# United States Department of the Interior
## Fish and Wildlife Service
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In Reply Refer To:

AESO/SE
2-21-98-F-373

June 3, 1998

**MEMORANDUM**

**TO:** Manager, Tucson Field Office, Bureau of Land Management, Tucson, Arizona

**FROM:** Acting Field Supervisor

**SUBJECT: Formal Consultation for the Cienega Creek Stream Restoration Project**

The U.S. Fish and Wildlife Service has reviewed the proposed Cienega Creek Stream Restoration Project on the Empire-Cienega Resource Conservation Area (RCA). Your request for formal consultation was received on February 11, 1998. This document represents the Service's biological opinion on the effects of that action on the endangered Gila topminnow *(Poeciliopsis occidentalis occidentalis)* and endangered southwestern willow flycatcher *(Empidonax traillii extimus).*

This biological opinion (BO) is based on information provided in your February 9, 1998, memorandum and Biological Evaluation (BE), telephone conversations, data in our files, and other sources of information. The deadline for delivering the BO is June 26, 1998. A complete administrative record of this consultation is on file in this office.

The Bureau requested concurrence with a not likely to adversely affect determination on the Huachuca water umbel *(Lilaeopsis schaffneriana* var. *recurva),* and no effect determinations on the jaguar *(Panthera onca),* bald eagle *(Haliaeetus leucocephalus),* and lesser long-nosed *bat (Leptonycteris curasoae yerbabuenae).* The Service concurs with the not likely to adversely affect determination on *Lilaeopsis,* given that surveys for *Lilaeopsis* must be conducted in potential habitat before any surface disturbing activities.

The Bureau has conducted informal and formal section 7 consultations on the RCA previously. In July 1993, the Bureau initiated formal consultation on a headcut repair and riparian pasture fencing (2-21-93-F-430). The Service determined that the proposed actions were interdependent and interrelated with the livestock grazing program. The Service recommended that the consultation be withdrawn, and that consultation on the headcut and the grazing program be initiated separately. The headcut repair and fencing consultation was withdrawn and consultation reinitiated for the headcut repair on January 3, 1994, and the Biological Opinion was completed on February 7, 1994. The consultation on the Cienega Creek Interim Grazing Plan was completed in January 1996.

| | |
|---|---|
| **2-21-95-F-177** | **Cienega Creek Interim Grazing Plan** |
| **2-21-90-F-196** | **Cienega Creek Diversion** |
| **2-21-93-1-430** | **Cienega Creek Headcut Repair and Fencing** |
| **2-21-90-1-150** | **Cienega Creek Pasture Fencing** |
| **2-21-90-F-196** | **Cienega Creek Diversion Dam and Repair** |
| **2-21-91-1-170** | **Cienega Creek Earthday Project** |
| **2-21-96-F-160** | **Programmatic Grazing Safford and Tucson Field Offices** |

**After reviewing the status of the Gila topminnow and the southwestern willow flycatcher, the environmental baseline for the action area, the effects of the proposed stream restoration project, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of these species nor will it adversely modify any designated critical habitat.**

## PROPOSED ACTION

**Stream restoration plan development involved a fishery biologist from the Bureau's Arizona State Office and two hydrologists from the Bureau's National Applied Resource Science Center in Denver, Colorado. Road realignment and cement crossing design was done by Bureau engineering staff out of the Bureau's Safford Field Office. There are six basic components involved in restoration of the stream segment adjacent to the historic Cienega Ranch.**

**1) <u>Dike and levee removal.</u> Three dikes and one levee would be removed using heavy equipment. At dike #1, the topography of the stream channel would be sloped to a smooth grade to match upstream and downstream portions of the stream bed. The fill to be removed from the dikes is estimated at 250 cubic yards for dike #1 and 1,600 cubic yards from dike #3. Because dike #3 has a spillway that has resulted in the erosion of a gully, 390 cubic yards of the fill would be used to restore the land surface to its original condition. Dike #3 would require a rock drop structure; the design chosen is a cross-vein weir (Rosgen 1997). This would act as a grade control to retain the existing stream bed shape. The upstream to downstream difference in elevation across dike #3 is 3.3'. Heavy equipment would be used to slope the flat pond bottom at a 0.5% grade for 200', whereby reducing the single drop by one foot. The resulting 2.3' drop structure would consist of rock 4 to 6' in diameter. Materials would be keyed into banks 10' on each side and two levels of footer rocks would underlay exposed rocks to prevent under scour and structure degradation. Fill behind the structure expected to be mobilized by scour from flooding would be removed when the cross vane weir is constructed. Dave Rosgen (pers. comm.) has estimated that the depth of the scour is approximately four times the height of the drop. The estimated volume of the scour hole is 25 cubic yards. Because the structure is made of boulders, it can be enhanced or modified in the future to meet any unanticipated changes in the channel. The banks would be revegetated with deer grass and riparian trees native to the area.**

**Dike #2 would be replaced with a cross vein weir as a grade control as prescribed above for Dike #3. The drop would be approximately 2.2 feet over a structure comprised of 4-6' diameter**

