



United States Department of the Interior

Fish and Wildlife Service

Arizona Ecological Services Field Office

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July 17, 1996

In Reply Refer To:

2-21-95-F-462

MEMORANDUM

TO: Regional Director, U.S. Fish and Wildlife Service, Albuquerque, New Mexico

FROM: Field Supervisor

SUBJECT: Final Biological Opinion for the Modified Roosevelt Dam and Its Effects on the Endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*) and Responses to Reclamation's Comments on Draft Biological Opinion

Attached is the final biological opinion for the effects of the Modified Roosevelt Dam in Gila and Maricopa Counties, Arizona, on the Endangered Southwestern Willow Flycatcher. We received Reclamation's comments on the draft biological opinion by facsimile on July 1, 1996. Although there were no comments regarding the Reasonable and Prudent Alternative, we carefully reviewed all comments and incorporated appropriate changes in their comments on the draft biological opinion. Reclamation addressed areas of disagreement with the Service. Per the request of your staff, we have provided a response to Reclamation's comments below for the record.

Issue 1 - The Service developed "worst-case" analysis; analysis based on assumptions

Reclamation commented that the biological opinion *"is based on a "worst-case" rather than a more appropriate "most probable" analysis.*" In the biological opinion the Service identified areas in which it disagrees with the analysis and assumptions used in Reclamation's biological assessment. Reclamation's "most probable" analysis did not acknowledge nor consider any indirect effects to regional population dynamics from temporary or long-term loss of reproduction. This omission leads the Service to conclude that Reclamation considers the Roosevelt Lake flycatcher population to be closed and not subject to immigration or emigration. The Service believes this is not the "most probable" situation, and that basing a "scientific" analysis on this assumption is flawed. Additionally, during our discussions the Service offered to issue an incidental take statement based on partial loss of the flycatcher population or its breeding habitat. Under that scenario, effects that only resulted in partial losses would be covered. Any losses above the partial limit would require reconsultation. Reclamation declined to take that approach.

Further, during the consultation process the Service gathered data to develop a life-table analysis for the Roosevelt Lake population and for the Kern River population in southern California. The results of that analysis suggested that reproduction at both the Roosevelt and Kern River sites was not sufficient to maintain those populations over the long-term. This is particularly alarming because those two populations are of the largest known and, at this time, experiencing only minimal levels of cowbird parasitism. Based on Reclamation's comments, Reclamation would apparently prefer the use of the probabilistic analysis provided by the life-table over heuristic analyses. However, the Service chose not to include the life-table analysis in the biological opinion because portions of the analysis relied on assumptions, even though the analysis used the "best available data." In the absence of definitive data, Reclamation had the option to delay consultation on the project while conducting additional research. The "assumptions" incorporated into the opinion are based on data from available studies on the southwestern willow flycatcher or are supported by the conservation biology literature.

Issue 2 - Opinion fails to consider threats without project

Reclamation believes that threats from the proposed action can only be understood by comparing existing threats without the project. The southwestern willow flycatcher was listed as endangered on March 29, 1995, after extensive comment and review period demonstrated that the scope and magnitude of existing threats were severe, that the flycatcher population was already small and highly fragmented, and that stochastic factors, alone, could render the population extinct within the foreseeable future. The biological opinion incorporates threats "without the project" into the environmental baseline. The Service acknowledged and identified many of those threats in the opinion. In the context of the environmental baseline and the consultation process, however, threats from the proposed action are additive, not equal to existing threats because they result from an agency action that can be modified to avoid effects to the species. Conversely, many of the existing threats from past actions cannot be modified. The sole basis of section 7(a)(2) is to ensure that agency actions do not add to the environmental baseline in a manner that would result in jeopardy to an endangered or threatened species. Thus, the Service agrees that the proposed action needs to be evaluated in the context of the environmental baseline for the species, but does not concur with the assessment that effects from the proposed action are equivalent to existing threats manifest as a result of Federal, State, and private actions implemented prior to enactment of the major Federal environmental laws.

Issue 3 - Agreement on evidence regarding management of lake

Reclamation contends that "all parties" agreed that "any management alternative of lake levels..., other than that resulting from the proposed project was any better (or worse) for flycatchers." The Service acknowledges in the biological opinion the extent of agreement between the Service and Reclamation and the uncertainties of the various alternatives that "all parties" considered in the section entitled, *Alternatives Considered to Avoid or Minimize Effects of the Action*. However, the Service reminds Reclamation that because of strong protest from the applicants, the biological merits of precluding the use of the new conservation space until flycatcher recovery to offset potential losses could be demonstrated elsewhere were never fully discussed,

nor were the biological merits of water management solely to maintain the existing habitat. As a result, the Service can not categorically agree that no evidence exists for any particular management option, because options intended for the sole benefit of maintaining the existing flycatcher habitat, either permanently or temporarily until sufficient recovery occurred elsewhere, never were fully addressed. The Service would welcome further discussion on the biological merits of maintaining habitat within the existing conservation pool as a sanctuary for the endangered southwestern willow flycatcher.

Issue 4 - Opinion fails to provide discussion of historical aspects of riparian habitat in project area

The Service disagrees with Reclamation's assertion. Pages 14 through 16 and 21 of the draft biological opinion discuss a variety of historical and current factors that potentially have contributed to the status of riparian habitats at Roosevelt Lake. Further, the Service referenced literature and photographs from the pre-dam and post-construction periods that we believe are important in developing a comprehensive historical perspective on the nature and distribution of riparian habitats at Roosevelt Lake.

Issue 5 - Misinterpretation of analysis in the biological assessment

The conclusion that Reclamation believes "best summarizes" impacts to the flycatcher is equivocal.

The probabilities of impacts cannot be precisely quantified because of a lack of data and the inability to predict future rainfall patterns.

However, the Service disagrees with the assumptions upon which this conclusion is based. Assumptions number five and eight in Reclamation's Biological Assessment clearly state that:

5) No residual effects from a year of habitat non-suitability will extend into a year of habitat suitability.

8) When habitats that were temporarily unsuitable again become suitable, they will be immediately colonized by SWFs.

The Service is concerned that highly probable indirect effects from temporary losses of reproduction were not addressed in the Biological Assessment and that these assumptions are based on the additional assumption that southwestern willow flycatcher populations are healthy and that the current distribution and numbers represent an "average" population. The southwestern willow flycatcher was listed as endangered on March 29, 1995, after extensive comment and review period demonstrated that the scope and magnitude of existing threats were severe, that the flycatcher population was already small and highly fragmented, and that stochastic factors, alone, could render the population extinct within the foreseeable future. The

Service documented many of the existing effects and threats and population status in the biological opinion, and does not consider the southwestern willow flycatcher to be comprised of healthy, average populations.

If you need further assistance with this biological opinion or the above comments, please contact Rob Marshall or Bruce Palmer.

A handwritten signature in cursive script, reading "Sam F. Spiller". The signature is written in dark ink and is centered on the page.

Sam F. Spiller

Attachment

SUMMARY
**BIOLOGICAL OPINION ON OPERATION OF MODIFIED ROOSEVELT DAM IN
GILA AND MARICOPA COUNTIES, ARIZONA**

Date of the opinion report: July 17, 1996

Action Agency: Bureau of Reclamation

Project: Dam height raised 77 feet to enable an increase in water conservation space of 15 feet and flood control space of 67 feet at Roosevelt Lake.

Listed species, species proposed for listing, and critical habitats: The endangered southwestern willow flycatcher (*Empidonax traillii extimus*).

Biological opinion/conference report: Jeopardy.

Reasonable and prudent alternative (RPA): One alternative with six components, including restriction on management of conservation space through September 1996; habitat acquisition and protection of a size that will support a minimum of 45 southwestern willow flycatcher territories; \$1.25 million management fund; funding for Recovery Coordinator for 10 years; research and monitoring program for 10 years; and cowbird management program for 10 years.

Incidental take/level of take anticipated: Harm to 45 southwestern willow flycatcher territories through habitat modification, and take of up to 90 individuals through reduced productivity and survivorship of individuals attempting to breed in modified habitat or individuals dispersing and attempting to breed in habitat outside of the proposed action area.

Reasonable and prudent measures (RPMs) and terms and conditions: Implementation of the RPMs. Terms and conditions are mandatory requirements. Restriction on management of new conservation space through September 1996; reduce incidences of cowbird parasitism through cowbird management program; all flycatcher-related research and monitoring to be conducted by skilled personnel that have participated in flycatcher training program; and ensure appropriate coordination and oversight of reasonable and prudent alternative and reasonable and prudent measures.

Conservation recommendations: Fund Arizona Partners In Flight Southwestern Willow Flycatcher Survey Program to survey lands withdrawn by Reclamation on the lower Colorado River to determine the breeding season status of flycatchers in region; by December 1998, identify all areas with potentially suitable habitat for the flycatcher on lands withdrawn by Reclamation in Arizona, New Mexico, and southern Utah and identify current conditions and management strategies to maintain or restore flycatcher habitat; and support on-going work by National Biological Service to identify sub-specific patterns of genetic variation in the willow flycatcher complex.



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July 17, 1996

In Reply Refer To:
AESO 2-21-95-F-462

To: Regional Director, U.S. Bureau of Reclamation, Boulder City, Nevada

From: Regional Director

Subject: Biological Opinion for the Southwestern Willow Flycatcher and the Operation of the Modified Roosevelt Dam

The U.S. Fish and Wildlife Service has reviewed the project plans for the operation of the Modified Roosevelt Dam at Roosevelt Lake, Gila and Maricopa Counties, Arizona. Your September 14, 1995, request for consultation was received on September 15, 1995. This document represents the Service's biological opinion on the effects of that action on the endangered southwestern willow flycatcher (*Empidonax traillii extimus*). This document is written in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

This biological opinion was prepared using information contained in the biological assessment dated September 1995 (Biological Assessment of the Possible Impacts of Modifications of Roosevelt Dam on the Southwestern Willow Flycatcher) (USBR 1995); meetings with project proponents; other letters and documents exchanged between Reclamation and the Service; discussions and field meetings with Reclamation, other agencies, and designated applicants; data in our files; the published and unpublished literature; and other sources of information. Only those sources which are specifically cited in the text are listed in the Literature Cited section of this document. The lack of specific reference to any report does not necessarily indicate that it was not reviewed or that it does not provide relevant background information.

It is the Service's biological opinion that the proposed action is likely to jeopardize the continued existence of the southwestern willow flycatcher. There is no proposed critical habitat in the project area.

CONSULTATION HISTORY

Reclamation and the Service began informal discussions regarding the proposed action and the development of the biological assessment in February 1995. The Service met with Arizona

Municipal Water Users Association (AMWUA) and Reclamation on April 17, 1995, and May 8, 1995, to discuss the proposed action. Reclamation submitted a draft Biological Assessment to the Service on April 26, 1995. On June 12, 1995, the Service met with Reclamation and Tonto National Forest (TNF) to discuss consolidation of actions being consulted on in the Tonto Basin. Staff from the Service, Reclamation, and TNF participated in a site visit to Roosevelt Lake on June 20, 1995, to identify locations with nesting flycatchers. A meeting to discuss the development of the biological assessment with Reclamation, SWCA Inc. (a consultant working for AMWUA), and the Service was held on July 19, 1995.

The Service received the final biological assessment (USBR 1995) with a request for formal consultation on September 15, 1995. The Service received additional documentation regarding sedimentation impacts at Roosevelt Lake on October 2, 1995. The Service acknowledged receipt of the request for consultation in a letter to Reclamation dated October 11, 1995. The Service met with Reclamation, SWCA Inc., and TNF on October 16, 1995, to discuss the biological assessment. On October 23, 1995, the Service received a notification from Reclamation that a draft Environmental Assessment for the Modified Theodore Roosevelt Dam Water Control Manual was available for comment and that the Bureau anticipated making a "Finding of No Significant Impact" regarding the operation of the flood control pool.

The Service, Reclamation, and applicants, approached this consultation process in a cooperative manner, investigating potential conservation actions to avoid, minimize, and or mitigate the impacts to the flycatcher. All parties provided additional information to the Service as needed to evaluate the conservation alternatives. The Service acknowledges this cooperation, which has led to an efficient consultation process while dealing with many complex issues. The record of meetings and other coordination activities follows.

The Service met with staff from Reclamation, TNF, Salt River Project (SRP), Central Arizona Water Conservation District (CAWCD), SWCA Inc., and the Salt River Pima Maricopa Indian Community (SRPMIC) on October 31, 1995, to discuss the proposed project and potential management that would avoid or minimize impacts to the flycatcher. The Service met again with Reclamation, SRP, and SWCA Inc. on November 7, 1995, to further discuss the potential to avoid or minimize effects to the flycatcher from the proposed action. On November 8, 1995, the Service received a copy of a letter from Reclamation to Mr. William Quinn, representing SRPMIC, clarifying language in the biological assessment regarding allocated storage space. The Service received additional information from Reclamation on November 20, 1995, regarding use of the existing power canal to create and maintain additional riparian habitat at Roosevelt Lake. On November 24, 1995, the Service received a copy of a letter from Reclamation, dated November 22, 1995, denying "applicant status" for this consultation to the Southwest Center for Biological Diversity.

On December 6, 1995, the Service, Reclamation, and staff from The Nature Conservancy met to discuss potential land acquisition as part of a mitigation plan. A site visit to the Salt River inflow was held December 7, 1995, to evaluate possible habitat enhancement opportunities, and was attended by the Service, Reclamation, TNF, SRP, AMWUA, and SWCA Inc. Work on the

consultation ceased during the furlough of Federal workers from December 15, 1995, to January 7, 1996. On January 9, 1996, Reclamation provided the Service draft language regarding the acquisition and protection of replacement habitat as a potential component of a reasonable and prudent alternative. A meeting to review the status of the biological opinion in light of the furlough of Federal personnel and to review potential research components of mitigation was held on January 22, 1996, and attended by the staffs of the Service, Reclamation, National Biological Service, CAWCD, SWCA Inc., SRPMIC, SRP, and AMWUA. A meeting to discuss potential management of lands to be acquired for mitigation was held on January 30, 1996, with the Service, Reclamation, and The Nature Conservancy.

The Service received a letter from Reclamation on January 22, 1996, requesting an extension of the consultation period to February 23, 1996. On February 1, 1996, Reclamation provided the Service draft language regarding two potential components of a reasonable and prudent alternative, establishment of a management fund for the southwestern willow flycatcher and deferring use of the new conservation space for long-term water storage until September 1, 1996. On February 13, 1995, the Service met with Reclamation, AMWUA, CAWCD, SRP, SRPMIC, SWCA Inc., and TNF to discuss the preliminary draft biological opinion. At that meeting, the Service provided Reclamation a preliminary draft biological opinion, which included the Service's determination that the proposed action was likely to jeopardize the continued existence of the southwestern willow flycatcher.

The Service received comments from Reclamation and SWCA Inc. on the preliminary draft biological opinion on February 16, 1995. The Service met with Reclamation, AMWUA, and CAWCD on March 6, 1996, to discuss the status of the consultation. On March 12, 1996, the Service met with Reclamation and SWCA Inc. to discuss the preliminary draft biological opinion. On April 2, 1996, the Service provided Reclamation a second preliminary draft biological opinion. On April 8, 1996, Reclamation and SWCA Inc. provided comments on the second preliminary draft. On April 16, 1996, the Service met with AMWUA, SRP, SRPMIC, Reclamation, and SWCA Inc. to discuss the reasonable and prudent alternative and status of the consultation. Reclamation transmitted by facsimile on April 16, 1996, draft language regarding a potential component of the reasonable and prudent alternative that would establish a coordinator position to oversee implementation of the reasonable and prudent alternative. The Service met with Reclamation, AMWUA, CAWCD, SRPMIC, and SWCA Inc. on April 29, 1996, to discuss the reasonable and prudent alternative in the biological opinion and the status of the consultation.

On April 29, 1996, the Service received a letter from Reclamation clarifying the role of the Army Corps of Engineers in developing a Water Control Manual for the operation of the new flood control space and its relation to the assessment of effects made in the Biological Assessment. Reclamation also forwarded to the Service on April 29, 1996, comments on the preliminary draft biological opinion from the Office of Assistant Secretary for Water and Air and from Interior's Solicitor's Office. On May 29, 1996, the Service sent a formal draft biological opinion to Reclamation. On July 1, 1995, the Service received by facsimile comments from Reclamation and the applicants on the May 29, 1996, draft biological opinion. On July 7, 1996, the Service met with Reclamation, Solicitor's Office, The Nature Conservancy, and

National Fish and Wildlife Foundation to discuss the land acquisition component of the reasonable and prudent alternative.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The purposes of the Modified Roosevelt Dam and Reservoir include: 1) improvement of the dam's safety under earthquake loadings; 2) improvement of the dam's safety with the creation of additional surcharge capacity to route the probable maximum flood; 3) increased flood control capabilities; 4) creation of additional active conservation capacity; and 5) expansion of public recreation opportunities. Modifications to Roosevelt Dam were authorized by the Plan 6 alternative to Orme Dam, which was approved by the Secretary of the Interior in 1984 [Section 301(a)(3) of the Colorado River Basin Project Act of 1968 (P.L. 90-537) and the 1978 Reclamation Safety of Dams Act (P.L. 95-578)]. The total cost of the modifications, including actual construction costs and associated fish and wildlife and cultural mitigation, is estimated to be \$430,392,000. The United States has invested \$359,904,000 of that amount, with approximately \$44,000,000 contributed by the cities of Phoenix, Mesa, Scottsdale, Glendale, Chandler, and Tempe. The increased capacity of Modified Roosevelt Dam will be used for additional, active conservation storage, increased surcharge capacity for flood control, and increased dead storage space. The additional conservation capacity will provide water for municipal use by the cities of Chandler, Glendale, Mesa, Phoenix, Scottsdale, and Tempe, as well as SRPMIC.

