roosevelt and/or acquired mitigation sites, and acquisition of water rights). ERO (2002) anticipates that most or all of the mitigation for the cuckoo will be met by the habitat

acquisition, restoration, and management accomplished for the flycatcher; however, additional mitigation will be implemented if needed to meet the mitigation obligations for the cuckoo. Under the 1996 biological opinion, Reclamation has acquired and is managing 232 acres of cottonwood-willow habitat suitable for cuckoos on the lower San Pedro River. An additional 220 acres of mitigation credit is in place in the form of retirement of groundwater pumping on the San Pedro Preserve. Reclamation is planning to purchase and manage another 200 acres of riparian woodland, much of which will likely be suitable for cuckoos. Assuming 150 of those 200 acres will be suitable, then SRP will need to acquire and manage another 244 acres of cuckoo habitat, and put in place another 93 acres of other conservation measures. Habitat restoration will consist, at a minimum, of establishment of riparian vegetation at the 20-acre Rockhouse site along the Salt River near its inlet to Roosevelt Lake. Habitat acquisition and management in perpetuity will occur in the Verde River Valley, the lower San Pedro or Safford river valleys, and other locations as necessary to meet the balance of the mitigation requirement. Habitat protection and management will occur on 300 acres of existing riparian habitat at Roosevelt (which are part of the 313-acre "other conservation measure" requirement), and at all habitat restoration and acquisition sites (part of the 626-acre requirement), and on any upland buffer sites acquired (part of the 313-acre requirement). All this mitigation is scheduled to be in place within three years of HCP approval. If we have underestimated the potential for cuckoo habitat at Roosevelt, this will be detected by regular monitoring of vegetation communities, and habitat acquisition, management, and other measures will be increased to mitigate for loss of up to 1,113 acres of occupied habitat.

At the mitigation sites, the cuckoo will benefit greatly, as existing habitats will be protected from threats such as agricultural and urban development, livestock grazing, high fire risk, forms of recreation that are incompatible with occupancy by cuckoos, and other human-caused impacts; hydrology will be restored and stressors removed, allowing development of suitable habitats; and riparian habitat will be developed on at least 20 acres at the Rockhouse site on the Salt Arm of Roosevelt. These measures are expected to mitigate loss of cuckoo habitat at Roosevelt due to inundation or dessication of habitats. The cuckoo will benefit from habitats acquired and managed for the flycatcher (for which the HCP would put in place 2,250 acres of mitigation) and potential development of cottonwoods on the lands of the Fort McDowell Yavapai Indian Community for bald eagles.

Summary - Long and Short Term Perspectives

As is the case for the flycatcher (see pages 46-47), effects to the cuckoo vary depending on the temporal perspective and the timing of the first inundation (or dessication) and loss of habitats. In the short term, if waters rise at Roosevelt in the spring of 2003 and all but 41 acres of the suitable habitats at Roosevelt are inundated, cuckoos arriving in May that opt to relocate may not be successful. Half or less of the mitigation will have been put in place, the Rockhouse site will not have been developed yet, and cuckoos may not have many opportunities for successful relocation. On the other hand, if significant loss of habitat does not occur for 3 or more years, all mitigation will have been put in place and cuckoos should have alternate habitats available (although not all habitats are likely to develop to their full potential for several more years).

In the long-term, baseline conditions in regard to operation of Roosevelt will not change, yet significant mitigation will be put in place. Roosevelt will continue to be operated at full capacity, and the extent and quality of cuckoo habitat will continue to vary with water levels, as in the past. Enhanced management and riparian restoration proposed in the HCP will improve the baseline conditions at Roosevelt. Elsewhere, significant acreage of cuckoo habitat will be acquired and maintained in perpetuity over the next 3 years. These mitigation measures will remove threats to and ensure continued availability of extant occupied habitats, and provide management for potentially suitable habitats to become suitable and ultimately occupied. Protection and management of suitable and potentially suitable habitats on the lower San Pedro and Verde rivers, in the Safford Valley, or elsewhere will improve the status of the cuckoo in those areas. Mitigation will occur for acreage of habitat likely to be lost at Roosevelt in any inundation event in the next 50 years. If we have underestimated the extent of occupied habitat that may be lost at Roosevelt, the HCP includes adaptive management for additional mitigation for loss of up to 1,113 acres of cuckoo habitat. Thus, measuring effects from the baseline conditions, the HCP and continued operation of Roosevelt will provide significant benefits to the status of the cuckoo over the long term.