**boulders. This would require demolition of the current cement structure using explosives and heavy equipment. The 3.2' drop would be sloped back 200 feet to create a 0.5% slope and reduce the drop 1'. A scour hole created by a 3.2' drop already exists behind this structure; therefore, little additional bed material is likely to be mobilized by flood flows. The banks would be revegetated with deer grass and riparian trees.**

**A single levee measuring 890' (4,770 cu. yd. fill) would be removed. Care would be taken to protect the existing stand of adult cottonwood trees. Only fill, small mesquite trees and underbrush would be removed. The soil surface would be flattened to match the stream bank to the adjacent fields thereby reconnecting the channel with an abandoned flood plain. No riparian vegetation would be disturbed.**

**Fill material totaling approximately 7,000 cubic yards would be removed from all four structures. The total area of riparian and stream bottom habitat that will be disturbed is approximately 1.06 acres. Concrete from Dike #2 may be used to fill the canal or as boulders to construct a cross vane weir at this site, if it is suitable. All excess fill would be used to fill a portion of the canal. Heavy equipment would be used to excavate dike and levee material and to construct grade control structures.**

**2) New channel configuration. When the canal was constructed in the early 1970's, the stream pattern was modified. Aerial photos taken before construction of the canal show the natural channel meander pattern. This pattern appears to be a stable one and would be re-constructed in the location now occupied by a road crossing on top of a small dike. Because the dike would be removed and a river bend constructed in this location, the road crossing would have to be relocated elsewhere.**

**The radius of curvature of the meander and placement would closely approximate the original channel pattern (radius = 149'). A moderately dense growth of trees along the path of the new channel would provide a ready source of bank stabilizing roots that should protect the constructed channel. So every effort would be made to retain as many trees as possible. Water that presently travels down the canal would be blocked with a modest earthen dike. This would back up water in the remaining short leg of the canal shunting it down the newly re-constructed portion of the stream. This leg of the canal would remain as a backwater habitat until sufficient sediment is deposited to fill the depression. Channel features such as pools are anticipated to form in the newly created stream channel through natural channel forming processes associated with floods. A bulldozer and other heavy equipment would be used to remove material to establish the new channel that is about 750' long and 40' wide with a grade of 0.5%. Little riparian vegetation (1-2 mature willows) will be disturbed during construction. Areas of bare soil would be planted for stabilization of newly constructed banks.**

**3) Cement road crossing and road realignment. The new road crossing is designed to pass water with minimal impact to the channel dimension and flood conveyance. The structure is to be 90' long by 16' wide. The eight-inch thickness of the slab would be reinforced with rebar. To protect the channel from scour that may occur in case of a severe flood, the upstream side would**

**have a two foot deep footing and the downstream portion would have a six foot deep footer. The depth of the downstream footer is to provide a grade control to block any head cutting that could occur before the project is fully stabilized by riparian vegetation. This is an important aspect of the project since no geologic grade controls occur upstream. Removal of the existing stream crossing would not result in the loss of additional riparian vegetation.**

**The road would be moved downstream approximately 1/4 mile to the site of the former crossing. The previous road is still present but would need to be improved. Approximately 2,400' of road would be improved to Bureau standard. The road surface would be raised six inches to improve drainage and approaches would have to be sloped to a more gentle grade. Placement of a cement crossing in the channel would disturb about 0.05 acres of riparian vegetation.**

**4) Canal plug. As mentioned above the canal would be retired through the installation of a small dike. The dike would require approximately 1,500 cubic yards of fill. Excess fill from the removal of the levee and dikes would be placed behind the dike built to block the canal. It is anticipated that the material would fill approximately 100' of the canal. Heavy equipment would be used to create the canal plug. If surface water is present during work on the canal or new stream segment, the water will be diverted entirely down the ditch that now feeds Cienega Creek with overflow from floods. Deepening this ditch by up to two feet would be necessary temporarily and rebuild the sand bag diversion dam temporarily to divert surface flows while construction is underway. Afterwards, the ditch will be covered with excess fill, planted with tree poles and allowed to revegetate through colonization of grasses and sedges already present along the ditch. Efforts to avoid stranding Gila topminnow would be followed according to the Biological Opinion for the Cienega Creek Diversion Dam (USFWS 1991). Approximately 0.52 acres of riparian vegetation would be disturbed on the canal by this aspect of the project.**

**5) Revegetation. The estimated area to be revegetated along the stream due to the project and past disturbance is about 2.0 acres. Volunteers would be used to dig deer grass and big sacaton grass and cut willow and cottonwood poles from the trees along the canal. Approximately 2,000 individual plants would be planted to establish stream bed and bank cover. Deer grass bunches would be subdivided into clumps on the site while being replanted. Deer grass can be planted during the growing season while the willow and cottonwood poles would be planted the following winter when poles are dormant. Plant materials would come primarily from the canal but additional deer grass would be harvested from ephemeral portions of Gardner Canyon or Mattie Canyon while leaving 80% of the existing plants undisturbed at this location. Hand tools and a tractor-mounted auger would be used to drill holes for plants. Holes would be drilled to free water for tree poles. Poles would be soaked and planted within 10 days of harvest. Where ground moisture conditions are poor, drip-irrigation would be used to supplement soil moisture. The source of irrigation water would be the marsh in the center of the project area. The water would be supplied by PVC pipe to each area of disturbance. Water would be supplied by a pump and filter system. "Spaghetti pipe" with lead head emitters would be used to supply each plant with water. The drip rate would be one gallon per minute applied below the surface of the ground by using plastic tubing placed in holes with the plants. Separate pumps would be used to supply water south of the marsh and north of the marsh. Irrigation would help prevent large losses of**