Theodore Roosevelt Dam is located on the Salt River approximately 75 miles northeast of Phoenix in Gila and Maricopa Counties within the TNF. The original Roosevelt Dam was completed in 1911. Construction for the Modified Roosevelt Dam began in 1991. The modification (proposed action) consists of raising 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. Raising the dam will allow for an increase in the top of the conservation pool 15 feet from the current 2136 foot elevation to 2151 feet. A 200-year flood event would inundate adjacent upland habitat to an elevation of 2175 feet. The probable maximum flood event would inundate adjacent upland habitat to an elevation of 2218 feet (Appendix A).

The current active conservation storage capacity (1,384,314 acre-feet; revised data provided by Reclamation July 1, 1996) as illustrated in Appendix A, refers to all of the water that is stored below the 2136-foot elevation conservation pool of the original dam. SRP will retain all rights to store and deliver this water as it could prior to the modification of the dam. The additional active conservation capacity is the space between elevations 2136 feet (top of existing conservation space) and 2151 feet (top of new conservation space). The estimated storage capacity is 304,729 acre-feet (revised data provided by Reclamation July 1, 1996) but will change depending on siltation. Because the sill elevation of the dam's outlet structures was raised above the bottom of the reservoir, approximately 18,652 acre-feet (revised data provided

by Reclamation July 1, 1996) of dead storage capacity has also been created in the new reservoir.

The flood control space between the 2151-foot elevation and 2175-foot elevation is allocated exclusively for regulation of flood flows. Flood waters would be temporarily stored in this space to reduce damage downstream. Reservoir levels would rise proportionally with the amount of water stored but would be expected to reach the 2175-foot elevation only during a 200-year flood event. Any flood waters captured above the 2151-foot elevation would be evacuated in 20 days or less as described in the Corps of Engineers Water Control Manual. Reclamation has contracted with the Army Corps of Engineers to develop a Water Control Manual that specifies how and when releases will be made from the modified Roosevelt Dam during flood conditions. This biological opinion addresses the operation of the modified Roosevelt Dam, including the flood control operation identified in the Water Control Manual.

The operation of the surcharge space between the 2175-foot elevation and 2218-foot elevation would be governed by the Corps of Engineers Water Control Manual. The surcharge space is the reservoir's capacity for passing the probable maximum flood, which would result from the most severe combination of hydrological and meteorological conditions considered possible for a particular drainage basin. For a given year, the probability of occurrence for this flood event is less than 1 chance in 10,000.

Although the storage capacity of Roosevelt Lake will increase with the proposed modifications, water levels in the new conservation pool may fluctuate widely depending on precipitation and downstream use. Typically, the conservation pool would be at its highest levels between March and May when winter precipitation and snowmelt combine to yield the highest inflows into Roosevelt Lake. Upon completion of the proposed action, the conservation pool would be allowed to rise to 2151 feet as inflows permit. The level of the conservation pool would be anticipated to fluctuate both seasonally and annually as a function of precipitation and releases for downstream uses.

Included as Reclamation's May 24, 1996, amendment to the Biological Assessment, is a modified project description which expands Reclamation's commitment to a conservation program for the southwestern willow flycatcher. The following text is included in Reclamation's Biological Assessment as section 1.B., inserted beginning on page 3 of the Biological Assessment:

SOUTHWESTERN WILLOW FLYCATCHER CONSERVATION PROGRAM

In addition to the mitigation measures described above for Roosevelt Dam, Reclamation has an ongoing program of endangered species conservation. These conservation activities are authorized and executed via section 7(a)(1) of the Endangered Species Act. The region-wide program currently includes activities to assist in the conservation of razorback sucker, bonytail chub, and other fish species on the lower Colorado River, as well as a native plant restoration program. In recognition of the precarious position of southwestern willow flycatcher and the riparian habitat upon which it relies, Reclamation

is committed to expand this conservation program to include the southwestern willow flycatcher.

Specifically, Reclamation will provide staff and seek funding under section 7(a)(1) to assist the Service in accelerating, expanding, and implementing conservation and recovery actions for the southwestern willow flycatcher. Through this expanded program, Reclamation is committed to:

- 1) Be an advocate for the southwestern willow flycatcher; to act as an information center on flycatcher biology/ecology, management, and research; to generate interest and raise funds; and to immediately accomplish on-the-ground conservation actions;
- 2) Identify and develop conservation strategies in cooperation with the Service, Reclamation, and other Federal, State, Tribal, and other entities, for incorporation into a Service recovery plan; to assess flycatcher distribution, site specific conditions, habitat and population trends, and potential management actions;
- 3) Evaluate potential management conflicts, and develop management opportunities and partnerships within occupied and unoccupied flycatcher habitat;
- 4) Coordinate with appropriate Service staff to provide all necessary information for the section 7 consultation process to minimize impacts to flycatchers and regulate incidental take; and
- 5) Prepare management agreements with agencies, local management entities, and private land owners.

STATUS OF THE SPECIES

The southwestern willow flycatcher is a small passerine bird (Order Passeriformes; Family Tyrannidae) approximately 5.75 inches long. It has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two whitish or buff wingbars are visible, the eye ring is faint or absent. The upper mandible is dark, the lower is light grading to dark at the tip. The southwestern willow flycatcher is a riparian obligate, nesting in riparian thickets associated with rivers, streams, and other wetlands where dense growth of willow (*Salix* sp.), *Baccharis*, buttonbush (*Cephalanthus* sp.), boxelder (*Acer negundo*), tamarisk or saltcedar (*Tamarix* sp.) or other plants are present, often with a scattered overstory of cottonwood (*Populus* sp.) and/or willow.

Surface water or saturated soils are usually present or nearby, especially early in the breeding season. During drier years surface water may be present early in the breeding season with only damp soil present or a total lack of soil moisture by late June or early July (Muiznieks *et al.* 1994, Sferra *et al.* 1995). The plant species composition and structure of nesting habitat varies across the bird's range. This variation ranges from relatively homogeneous patches of one or

several shrub or tree species that form a single cover layer up to approximately six meters in height (20 feet) to structurally heterogeneous patches of many tree and shrub species with distinct overstory, sub-canopy, and groundcover levels (Brown 1988, Whitfield 1990, Sedgewick and Knopf 1992, Muiznieks *et al.* 1994, Tibbitts *et al.* 1994, Maynard 1995, Sferra *et al.* 1995, Whitfield and Strong 1995). Within this range, unifying characteristics of nesting habitat include high percent canopy cover (> 85%) and high vertical foliage density from ground to canopy (Whitfield 1990, Spencer *et al.* 1996).

Empidonax traillii extimus is one of five currently-recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993). It is a neotropical migratory species that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historical range of the southwestern willow flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja)(Unitt 1987).

The Service included the flycatcher on its Animal Notice of Review as a category 2 candidate species on January 6, 1989 (USFWS 1989). The southwestern willow flycatcher was proposed for listing as endangered, with critical habitat, on July 23, 1993 (USFWS 1993). A final rule listing the southwestern willow flycatcher as endangered was published on February 27, 1995 (USFWS 1995). The listing became effective on March 29, 1995. The States of California and New Mexico also list the southwestern willow flycatcher as endangered (California Department of Fish and Game 1992, and New Mexico Department of Game and Fish 1988). The state of Arizona considers the southwestern willow flycatcher a species of special concern (AGFD 1996). Following the review of comments received during the public comment period, the Service deferred the designation of critical habitat, invoking an extension on this decision until July 23, 1995. A moratorium on listing actions under the Act passed by Congress in April 1995 required the Service to cease work on the designation of critical habitat until the moratorium is lifted.

Recent surveys have documented breeding populations of southwestern willow flycatchers in three states (California, Arizona, and New Mexico). Small numbers of probable breeders have been documented in Utah and Colorado, but breeding by known *E.t. extimus* has not been verified in those states. Statewide surveys in Arizona from 1993 to 1995 documented southwestern willow flycatchers at approximately 21 of over 400 sites surveyed (Muiznieks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996). Sferra *et al.* (1995) estimated a total of 119 territorial males on 11 drainages in Arizona. Statewide surveys in New Mexico have documented approximately 135 territories on eight drainages (Parker and Hull 1994, Maynard 1995). In California, approximately 127 territories have been found on five drainages (Whitfield 1994, Whitfield and Strong 1995, Holmgren *in litt.*). Combining survey data collected throughout the flycatchers' range since 1990 (including unverified sightings in Utah and Colorado), the Service has documented approximately 420 flycatcher territories on 32 drainages. More than 75% of known occupied sites are comprised of an estimated five or fewer flycatcher territories, and many sites consist of single, unmated males. Currently, only five sites rangewide are known to be comprised of more than 20 territories; South Fork Kern River (Kern

Co., CA), upper San Luis Rey River (San Diego Co., CA), Roosevelt Lake (Gila and Maricopa Co., AZ), San Pedro River (Pinal Co., AZ), and the largest known flycatcher site, Gila River (Grant Co., NM), which is comprised of an estimated 80 to 120 territories.

Life History

The southwestern willow flycatcher is an insectivore, foraging within and above dense riparian vegetation, taking insects on the wing or gleaning them from foliage (Wheelock 1912, Bent 1960). No information is available on specific prey species.

The southwestern willow flycatcher begins arriving on breeding grounds in late April and May (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994, Muiznieks *et al.* 1994, Maynard 1995, Sferra *et al.* 1995). Migration routes are not completely known. However, willow flycatchers have been documented migrating through drainages in Arizona that do not currently support breeding populations, including upper San Pedro River (BLM, unpubl. data), Colorado River through Grand Canyon National Park (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994), lower Colorado River (Muiznieks *et al.* 1994, Spencer *et al.* 1996), Verde River tributaries (Muiznieks *et al.* 1994), and Cienega Creek (BLM, *in litt.*). These observations probably include subspecies *E.t. brewsteri* and *E.t. adastus*. Flycatchers of the genus *Empidonax* rarely sing during fall migration, so that a means of distinguishing some migrating *Empidonax* species without a specimen is not feasible (Blake 1953, Peterson and Chalif 1973). However, willow flycatchers have been reported to sing and defend winter territories in Mexico and Central America (Gorski 1969, McCabe 1991).

Southwestern willow flycatchers begin nesting in late May and early June and fledge young from late June through mid-August (Willard 1912, Ligon 1961, Brown 1988, Whitfield 1990, Sogge and Tibbitts 1992, Sogge *et al.* 1993, Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995). Southwestern willow flycatchers typically lay three to four eggs in a clutch (range = 2-5). The breeding cycle, from laying of the first egg to fledging, is approximately 28 days. Eggs are laid at one-day intervals (Bent 1960, Walkinshaw 1966, McCabe 1991); they are incubated by the female for approximately 12 days; and young fledge approximately 12 to 13 days after hatching (King 1955, Harrison 1979). Southwestern willow flycatchers typically raise one brood per year but have been documented raising two broods during one season (Whitfield 1990). Southwestern willow flycatchers have also been documented reneating after nest failure (Whitfield 1990, Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994, Muiznieks *et al.* 1994, Whitfield 1994, Whitfield and Strong 1995).

Whitfield, who has accumulated the largest data set on *E.t. extimus*, reported the following data on survivorship of adults and young: of 58 nestlings banded since 1993, 21 (36%) returned to breed; of 57 birds banded as adults (after hatch year) since 1989, 18 (31%) returned to breed at least one year (10 males, 8 females), five (9%) returned to breed for two years (all males), and two (3.5%) returned to breed for three years (M. Whitfield, Kern River Preserve, pers. comm.) Whitfield (1995) also documented statistically significant variation in return rates of juveniles as a function of fledging date; approximately 21.9 % of juveniles fledged on or before

July 20th returned to her study area the following year, whereas only 6.4 % of juveniles fledged after July 20th returned the following year.

Walkinshaw (1966), who studied *E.t. traillii* in Michigan, estimated that 40.9% of the males at his study site returned to breed for at least two years, 22.7% returned for at least three years, 13.6% returned for at least four years, and at least 4.5% returned during their fifth year. Female return rates were substantially lower. Only 22.6% returned to breed for one year. These data are consistent with survival rates for other passerines (Gill 1990, chap. 21) and suggest that the lifespan of most *E.t. extimus* is probably two to three years.

Brood parasitism of southwestern willow flycatcher nests by the brown-headed cowbird (*Molothrus ater*) has been documented throughout the flycatcher's range (Brown 1988, Whitfield 1990, Muiznieks *et al.* 1994, Whitfield 1994, Hull and Parker 1995, Maynard 1995, Sferra *et al.* 1995, Sogge 1995b). Cowbirds lay their eggs in the nests of other species directly affecting their hosts by reducing nest success. Cowbird parasitism reduces host nest success in several ways. Cowbirds may remove some of the host's eggs, reducing overall fecundity. Hosts may abandon parasitized nests and attempt to renest, which can result in reduced clutch sizes, delayed fledgling, and reduced overall nesting success and fledgling survivorship (Whitfield 1994, Whitfield and Strong 1995). Cowbird eggs, which require a shorter incubation period than those of many passerine hosts, hatch earlier giving cowbird nestlings a competitive advantage over the host's young for parental care (Bent 1960, McGeen 1972, Mayfield 1977, Brittingham and Temple 1983). Where studied, high rates of cowbird parasitism have coincided with southwestern willow flycatcher population declines (Whitfield 1994, Sogge 1995a, Sogge 1995c, Whitfield and Strong 1995), or, at a minimum, resulted in reduced or complete elimination of nesting success (Muiznieks *et al.* 1994, Whitfield 1994, Maynard 1995, Sferra *et al.* 1995, Sogge 1995a, Sogge 1995c, Whitfield and Strong 1995). Whitfield and Strong (1995) found that flycatcher nestlings fledged after July 20th had a significantly lower rate of survival, and that cowbird parasitism was often the cause of delayed fledging.

Population Dynamics

Population size: Current estimates for total numbers of remaining southwestern willow flycatchers are 500 or fewer territories rangewide (Unitt 1987, USFWS 1995). Statewide survey efforts throughout the flycatcher's range since 1990 have documented approximately 127 territorial males in southern California (Whitfield 1993, Griffith and Griffith 1994, Holmgren *in litt.*), approximately 119 territorial males in Arizona in 1994 (Sferra *et al.* 1995), and approximately 150 territorial males in New Mexico (Parker and Hull 1994, Maynard 1995, Hull and Parker 1995). A small number of territorial males (≤ 5) has been documented in both southern Utah and southwestern Colorado during 1993, and 1994 surveys. However, breeding of confirmed *E.t. extimus* has not been confirmed in those states (Sogge 1995a, K. McDonald, Utah Division of Natural Resources, pers. comm., T. Ireland, USFWS, Colorado, *in litt.*). Rangewide, > 75% of the locations with flycatchers are comprised of an estimated five or fewer territorial males.

Population stability: Southwestern willow flycatcher breeding populations are small, widely-separated and vulnerable to extirpation. The Service believes that the viability of many of the local breeding groups is questionable, and that at current population levels, and with continuing threats, extinction of this species is foreseeable. Southwestern willow flycatchers are absent from many areas previously occupied or are present in reduced numbers (Hubbard 1987, Unitt 1987, Sogge *et al.* 1993, Sogge and Tibbitts 1994, Muiznieks *et al.* 1994, Sferra *et al.* 1995). Former populations in Arizona on the lower Salt River, Santa Cruz River, and lower Colorado River near Yuma are believed to have been extirpated. Small groups of one to seven willow flycatcher territories have been detected on the Santa Maria River, lower San Pedro River, Verde River, Tonto Creek, middle Salt River, upper Gila River, Little Colorado River, and the Colorado River in Marble Canyon (Sogge *et al.* 1993, Sogge and Tibbitts 1994, Muiznieks *et al.* 1994, Sferra *et al.* 1995).