Cumulative Effects

The southwestern willow flycatcher cumulative effects section, which includes a thorough discussion of cumulative effects in the action area, is included here by reference. Most activities at Roosevelt unrelated to dam operations will be Federal actions, and thus are not considered cumulative. Inundation of habitat at Roosevelt may provide boaters, water skiers, or jet skiers access to cuckoo nesting habitat. Noise, wave action, and the presence of people and water craft may cause cuckoos to temporarily or permanently abandon nests, or birds searching for nest sites may opt to not nest in such areas. SRP does not authorize these activities, but they may occur near nests. Effects to cuckoos, including any incidental take, is most appropriately addressed in consultation or section 10(a)(1)(B) permits with agencies that authorize or license these recreational activities (if and when the species is listed). Illegal camping, off-highway vehicle use, camp fires, and other recreational activities near nests at Roosevelt could also result in harassment of, or harm to, cuckoos.

Of the effects described in the flycatcher writeup, the most important for the cuckoo are cumulative effects downstream of Granite Reef Dam on the Salt and Gila rivers, and at the mitigation sites. Downstream of Granite Reef Dam, lands are primarily privately-owned, but considerable acreage is also managed by the State Land Department, Bureau of Land Management, and Gila Bend Indian Nation. In these areas, development will frequently require a section 404 Clean Water Act permit from the Army Corps of Engineers, and other Federal permits or authorizations. Activities likely to occur on non-Federal lands not requiring a Federal authorization or funding include clearing of land and construction of farms or housing, livestock grazing, ground water pumping, and continued agricultural activities, including use of pesticides and fertilizers that may be toxic to birds or invertebrates that birds, including cuckoos, feed upon. State lands could be leased for sand and gravel mining, which currently occurs in several areas along the Salt and Gila rivers, or could be sold for housing or industrial purposes.

As discussed in the environmental baseline for the flycatcher, construction and operation of Bartlett and Horseshoe dams, grazing, and recreation have adversely affected riparian communities on the Verde River at and downstream of Horseshoe Reservoir (Beauchamp and Stromberg 2001, Sommers *et al.* 2002, U.S. Fish and Wildlife Service 2002a&b). These activities and their effects are expected to continue into the future. Potentially suitable habitats at the Highway 87 crossing or elsewhere may be adversely affected. A relatively narrow floodplain, at least upstream of the Needles, also limits opportunities for cuckoo habitat to develop. Due to recent changes in dam operation and law enforcement, conditions are expected to improve somewhat below Bartlett Dam over baseline conditions (see flycatcher cumulative effects section).

As discussed for the flycatcher, areas targeted for mitigation, including the lower San Pedro River, Verde River in the Verde Valley, and Gila River in the Safford Valley were selected because many private parcels exist and thus provide opportunity for acquisition and management. All three areas have considerable agricultural development, rural housing development, dispersed recreation, roads, livestock grazing, sand and gravel mining, and other activities on private or State lands that threaten habitats used or potentially used by the cuckoo. On the other hand, acquisitions and management by The Nature Conservancy, as well as actions by citizen's groups, are contributing to the conservation of riparian habitats in areas targeted for mitigation (see flycatcher cumulative effects section for more information).

Non-federal activities that may result in incidental take of yellow-billed cuckoos can be addressed through the section 10(a)(1)(B) permitting process (if and when the species is listed).

CONCLUSION

After reviewing the current status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's conference opinion that the proposed action is not likely to jeopardize the continued existence of the western yellow-billed cuckoo. No critical habitat has been proposed for the cuckoo, thus none will be affected. We present our no-jeopardy conclusion for the following reasons:

1. Although issuance of an incidental take permit and associated effects of operating Roosevelt Dam and implementing a mitigation and minimization program is expected to have short-term adverse effects to the cuckoo, in the long term, the cuckoo is expected to benefit significantly, because the baseline condition at Roosevelt will improve due to more intensive management of existing habitats and habitat restoration, and conservation in mitigation areas on the San Pedro, Verde, Gila and/or other rivers will be much enhanced.

2. Numbers of cuckoos and acres of habitat expected to be impacted are not clear due to lack of surveys at Roosevelt, cuckoo populations that appear to fluctuate from year to year, and limited ability to accurately predict acres of habitat present in the future; however, SRP proposes to initiate cuckoo surveys and mitigate for loss of 313 acres of currently extant tall, dense riparian vegetation that, based on the best information available, is suitable for cuckoos. SRP has included adaptive management in their HCP for up to an additional 800 acres of occupied

habitat, if this analysis underestimates total future occupied habitat loss due to operation of Roosevelt Dam.

3. Our best estimate is that cuckoos at risk from operation of Roosevelt Dam roughly represents no more than 12.3% (and probably significantly less) of all cuckoos in Arizona, and the western population that is designated a candidate has an extensive range that includes the western states and northern Mexico.