**plants should conditions become harsh. Livestock would continue to be fenced out of the project reach to maximize protection of vegetation. All plastic materials would be removed and disposed of once the plants are established.**

**Two portions of road would be abandoned when the new crossing is placed downstream and dike #3 is removed. These areas would be mechanically ripped so that natural reseeding from the adjacent dense stands of sacaton can occur.**

**6) Monitoring. Photos would be taken at six fixed locations in association with six monumented channel survey cross section locations. Four well points consisting of 3/4" steel pipe would be driven approximately 20' into ground on adjacent terraces to follow changes in the water table over time. A hand held or mounted auger would be used to drill holes to about 10' in depth. An electric generator and hammer drill would be used to set the well points to a depth of about 25'. Water depth and instantaneous discharge would be monitored quarterly. The Riparian Area Condition Evaluations (RACE) monitoring and willow flycatcher surveys would be conducted annually to follow recovery of the project area. This area would also be assessed for proper functioning condition following Bureau protocol (Prichard 1993).**

**An area for staging and holding equipment will be required. The eastern portion of the agricultural fields and the area near the old Cienega Ranch would be used to stockpile fill and to park and service heavy equipment. A tent, trailer, and small fenced compound will be placed in the agricultural fields for shade and security of materials and equipment.**

**The proposed mitigation measures are as follows:**

**1) revegetation using deer grass and riparian tree poles to stabilize disturbed areas;**

**2) irrigation of revegetation to improve establishment;**

**3) poling of trees in the canal will not begin until trees are dormant;**

**4) before starting the project in June, the areas where heavy equipment and other activities will occur will be surveyed for willow flycatchers;**

**5) implement willow flycatcher mitigation measure as directed by the Programmatic Grazing BO for the Safford and Tucson Field Offices ( 2-21-96-F-160). These include surveying, classifying and mapping willow flycatcher locations and habitat, excluding livestock from riparian areas, managing suitable habitat so that it does not degrade in quality, and controlling cowbird populations;**

**6) collect revegetation materials from the canal;**

**7) salvage any Gila topminnow that may become stranded by diversion of water in the canal during construction and move them to permanent water;**

8) screen diversions so that Gila topminnow will not enter areas where stranding is likely or where heavy equipment is operating;

9) conduct surveys for Huachuca water umbel in the project area and downstream to locate any new colonization immediately before construction; and

10) avoid disturbance to areas in the project area if the umbel is found.

## STATUS OF THE SPECIES

### Gila Topminnow

The Gila topminnow was listed in 1967 without critical habitat. Only populations in the United States are listed under the Endangered Species Act (ESA). The Gila topminnow is a small, live bearing fish found in the Gila, Sonora, and de la Concepcion River basins in Arizona, New Mexico, and Sonora, Mexico (Minckley 1973, Vrijenhoek *et al.* 1985), but is listed only in the US. It was once among the commonest fishes of the Gila River Basin (Hubbs and Miller 1941). The reasons for decline of this fish include past dewatering of springs and marshlands, impoundment, channelization, diversions, regulation of flow, land management practices that promote erosion and arroyo formation, and the introduction of predacious and competing nonnative fishes (Minckley 1985, Miller 1961). Other listed fish suffer from the same impacts (Moyle and Williams 1990). The effects of nonnative fishes on Gila topminnow are well documented. Both large (Bestgen and Propst 1989) and small (Meffe et al.1983) nonnative fish impact the topminnow, as can nonnative crayfish (Fernandez and Rosen 1996).

Gila topminnow belong to a group of live-bearing fishes within the family *Poecilidae* that includes the familiar guppy. Males are smaller than females, rarely greater than 25 mm (1 inch), while females are larger, reaching 51 mm (2 inches). Body coloration is tan to olivaceous, darker above, lighter below, often white on the belly. Breeding males are usually darkly blackened, with some golden coloration of the midline, and with orange or yellow at base of the dorsal fin. Fertilization is internal, and sperm packets are stored which may fertilize subsequent broods. The brood development time is 24 to 28 days. Two to 3 broods in different stages develop simultaneously in a process known as superfetation. Gila topminnow give birth to 1-31 young per brood (Schoenherr 1974). Larger females produce more offspring (Minckley 1973).

Gila topminnow mature a few weeks to many months after birth, depending on when they are born. They breed primarily from March to August, but some pregnant females occur throughout the year (Schoenherr 1974). Some young are produced in the winter months. Minckley (1973) and Constantz (1980) reported that Gila topminnow eat bottom debris, vegetation, amphipods, and insect larvae when available.

Gila topminnow and many other poeciliids can tolerate many physical and chemical states. They are good colonizers in part because of this tolerance and in part because one gravid female can

start a population (Meffe and Snelson 1989). Minckley (1969, 1973) described their habitat as edges of shallow aquatic habitats, especially where abundant aquatic vegetation exists.