Extensive survey efforts since 1993, particularly in Arizona and New Mexico, have verified breeding status, or the lack thereof, at historic flycatcher locations (Muiznieks *et al.* 1995, Maynard 1995, Sferra *et al.* 1995, Spencer *et al.* 1996). These surveys have also documented flycatchers at locations where historic data was not collected. Intensive, standardized monitoring efforts have documented declines in some flycatcher populations, and/or high levels of brood parasitism and poor reproductive success in others. Some populations appear to have stabilized after cowbird control efforts were implemented.

The number of territorial males and paired flycatchers detected on the Colorado River in the Grand Canyon has fluctuated since monitoring began in 1982. Nesting success, however, has been consistently poor. Brown (1988) observed two flycatcher territories in the Grand Canyon in 1982 and as many as 11 in 1987. For the same study period, Brown (1994) reported that at least 50% of flycatcher nests were parasitized by brown-headed cowbirds. Data on productivity was not reported. In 1992, when comprehensive nest monitoring was initiated, two pairs were present, with only one establishing a nest. That nest successfully fledged three flycatchers (Sogge and Tibbitts 1992). In 1993, one breeding pair, one male with two females, and six unpaired males were detected. Three nests were found, all of which were parasitized by brown-headed cowbirds. No flycatchers were successfully reared (Sogge *et al.* 1993). Four pairs and one unpaired male occupied Grand Canyon in 1994. Nine nests were attempted, at least four of which were parasitized by cowbirds. All nesting attempts failed (Sogge and Tibbitts 1994). In 1995, one breeding pair and three unpaired males were detected (Sogge *et al.* 1995). One nest was found with a single cowbird egg on May 23. On June 4, three flycatcher eggs were present, but the cowbird egg was missing. That nest successfully fledged one flycatcher. In summary, since 1992, 10 known pairs of willow flycatchers have made 14 nesting attempts in the Grand Canyon, two of which successfully fledged a total of four flycatchers.

Poor nesting success and population decline have been observed in the Verde Valley at Clarkdale, where four territorial males were first observed in 1992. In 1993, two pairs were present, one nest was documented and contained a single cowbird nestling (Muiznieks *et al.* 1994). In 1994, two pairs and one unpaired male were present. Two nests were found, one of which successfully fledged two flycatchers, the other fledged a single cowbird (Sferra *et al.* 1995). Data from 1995 indicate that two unpaired males occupied the Clarkdale site (Sogge

1995a); however, extensive monitoring efforts were not possible due to landowner restrictions on access to the site. Surveys during the 1996 breeding season failed to detect any southwestern willow flycatchers at the Clarkdale site. One nesting pair of flycatchers was discovered at Tavasci Marsh approximately 1.5 miles east of the Clarkdale site.

Elsewhere in Arizona, population loss or undetected dispersal of small breeding groups have been documented since 1993. For example, surveys in 1993 estimated five territorial males at Dudleyville Crossing on the San Pedro River (Pinal Co.). However, surveys in 1994 and 1995 failed to detect any flycatchers at that location (Muiznieks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996). Flycatchers detected in 1993 at Soza Wash on the San Pedro River were not detected in followup surveys in 1995, and a flycatcher observed at Ister Flat on the Verde River were not detected in followup surveys during 1994. At other locations, such as Cook's Lake and PZ Ranch on the San Pedro River, the number of flycatchers appears to have remained stable over the last several years (Muiznieks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996). As a result of consultations on grazing management in the Tonto Basin, the Tonto NF implemented a cowbird management program in 1996 targeted to increase the reproductive success of southwestern willow flycatchers at Roosevelt Lake.

Followup surveys in the Gila Valley near Cliff, New Mexico by Parker and Hull (1994) and Hull and Parker (1996) verified that a relatively large population documented by Egbert (1981) and Montgomery *et al.* (1985) is extant. This population, estimated to have between 80 and 120 territories (the largest known flycatcher population) is comprised of small breeding groups distributed in various-sized riparian patches over a distance of approximately five miles of privately-owned land. Putative population increases in that area are confounded by variation in survey methods and survey timing between surveys conducted in the 1980s and those conducted in 1994 and 1995 (Parker and Hull 1994).

In California along the Kern River, Whitfield (1993) documented a precipitous decline in the total flycatcher population (44 to 27 pairs) from 1989 to 1993. During that same period cowbird parasitism rates between 50 and 80 percent were also documented (Whitfield 1993). A cowbird trapping program initiated in 1992 has reduced cowbird parasitism rates to <10 percent. Flycatcher population numbers appear to have stabilized at 32 to 34 pairs in 1993, 1994, and 1995 (Whitfield 1994, Whitfield and Strong 1995).

Status and Distribution

Reasons for listing: The southwestern willow flycatcher was listed as endangered in response to documented declines in population size and extent of historic range occupied resulting from loss, modification, and fragmentation of riparian habitat and parasitism by the brown-headed cowbird (USFWS 1993, USFWS 1995). Critical habitat was proposed to provide additional protection for areas (occupied and unoccupied) necessary for the survival and recovery of this species.

Rangewide trend: Southwestern willow flycatcher populations are extremely small and vulnerable to extirpation; >75% of extant flycatcher locations are occupied by an estimated 5

or fewer territorial males. Rangewide monitoring continues to document declines in some locations. Some breeding groups are presumed relatively stable, others apparently have stabilized as a result of cowbird trapping programs (Whitfield 1994, Whitfield and Strong 1995). The small size of flycatcher breeding groups is of concern because small passerines typically exhibit substantial annual variation in population size. This normal variation is compounded by the low numbers of flycatchers rangewide, the reduction in distribution that has occurred this century, and by threats described below and elsewhere in this biological opinion.

Continued threats: Additional habitat losses will likely include both small- and large-scale losses and be of the same types as known to date (i.e. habitat loss, fragmentation, and modification). The Service expects incidences of cowbird parasitism will vary spatially and temporally as a function of local cowbird population dynamics and local changes in the extent of riparian habitats. In addition to habitat loss, modification, and fragmentation, and cowbird parasitism, the small size of flycatcher populations leaves them extremely vulnerable to environmental stochasticity (e.g. extreme weather events, disease), demographic stochasticity (e.g. shifts in birth/death rates and sex ratios), and possibly inbreeding depression.

Synthesizing recent empirical and theoretical studies on population genetics, Lande (1995) suggested that the number 500, long held by some in the conservation biology community to represent the minimum effective population size necessary to maintain a viable population of any species, is far too small. Lande contended that effective population sizes should be much larger in order for a species to maintain normal levels of potentially adaptive genetic variance to counteract the effects of random genetic drift. Lande concluded that, because recovery goals for listed species are often not much higher than the actual population size at the time of listing, maintenance of adequate evolutionary potential and long-term genetic viability was doubtful unless populations were recovered to much larger sizes.

Effective population size takes into account the actual individuals that are breeding and how many offspring they are contributing to the next generation. The effective population size for a species may be much smaller than the censused population size because of uneven sex ratios, uneven breeding success among females, and low population numbers which exacerbate the above factors. The total number of southwestern willow flycatcher territories documented since extensive survey and monitoring efforts were initiated in 1993 is approximately 420. The Service estimates that as many as 500 territories may exist rangewide. However, many locations with flycatchers consist of few pairs or single, unmated males. Thus, based on flycatcher census data and Lande's hypothesis, the effective population size for the southwestern willow flycatcher is probably critically low.

Sensitivity to impacts: The southwestern willow flycatcher's sensitivity to changes in habitat is high as a result of the small sizes of nesting groups, the small sizes of riparian habitats occupied, and the highly fragmented distribution of habitats. The extent of riparian habitat, its distribution, continuity, and species composition, has been substantially altered in the southwest (Phillips *et al.* 1964, Carothers *et al.* 1974, Rea 1983, Johnson and Haight 1984, Katibah 1984, Johnson *et al.* 1987, Franzreb 1987, Unitt 1987, General Accounting Office 1988, Szaro 1989, Dahl 1990, State of Arizona 1990). Reductions in the extent and composition of riparian habitat

may decrease suitability and carrying capacity, thereby depressing numbers of flycatchers that can occupy an area. These effects have resulted in a contraction of the range occupied by the southwestern willow flycatcher, a reduction in the number of flycatcher populations rangewide, and isolation of flycatcher populations, potentially changing historical emigration/immigration patterns and severing genetic exchange among populations.

Recovery rate: Recovery rate characterizes the resilience or ability of a species or population to recover from different magnitudes of disturbance. The resilience of the southwestern willow flycatcher and its habitat are both relevant aspects of its survival. The southwestern willow flycatcher has declined in extent of range occupied and population size as a result of habitat loss, modification, and fragmentation. Riparian habitats by nature are dynamic, with their natural distribution in time and space governed mostly by flood events, watershed conditions, and stream-flow patterns. Current conditions along southwestern rivers and streams are such that natural or historic flow patterns have been greatly modified. Rivers have been impounded and diverted, catastrophic flood events occur with greater frequency and shorter duration, and minimum flow events occur with greater frequency and longer duration. Some watersheds are degraded, many stream channels are highly degraded, floodplains and riparian communities are reduced in extent, and the species composition of riparian communities has been modified by exotic species and herbivory by domestic livestock. These conditions have significantly diminished the potential for southwestern rivers and streams to develop suitable habitat for the southwestern willow flycatcher. The recovery rate of breeding populations will be a function of local population dynamics (i.e. total population size, annual reproductive success and mortality rates, rates of dispersal from other breeding locations) and habitat suitability. Because local populations are widely separated and small in size (Muiznieks *et al.* 1994, Sferra *et al.* 1995), stability may be difficult to achieve in the short term. These factors, combined with the small size of flycatcher populations indicate that this species' resilience to additional disturbance is low and that recovery rates are anticipated to be slow.

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 in the action area to provide a platform to assess the effects of the action now under consultation.

Theodore Roosevelt Lake was created with the completion of Roosevelt Dam in 1911. The lake drains approximately 5793 square miles of land (SRP Watershed Monitoring map) and forms at the confluence of the Salt River and Tonto Creek. At the maximum conservation pool level of 2136 feet, the lake's surface covers 19,200 acres (30 square miles). The Roosevelt Lake watershed is comprised of a wide diversity of biotic communities. Lands immediately surrounding Lake Roosevelt are comprised of classic "Arizona desert" or the Arizona Upland Subdivision of the Sonoran Desert (Brown 1982). Higher elevation lands within the watershed

are comprised of semidesert grassland, plains/great basin grassland, interior chaparral, madrean evergreen woodland, great basin conifer woodland, and montane conifer forest (Brown and Lowe 1980, Brown 1982).

Inflow into Roosevelt Lake is perennial. Winter inflow results from storms, snowmelt, and the outflow of groundwater. The largest floods occur during this time of the year when conditions combine to produce rain upon existing snowpack. Normal winter runoff, associated with melting of the snowpack, gradually increases during the winter as watershed conditions become saturated and peak in early April as snowpack is depleted. In contrast, summer inflow is much less than winter inflow and is characterized by a much smaller baseflow component indicative of drier conditions. Storm flows resulting from localized thunderstorm activity in the July through September period produce small day-to-day fluctuations in runoff and a gradual increase in baseflow. Because only small portions of the watershed are producing runoff at any particular time during this season, runoff into the reservoir is typically much smaller in both peak and volume than winter storm-related runoff. There are no major facilities that regulate flows upstream of Roosevelt Dam. However, there are diversions used primarily for agricultural irrigation, mining, and municipal uses.

The Salt River and Tonto Creek watersheds have undergone significant change over the last 125 years as European settlers colonized the area. Livestock grazing, mining, water developments, timber extraction, fire suppression, and recreation have resulted in significant changes to the biotic and abiotic features of this system. While timber extraction, grazing, and fire suppression have altered the extent and species composition of upland plant communities, the most severe impacts of those activities and other land-uses have occurred in riparian bottomlands.

Historical data characterizing biological communities are limited for the period prior to the late 1800s. An oral history compiled by Croxen (1926) indicates that conditions in both upland and riparian areas in the Tonto Basin changed dramatically with the advent of livestock grazing around 1876. Among those changes were a conversion of native bunch-grass-dominated to shrub-dominated uplands, and a reduction in the extent of riparian vegetation in bottomlands. Regarding changes to riparian areas, Croxen (1926) quotes Florence A. Packard, who settled in the Tonto Basin in 1874.

Tonto Creek was timbered with the local creek bottom type of timber from bluff to bluff, the water seeped rather than flowed down through a series of sloughs and fish over a foot in length could be caught with little trouble. Today this same creek bottom is little more than a gravel bar from bluff to bluff. Most of the old trees are gone, some have been cut for fuel, many others cut down for the cattle during droughts and the winters when the feed was scarce on the range, and many have been washed away during the floods that have rushed down this stream nearly every year since the range started to deplete.

Photographs are not available to verify the above statements regarding pre-livestock conditions. Photographs taken in conjunction with the development of the Roosevelt Lake Power Canal in 1906 indicate that the lower end of Tonto Creek consisted of a highly-braided channel that

lacked any significant stands of cottonwood-willow or riparian vegetation in general. Some changes in management of livestock and other land-uses have been implemented since that time; however, Tonto Creek remains unstable with portions consisting of an incised channel and other portions braided. Field and aerial inspection of lower Tonto Creek in July of 1995 indicated trespass cattle in riparian bottomlands as well as unauthorized channel manipulation by private property owners.

Grazing throughout the watershed and timber extraction in the upper watershed occurred concurrently with shifts in weather patterns at the turn of the century. Drought years were interspersed with years of unusually high precipitation, probably exacerbating impacts of various land-uses during the last quarter of the 19th Century. Riparian areas on the lower Tonto Creek and Salt River below Pinal Creek underwent significant modification with the development of Roosevelt Dam in 1911 and subsequent construction of Horse Mesa Dam, Mormon Flat Dam, Stewart Mountain Dam, and Granite Reef Diversion Dam on the lower Salt River. These projects have significantly modified the lower Salt River drainage by converting desert habitat and alluvial-influenced riparian areas to lacustrine-influenced reservoirs. Perennial water no longer flows for any distance between Granite Reef Dam and the confluence of the Salt and Gila rivers. Residential and commercial development have resulted in extensive bank stabilization and channelization through the use of berms. The result of these actions on the lower Salt River has been the conversion of riparian and aquatic habitats to areas for which the primary purpose is flood water conveyance. Significant aquatic and riparian wildlife habitats for native fauna are largely absent.

In areas where significant riparian habitat does develop, such as the inflows to reservoirs, the exotic tamarisk has become dominant, replacing multi-layered, multi-species native communities with monotypic stands uniform in structure. With its deep root system and production of seed from March through October, tamarisk thrives or persists where surface flow has been reduced or lost (Minckley and Brown 1982). The development of reservoirs and the concomitant change in flood regimes essential to the establishment of native riparian communities has enabled tamarisk to replace native broadleaf plants. Furthermore, tamarisk establishment often results in a self-perpetuating regime of periodic fires, which were uncommon in native riparian communities (Busch and Smith 1993).

Tamarisk is the dominant riparian species immediately surrounding Roosevelt Lake. Cottonwood-willow habitat is interspersed with tamarisk on Tonto Creek and becomes more prevalent upstream. Significant stands of cottonwood-willow are absent on the Salt River between State Highway 288 and the inflow. Inspection of aerial photos of the project area indicates that the current habitat occupied by southwestern willow flycatchers developed sometime after 1980. Aerial photographs dating back to 1946 indicate that the distribution, amount, and, perhaps, species composition of riparian habitat at the Salt River and Tonto Creek inflows have changed.

Changes in livestock management in Tonto Creek have been implemented to help restore riparian habitats in that system. Reclamation funded the Tonto Creek Riparian Unit (TCRU), a 5,900-acre riparian management area at the inflow of Tonto Creek to Roosevelt Lake. The TCRU was

established with the specific goal of achieving recovery of the degraded Tonto Creek riparian community. It included a five-year study to determine the efficacy of changes in grazing management and funding for range improvements on surrounding livestock grazing allotments. In the initial development of TCRU, Reclamation anticipated that recovery of TCRU would be a long-term process that may be periodically setback as a consequence of deteriorated watershed conditions (USBR 1991).

Riparian habitats at Roosevelt Lake would continue to change over time without the proposed action. The scope and magnitude of anthropogenic effects in the Tonto Basin and Salt River drainage, combined with unpredictable natural variances in drought and precipitation, leave riparian habitats and potential floodplain areas at Roosevelt Lake vulnerable to scouring from floods, excessive sedimentation, desiccation, fire, recreational impacts, development, livestock grazing, changes in water quality, etc. These threats are real and are already having significant effects to flycatcher populations elsewhere in the bird's range as evidenced by the June 1995 fire on the Gila River in Pinal, County, Arizona where approximately three miles of riparian habitat potentially occupied by southwestern willow flycatchers burned; a January 1996 incident on the Santa Ynez River in California where up to 1.3 miles of occupied flycatcher habitat was cleared for agricultural expansion; an April 10, 1996, fire that destroyed approximately two miles of occupied southwestern willow flycatcher habitat on the Rio Grande in New Mexico; and 4) a June 1996 fire on the San Pedro River at the PZ Ranch, which has one of the largest known concentrations of nesting flycatchers in Arizona. These impacts to flycatchers and flycatcher habitat happen rapidly, often go undetected, and occur with a frequency and on a scale that continues to negate gains in the establishment of riparian habitat elsewhere. These existing and potential threats, and the uncertainty of habitat conditions into the future, at Roosevelt Lake and elsewhere, are the factors that are used, in part, to determine the environmental baseline for the flycatcher as well as the threshold for jeopardy determinations under section 7(a)(2) of the Act.