4. Proposed land acquisition and management for the cuckoo (939 acres) would occur primarily within large river systems and large habitat patches, and will be complemented by other ongoing riparian conservation efforts in the same areas, including mitigation for the flycatcher (2,250 acres). Habitat acquired or restored as mitigation will be managed in perpetuity for the benefit of the cuckoo.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Section 3 of the Act defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." Harm and harass were both further defined in 50 CFR 17.3. Harm is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The HCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the HCP, together with the terms and conditions described in the Implementing Agreement and any section 10(a)(1)(B) permit or permits issued with respect to the HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14 (i). Such terms and conditions are nondiscretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the Applicant fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the Roosevelt HCP, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the HCP and its accompanying section 10(a)(1)(B) permit.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

We use maximum acres of habitat anticipated to be lost as a result of the proposed action over the term of the permit (50 years) as a surrogate to quantify take of cuckoos. A rough estimate of numbers of cuckoos taken by loss of habitat is presented in the Effects of the Proposed Action.

We anticipate that cuckoos occupying up to 1,113 acres of habitat at Roosevelt may be taken in the form of harm annually. Within this acreage, cuckoos may be harmed as a result of modification or degradation of habitat due to inundation or dessication, they may be injured or killed if trees fall causing eggs or nestlings to drown, and nestlings could fall from nests and drown. We anticipate modification or degradation of habitat due to inundation or dessication would occur 2-3 times during the 50-year life of the permit.

Harm. Harmed cuckoos may attempt to nest in suboptimal habitats at Roosevelt, may relocate, or may die. Nest productivity is expected to decline significantly when the reservoir fills and would stay low until reservoir levels decline and habitats recover. Releases from Roosevelt Dam that lower reservoir levels may cause dessication of cuckoo habitat. Dessication will occur over a longer time period than an inundation event, thus birds may have more time to adjust and relocate to other habitats. Cuckoo eggs and nestlings could also be injured or killed by high reservoir levels that inundate and undermine the base of nest trees. These trees may fall during storms or high winds, causing eggs and nestlings to drown. Nestlings could also fall out of nests and drown in water at the base of nest trees.

No incidental take is anticipated in the action area outside of Roosevelt Lake as a result of the proposed action.

EFFECT OF THE TAKE

In this biological opinion, the Service finds that the level of take anticipated is not likely to jeopardize the continued existence of the western yellow-billed cuckoo. The reasons for this conclusion are the same as described under the conclusion, above.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation measures provided for in the HCP and the terms and conditions in the Implementing Agreement are incorporated here by reference as reasonable and prudent measures and terms and conditions. We find they fully offset the impacts of the incidental taking of the yellow-billed cuckoo resulting from the continued operation of Roosevelt Dam. No additional reasonable and prudent measures or terms and conditions are needed to minimize anticipated incidental take.

MIGRATORY BIRD TREATY ACT

If the yellow-billed cuckoo is listed as threatened or endangered, the Incidental Take Permit that is the subject of this opinion shall constitute a Special Purpose Permit under 50 C.F.R. § 21.27 for take of cuckoos in the amount and subject to the terms and conditions specified in the permit, the Implementing Agreement, and the habitat conservation plan. Any such take will not be in violation of the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712). Prior to listing as threatened or endangered, the Fish and Wildlife Service will not refer the incidental take of any migratory bird, including the yellow-billed cuckoo, for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-712) if such take is in compliance with all conservation measures described in the proposed HCP, together with the terms and conditions described in the associated Implementing Agreement and Incidental Take Permit.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of our section 2(c) or 7(a)(1) responsibilities for the flycatcher, bald eagle, Yuma clapper rail, and western yellow-billed cuckoo. We have no further conservation recommendations.

DISPOSITION OF DEAD OR INJURED LISTED ANIMALS

Disposition of dead or injured listed animals will be addressed in the terms and conditions of the section 10(a)(1)(B) incidental take permit.

REINITIATION NOTICE

This concludes formal consultation on our proposed issuance of an incidental take permit to SRP for operation of Roosevelt Dam and Lake in Maricopa and Gila counties, Arizona. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may adversely affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by this action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation, if it is determined that the impact of such taking will cause an irreversible and adverse impact to the species.

If we may be of further assistance in this matter, please contact Jim Rorabaugh (x238) or Sherry Barrett (520/670-4617) of my staff.

[Signature]

For Steven L. Spangle, Field Supervisor
Tom Gatz

2/21/03
Date

Concur:

[Signature]

Geoffrey L. Haskett, Deputy Regional Director
David Yarnie

2/24/03
Date

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

Director, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Mesa, AZ
Forest Supervisor, Tonto National Forest, Phoenix, AZ
District Ranger, Tonto Basin Ranger District, Tonto Basin, AZ
Arca Manager, Bureau of Reclamation, Phoenix, AZ

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