Gila topminnows are known to occur in streams fluctuating from 6 to 37°C, pH from 6.6 to 8.9, dissolved oxygen levels of 2.2 to 11 milligrams/liter, and can tolerate salinities approaching those of sea-water (Meffe *et al*. 1983). Topminnows can burrow under mud or aquatic vegetation when water levels decline (Deacon and Minckley 1974, Meffe *et al*. 1983). Sonoran topminnows *(Poeciliopsis occidentalis)* regularly inhabit springheads with high loads of dissolved carbonates and low pH (Minckley *et al*. 1977, Meffe 1983, Meffe and Snelson 1989). This factor has helped protect small populations of topminnows from mosquitofish that are usually rare or absent under these conditions.

To summarize the Gila topminnow habitat requirements, this fish needs 1) unpolluted water that can have wide variation in temperature, pH and salinity, 2) shallow water with abundant aquatic plants including algae that supports aspect of cover and food production, 3)channel morphology that prevent habitats from scouring severely which will remove this weak swimmer from its habitat, 4) habitat areas free of nonnative competitors and predators, and 5) areas with slow currents and soft bottoms.

Historically, the Gila topminnow was abundant in the Gila River drainage and was called one of the commonest fishes of the Colorado River basin, particularly in the Santa Cruz system (Hubbs and Miller 1941). Presently, 11 of the 15 recent natural Gila topminnow populations are considered extant (Table 1)(Weedman and Young 1997). Only three of these populations can be considered secure. There have been 175 wild sites stocked with Gila topminnow. Topminnow persist at 18 of these localities. Of the 18, one site is outside historic range and four contain nonnative fish (Weedman and Young 1997). Further, only five of these stocked populations would count toward recovery under the draft revised Gila topminnow recovery plan (Abarca et al. 1994). The Sonoran Topminnow Recovery Plan (USFWS 1984) established criteria for down- and delisting. Criteria for down-listing were met for a couple years. However, due to concerns regarding the status of several populations, down-listing was delayed. Subsequently, the number of reintroduced populations dropped below that required for down-listing, where it has stayed. Yaqui topminnow are now covered by the Yaqui Fishes Recovery Plan (USFWS 1995). A revised recovery plan for the Gila topminnow is being prepared (Abarca et al. 1994).

The status of the species is poor. The Gila topminnow has gone from being one of the commonest fishes of the Gila basin, to one that exists at not more than 29 localities. Many of these localities are small and highly threatened. The theory of island biogeography can be applied to these habitat remnants, as they function similarly (Meffe 1983). Species on islands are more prone to extinctions than continental areas that are similar in size. Meffe (1983) considered extinction of populations almost as critical as recognized species extinctions. Fish in California that are in trouble tend to be endemic, restricted to a small area, part of fish communities with fewer than five species, and found in isolated springs or streams (Moyle and Williams 1990).

**Table 1 Status of natural Gila to minnow populations**

| Site | Ownership | Extant?[1] | nonnatives? | Mosquitofish? | Habitat Size | Threats[3] |
|---|---|---|---|---|---|---|
| Bylas Spring | San Carlos | YES | YES | YES | S D | M, N G |
| Cienega Creek | Bureau | YES | NO | NO | L | M, R N |
| Cocio Wash | Bureau | NO 1982 | UNKNOWN | UNKNOWN | S | H, M |
| Cottonwood Spring | Private | YES | NO | NO | S | M, N |
| Fresno Canyon | State Parks | YES | YES | NO[4] | M | H, N G |
| Middle Spring | San Carlos | YES | YES | YES | S | H, N G |
| Monkey Spring | Private | YES | NO | NO | S | L, W |
| Redrock Canyon | USFS | YES | YES | YES | M D | H, R G N |
| Sabino Canyon | USFS | NO 1943 | YES | NO | M | H, R N |
| Salt Creek | San Carlos | YES | NO | NO | S | M, N G |
| San Pedro River | Private | NO 1976 | YES | YES | - | H, W N G R |
| Santa Cruz River<br>San Rafael<br>Tumacacori<br>Tucson | Private | <br>NO 1993<br>YES<br>NO 1943 | YES<br>[4] | YES | L D | H, W N R G C U |
| Sharp Spring | Private | YES | YES | YES | M | H, N G |
| Sheehy Spring | Private | NO 1987 | YES | YES | S | H, N G |
| Sonoita Creek | Private, TNC, State Parks | YES | YES | YES | L D | H, W N G |
| Tonto Creek | Private | NO 1941 | YES | YES | L | H, N R G W |

[1] last year seen
[2] L = large M= medium S = small D = disjunct
[3] Immediacy H = high M = moderate L = low
Type W = water withdrawal C = contaminants R = recreation N = nonnatives
G = grazing M = mining U = urbanization
[4] none recently, they have been recorded
[5] recently renovated