Status of the Species in the Project Area

Patterns of historic abundance, distribution, and habitat use of southwestern willow flycatchers at Roosevelt Lake or the Tonto Creek and Salt River inflows are not known because status surveys were not conducted at the lake until 1993. Southwestern willow flycatchers were first documented at the Tonto Creek inflow in 1993 when limited field surveys by Reclamation biologists estimated up to three territorial males on an island dominated by tamarisk (Muiznieks *et al.* 1994). One nest containing two nestlings and one unhatched egg was found, but follow-up monitoring was not conducted to determine the nest's outcome. Two late-season surveys (\geq July 1) were conducted at the Salt River inflow where one to two territorial males were estimated in a large, contiguous stand of tamarisk (Muiznieks *et al.* 1994).

More extensive surveys in 1994 estimated eight territories (seven pairs confirmed) at the Tonto Creek inflow and 25 territories (15 pairs confirmed) at the Salt River inflow (Sferra *et al.* 1995). Seven nests were located at the Tonto Creek site; 9 nestlings were estimated from six nests. The content of one nest was not checked. Fledging was documented at one nest. The outcomes of the remaining nests were not determined. At the Salt River site, 10 nests were found in 1994 (Sferra *et al.* 1995). Fourteen nestlings were documented from five nests; three nests fledged

four flycatchers; one nest apparently was depredated; the contents of two nests were not determined; and the outcomes of four nests were not determined.

Intensive monitoring efforts in 1995 estimated 9 territories (8 confirmed pairs) at the Tonto Creek site and 12 territories (9 confirmed pairs) at the Salt River site (Spencer *et al.* 1996). Eight nests containing a total of 23 eggs were located at the Tonto Creek site. Of the eight nests found at Tonto Creek, two were abandoned and six fledged a total of 14 flycatcher young (Table 1). Three nests were thought to contain a total of four infertile eggs. Two nests were parasitized by cowbirds, one of which was abandoned and the cowbird egg disappeared from the other. At the Salt River site, seven nests were found and two additional nests were suspected based on the presence of adults and fledglings. Thirteen eggs were documented in the seven nests, including one cowbird egg; three of those nests fledged five flycatchers and one nest fledged one cowbird. Three additional fledglings were observed with two adult pairs. Of the 9 nests found or suspected at the Salt River site, five nests fledged a total of 9 flycatchers and one nest fledged a single cowbird (Table 1).

Table 1. Southwestern Willow Flycatcher Nesting Data for Roosevelt Lake, 1995 (from Spencer *et al.* 1996).

	Territories	Pairs	Nests	Eggs	Successful Nests	Fledged	Nests Parasitized	Parasitized and Successful ¹
Tonto Creek	9	8	8	23	6	14	2	1
Salt River	12	9	7 (9) ²	13	3 (5) ²	9	1	0
Total	21	17	15 (17) ²	36	9 (11) ²	23	3	1

¹ Nests parasitized by cowbirds but successfully fledging at least one flycatcher.

² Suspected.

Overall, at both Tonto Creek and Salt River, 21 flycatcher territories were estimated and 17 pairs were confirmed. Fifteen nests were found and two were suspected, based on observations of adults with fledglings, for a total of 17 flycatcher nests. At least 36 eggs were laid in the 15 nests found for a minimum mean clutch size of 2.4 eggs. Eleven nests (9 observed, two suspected) were successful (65% nest success) fledging 23 flycatcher young (1.35 young fledged/nest). Three flycatcher nests were parasitized by cowbirds; one the nests failed, one fledged a single cowbird, and in the last the cowbird egg disappeared and the flycatchers successfully fledged two flycatcher young.

Survey effort at both of the Roosevelt Lake breeding sites has varied among the three survey years confounding analysis of population trend. However, survey and monitoring efforts statewide have been consistent within years, enabling comparisons of relative population size

among all sites surveyed. Based on 1994 and 1995 data, the combined populations of the Salt River and Tonto Creek breeding sites comprise the second largest known population in Arizona and the only known population on the Salt River or Tonto Creek drainages. The number of breeding birds at Roosevelt Lake is second in size only to two closely-spaced breeding sites on the San Pedro River in Pinal County approximately 65 miles to the southeast. A comparison of these two populations is given in Table 2.

Table 2. Survey Data for Arizona's Two Largest Known Southwestern Willow Flycatcher Populations.

Breeding Population	Year	Estimated Territories	Estimated Pairs	Total Birds	Percent of Known Territories Statewide
Roosevelt Lake ¹	1994	33	22	55	29%
San Pedro River ²	1994	39	25	64	35%
Roosevelt Lake	1995	21	17	38	24%
San Pedro River	1995	32	28	60	37%
Roosevelt Lake	1996	44	28	72	-
San Pedro River	1996	26	22	48	-

¹Data for Salt River inflow and Tonto Creek inflow (from Sferra *et al.* 1995, Spencer *et al.* 1996, preliminary 1996 data from AGFD/NBS monitoring).

²Data for Cook's Lake, Cook's Lake Seep, and PZ Ranch (from Sferra *et al.* 1995, Spencer *et al.* 1996, preliminary 1996 data from AGFD/NBS monitoring).

EFFECTS OF THE ACTION

The Service's primary task in developing a biological opinion is to determine whether the proposed action is likely to jeopardize the continued existence of any listed species (51 *Federal Register* 1962). "Jeopardize the continued existence of" is defined as, "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (58 *Federal Register* 19958). The jeopardy/non-jeopardy determination is based on an evaluation of: (1) a species' status in the project area and rangewide (see above sections); (2) the effects of the proposed action on the survival and recovery of a listed species (including interdependent and interrelated actions); (3) the aggregate effects of other Federal actions on a listed species (e.g. amount of take occurring as a result of Federal actions subject to previous consultations); and (4) the cumulative effects on a listed species (i.e. future non-Federal actions that are reasonably certain to occur in the action area).

The Service's analysis differs considerably from that provided by Reclamation in their Biological Assessment. Reclamation based their determination of effects on the assumption that effects to

flycatchers at Roosevelt Lake would be temporary, that there would be no residual effects to flycatchers from years when habitat is inundated, and that effects to the flycatcher from impacts independent of the proposed action may exceed those of inundation. Despite the existing threats to flycatcher habitat without the proposed action, the Service disagrees with the analysis in the Biological Assessment and believes that the draft and final biological assessments did not adequately address the potential scope and magnitude of effects for the proposed action. In particular, the Biological Assessment did not address any of the potential indirect effects to flycatcher populations regionwide, such as reductions in productivity and survivorship as a result of temporary degradation or losses of habitat at Roosevelt Lake. The Service believes that it is essential to evaluate all direct, indirect, interrelated, interdependent, and cumulative effects in order to characterize the potential scope and magnitude of effects of the proposed action.

Because of the extremely small number of southwestern willow flycatcher territories estimated to remain rangewide (400-500), the small size, fragmented distribution, and vulnerability of extant flycatcher populations to stochastic processes (e.g. fire, disease, catastrophic storms, etc.) alone, the Service is concerned about the degradation or loss of any breeding site. The Roosevelt Lake area is particularly important because of the number of nesting pairs. The Service believes impacts of the proposed action may include, but are not limited to, increased adult mortality and loss of reproduction by flycatchers attempting to breed in modified habitat or dispersing to attempt reproduction elsewhere. Unpredictable weather patterns preclude exact determinations as to when habitat would be modified or eliminated. However, the purpose of the proposed action is to utilize the newly-created conservation space, which does not preclude total inundation and loss of existing habitat nor incremental degradation.

Based on the analyses presented below, it is the Service's opinion that the proposed action is likely to render riparian habitat at the Salt River and Tonto Creek inflows unsuitable for the flycatcher, and that the development of new habitat around Roosevelt Lake is uncertain. The Service believes that habitat modification resulting from the proposed action is likely to result in: (1) the reduction and eventual displacement of flycatchers from the existing Roosevelt Lake breeding sites; (2) higher adult mortality rates, delayed breeding, reduced nesting success and lower survivorship of fledglings as a result of displacement; (3) the loss of a potential "source" breeding population that may maintain, in part, through emigration, other flycatcher breeding populations; (4) the fragmentation of and decline in flycatcher populations regionwide; and (5) the severing of genetic exchange as a result of population fragmentation. Therefore, the Service's evaluation of effects of the proposed action is based on the ultimate loss of southwestern willow flycatchers from Roosevelt Lake as addressed in the incidental take statement.

Based on empirical data from the San Carlos Reservoir on the Gila River and modeling data for lake levels presented in the biological assessment, the Service believes there is a high probability that the proposed action would result in the modification and/or mortality of tamarisk stands currently occupied by southwestern willow flycatchers at Roosevelt Lake. The extent to which habitat would be modified, degraded, or rendered unsuitable for flycatchers would be a function of the timing, amount, and duration that water is stored in the new conservation pool. The timing and duration is primarily dependent upon weather patterns but may also be partially

determined by reservoir operations. Based on available data on the effects of inundation on tamarisk, as inundation level and duration increase, the probability of significant degradation of southwestern willow flycatcher habitat and mortality of tamarisk also increases.

Carefully designed studies have not been conducted to establish the tolerance limits of tamarisk to inundation. Warren and Turner (1972), studying tamarisk stands of trees up to 11 feet in height, documented near complete tamarisk mortality at the nearby San Carlos Reservoir after more than 90 days of near total inundation. The base elevation of the nest trees used by flycatchers at Roosevelt Lake is estimated to lie between 2126 and 2132 feet (USBR 1995, p. 11). The maximum elevation of the current conservation pool is 2136 feet. The mean height of nest trees used in 1995 at the Salt River inflow was 25.8 ± 4.2 feet ($n=7$), and 19.9 ± 5.7 feet ($n=8$) at the Tonto Creek inflow (Spencer *et al.* 1996). Thus, the elevation at which the average flycatcher nest tree would be completely inundated at the Salt River inflow is approximately 2154.8 feet (mean base elevation of nest trees = 2129 feet plus 25.8 feet), and approximately 2148.9 feet at the Tonto Creek inflow (2129 feet plus 19.9 feet).

Historic reservoir elevation data presented in Figure 1 in USBR (1995) (Appendix D) indicate that a change in precipitation, reservoir management, or a combination of the two occurred after 1965. Inspection of those data indicate a substantial increase in the frequency with which the conservation pool reached its maximum elevation of 2136 feet during the 29-year period between 1966 and 1994 as compared with the period between 1911 and 1965. Because lake level data in USBR (1995) is provided only at monthly intervals (end of each month), only the minimum number of days that nesting habitat would be inundated, or nearly inundated, can be determined precisely. This is important because the actual number of days that water is held above a certain elevation can vary substantially. For example, simulated end-of-the-month lake levels for 1973 (Appendix B) are: February = 2124.3 feet; March = 2150.0 feet; April = 2151.1 feet; May = 2151.1 feet; June = 2149.7 feet; and July = 2144.9 feet. Technically, lake levels were only above 2148 feet for 90 days (April, May, and June). However, because lake levels could rise above 2148 feet by early March (e.g. March 5) and lake levels might not recede below 2148 feet until late July (e.g. July 25), the potential number of days the lake level exceeded 2148 feet in this example is as high as 141 days.

A comparison of the above data on inundation of nest trees with simulated water levels for the last 29-year period (see Appendix B and C) indicates that water levels would have reached or exceeded the 2148-foot level for a minimum of 90 days during eight of the last 29 years (1966, 1973, 1979, 1980, 1983, 1984, 1985, 1993). Water levels would have reached or exceeded the 2148-foot level for a minimum of 120 days during seven of the last 29 years, for a minimum of 150 days during three of the last 29 years, and for a minimum of 180 days during one of the last 29 years. Because the data in Appendix B are presented at monthly intervals, the potential maximum number of days the lake reached or exceeded 2148 feet is much higher, ranging from approximately 141 days in 1973 to 200 days in 1984 and 1985 (projection based on lake reaching or exceeding 2148 feet at least 25 days prior to the end of the first month in which a lake level of 2148 feet or higher is recorded in Appendix B, and on the lake not receding below 2148 feet for at least 25 days after the last month in which a lake level of 2148 feet or higher is recorded in Appendix B). Each of these events would have completely inundated average

flycatcher nesting trees and portions of breeding habitat at the Tonto Creek inflow for a duration that resulted in complete mortality of tamarisk at San Carlos Reservoir. The Service believes this frequency and duration of inundation indicates there is a high probability that the proposed action would result in mortality of tamarisk used for flycatcher nests at the Tonto Creek inflow.

The Biological Assessment (USBR 1995) (Appendix B) provided simulation data for elevations up to 2151.10 feet, so our assessment is restricted to partial inundation at the Salt River site. Based on simulation data, water levels would have reached at least the 2151-foot level and come within four feet of completely inundating the average nest tree at the Salt River site for a minimum of 90 days during six of the last 29 years, for a minimum of 120 days during four of the last 29 years, and for a minimum of 150 days during two of the last 29 years. Because the data in Appendix B are presented at monthly intervals, the potential maximum number of days the lake reached or exceeded 2151 feet is much higher, ranging from approximately 141 days in 1980 to 200 days in 1979 (projection based on lake reaching 2151 feet at least 25 days prior to the end of the first month in which a lake level of 2151 feet is recorded in Appendix B, and on the lake not receding below 2151 feet for at least 25 days after the last month in which a lake level of 2151 feet is recorded in Appendix B). Each of these events would have come within four feet of totally inundating average flycatcher nest trees and portions of breeding habitat at the Salt River inflow. During some years nesting habitat at the Salt River inflow would have been totally inundated if waters were held above the 2151-foot level as operational plans allow for. The Service believes that this frequency and duration of inundation indicates there is a high probability that the proposed action would result in mortality of tamarisk habitat used for flycatcher nests at the Salt River inflow.

In addition to the risk of tamarisk mortality from inundation, partial flooding may alter tamarisk phenology and branching structure. Complete or partial flooding of nesting habitat that occurs through the end of April, or later, may modify habitat by delaying development of tamarisk foliage. Tamarisk trees that remain devoid of foliage while flycatchers begin establishing territories (early to mid-May) are likely to be unsuitable for breeding, possibly resulting in abandonment of territories, attempts to relocate, and/or delayed breeding. Whitfield and Strong (1995) demonstrated that delayed breeding resulted in lower survivorship of juveniles. Thus, flooding events that do not kill trees, but produce only a seasonal effect in delaying foliage development, may result in habitat degradation and loss of flycatcher productivity.

Flooding could also suspend large woody material and other debris that may modify the branch structure of trees used for nesting, roosting, and foraging. Even under a scenario where all flood waters above 2136 feet would be stored only temporarily (e.g. evacuated annually prior to April 15), the Service believes that repeated inundation up to 2151 feet may degrade habitat by modifying structural features potentially important in the flycatcher's life history.

A comparison of nest-site data from Spencer *et al.* (1996) with simulated lake levels presented in Table 4 of USBR (1995) (see Appendix B and C) can also be used to estimate the frequency with which nest trees would be inundated to the level of mean nest height. The mean height of flycatcher nests at the Salt River inflow during 1995 was 14.6 ± 3.6 feet ($n=7$), and 11.4 ± 3.1 feet ($n=8$) for nests at the Tonto Creek inflow (Spencer *et al.* 1996). When added to mean

base elevation of nest trees (2129 feet), flood events reaching 2143.6 feet and 2140.4 feet in elevation would inundate most nests at the Salt River and Tonto Creek inflows, respectively. According to the simulated lake level data, trees would have been inundated up to an elevation of 2144 feet by the end of April during 13 of the last 29 years, by the end of or through May during 10 of the last 29 years, through June during seven of the last 29 years, and through July during three of the last 29 years. Further, based on simulation data in **Appendix B**, lake levels would have exceeded 2140 feet by or through the end of May for five consecutive years (1983 - 1987), rendering habitat unsuitable during the time most first nests are initiated and for a number of years that exceeds the average lifespan of the southwestern willow flycatcher. This analysis indicates there is a high probability that flycatcher nesting locations and portions of breeding habitat would be inundated during the breeding season in some years, and potentially for a number of consecutive years that exceeds the average lifespan of the flycatcher. The Service believes that temporary loss of nesting habitat, either as a result of inundation during one or consecutive breeding seasons or delayed phenology of tamarisk nesting habitat, may result in site abandonment or delayed breeding by southwestern willow flycatchers.