**The highest priority actions in the draft revised Gila topminnow recovery plan are ones that are absolutely essential to prevent extinction in the future (Abarca et al. 1994). Federal actions have contributed to the degraded baseline of the Gila topminnow. Section 7 consultations on Federal actions affecting Redrock Canyon and Sonoita Creek in the Santa Cruz River subbasin and others in the Gila Giver basin have contributed to the lowered baseline for the Gila topminnow. An indication of the poor baseline situation of the Gila topminnow is that two formal consultations, including the CAP Gila, have resulted in jeopardy opinions. Although the reasonable and prudent alternatives remove jeopardy, other adverse effects are not removed by the RPA's. Other Federal actions and non-federal actions that have not undergone section 7 consultation also have unmitigated adverse effects that contribute to the degraded baseline.**

**Southwestern Willow Flycatcher**

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

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

***Empidonax traillii extimus* is one of four 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.

On April 26, 1996, the moratorium was lifted and on May 16, 1996, the Service published a notice in the Federal Register announcing listing prioritization guidance. Listing actions were placed in categories of decreasing order of priority: Tier 1 - Emergency listings; Tier 2 - Finalization of listing decisions on proposed species; and Tier 3 - all other listing actions (proposed rules, petition findings, critical habitat designations). On May 15, 1996, the Southwest Center for Biological Diversity filed a lawsuit claiming that the Service violated the Act by not finalizing critical habitat for the southwestern willow flycatcher. On March 20, 1997, the District Court ordered the Service to finalize critical habitat for the flycatcher by July 18, 1997. As ordered, the critical habitat was published on July 18, 1997, and became effective on August 21, 1997. A correction notice was published in the Federal Register on August 20, 1997.

## Life History

The southwestern willow flycatcher 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. However, fecal samples containing identifiable invertebrate body parts were collected during banding operations from more than 70 southwestern willow flycatchers in California, Arizona, and southwestern Colorado (M. Sogge, pers. comm.). These samples could yield important data on prey use at various locations and timing throughout the breeding season.

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

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 renesting after nest failure (Whitfield 1990, Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994, Muiznieks *et al.* 1994, Whitfield 1994, Whitfield and Strong 1995).

Whitfield, who has accumulated the largest data set on *E. t. extimus,* reported the following data on the 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 much lower. Only 22.6% returned to breed after one year. Whitfield and Walkinshaw do not incorporate potential emigration rates into their estimates of returns and, thus, may underestimate actual survivorship. However, these data are consistent with survival rates for other passerines (Gill 1990, chap. 21) suggesting that the lifespan of most *E. t. extimus* is probably two to three years (i.e., most flycatchers survive to breed one or two seasons).

Brood parasitism of southwestern willow flycatcher nests by the brown-headed cowbird *(Molothrus ater)* has been documented throughout the flycatcher's range (Brown 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 fledging, and reduced overall nesting success and fledgling survivorship (Whitfield 1994, Whitfield and Strong 1995). Cowbird eggs, which require a shorter incubation period than those of many passerine hosts, hatch earlier giving cowbird nestlings a competitive advantage over the host's young for parental care (Bent 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 return rate and that cowbird parasitism was often the cause of delayed fledging.**

## Habitat Use

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

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

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

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

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

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

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

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

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

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

Nest placement and nesting substrate

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

Nest height relative to the base of nest substrate also varies across the southwestern willow flycatcher's range and may be correlated with height of nest substrate or overall canopy height. Table 2 presents data on nest heights in different riparian habitat types across the flycatcher's range. Southwestern willow flycatcher nests have been found as low as 0.6 m above the ground to 14 m above the ground. The data presented in Table 2 demonstrate that flycatchers using predominantly native broadleaf riparian habitats nest relatively low to the ground (between 1.8 m and 2.1 m on average), whereas those using mixed native/exotic and monotypic exotic riparian habitats nest relatively high above the ground (between 4.3 m and 7.4 m on average).

Historic egg/nest collections and species' descriptions from throughout the southwestern willow flycatcher's range confirm the bird's widespread use of willow for nesting (Phillips 1948, Phillips *et al.* 1964, Hubbard 1987, Unitt 1987, T. Huels *in litt.* 1993, San Diego Natural History Museum 1995). Of the 34 nests found by Brown in 1902 near Yuma on the lower Colorado and Gila rivers, 33 were in Goodding's willow and one was in arrowweed. Data from historic egg collections from southern California and more current studies indicate that 75 to 80% of nests were placed in willows (San Diego Natural History Museum 1995). Currently, southwestern willow flycatchers use a wide variety of plant species for nesting substrates. At the monotypic willow stands that characterize high elevation sites in Arizona, Geyer willow was used almost exclusively for nesting (Muiznieks *et al.* 1994). At the inflow to Lake Mead on the Colorado River, Goodding's willow was the primary nesting substrate (R. McKeman, unpubl. data). Along a 20-mile stretch of the Gila River in Grant County, New Mexico, where boxelder is the dominant understory species, 76% of flycatcher nests were placed in boxelder, with the remainder in Russian olive and saltcedar (Skaggs 1996). At the inflows of Tonto Creek and Salt River to Roosevelt Lake in Gila County, Arizona, both of which consist of monotypic stands of saltcedar, 100% of flycatcher nests were placed in saltcedar (Muiznieks *et al.* 1994, Sferra *et al.* 1995, Spencer *et al.* 1996, 1997). On the San Luis Rey River in San Diego County, California, approximately 90% of flycatcher nests were placed in live oak (*Quercus agrifolia*), which became the dominant plant species next to the stream after willows were removed in the 1950s as a water

**Table 2. Nest height and nest substrate height data by riparian habitat type for the southwestern willow fl catcher.**

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

**conservation measure and a reservoir upstream reduced flood frequency and streamflow volume (San Diego Natural History Museum 1995, W.Haas, pers. comm.). Other plant species that southwestern willow flycatcher nests have been documented in include: buttonbush, black twinberry *(Lonicera involucrata),* Fremont cottonwood, white alder *(Alnus rhombifolia*), blackberry *(Rubus ursinus),* Russian olive, and *S. hindsiana.***

**Territory size**

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

**Distribution and abundance**

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

**Phillips (1948) first described *E. t. extimus* from a specimen collected by Gale Monson on the lower San Pedro River near Feldman, AZ. The taxonomic validity of *E. t. extimus* was subsequently reviewed by Hubbard (1987), Unitt (1987), and Browning (1993), and has been accepted by most authors (e.g., Aldrich 1951, Behle and Higgins 1959, Phillips *et al.* 1964, Oberholser 1974, Monson and Phillips 1981, Harris *et al.* 1987, Schlorff 1990, Harris 1991). Unitt (1987) reviewed historical and contemporary records of *E. t. extimus* throughout its range, determining that it had "declined precipitously..." and that although the data reveal no trend in the past few years, the population is clearly much smaller now than 50 years ago, and no change in the factors responsible for the decline seem likely.**

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

**California**

**The historic range of *E. t. extimus* in California apparently included all lowland riparian areas in the southern third of the state. It was considered a common breeder where suitable habitat existed (Wheelock 1912, Willett 1912, 1933, Grinnel and Miller 1944). Unitt (1984, 1987) concluded that it was once common in the Los Angeles basin, the San Bernardino/Riverside area, and San Diego County. Specimen and egg/nest collections confirm its former distribution in all coastal counties from San Diego Co. to San Luis Obispo Co., as well as in the inland counties, Kern,**

Inyo, Mohave, San Bernardino, and Imperial. Unitt (1987) documented that the flycatcher had been extirpated, or virtually extirpated (i.e., few territories remaining) from the Santa Clara River (Ventura Co.), Los Angeles River (Los Angeles Co.), Santa Ana River (Orange and Riverside counties), San Diego River (San Diego Co.), lower Colorado River (Imperial and Riverside counties and adjacent counties in AZ), Owen's River (Inyo Co.), and the Mohave River (San Bernardino Co.). Its former abundance in California is evident from the 72 egg and nest sets collected in Los Angeles County, alone, between 1890 and 1912, and from Herbert Brown's 34 nests and nine specimens taken in June of 1902 from the lower Colorado river near Yuma. Local collections of this magnitude suggest that this subspecies was locally very abundant.

Survey and monitoring efforts since the late 1980s have confirmed the southwestern willow flycatcher's presence at 18 locations on 11 drainages in southern California (including Colorado River). Current known flycatcher breeding sites are restricted to three counties, San Diego, Riverside, Santa Barbara, and Kern. Combining survey data for all sites surveyed since the late 1980s for a composite population estimate, the total known southwestern willow flycatcher population in southern California is 114 territories (Table 3). Of the 18 sites where flycatchers have been documented, 72% (13) contain five or fewer territorial flycatchers; 22% (four sites) have single pairs, or unmated territorial birds. Only three drainages are known to have 20 or more flycatcher territories, the San Luis Rey River (San Diego Co.), South Fork Kern River (Kern Co.), and Santa Ynez River (Santa Barbara Co.).

Authorized (permitted) and unauthorized activities in riparian habitats continue to adversely affect occupied flycatcher habitat in southern California. For example, approximately one km of occupied habitat on the Santa Ynez River in Santa Barbara County was modified or eliminated in 1996 when expansion of agricultural fields resulted in clearing of riparian vegetation (USFWS *in litt.)*. Despite the vast potential for riparian habitat and southwestern willow flycatcher recovery on Camp Pendleton in San Diego County, a programmatic section 7 consultation resulted in a conservation target of only 20 southwestern willow flycatcher pairs (Table 4). The Base currently has approximately 22 pairs of flycatchers, in contrast to the 348 pairs of the sympatric and endangered least Bell's vireo *(Vireo bellii pusillus),* which through the Base's conservation efforts increased from a low of 27 pairs in 1984. A section 7 consultation on the operations of Lake Isabella (Kern County) provided for complete, long-term inundation of the 485-ha South Fork Wildlife Area, also proposed critical habitat for the flycatcher. The Wildlife Area represents a significant recovery area occupied by 8 to 10 pairs of flycatchers before inundation and lies downstream of one of California's largest southwestern willow flycatcher breeding groups on the Kern River Preserve.