Existing southwestern willow flycatcher habitat is found at the Tonto Creek and Salt River inflows close to the current maximum conservation pool elevation of 2136 feet. As the reservoir operations change to accommodate the proposed action, new habitat may develop at the new maximum conservation pool elevation near 2151 feet elevation. However, the factors which contributed to creation of the current habitat included a combination of environmental factors and reservoir operations. Thick patches of tamarisk developed as a result of flood-deposited sediments during a period of high reservoir levels. Environmental factors in conjunction with hydrologic and topographic features appear to be the overriding influences in the development of these habitats. Development of new habitat appropriate for southwestern willow flycatchers is, at best, uncertain.

If an alternate presumption is evaluated, that flycatchers were only displaced during years when inundation extends into the breeding season and that the proposed action did not degrade habitat nor result in the permanent loss of this breeding site, then the effects of losing reproduction from one or several breeding cohorts in a row on the long-term viability of a short-lived species such as the flycatcher should be considered. The Service believes that a short-lived species such as the flycatcher is particularly vulnerable to short-term adverse effects (i.e. loss of reproduction during one year), because the result would be reduced recruitment into the population regionwide in subsequent years and concomitant loss of reproduction from what probably comprises the largest breeding cohort (birds returning to breed for their first time after hatching). The net effect to the species regionwide would be a reduction in population potential regardless of the flycatcher's emigration/immigration patterns. Repeated periodically over time, there is a high probability that the population would not be able to sustain itself. Repeated for several or more consecutive years, there is a high probability that the population would be eliminated in several generations or less. The Service believes that these types of "sublethal" effects, which operate undetected without careful study, have resulted in the absence of flycatchers from over 70 historic locations rangewide (Unitt 1987).

The intended purpose of the proposed action is to store water and control floods. Based on past use of the reservoir and that the current flycatcher habitat occurs within a zone that will be inundated completely when precipitation permits, the Service believes that there is a high probability that one or several effects described above will render the habitat at Roosevelt Lake unsuitable for southwestern willow flycatchers, or reduce flycatcher productivity to the point where the population cannot maintain itself. Reclamation and SRP have indicated that floods equivalent to those occurring in 1993 could fill the lake to capacity in one season. Thus, if the project were to proceed as proposed, the potential exists for flycatcher habitat to be inundated, modified, degraded, or lost altogether as early as the spring of 1997. The Service believes that although some flycatchers using that habitat may successfully relocate, the high degree of habitat fragmentation, low amount of suitable habitat available, and biological costs associated with dispersal make it unlikely that more than a small portion of the Roosevelt Lake population would survive to reproduce.

Riparian patches believed to be suitable for southwestern willow flycatchers (native or non-native vegetation) are limited in the remainder of the Salt River and Tonto Creek drainages. As a riparian obligate, southwestern willow flycatchers depend upon riparian areas for carrying out their life cycle. Destruction of riparian vegetation directly reduces the capacity of an area to support flycatchers. Habitat loss, modification, and fragmentation are believed to be the primary factors involved in the decline of the southwestern willow flycatcher (USFWS 1993, 1995). Continued losses of riparian habitat, such as those predicted here, are expected to have ramifications beyond just the Roosevelt Lake population by further reducing population numbers and destabilizing regional population dynamics through the processes described below.

Habitat loss and habitat fragmentation are interrelated processes that affect patterns of species' abundance and distribution at local and regional scales (Pulliam and Dunning 1994). Habitat loss is the reduction of the total amount of a particular habitat type in a landscape. Fragmentation is the apportionment of the remaining habitat into smaller, more isolated patches (Harris 1984, Wilcove *et al.* 1986, Saunders *et al.* 1991). Habitat loss is often manifested as the conversion of one habitat type to another (e.g., conversion of a forested tract to agricultural fields). By reducing the amount of space that can be occupied, habitat loss reduces the total number of individuals that can occur at a particular location or throughout a region.

Riparian habitat in the Southwest is naturally rare and patchy, occurring as widely-separated ribbons of forest within a primarily arid landscape. In Arizona, for example, riparian habitat comprises less than 0.5 percent of the landscape (Strong and Bock 1990). The actual extent of habitat suitable for the southwestern willow flycatcher is much more restricted. Wide-ranging or highly mobile species that rely on naturally patchy habitats, such as the willow flycatcher, persist at regional scales as metapopulations, or local breeding groups that are linked together and maintained over time by immigration and emigration (Pulliam and Dunning 1994). Evidence for the flycatcher fitting the metapopulation model comes from locations such as the Grand Canyon and Verde Valley where small populations have persisted, despite levels of productivity insufficient to replace breeding adults. Persistence of local breeding groups is a function of the group's size (numbers of individuals) and the ability of individuals to disperse from one breeding location to another. Fragmentation reduces the chance of an individual

successfully finding suitable habitat by isolating habitat patches. Searching for increasingly isolated patches leaves individuals vulnerable to mortality from competition, starvation, or predation and can result in loss of breeding opportunities.

Habitat loss and fragmentation combine to isolate and reduce in number and size the spaces necessary for breeding, feeding, sheltering, and migrating. Loss and reduction of space to carry out a species' life cycle increases the probability of extinction of local breeding groups, particularly those that consist of few individuals (Pulliam and Dunning 1994). Habitat loss and fragmentation, ultimately, reduce the viability of a metapopulation or the species as a whole. Loss of the Roosevelt Lake flycatcher population would increase population/habitat fragmentation by increasing the distance between the two closest known flycatcher breeding sites from approximately 65 air miles (Roosevelt Lake to San Pedro River) to approximately 135 air miles (San Pedro River to Verde River at Camp Verde). In addition, the Roosevelt Lake flycatcher population is the only known breeding population on the Salt River and Tonto Creek drainages. The degree to which this population interacts through dispersal, immigration, or emigration with populations on the San Pedro River, Verde River, or other populations in Arizona or regionwide is not known. However, based on the size, central location of the Roosevelt Lake flycatcher population rangewide, and the proximity of this population to others in Arizona, the Service believes that it is likely the Roosevelt Lake population plays a significant role in regional population dynamics and maintenance of genetic diversity. Therefore, the loss or diminishment of the size or viability of the Roosevelt Lake population may result in loss of populations throughout the region.

SUMMARY

Habitat loss, modification, and fragmentation are the primary causes of species' endangerment throughout the world. Eisner *et al.* (1995) estimate that of the 100,000-plus species native to the U.S., 1.5% alive at the turn of the century are now extinct. In the continental U.S., 26 bird species or subspecies are extinct or listed as endangered as a result of human-caused habitat loss (Table 3). The population status of the endangered species in Table 3 vary considerably. Several species still number from one thousand to several thousand (e.g. least Bell's vireo, golden-cheeked warbler), whereas the flycatcher population rangewide consists of less than 500 known territories.

The Service believes that given the flycatcher's status, modifying the habitat of an established population to the extent described above, either temporarily during the breeding season or permanently, would result in delayed or lost breeding attempts, decreased productivity and survivorship of adults that disperse in search of suitable breeding habitat, and decreased productivity of adults that attempt to breed at Roosevelt Lake. Reducing adult productivity and survivorship over the long-term, or eliminating both in the short-term, may result in partial or complete loss of 25 - 30% of the southwestern willow flycatcher territories documented in Arizona (the second largest known breeding population in the State; see Table 2.). Ultimately, partial or complete loss of the Roosevelt Lake breeding population may affect flycatcher populations regionwide by increasing isolation/fragmentation of habitats and populations,

reducing immigration/emigration rates and potentially changing patterns of source and sink populations, and severing genetic exchange.

Table 3. Bird Species or Subspecies of the Continental U.S. Extinct or Listed as Endangered as a Result of Habitat Loss, Modification, or Fragmentation.

Species/ Subspecies	Scientific Name
Extinct/Thought to Be Extinct ¹	
San Clemente Bewick's wren	<i>Thryomanes bewickii leucophrys</i>
Texas Henslow's sparrow	<i>Ammodramus henslowii houstonensis</i>
Dusky seaside sparrow	<i>Ammodramus maritimus nigrescens</i>
Santa Barbara song sparrow	<i>Melospiza melodia graminea</i>
Bachman's warbler	<i>Vermivora bachmanii</i>
Ivory-billed woodpecker	<i>Campephilus principalis</i>
Listed as Endangered ²	
California clapper rail	<i>Rallus longirostris obsoletus</i>
Light-footed clapper rail	<i>Rallus longirostris levipes</i>
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>
Wood stork	<i>Mycteria americana</i>
Whooping crane	<i>Grus americana</i>
Mississippi sandhill crane	<i>Grus canadensis pulla</i>
Piping plover	<i>Charadrius melodus</i>
Least tern	<i>Sterna antillarum</i>
Roseate tern	<i>Sterna dougallii dougallii</i>
Attwater's prairie chicken	<i>Tympanuchus cupido attwateri</i>
Snail kite	<i>Rhostrhamus sociabilis plumbeus</i>
Red-cockaded woodpecker	<i>Picoides borealis</i>
San Clemente loggerhead shrike	<i>Lanius ludovicianus mearnsi</i>
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>
Florida scrub jay	<i>Aphelocoma coerulescens coerulescens</i>
Black-capped vireo	<i>Vireo atricapillus</i>
Least Bell's vireo	<i>Vireo bellii pusillus</i>
Golden-cheeked warbler	<i>Dendroica chrysoparia</i>
Cape Sable seaside sparrow	<i>Ammodramus maritimus mirabilis</i>
Florida grasshopper sparrow	<i>Ammodramus savannarum floridanus</i>

¹ from Ehrlich *et al.* (1992).

² from 50 CFR 17.11 & 17.12 (1993) and Ehrlich *et al.* (1992).

Considered in the aggregate of all agency actions that have undergone section 7 consultation since the flycatcher was listed, the proposed action could result in the largest loss of currently-

occupied habitat and displacement and/or mortality of the greatest number of flycatchers. The proposed action would continue the trend of habitat loss documented through the section 7 consultation process. Table 4 presents a summary of agency actions rangewide that have undergone section 7 consultation and the levels of "take" permitted for the southwestern willow flycatcher. Seven of 15 completed consultations were anticipated to result in take of flycatchers, permanent loss of habitat, or adverse modification of proposed critical habitat.

Table 4. Agency Actions That Have Undergone Section 7 Consultation and Levels of Incidental Take Permitted for the Southwestern Willow Flycatcher Rangewide.

Action	Federal Agency ¹	Incidental Take Anticipated
Arizona		
Glen Canyon Spike Flow (Coconino Co.)	USBR	Loss of Proposed Critical Habitat
Solomon Bridge (Graham Co.)	FHWA	Loss of 2 Territories
Eastern Roosevelt Lake Watershed Allotment (Maricopa Co.)	Tonto NF	Indeterminable
Tonto Creek Riparian Unit (Maricopa Co.)	Tonto NF	Indeterminable
Modified Roosevelt Dam (Gila/Maricopa Co.)	USBR	Annual Loss of 45 Territories; Reduced Productivity/Survivorship of 90 Birds
U.S. Hwy 93 Wickenburg (Mohave Co.)	FHWA	Consultation in process
Romero Road Bridge (Pinal Co.)	FEMA	Consultation in process
Grazing on 13 Allotments (Pinal Co.)	BLM	Consultation in process
Cedar Bench Allotment (Yavapai Co.)	Tonto NF	Indeterminable
Tuzigoot Bridge (Yavapai Co.)	NPS	None
Verde Valley Ranch (Yavapai Co.)	Corps	Loss of 2 Flycatcher Territories
Windmill Allotment (Yavapai Co.)	Coconino NF	Loss of 1 Flycatcher Nest Annually
Lower Gila Resource Plan Amend. (Yuma Co.)	BLM	Consultation in process
California		
Lake Isabella Operations (Kern Co.)	Corps	Inundation of 700 Acres of Habitat; Reduced Productivity of 14 Pairs
Orange County Water District (Orange Co.)	Corps	None
Prado Basin, (Riverside/San Bernardino Co.)	Corps	None
Temescal Wash Bridge (Riverside Co.)	Corps	Harm to 2 Flycatcher Individuals
Camp Pendleton Cooperative Agreement (San Diego Co.)	DOD	Loss of 4 Flycatcher Territories
Nevada		
Gold Properties Resort (Clark Co.)	BIA	Harassment of 1 Flycatcher via Habitat Loss
New Mexico		
Corrales Unit, Middle Rio Grande (Bernalillo Co.)	Corps	None

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

Habitat loss, fragmentation, and modification are the primary factors involved in the decline of the southwestern willow flycatcher (USFWS 1993, 1995) and are the primary threats to the survival and recovery of this species. Given that less than 500 territories are known rangewide and that over 75% of flycatcher sites are comprised of an estimated five or fewer territories, the Service believes that further losses of occupied habitat, suitable unoccupied habitat, and/or loss of individual flycatchers are inconsistent with the need to provide for the survival and recovery of this species.

CUMULATIVE EFFECTS

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities that are reasonably certain to occur during the course of the Federal activity subject to consultation. 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.

Numerous private inholdings occur on Tonto Creek contiguous with the project area. Further development or subdivision of these parcels may result in additional loss of riparian habitat, either by direct habitat loss or land-use activities that indirectly contribute to habitat loss through accelerated erosion, channel destabilization, changes in water quality, etc. The Service has documented numerous, unauthorized actions involving manipulation of the active channel on Tonto Creek that directly threaten the maintenance or establishment of riparian habitat suitable for the flycatcher. The Service has also documented trespass livestock in the Tonto Creek Riparian Unit, the mitigation area for the original Plan 6 consultation associated with the Modified Roosevelt Dam. The Service has documented similar cases of intentional and unintentional southwestern willow flycatcher habitat destruction in California and New Mexico. These activities and violations are persistent throughout the range of the flycatcher and the Service anticipates that these types of activities will continue legally and illegally on both private and Federal lands.

The Cooper Ornithological Society adopted a resolution in 1995 supporting the designation of critical habitat for the southwestern willow flycatcher (COS 1995). The resolution emphasized that widescale habitat loss and fragmentation are the primary causes of the flycatcher's decline and concluded that recovery of the flycatcher will *"require protection and recovery of riparian habitats and ecosystems, not simply prevention of 'take' of individual flycatchers."* Cumulative effects are the most difficult effects to document because they occur or originate on non-Federal lands. The nature and number of cumulative effects documented by the Service, however, indicate a significant and pervasive effect on riparian habitats, many in potential violation of applicable laws such as the Clean Water Act or the Endangered Species Act. In light of these cumulative effects occurring rangewide, the threshold for a jeopardy determination on agency actions is lowered.

CONCLUSION

The southwestern willow flycatcher's current status is characterized by extremely small, widely-scattered sites containing an estimated five or fewer territories; many locations contain single, unmated males. Some breeding locations continue to experience high rates of brood parasitism by the brown-headed cowbird. The small, fragmented nature of flycatcher populations makes this species vulnerable to stochastic processes alone, and the Service anticipates continued extirpation at sites containing few birds. It is the Service's opinion that continued losses of established breeding sites, or temporary impacts that negatively affect reproduction and survivorship would significantly reduce the reproduction, numbers, and distribution of the southwestern willow flycatcher rangewide. After reviewing the species' status in the project area and rangewide, the effects of the proposed action on the survival and recovery of the flycatcher, the aggregate effects of other Federal actions on this species, and the cumulative effects, it is the Service's biological opinion that implementation of the Operation of the Modified Roosevelt Dam as proposed is likely to jeopardize the continued existence of the southwestern willow flycatcher.

ALTERNATIVES CONSIDERED TO AVOID OR MINIMIZE EFFECTS OF THE ACTION

During the course of this consultation, extensive discussions were held with Reclamation and applicants to develop and review project alternatives and on-site management actions that would avoid or minimize effects of the proposed action. The project alternatives and on-site management actions discussed focused primarily on maintaining riparian habitat at Roosevelt Lake that would be suitable for the flycatcher over time and space. Because of the importance of trying to maintain and enhance the flycatcher population at Roosevelt Lake, Reclamation and the Service devoted a considerable amount of time outside of formal meetings gathering data and information needed to assess the various alternatives and management actions. These alternatives and management actions are listed below along with a brief discussion of the biological merits, technical feasibility, and likelihood of success for each. They include both conceptual and technical approaches to avoiding and minimizing impacts to the flycatcher. Although these alternatives and actions were ultimately rejected on their own, portions of these alternatives and actions may form part of the reasonable and prudent alternative.

1. Reservoir Management to Enhance Flycatcher Breeding Habitat

One management tool available to avoid or minimize effects to the flycatcher at Roosevelt Lake would be to manage reservoir levels such that new riparian habitat is created at higher elevations of the Tonto Creek and Salt River inflows prior to modifying existing occupied habitat. The goal of this action would be to enhance riparian habitat at Roosevelt Lake and provide for habitat continuity in time and space to reduce the probability that flycatchers abandon the area. To accomplish this, operation of the reservoir might be characterized by gradual increases in spring reservoir levels that would enable riparian habitat to establish at higher elevations without degrading or killing currently-occupied habitat.

This alternative would require the Cities of Chandler, Glendale, Mesa, Phoenix, Scottsdale, and Tempe, and SRPMIC to defer use of a portion of the new conservation space until sufficient suitable habitat developed near the 2151-foot level. Although more conservation space would be available for water storage as habitat developed at higher elevations, the indefinite time period associated with this alternative was of considerable concern to the applicants. One factor, in particular, precluded the Service and Reclamation from projecting the rate at which new suitable habitat would develop and conservation space would be available. The habitat currently occupied by flycatchers probably developed after large floods deposited fine sediments creating deltas at the inflows. Since these events cannot be predicted with any reliability, there is no way to predict when maximum storage capacity could be utilized. Ultimately, however, this option was not considered feasible from a technical nor biological standpoint because of the difficulty in balancing water needs for developing habitat with the need to avoid destroying existing habitat or affecting reproductive attempts through prolonged inundation.

2. Creation of New Riparian Habitat Along the Abandoned Power Canal

Reclamation suggested that the original, abandoned power canal used during the construction of Roosevelt Dam might be used to create riparian habitat adjacent to the canal. Riparian habitat would be created and maintained, essentially, by periodic flood irrigation. This alternative was rejected because riparian habitat created would most likely consist of very narrow, linear patches parallel to the canal, which are not considered suitable habitat for the flycatcher. Flycatchers have not been documented using this type of habitat in Arizona.

3. Creation of New Riparian Habitat in Upland Areas Using Irrigation

We also explored the possibility of creating new riparian habitat in upland areas, particularly in the vicinity of Pinto Creek and abandoned agricultural fields adjacent to the Salt River. Riparian habitat would be created and maintained via the use of canals and flood irrigation. This option was rejected because although it is technically feasible to establish native broadleaf plants or tamarisk, the probability of establishing habitat suitable for southwestern willow flycatchers was considered low. While technically feasible to establish riparian plants, too little is known of other important habitat components (e.g. foraging habitat) to be able to evaluate the likelihood of success of this alternative.

4. Creation of New Riparian Habitat by Creating Spoil Islands

We also investigated the possibility of creating new riparian habitat within the new conservation pool by creating spoil islands at or near the 2151-foot elevation. The goal of this alternative would be to mimic sediment deposition at the currently-occupied sites, but at a higher elevation, to encourage riparian habitat establishment near the top of the new conservation pool. This option was rejected because although it is technically feasible to establish spoil islands and riparian plantings, the probability of establishing habitat suitable for southwestern willow flycatchers was considered low and the probability of a flood eroding away the spoil pile considered high.

REASONABLE AND PRUDENT ALTERNATIVE

Regulations implementing section 7 define reasonable and prudent alternatives (RPAs) as alternative actions, identified during formal consultation, that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, (3) are economically and technologically feasible, and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or of resulting in the destruction or adverse modification of critical habitat.

One RPA has been identified below. If all components of the following reasonable and prudent alternative are implemented, the proposed project is not likely to jeopardize the continued existence of the southwestern willow flycatcher. For clarification on the implementation schedule for each the following components, a summary is provided in **Table 5**.

- 1a. **Management of New Conservation Space.** The Service believes it is critical to provide for an additional year of reproduction by southwestern willow flycatchers at Roosevelt Lake and to conduct preliminary research associated with long-term monitoring of the effects of the proposed action. The Service believes that permitting long-term storage in the new conservation space during the 1996 breeding season would preclude accomplishing the above unless precipitation was inadequate to fill the new conservation space. Therefore, Reclamation shall not permit long-term storage of water in the new conservation space (elevation 2136 to 2151 feet) until after September 1, 1996. Flood events occurring prior to September 1, 1996, that require use of the conservation space between 2136 and 2151 feet shall be managed on a short-term basis only. Specifically, the space between 2136 and 2151 feet shall be used in a manner similar to that between 2151 and 2175 feet as specified in the Corps of Engineers operation manual for Roosevelt Dam, where all flood waters above 2151 feet are evacuated within 20 days.

Note: Use of the new conservation space after September 1, 1996, shall be contingent upon Reclamation accomplishing RPA 1b.

- 1b. **Southwestern Willow Flycatcher Habitat Protection.** To mitigate for any reduction in southwestern willow flycatcher productivity and survivorship, or modification or loss of flycatcher habitat used for establishing territories, nesting, foraging, and rearing flycatcher young, Reclamation shall purchase, acquire, or otherwise arrange for the acquisition and perpetual protection and management of appropriate replacement habitat for the southwestern willow flycatcher subject to the conditions listed below.

- 1) Replacement habitat shall include contiguous native broadleaf riparian habitat, which may include willow, boxelder, buttonbush, ash, and cottonwood. Tamarisk may be a component but not the dominant species in areal extent. Contiguous vegetation must contain early to mid-successional stages of the above vegetation species characterized by high canopy cover (approximately 85%) and high vertical foliage density (approximately 50%) in all strata.

Table 5. Implementation Schedule for Components of the Reasonable and Prudent Alternative, Biological Opinion for Modified Roosevelt Dam (shaded portions represent years and duration for the implementation of components).

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1a. Management of Conservation Space	Restricted to September 1.	No restrictions.*									
1b. Habitat Protection	Acquisition assured by Sept 1, 1996.*										
1c. Management Fund	Funded no later than Sept 1, 1996.										
1d. Conservation Coordinator	Funded no later than Oct 1, 1996.										
1e. Research and Monitoring											
1) Population Status Nest Monitoring	Initiate spring 1996; continues 10 years at 5 identified sites.										
2) Demographic Data	Initiate spring 1996; continues 5 years at 5 identified sites.										
Color Banding	Initiate spring 1996; continues 5 years.										
3) Dispersal Monitoring	Initiate in spring 1997; continues 5 years.										
4) Genetic Sampling	1996 and 1997 only.										
5) Aerial Photos	Complete		Complete		Complete		Complete		Complete		Complete
Aerial Photo Report	Complete				Complete						Complete
Vegetation Sampling/Report					Complete						Complete
1f. Cowbird Management	Initiate Spring 1997; continues 10 years.										

* Use of the new conservation space is precluded until habitat acquisition in 1b is completed.

- 2) Replacement habitat shall have contiguous habitat with the above characteristics sufficient in size to maintain a minimum of 45 flycatcher territories. Furthermore, replacement habitat shall not already be protected from land-use or other activities that threaten flycatcher reproductive success or establishment and maintenance of suitable flycatcher habitat.
- 3) Replacement habitat shall be associated with perennial water and a floodplain not characterized by erosion, downcutting and a significantly-lowered water table.
- 4) To maximize the potential that replacement habitat will provide for population expansion and recovery in the short-term (1 to 5 years), replacement habitat shall be located near an extant southwestern willow flycatcher population (i.e. on the same drainage or confluent drainages) or in an historically-occupied location.
- 5) Reclamation shall submit for the Service's review a proposal for acquisition (including a proposed habitat management plan), and Reclamation shall have arranged for the acquisition and perpetual protection of replacement lands by September 1, 1996.
- 6) The habitat management plan shall specify under what conditions any habitat management activities will be performed in replacement habitat for the benefit of the flycatcher, or for the benefit of other species, including seasonal restrictions on activities within or near flycatcher habitat, and development of trails or structures.
- 7) Grazing or holding of livestock (cattle, burros, horses, llamas, etc.) shall not be permitted on replacement habitat nor in adjacent areas within the 100-year floodplain.
- 8) Exclusive of the cowbird management program (1f), attracting migratory or resident birds through the use of bird seed shall not be permitted within replacement habitat or adjacent lands under Reclamation management, other Federal or State entity, or that of a designated third party.
- 9) All water rights associated with the property, necessary for continued maintenance of the riparian habitat indicated in 1(b)(1), shall not be relinquished or diverted for use off property.
- 10) The Service reserves the right to visit replacement habitat for monitoring compliance, conducting status surveys, or monitoring and research work. The Service will make every reasonable effort to coordinate all site visits with the land management authority.
- 11) No trails or structures shall be developed within the 100-yr floodplain without approval of the Service.

12) If Reclamation chooses to make arrangements with a third party for habitat acquisition, protection, and management, the third party shall have demonstrated a successful record of resource management and riparian habitat protection. The party shall also have a demonstrated record of successful management of perpetual endowments for habitat acquisition and management. If Reclamation arranges with a third party for long-term habitat protection and management, Reclamation shall ensure funding sufficient to establish an endowment from which annual management expenses are drawn only from interest on the endowment.

Note: Reclamation shall not begin use of the new conservation space until RPA 1b is completed.

- 1c. **Southwestern Willow Flycatcher Management Fund.** To achieve recovery actions that improve the status of the flycatcher to off-set project-related threats that cannot feasibly be removed, the Service believes that management of the southwestern willow flycatcher and its habitat should be included as part of an RPA. Establishment of a southwestern willow flycatcher management fund will enable the Service, in cooperation with Reclamation, other Federal, State, and Tribal entities, to carry out specific management actions, as they are identified, to benefit extant flycatcher populations, apparently suitable but currently unoccupied habitat, potential flycatcher habitat at Roosevelt Lake, other areas in Arizona, or rangewide. This fund has been established in order to promote the continued survival of the species while the long-term benefits of other components of the RPA are being realized.

Impacts to flycatcher habitat are widespread and chronic such that accomplishing actions to remove jeopardy for the proposed action will be complex and expensive. The Service believes that funding sufficient to protect a substantial amount of riparian acreage and extant flycatcher populations is necessary to bring the proposed action below the jeopardy threshold. The activities that would accomplish the required protection include, but are not limited to, additional habitat acquisition, conservation easements on riparian and adjacent habitats, fencing of riparian areas to exclude livestock, physical habitat restoration such as riparian plantings, and cowbird trapping or predator control programs. Below, we outline estimated costs associated with the activities in one potential scenario the Service believes would accomplish the needed protection and meet the requirements of removing jeopardy. This outline is an example and is not intended to provide a formula for the types of actions or proportions of the management fund dedicated to particular activities. The Service anticipates that the actual activities funded and the proportions at which they are funded will differ from those outlined below.

Example of Potential Use of Management Fund

Conservation Activity	Estimated Cost	Total
i) Conservation easements on 75 acres:	\$3,500/acre	\$262,500
ii) Exclosure fencing on 75 miles of riparian habitat	\$5,000/mile	\$375,000
iii) Cowbird trapping @ 5 locations for 10 years	\$12,500/location/yr	\$625,000
	Total	\$1,262,500

To accomplish these or other potential recovery actions, Reclamation shall establish a southwestern willow flycatcher management fund in the amount of \$1,250,000. Monies in the southwestern willow flycatcher management fund shall be used exclusively for management actions that will benefit the southwestern willow flycatcher or its habitat. The management fund shall not be used for research projects, nor for administrative or overhead costs associated with funded management activities. Because the Service and Reclamation recognize that southwestern willow flycatcher populations rangewide are small, widely-separated and vulnerable to extirpation, monies in the southwestern willow flycatcher management fund may be used wherever flycatcher management or habitat management can be effectively achieved, including Federal, State, Tribal, and private lands. This account shall be funded as soon as possible but must be available no later than September 1, 1996. The following conditions will apply to expenditures of monies from the southwestern willow flycatcher fund:

- 1) The Service's biologists will have the primary responsibility for developing or identifying management actions to be funded from the southwestern willow flycatcher management fund. The Service will develop recommendations in cooperation with other Federal, State, and Tribal entities and other landowners.
- 2) Reclamation will have the primary responsibility for accounting and disbursement of funds from the southwestern willow flycatcher management fund.
- 3) The Service and Reclamation, jointly, will have the responsibility for approving all management actions and expenditures of monies from the southwestern willow flycatcher management fund.
- 4) Southwestern willow flycatcher management fund monies shall be used only for implementation of management actions identified and approved by the Service and Reclamation. No monies shall be used by the Service, Reclamation, or any other

Federal, State, or Tribal agency to cover administrative or overhead costs associated with implementing management actions.

- 1d. **Southwestern Willow Flycatcher Conservation Coordinator.** The habitat acquisition specified in 1b, and research and management components specified in 1e and 1f, are expected to benefit the flycatcher over the long-term. However, the long-term benefits associated with those actions would not offset the substantial impacts that would occur if the permitted incidental take is realized in the short-term. The high level of incidental take associated with this project further depresses a critically low southwestern willow flycatcher environmental baseline and may affect flycatcher populations rangewide through reducing overall population size and changing emigration and dispersal patterns. In addition, the current rate and pattern of habitat loss and fragmentation, as documented in recent section 7 consultations, reflects considerable uncertainty regarding the efficacy of the long-term management actions. The southwestern willow flycatcher's status is increasingly tenuous as virtually all habitats/sites are exposed to numerous anthropogenic and natural threats.

To resolve the uncertainty that the long-term management actions can off-set potentially high short-term losses, and to address the high level of incidental take, immediate benefits to the species must be realized. As all conservation options in the project vicinity appear to have been exhausted, the only remaining way to ameliorate the effects to the species is within the context of its rangewide status. To allow filling of the lake prior to documenting "replacement" birds for all incidental take, there must be effective planning to direct management commitments and implementation of recovery actions rangewide.

Removal of jeopardy from the Roosevelt Lake project requires a substantial increase in southwestern willow flycatcher recovery efforts (planning and implementation) over what would occur if there were no proposed projects. The species' baseline must be elevated as quickly as possible to minimize the likelihood of extinction. Accomplishing conservation actions on-the-ground, where protection and active management are critically needed, will require adequate staff and a dedicated effort.

The Service believes a coordinating biologist is needed to assist the Service in initiating recovery and conservation planning, and to ensure that the components of this RPA are accomplished consistent with the standard for ensuring both the survival and recovery of the species, as set forth in section 7(a)2 of the Act. In order to carry out the expanded southwestern willow flycatcher conservation program (described in section I.B of Reclamation's amended biological assessment) and the implementation of the RPA, Reclamation shall staff a full-time position for a period of 10 years. This Southwestern Willow Flycatcher Conservation Coordinator position shall be staffed as soon as possible, but funding shall be made available no later than October 1, 1996. The Conservation Coordinator should be stationed where coordination with the Service, Arizona Game and Fish Department, National Biological Service, and oversight of other components of this RPA are easily facilitated. Close coordination by the Conservation Coordinator with the

Service is necessary to utilize the Service's regulatory authority under sections 7 and 9 of the Act and other Service programs, in order to bring interested parties together, complete management agreements, and assist in implementing flycatcher conservation actions to offset project-related impacts.

The Southwestern Willow Flycatcher Conservation Coordinator will develop an annual work plan. Reclamation and the Service will have joint responsibility for the approval of the work plan. Quarterly coordination meetings will be conducted among Reclamation, the Service, National Biological Service, and Arizona Game and Fish Department in January, April, July, and October of each year to review work objectives and assess how the full scope of the responsibilities of the Conservation Coordinator position is being accomplished.

The Conservation Coordinator is to aggressively accelerate, expand, and implement conservation actions for the southwestern willow flycatcher. The following responsibilities will apply to this position.

- 1) Coordinate the implementation of the management fund specified in 1b to maximize the immediate benefits to extant flycatcher populations;
- 2) Assist the Service in coordination of southwestern willow flycatcher research activities, ensure that research and monitoring results from RPA component 1e are integrated into planning documents and available for section 7 consultations in a timely manner, and to assist the Service in translating research results into effective management strategies;
- 3) Coordinate and take the lead in the implementation of the various components of this RPA;
- 4) Ensure conservation opportunities are accomplished in a timely manner;

In addition, the Conservation Coordinator will be responsible for implementing the expanded Reclamation southwestern willow flycatcher conservation program described in Section I.B of Reclamation's amended Biological Assessment. In implementing this program the Conservation Coordinator would undertake the following responsibilities:

- 5) Be an advocate for the southwestern willow flycatcher; assist the Service in disseminating information on flycatcher biology, ecology, management, and research; generate interest and seek funding; immediately accomplish on-the-ground conservation actions;
- 6) Identify and develop conservation strategies in cooperation with the Service, Reclamation, and other Federal, State, Tribal, and other entities, for incorporation into a Service recovery plan; to assist the Service in assessing flycatcher distribution, site specific conditions, habitat and population trends, and potential management actions;

- 7) Evaluate potential management conflicts, develop management opportunities and partnerships within occupied and unoccupied flycatcher habitat;
 - 8) Coordinate with appropriate Service staff to provide all necessary information for the section 7 consultation process to minimize impacts to flycatchers and regulate incidental take; and
 - 9) Assist Service in preparing management agreements with agencies, local management entities, and private land owners.
- 1e. **Research and Monitoring.** To monitor and assess the long-term, regional effects of the proposed action on the southwestern willow flycatcher, and to guide the management of mitigation and other management actions described above in 1b and 1c, Reclamation shall fund a comprehensive flycatcher research program for a period of 10 consecutive years beginning with the 1996 breeding season. The Service anticipates that impacts to flycatchers at Roosevelt Lake may affect flycatcher populations elsewhere in central and southern Arizona. The research and monitoring components described below are designed, in part, to determine aspects of flycatcher population dynamics throughout the region, including the relationship of the Roosevelt Lake flycatcher population to populations regionwide, dispersal patterns, emigration patterns, and demographic and genetic characteristics. The Service anticipates that any population enhancement to compensate for impacts at Roosevelt Lake is likely to originate primarily from the San Pedro River flycatcher population, the closest and largest known population to Roosevelt Lake. The Service also anticipates that flycatchers dispersing from Roosevelt Lake to breed elsewhere as a result of the proposed action may attempt to breed within the region bounded by the Verde River to the west and San Pedro and Gila Rivers to the south and east. Thus, the research and monitoring outlined below is focused at Roosevelt Lake and vicinity and the San Pedro River and vicinity. This regionwide approach will enable the Service and Reclamation to monitor and document the effects of the proposed action as well as population enhancement anticipated to result from the implementation of the RPA.