**Arizona**

Historic records for Arizona indicate the former range of the southwestern willow flycatcher included portions of all major river systems (Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro) and major tributaries, such as the Little Colorado River and headwaters, and White River. Unitt (1987) noted that "probably the steepest decline in the population levels of *extimus* has

**Table 3. Rangewide population status for the southwestern willow flycatcher (based on composite of 1993-1995 survey data and 1996 survey data from lower Colorado River)[1].**

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

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

**Table 4. Agency actions that have undergone section 7 consultation and levels of incidental take permuted for the southwestern willow flycatcher rangewide.**

| Action (County) | Year | Federal Agency[1] | Incidental Take Anticipated |
|---|---|---|---|
| **Arizona** | | | |
| Eastern Roosevelt Lake Watershed Allotment (Maricopa) | 1995* | Tonto NF | Indeterminable |
| Tonto Creek Riparian Unit (Maricopa) | 1995* | Tonto NF | Indeterminable |
| Cedar Bench Allotment (Yavapai) | 1995 | Tonto NF | Indeterminable |
| Tuzigoot Bridge (Yavapai) | 1995* | NPS | None |

Table 4. Agency actions that have undergone section 7 consultation and levels of incidental take permitted for the southwestern willow flycatcher rangewide.

| Action (County) | Year | Federal Agency[1] | Incidental Take Anticipated |
|---|---|---|---|
| Verde Valley Ranch (Yavapai) | 1995* | Corps | Loss of 2 flycatcher territories |
| Windmill Allotment (Yavapai) | 1995 | Coconino NF | Loss of 1 flycatcher nest annually |
| Romero Road Bridge (Pinal) | 1995* | FEMA | Consultation in process |
| Glen Canyon Spike Flow (Coconino) | 1996 | USBR | Adverse modification of proposed critical habitat |
| Solomon Bridge (Graham) | 1996* | FHWA | Loss of 2 territories |
| Modified Roosevelt Dam (Gila/Maricopa) | 1996* | USBR | Loss of 45 territories; reduced productivity/ survivorship 90 birds |
| U.S. Hwy 93 Wickenburg (Mohave) | 1997* | FHWA | Harassment of 4 pairs |
| Grazing on 13 Allotments (Pinal) | 1996 | Bureau | Consultation in process |
| Lower Gila Resource Plan Amend. (Yuma) | 1997 | Bureau | Indeterminable |
| Lower Colorado River Operations | 1997* | USBR | Indeterminable |
| U.S. F. S. Region 3 Forest Plans | 1997 | USFS | None |
| Safford District Grazing Allotments | 1997 | Bureau | Indeterminable |
| Virgin River Diversion/Fill (Mohave) | 1997 | EPA | None |
| California | | | |
| Prado Basin (Riverside/San Bernardino) | 1994 | Corps | None |
| Orange County Water District (Orange) | 1995 | Corps | None |
| Temescal Wash Bridge (Riverside) | 1995 | Corps | Harm to 2 flycatchers |
| Camp Pendleton (San Diego) | 1995 | DOD | Loss of 4 flycatcher territories |
| Lake Isabella Operations 1996 (Kern) | 1996* | Corps | Inundation 700 ac proposed critical habitat; reduced productivity 14 pairs |
| Lake Isabella Long-Term Operations (Kern) | 1997* | Corps | Consultation in process |
| Nevada | | | |
| Gold Properties Resort (Clark) | 1995 | BIA | Harm to 1 flycatcher from habitat loss |
| New Mexico | | | |
| Corrales Unit, Rio Grande (Bernalillo) | 1995 | Corps | None |
| Rio Puerco Resource Area | 1996 | Bureau | Consultation in process |

Table 4. Agency actions that have undergone section 7 consultation and levels of incidental take permitted for the southwestern willow flycatcher rangewide.

| Action (County) | Year | Federal Agency | Incidental Take Anticipated |
|---|---|---|---|
| Farmington District Resource Management Plan | 1996* | Bureau | Consultation in process |
| Mimbres Resource Area Management Plan | 1996* | Bureau | Consultation in process |

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

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

occurred in Arizona." The bird has been extirpated, or virtually extirpated from the Santa Cruz River (Pima Co.), upper San Pedro River (Cochise Co.), lower San Pedro River at PZ Ranch (Pinal Co.), Blue River (Greenlee Co.), Colorado River at Lees Ferry (Coconino Co.), Colorado River (Yuma Co.), Gila River (Yuma Co.), and Verde River at Tuzigoot Bridge (Yavapai Co.). Currently, 150 territories are known from 39 sites along nine drainages statewide, including the Colorado River (Table 3). As in California, the majority of breeding groups in Arizona are extremely small; of the 39 sites where flycatchers have been documented, 74% (29) contain five or fewer territorial flycatchers. Moreover, 15 to 18% of all sites in Arizona comprise single, unmated territorial birds.

Permitted activities and stochastic events also continue to adversely affect the distribution and extent of occupied and potential breeding habitat throughout Arizona. For example, the Bureau of Reclamation was provided maximum flexibility in operating the new conservation space at Roosevelt Lake, which at capacity would totally inundate the riparian stands occupied by Arizona's largest breeding group (Table 4). As a result of Reclamation's operations on the lower Colorado River, the 445-ha Goodding's willow stand at the inflow to Lake Mead has been partially inundated since September 1995. Despite partial inundation, approximately eight pairs of flycatchers were documented nesting at the inflow during the 1996 breeding season. As of April 1997, however, inundation of that habitat was nearly complete. Reclamation (1996) projected the mortality of that stand sometime during 1997 as a result of prolonged inundation of root crowns (i.e., > two growing seasons).