The research and monitoring program shall consist of studies to: 1) monitor population size, nesting attempts and productivity; 2) obtain demographic data suitable for modelling population dynamics (e.g. life-table, minimum viable population analyses); 3) obtain data on dispersal patterns and rates and patterns of immigration/emigration; 4) obtain and analyze genetic samples for comparison with other flycatcher populations rangewide; and 5) monitor changes in habitat extent, vegetative species composition and structure. All research actions described below conform to the standards and priorities identified by Arizona Partners In Flight in their list of *Research and Data Needs for the Endangered Southwestern Willow Flycatcher* (Marshall 1995).

Each of the five research components shall have a specific set of objectives and a specific time frame in which the objectives shall be completed. Clear objectives and time frames will enable Reclamation to project funding needs and plan for implementation, which,

in turn, will enable the Service to anticipate when important data will be available for inclusion in recovery planning and future consultations. All data collected annually by Reclamation or other Federal, State, or private entity shall be submitted in draft for the Service's review by October 30 of each year. Study objectives and time frames are outlined more specifically below.

1) Population monitoring/nesting productivity studies - Reclamation shall conduct status surveys to estimate flycatcher population sizes and distribution at Roosevelt Lake, Cook's Lake, Cook's Seep, PZ Ranch (with landowner permission), and any property acquired as mitigation under RPA 1b for 10 years. Status surveys will help the Service and Reclamation evaluate the flycatcher's population status in relation to the proposed action and provide survey data needed for developing recovery actions. Surveys shall commence with the 1996 breeding season. Status surveys shall be completed annually for the entire 10-year period. All surveys shall be conducted in cooperation with the Arizona Partners In Flight southwestern willow flycatcher monitoring program coordinated by Arizona Game and Fish Department and the Service and shall emphasize determining the identity of any color-banded flycatchers per #2 below.

Reclamation shall implement a nest monitoring study to determine: 1) the identities of nest owners (band combinations of males and females); 2) the number of nesting attempts, clutch sizes, hatching success, fledging success; 3) levels and distribution of brown-headed cowbird parasitism; 4) causes of nest loss/failure; 5) breeding season length; and 6) habitat use at Roosevelt Lake, Cook's Lake, Cook's Seep, PZ Ranch (with landowner permission), and any property acquired as mitigation under RPA 1b. Nest monitoring will help the Service and Reclamation evaluate the flycatcher's population status in relation to the proposed action and provide data necessary for developing recovery actions. Nest monitoring shall be conducted at each of the above locations for the entire 10-year period beginning in 1996, or until flycatchers no longer occupy the area (if prior to 2005). All monitoring shall be conducted in cooperation with the Arizona Partners In Flight southwestern willow flycatcher monitoring program coordinated by the Arizona Game and Fish Department.

2) Demographic data - In conjunction with the population monitoring and nesting productivity research specified in number one above, Reclamation shall collect demographic data (including birth/death rates of banded flycatchers, lifetime reproductive success of banded flycatchers, age-specific reproductive success of banded flycatchers, and longevity of banded flycatchers), by attempting to color band all flycatcher pairs, single males or females holding territories, and nestlings at Roosevelt Lake, Cook's Lake, Cook's Seep, PZ Ranch (with landowner permission), and any property acquired as mitigation under RPA 1b.

Demographic data will enable the Service and Reclamation to evaluate the impact of the proposed action and other Federal actions on flycatcher life-history traits as well as provide data critical for developing a recovery plan and implementing recovery actions. Color banding shall be conducted at each of the above sites for a minimum of five years,

unless the site has been demonstrated to no longer contain flycatchers (if prior to five years). Color banding shall begin with the 1996 breeding season. Color banding shall be done in cooperation with other banding efforts throughout Arizona and elsewhere in the southwestern willow flycatcher's range.

3) Dispersal/emigration studies - In conjunction with the color banding study specified in number two above and status surveys in number one above, Reclamation shall conduct, in cooperation with the Arizona Partners In Flight southwestern willow flycatcher monitoring program coordinated by the Arizona Game and Fish Department, status surveys to determine dispersal patterns of color-banded flycatchers. Data on dispersal and emigration patterns will help the Service and Reclamation evaluate the effects of the proposed action and other Federal actions on flycatcher population dynamics and provide data critical for developing a recovery plan and implementing recovery actions.

Surveys shall be conducted at locations where birds are banded (Roosevelt Lake, Cook's Lake, Cook's Seep, PZ Ranch [with landowner permission], and any property acquired as mitigation under RPA 1b.), and along portions of occupied drainages between and adjacent to those populations, and in potentially suitable habitat along confluent drainages. To clarify, status surveys shall be conducted: 1) in potentially suitable habitat within currently-occupied drainages where color-banding will be implemented (Salt River, Tonto Creek, San Pedro River); 2) in suitable habitat between breeding populations on the San Pedro; 3) in suitable habitat on the San Pedro River within 25 miles upstream and downstream of currently-occupied locations; 4) within suitable habitat on the Salt River and Tonto Creek within 25 miles of the Roosevelt Lake flycatcher population; 5) in suitable habitat on confluent drainages with the San Pedro River (i.e. Aravaipa Creek, Gila River upstream to the San Carlos Reservoir and downstream to Price); and 6) in suitable habitat on drainages confluent with the Salt River (i.e. Verde River inflow to Horseshoe Reservoir downstream to confluence). Dispersal/emigration studies shall be conducted for a period of no less than six consecutive years beginning in 1997. All status surveys shall be conducted according to protocol (Tibbitts *et al.* 1994, or revisions to that document).

For the purposes of this biological opinion only, suitable survey habitat is characterized by: Patches of native riparian shrubs or trees (willow, cottonwood, box elder, ash, or mixtures of these species), pure stands of tamarisk, or mixtures of native species and tamarisk characterized by high stem density or high foliage volume in the lowest stratum and/or mid-stratum. Patches may have either a single stratum and relatively low canopy (minimum canopy height of 12 feet) characteristic of an early- to mid-seral stage, or have several vegetation strata including a relatively tall canopy of cottonwood or willow (e.g. 50 feet). Riparian patches may be highly irregular in shape, but should have a minimum depth of 30 feet. Other wetland plants that may be associated with the above shrubs/trees include dense stands of *Baccharis*, buttonbush, cattail (*Typhus* sp.), bulrush (*Scirpus* sp.), or other emergents. Open water, cienegas, marshy seeps, or saturated soil should be in the vicinity (within 300 feet), at least in May, during years with average

precipitation and average releases from upstream impoundments. **Knowledge of average hydrologic conditions for any particular area should be obtained in advance of surveys so that field determinations are not confounded by drought conditions or by recent human-induced manipulations to floodplains (e.g. creation of berms, channel reconfiguration, etc.).**

4) Genetic sampling - To better understand genetic relationships and population dynamics of the Roosevelt Lake flycatcher population in relation to other flycatcher populations regionwide, Reclamation shall provide for blood and/or tissue samples to be obtained and analyzed from the Roosevelt Lake and San Pedro River flycatcher populations for use in the ongoing flycatcher genetics study by the National Biological Service. Data on sub-specific status, and estimates of heterozygosity and immigration rates will enable the Service and Reclamation to evaluate the impacts of the proposed action and other Federal actions on the population dynamics of the southwestern willow flycatcher. Sampling work shall be completed within two consecutive breeding seasons beginning in 1996.

5) Habitat monitoring - To evaluate the effects of the proposed action on southwestern willow flycatcher habitat, Reclamation shall monitor changes in the extent of riparian habitats, vegetative species composition, and structure at Roosevelt Lake through 2006. Aerial photographs of appropriate scale (e.g. 1:800) and quality to permit planimetry and cover-typing shall be used to map the distribution, size, and types of riparian habitats at both the Salt River inflow (from State Highway 288 downstream) and Tonto Creek inflow (from the northwest corner of T5N, R11E downstream). Aerial photos shall be obtained at two-year intervals starting in 1996 (or 1995 if appropriate photos are available) and be taken in June or July. To establish a baseline, Reclamation shall use 1995 photos (if appropriate scale and perspective) or photos obtained in June or July of 1996 to develop a cover-type map or maps that portray the distribution and types of riparian habitats (e.g. cottonwood-willow, tamarisk, mixed broadleaf/exotic, etc.). Reclamation shall also prepare tabular data summarizing the total area of each riparian habitat type, the dimensions of each contiguous patch of riparian vegetation (i.e. length and width or largest diameter circle that will fit in irregularly-shaped patches), and basic statistics (mean, min, max) on the area and shape of riparian habitat types and contiguous patches of riparian vegetation. Reclamation shall present the results of the aerial photography and cover-typing analysis to the Service by December 31, 1996. To monitor changes in the extent and types of riparian habitats, Reclamation shall provide the same analysis for photos obtained during year four (either 1999 or 2000) and year 10 (either 2005 or 2006). Results of each of these follow-up monitoring efforts shall be presented to the Service no later than December 31 of the year during which the photos are obtained.

To evaluate the effects of the proposed action on riparian habitat structure in the areas of Tonto Creek and Salt River defined above, Reclamation shall conduct vegetation sampling in each of the habitat types delineated in the cover-typing work described above. The vegetation sampling shall quantitatively characterize, using a standardized

and statistically valid sampling method, species composition, species' frequency of occurrence, canopy height, percent canopy cover, stem density, and vertical foliage density. All vegetation sampling shall be conducted between the months of June and September. Reclamation shall establish a baseline by completing vegetation sampling in 1997 and presenting results to the Service by December 31, 1997. To monitor habitat changes during the 10-year research period, Reclamation shall conduct follow-up vegetation sampling to coincide with the covertype mapping described above (i.e. vegetation sampling shall also be conducted in either 1999 or 2000 and either 2005 or 2006). Results of each of these monitoring efforts shall be presented to the Service no later than December 31 of the year during which the vegetation sampling is conducted.

- 1f. **Cowbird Management Program.** To help decrease incidences of nest abandonment due to cowbird parasitism and increase flycatcher fledgling productivity, Reclamation shall implement a cowbird trapping program at Cook's Lake, Cook's Seep, PZ Ranch (with landowner permission), and any property acquired as mitigation under RPA 1b. Cowbird trapping shall be implemented annually from April 1 through July 15 beginning in 1997 and conducted for 10 years (through 2006), except at any property acquired as mitigation under RPA 1b where trapping shall commence in 1997 and be conducted for 10 years (through 2006). Reclamation shall provide data annually on the locations of all traps (plotted on a topographic map or map or aerial photo of larger scale), daily numbers and sexes of cowbirds and non-target species captured per trap, and the dates of captures.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, would, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

AMOUNT OR EXTENT OF TAKE

The Service anticipates that, by modifying habitat, the proposed action will result in the eventual loss, temporary or permanent, of flycatchers with a potential annual take of up to 45 southwestern willow flycatcher territories at Roosevelt Lake (Salt River and Tonto Creek inflows). Take in the form of harm would result from temporary or permanent habitat modification. The Service also anticipates that habitat modification will result in reduced survivorship and productivity annually of up to 90 individual flycatchers. Habitat modification

is anticipated to result in delayed or lost breeding attempts, decreased productivity and survivorship of adults that attempt to breed in modified habitat or disperse in search of suitable breeding habitat elsewhere.

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

REASONABLE AND PRUDENT MEASURES

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

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the southwestern willow flycatcher.

1. Manage water levels at Roosevelt Lake so that flycatcher habitat is not inundated during the 1996 breeding season.
2. Reduce incidences of nest abandonment and losses of flycatcher productivity due to cowbird parasitism.
3. Have all flycatcher-related research and monitoring conducted by skilled personnel with appropriate training and permits.
4. Reduce take by ensuring appropriate coordination and oversight of reasonable and prudent alternative and reasonable and prudent measures.

TERMS AND CONDITIONS

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

1. The following terms and conditions will implement reasonable and prudent measure one.
 - 1.1) Do not permit long-term storage of water in the new conservation space (elevation 2136 to 2151 feet) until after September 1, 1996. Flood events occurring prior to September 1, 1996 that require use of the conservation space between 2136 and 2151 feet shall be managed on a short-term basis only. Specifically, the space between 2136 and 2151 feet shall be used in a manner similar to that between 2151 and 2175 feet as specified in the Corps of Engineers operation manual for Roosevelt Dam. Corps of Engineers operating criteria require flood water above 2151 feet to be evacuated within 20 days.
2. The following terms and conditions will implement reasonable and prudent measure two.
 - 2.1) To help decrease incidences of nest abandonment due to cowbird parasitism and increase flycatcher fledgling productivity at sites managed by Reclamation and/or sites likely to contain flycatchers dispersing from Roosevelt Lake, Reclamation shall implement a cowbird trapping program at Cook's Lake, Cook's Seep, PZ Ranch, and any property acquired as mitigation under RPA 2b. Cowbird trapping shall be implemented annually from April 1 through July 15 beginning in 1996 and conducted for 10 years (through 2005), except at any property acquired as mitigation under RPA 2b where trapping shall commence in 1997 and be conducted for 10 years (through 2006). Data provided annually shall include the locations of all traps plotted on a topographic map, or map or aerial photo of larger scale, daily numbers and sexes of cowbirds and non-target species captured per trap, and the dates of captures.
3. The following terms and conditions will implement reasonable and prudent measure three.
 - 3.1) All flycatcher-related research and management work shall be conducted by experienced personnel that have completed an Arizona Partners In Flight southwestern willow flycatcher training session. All personnel handling flycatchers in banding operations shall have Federal, State, and other appropriate permits and be supervised by individuals holding a Master Banding Permit and that have experience mist-netting and banding southwestern willow flycatchers or other small passerines. All personnel involved in nest searching and monitoring shall have experience in monitoring passerine birds, and shall be supervised by individuals who have experience searching and monitoring southwestern willow flycatcher nests or those of other small passerines.
4. The following terms and conditions will implement reasonable and prudent measure four.
 - 4.1) To reduce take and provide for coordination and overall management of activities specified under reasonable and prudent measures and reasonable and prudent alternatives,

Reclamation shall fund for a period of no less than 10 years beginning October 1, 1996, one employee assigned as the southwestern willow flycatcher Conservation Coordinator.

Reporting Requirements

Upon locating a dead, injured, or sick endangered or threatened species specimen, initial notification must be made to the Service's Law Enforcement Office in Mesa, Arizona (602-379-6443). Care should be taken in handling sick or injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

Notice: While the incidental take statement provided in this consultation satisfies the requirements for listed species under the Act, as amended, it does not constitute an exemption from the prohibitions of take of non-listed migratory birds under the more restrictive provisions of the Migratory Bird Treaty Act. Take of protected migratory species (not listed under the Endangered Species Act) requires a Migratory bird Special Purpose Permit, as set forth in 16 U.S.C. § 704.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following actions:

1. Fund the Arizona Partners In Flight southwestern willow flycatcher survey program coordinated by the Arizona Game and Fish Department to survey lands withdrawn by Reclamation on the lower Colorado River (from Lake Mead to the border with Mexico) to determine the breeding season status of flycatchers in that region.
2. By December of 1998, identify all areas with native and non-native riparian habitat potentially suitable for the flycatcher on all lands withdrawn by Reclamation in Arizona, New Mexico, and southern Utah. For areas that currently have suitable habitat, complete surveys through the Arizona Partners In Flight southwestern willow flycatcher survey program or equivalent programs in New Mexico and Utah to determine flycatcher breeding status. For all areas with suitable habitat, as well as those with potential habitat, identify the current condition of riparian habitats (i.e. size, shape, vegetative species composition and structure, and hydrological conditions of habitat patches) even

- if management has been turned over to another agency, current land-use practices, and management strategies to maintain suitable habitat for the flycatcher or to restore habitat. Synthesize the above data on suitable and potential habitat, breeding status, and management actions for all three states in a report containing tabular, graphical, and GIS-based data, where appropriate. Include in the report a timetable for implementing specific management actions that will benefit extant flycatcher populations, maintain suitable habitat, or restore potential, degraded habitat.
3. Support ongoing work by the National Biological Service to identify sub-specific patterns of genetic variation in the willow flycatcher complex (all subspecies) and to derive rangewide estimates of population fragmentation (i.e. estimates of heterozygosity, distance measures, immigration rates) within the southwestern willow flycatcher.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the proposed operation of the modified Roosevelt Dam in Gila and Maricopa Counties, Arizona, and its effects on the southwestern willow flycatcher. As required by 50 CFR 402.16, reinitiation of formal consultation is required if: (1) the amount or extent of incidental take is reached; (2) new information reveals effects of the agency action that may impact listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; (4) a new species is listed or critical habitat designated that may be affected by the action; or 5) Reclamation does not carry out reasonable and prudent alternatives or reasonable and prudent measures as specified in this biological opinion.

If we can be of further assistance, please contact Rob Marshall or Bruce Palmer at the Arizona Ecological Services Field Office (602-640-2720).

Sincerely,

Regional Director

Attachment

Mr. Robert W. Johnson

Final Biological Opinion for the Modified Roosevelt Dam: 2-21-95-F-462

46

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LITERATURE CITED

- Arizona Game and Fish Department. 1996. Wildlife of special concern in Arizona (Draft). Nongame and Endangered Wildlife Program. Arizona Game and Fish Department, Phoenix, Arizona. 23 pp.
- Bent, A.C. 1960. Bent's Life Histories of North American Birds. Vol. II, Land Birds. Harper & Brothers, New York. 555 pp.
- Biosystems Analysis, I. 1995. Tonto Creek Riparian Unit (TCRU) riparian habitat monitoring study, Lower Colorado Region Central Arizona Project. Annual Report. Biosystems Analysis, Inc., Santa Cruz, California.
- Blake, E.R. 1953. Birds of Mexico. University of Chicago Press, Chicago, IL. 644 pp.
- Brittingham, M.C. and S.A. Temple. 1983. Have cowbirds caused forest songbirds to decline? *BioScience* 33:31-35.
- Brown, B.T. 1988. Breeding Ecology of a Willow Flycatcher Population in Grand Canyon, AZ. *Western Birds* 19:25-33.
- Brown, B.T. 1994. Rates of brood parasitism by brown-headed cowbirds on riparian passerines in Arizona. *Journal of Field Ornithology* 65:160-168.
- Brown, D.E. 1982. Biotic Communities: Southwestern United States and Northwestern Mexico. University of Utah Press, Salt Lake City, Utah. 342 pp.
- Brown, D.E. and C.H. Lowe. 1980. Biotic Communities of the Southwest. USDA Forest Service Rocky Mountain Forest and Range Experiment Station. 1:1,000,000.
- Browning, M.R. 1993. Comments on the taxonomy of *Empidonax traillii* (willow flycatcher). *Western Birds* 24:241-257.
- Busch, D.E. and S.D. Smith. 1993. Effects of fire on water and salinity relations of riparian woody taxa. *Oecologia* 94:186-194.
- California Department of Fish and Game. 1992. State and Federal endangered and threatened animals of California (Revised July 1992). California Department of Fish and Game, Natural Heritage Division, Sacramento, California. 13 pp.
- Carothers, S.W., R.R. Johnson, and S.W. Aitchison. 1974. Population structure and social organization of southwestern riparian birds. *American Zoologist* 14:97-108.

Cooper Ornithological Society. 1995. Resolution supporting designation of critical habitat for the southwestern willow flycatcher. *The Condor* 97:1092.

Croxen, F.W. 1926. History of grazing on Tonto Creek. Paper Presentation at the Tonto Grazing Conference, Phoenix, AZ, November 4-5, 1926. Arizona Historical Society. 13 pp.

Dahl, T.E. 1990. Wetlands losses in the United States, 1780s to 1980s. USDI Fish and Wildlife Service, Washington, D.C. 13 pp.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1992. Birds in jeopardy. The imperiled and extinct birds of the United States and Canada, including Hawaii and Puerto Rico. Stanford University Press, Stanford, California. 259 pp.

Eisner, T., J. Lubchenco, E.O. Wilson, D.S. Wilcove, and M.J. Bean. 1995. Building a scientifically sound policy for protecting endangered species. *Science* 268:1231-1232.

Franzreb, K.E. 1987. Perspectives on managing riparian ecosystems for endangered bird species. *Western Birds* 18:3-9.

General Accounting Office. 1988. Public rangelands: Some riparian areas restored but widespread improvement will be slow. Report to Congressional Requesters GAO/RCED-88-105. U.S. General Accounting Office, Washington, D.C. 85 pp.

Gill, F.B. 1990. Ornithology. W.H. Freeman and Company, New York, New York. 660 pp.

Gorski, L.J. 1969. Traill's Flycatchers of the "fitz-bew" songform wintering in Panama. *The Auk* 86:745-747.

Griffith, J.T. and J.C. Griffith. 1994. 1994 brown-headed cowbird removal program on Marine Corps Base Camp Pendleton, California. Final Report October 18, 1994, P.O. NO. M00-681-M4840. Griffith Wildlife Biology, Calumet, Michigan.

Harris, L.D. 1984. Fragmented forest: Island biogeography theory and the preservation of biotic diversity. University of Chicago Press, Chicago, Illinois.

Harrison, H.H. 1979. A field guide to western birds' nests of 520 species found breeding in the United States west of the Mississippi River. Houghton Mifflin Company, Boston, Massachusetts. 279 pp.

Howell, S.N.G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, New York, New York. 851 pp.

- Hubbard, J.P. 1987. The Status of the Willow Flycatcher in New Mexico. Endangered Species Program, New Mexico Department of Game and Fish, Sante Fe, New Mexico. 29 pp.
- Hull, T. and D. Parker. 1995. The Gila Valley revisited: 1995 survey results of willow flycatchers found along the Gila River near Gila and Cliff, Grant County, New Mexico. Prepared by Applied Ecosystem Management, Inc. for the Phelps Dodge Corporation. 25 pp.
- Johnson, R.R. and L.T. Haight. 1984. Riparian problems and initiatives in the American Southwest: A regional perspective. Pages 404-412, in R.E. Warner and K.M. Hendrix eds. California riparian systems: Ecology, conservation, and productive management. University of California Press, Berkeley, California.
- Johnson, R.R., L.T. Haight, and J.M. Simpson. 1987. Endangered habitats versus endangered species: a management challenge. *Western Birds* 18:89-96.
- Katibah, E.F. 1984. A brief history of riparian forests in the Central Valley of California. Pages 23-29, in R.E. Warner and K.M. Hendrix eds. California Riparian Systems: Ecology, Conservation, and Productive Management. University of California Press, Berkeley, California.
- King, J.R. 1955. Notes on the life history of Traill's Flycatcher (*Empidonax traillii*) in southeastern Washington. *The Auk* 72:148-173.
- Lande, R. 1995. Mutation and conservation. *Conservation Biology* 9:782-791.
- Ligon, J.S. 1961. New Mexico Birds and where to find them. The University of New Mexico Press, Albuquerque, New Mexico.
- Marshall, R.M. 1995. Research and data needs for the endangered southwestern willow flycatcher (*Empidonax traillii extimus*). Prepared by the Research Sub-committee of Arizona Partners In Flight. 5 pp.
- Mayfield, H. 1977. Brown-headed cowbird: agent of extermination? *American Birds* 31:107-113.
- Maynard, W.R. 1995. Summary of 1994 survey efforts in New Mexico for southwestern willow flycatcher (*Empidonax traillii extimus*). Contract # 94-516-69. New Mexico Department of Game and Fish, Sante Fe, New Mexico. 48 pp.
- McCabe, R.A. 1991. The little green bird: ecology of the willow flycatcher. Palmer Publications, Inc., Amherst, Wisconsin. 171 pp.
- McGeen, D.S. 1972. Cowbird-host relationships. *The Auk* 89:360-380.

Minckley, W.L. and D.E. Brown. 1982. Interior and California riparian deciduous forests and woodlands. Pages 250-254, in D.E. Brown ed. Biotic communities: Southwestern United States and Northwestern Mexico. University of Utah Press, Salt Lake City, Utah.

Muiznieks, B.D., T.E. Corman, S.J. Sferra, M.K. Sogge, and T.J. Tibbitts. 1994. Arizona Partners In Flight 1993 southwestern willow flycatcher survey. Technical Report 52. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, Arizona. 25 pp.

New Mexico Department of Game and Fish. 1988. Handbook of species endangered in New Mexico., Sante Fe, New Mexico.

Parker, D. and T. Hull. 1994. The Gila Valley Revisited. Results of a 1994 survey of willow flycatchers found along the Gila River Gila, Gila and Cliff, Grant County New Mexico. Applied Ecosystem Management, Flagstaff, Arizona. 29 pp.

Peterson, R.T. 1990. A field guide to western birds. 3rd ed. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.

Peterson, R.T. and E. Chalif. 1973. A field guide to Mexican birds. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.

Phillips, A., J. Marshall, and G. Monson. 1964. The birds of Arizona. University of Arizona Press, Tucson, Arizona. 212 pp.

Phillips, A.R. 1948. Geographic variation in *Empidonax traillii*. *The Auk* 65:507-514.

Pulliam, H.R. and J.B. Dunning. 1994. Demographic processes: Population dynamics on heterogeneous landscapes. Pages 179-208, in G.K. Meffe and C.R. Carroll eds. Principles of Conservation Biology. Sinauer Associates, Inc., Sunderland, Massachusetts.

Rea, A.M. 1983. Once a river: bird life and habitat changes on the middle Gila. University of Arizona Press, Tucson, Arizona. 285 pp.

Ridgely, R.S. and G. Tudor. 1994. The Birds of South America: Suboscine Passerines. University of Texas Press, Austin, Texas. xxx pp.

Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Biological consequences of ecosystem fragmentation: A review. *Conservation Biology* 5:18-32.

Sedgwick, J.A. and F.L. Knopf. 1992. Describing willow flycatcher habitats: scale perspectives and gender differences. *The Condor* 94:720-733.

- Sferra, S.J., R.A. Meyer, and T.E. Corman. 1995. Arizona Partners In Flight 1994 southwestern willow flycatcher survey. Final Technical Report 69. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, Arizona. 46 pp.
- Sogge, M.K. 1995a. Southwestern willow flycatcher (*Empidonax traillii extimus*) monitoring at Tuzigoot National Monument. 1995 progress report to the National Park Service. National Biological Service Colorado Plateau Research Station/Northern Arizona University, Flagstaff, Arizona. 20 pp.
- Sogge, M.K. 1995b. Southwestern willow flycatcher surveys along the San Juan River, 1994 - 1995. Final report to the Bureau of Land Management, San Juan Resource Area. National Biological Service Colorado Plateau Research Station/Northern Arizona University, Flagstaff, Arizona. 27 pp.
- Sogge, M.K. 1995c. Southwestern willow flycatchers in the Grand Canyon. Pages 89-91, in E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran, and M.J. Mac eds. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. Department of the Interior, National Biological Service, Washington, DC.
- Sogge, M.K., T.J. Tibbitts, C. van Riper III, and T.J. May. 1995. Status of the southwestern willow flycatcher along the Colorado River in Grand Canyon National Park - 1995. Summary Report. National Biological Service Colorado Plateau Research Station/Northern Arizona University. 26 pp.
- Sogge, M.K. and T.J. Tibbitts. 1994. Distribution and status of the southwestern willow flycatcher along the Colorado river in the Grand Canyon - 1994. Summary Report. National Biological Survey Colorado Plateau Research Station/Northern Arizona University, Flagstaff, Arizona. 37 pp.
- Sogge, M.K., T.J. Tibbitts, and S.J. Sferra. 1993. Status of the southwestern willow flycatcher along the Colorado River between Glen Canyon Dam and Lake Mead - 1993. Summary Report. National Park Service Cooperative Park Studies Unit/Northern Arizona University, U.S. Fish and Wildlife Service, and Arizona Game and Fish Department., Flagstaff, Arizona. 69 pp.
- Sogge, M.K. and T.J. Tibbitts. 1992. Southwestern willow flycatcher (*Empidonax traillii extimus*) surveys along the Colorado River in Grand Canyon National Park and Glen Canyon National Recreation Area. National Park Service Cooperative Park Studies Unit/Northern Arizona University, Flagstaff, Arizona. 43 pp.

- Spencer, J.A., S.J. Sferra, T.E. Corman, J.W. Rourke, and M.W. Sumner. 1996. Arizona Partners In Flight 1995 southwestern willow flycatcher survey. Technical Report 97, March 1996. Arizona Game and Fish Department, Phoenix, Arizona. 69 pp.
- State of Arizona. 1990. Final report and recommendations of the Governor's riparian habitat task force (October 1990). Executive Order 89-16. Streams and Riparian Resources. Governor's Riparian Habitat Task Force, Phoenix, Arizona. 28 pp.
- Stiles, F.G. and A.F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock, Ithaca, New York. 364 pp.
- Strong, T.R. and C.E. Bock. 1990. Bird species distribution patterns in riparian habitats in southeastern Arizona. *The Condor* 92:866-885.
- Szaro, R.C. 1989. Riparian forest and scrubland community types of Arizona and New Mexico. *Desert Plants* 9:70-138.
- Tibbitts, T.J., M.K. Sogge, and S.J. Sferra. 1994. A survey protocol for the southwestern willow flycatcher (*Empidonax traillii extimus*). Technical Report NPS/NAUCPRS/NRTR-94/04. National Park Service Colorado Plateau Research Station, Flagstaff, Arizona. 24 pp.
- Unitt, P. 1987. *Empidonax traillii extimus*: An endangered subspecies. *Western Birds* 18:137-162.
- U.S. Bureau of Reclamation. 1995. Biological assessment of the possible impacts of modifications of Roosevelt dam on the southwestern willow flycatcher. Prepared by Bureau of Reclamation, Lower Colorado Region and SWCA Inc. 49 pp.
- U.S. Bureau of Reclamation. 1991. Resource Development Plan for Tonto Creek Riparian Unit (TCRU) Wildlife Mitigation, Theodore Roosevelt Dam. Agreement No. 12-03-91-026.
- U.S. Fish and Wildlife Service. 1995. Final rule determining endangered status for the southwestern willow flycatcher. *Federal Register* 60:10694-10715.
- U.S. Fish and Wildlife Service. 1993. Notice of 12-month petition finding/proposal to list *Empidonax traillii extimus* as an endangered species, and to designate critical habitat. *Federal Register* 58:39495-39522.
- U.S. Fish and Wildlife Service. 1989. Notice of review: animal candidate review for listing as endangered or threatened species. *Federal Register* 54:554.
- Walkinshaw, L.H. 1966. Summer biology of Traill's flycatcher. *Wilson Bulletin* 78:31-46.

Warren, D.K. and R.M. Turner. 1972. Saltcedar (*Tamarisk chinensis*) seed production, seedling establishment, and response to inundation. *Journal of Arizona Academy of Sciences* 10:135-144.

Wheelock, I.G. 1912. Birds of California: an introduction to more than three hundred common birds of the state and adjacent islands. A.C. McClurg and Company, Chicago, Illinois.

Whitfield, M.J. 1990. Willow flycatcher reproductive response to brown-headed cowbird parasitism. Masters Thesis, California State University, Chico, California State University, Chico, California.

Whitfield, M.J. 1993. Brown-headed cowbird control program and monitoring for willow flycatchers, South Fork Kern River, California. Draft report to California Department of Fish and Game, Contract #FG 2285., Weldon, California. 11 pp.

Whitfield, M.J. 1994. A brown-headed cowbird control program and monitoring for the southwestern willow flycatcher, South Fork Kern River, California, 1994. Prepared for the California Department of Fish and Game. Kern River Research Center, Weldon, California. 12 pp.

Whitfield, M.J. and C.M. Strong. 1995. A brown-headed cowbird control program and monitoring for the southwestern willow flycatcher, South Fork Kern River, California. California Department of Fish and Game, Bird and Mammal Conservation Program Report 95-4, Sacramento, California. 17 pp.

Wilcove, D.S., C.H. McLellan, and A.P. Dobson. 1986. Habitat fragmentation in the temperate zone. Pages 237-256, in M.E. Soule ed. Conservation biology: The science of scarcity and diversity. Sinauer Associates, Sunderland, Massachusetts.

Willard, F.C. 1912. A week afield in southern Arizona. *The Condor* 14:53-63.