In June of 1996, a catastrophic fire destroyed approximately one km of occupied habitat on the San Pedro River in Pinal County. That fire resulted in the forced dispersal or loss of up to 8 pairs of flycatchers (Paxton *et al.* 1996). In June of 1995, approximately three miles of occupied riparian habitat burned on the Gila River in Pinal County (Bureau of Land Management *in litt.)*. It is not known how many flycatchers occupied that location. Approximately two km of riparian habitat burned in Graham County near Safford during 1996. It is not known whether that area

**was occupied by southwestern willow flycatchers; however, it did lie just downstream of an occupied patch that was partially eliminated by reconstruction of the Solomon Bridge (Table 4). The anticipated effect of construction of the Solomon Bridge was dispersal of flycatchers into adjacent habitat. The capability of adjacent habitat to absorb that dispersal was compromised by the fire near Safford.**

**New Mexico**

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

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

**Unitt (1987), Hubbard (1987), and more recent survey efforts have documented extirpation or virtual extirpation in New Mexico on the San Juan River (San Juan Co.), near Zuni (McKinley Co.), Blue Water Creek (Cibola Co.), Rio Grande (Dona Ana Co. and Socorro Co.). Survey and monitoring efforts since 1993 have documented 173 flycatcher territories on eight drainages (Table 3). Approximately 135 of these territories occur in remnant strips of riparian forest within a 20-mile stretch of the Gila River in Grant Co. (Skaggs 1996). This area contains the largest known breeding group rangewide. Outside Grant County, however, few flycatchers remain. Statewide, 84% (16) of the 19 sites with flycatchers contain five or fewer territorial birds. Six sites consist of single pairs or unmated territorial flycatchers, and six others contain two pairs or two unmated territorial birds.**

**Texas**

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

**Colorado**

**The taxonomic status and the historic distribution and abundance of willow flycatchers in southwestern Colorado remains unclear due to a lack of specimen data and breeding records. Preliminary data on song dialects suggests that the few birds recently documented in southwestern Colorado may be *E. t. extimus.* These sightings have prompted State and Federal agencies to delineate provisional boundaries for *E. t. extimus* and sponsor statewide survey efforts. Survey efforts since 1993 have documented a total of six locations in Delta, Mesa, and San Miguel counties where willow flycatchers have been found (Table 3). Two locations have single, unmated males; two locations have single pairs, and the remaining two locations are comprised of four to seven territories each.**

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

**Utah**

**Specimen data reveal that *E. t. extimus* historically occurred in southern Utah along the Colorado River, San Juan River, Kanab Creek, Virgin River, and Santa Clara River (Unitt 1987). The northern boundary of *E. t. extimus* in south-central Utah remains unclear due to a lack of specimen data from that region. The southwestern willow flycatcher no longer occurs along the Colorado River in Glen Canyon where Lake Powell inundated historically-occupied habitat, nor in unflooded portions of Glen Canyon near Lee's Ferry where flycatchers were documented nesting in 1938. Similarly, recent surveys on the Virgin River and tributaries and Kanab Creek have failed to document the presence of flycatchers (McDonald *et al.* 1995). Single, territorial males and possibly a pair of flycatchers was documented at two locations on the San Juan River (San Juan Co.) in 1995, but breeding was not confirmed (Sogge 1995b, R.Marshall, pers. obs.). The population totals for Utah are summarized in Table 3.**

**Nevada**

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

**Rangewide, the current known population of southwestern willow flycatchers stands at approximately 454 territories (Table 3). These results indicate a critical population status; more than 75% of the locations where flycatchers have been found consist of five or fewer territorial birds and up to 20% of the locations comprise single, unmated individuals. The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances [e.g., approximately 88 km straight-line distance between breeding flycatchers at Roosevelt Lake, Gila Co., and the next closest breeding groups known on either the San Pedro River (Pinal Co.) or**

**Verde River (Yavapai Co.)]. Additional survey effort, particularly in southern California, may discover additional small breeding groups. However, rangewide survey efforts have yielded positive results in less than 10% of surveyed locations. Moreover, survey results reveal a consistent pattern rangewide: the southwestern willow flycatcher population as a whole is comprised of extremely small, widely-separated breeding groups or unmated flycatchers.**

**The data presented in Table 3 represents a composite of surveys conducted since 1992. Locations that had flycatchers for only one year were tabulated as if the location is still extant. Given that extirpation has been documented at several locations during the survey period, this method of analysis introduces a bias that may overestimate the number of breeding groups and overall population size. In addition, females have been documented singing as frequently as males. Because the established survey method relies on singing birds as the entity defming a territory (Tibbitts *et al.* 1994), double-counting may be another source of sampling error that biases population estimates upward. The figure of 454 southwestern willow flycatcher territories is an approximation based on considerable survey effort, both extensive and intensive. Given sampling errors that may bias population estimates positively or negatively (e.g., incomplete survey effort, double-counting males/females, composite tabulation methodology), natural population fluctuation, and random events, it is likely that the total population of *E. t. extimus* is fluctuating at between 300 and 500 territories with a substantial proportion of individuals remaining unmated. This figure is alarming because even if all extant sites were fully protected, at such low population levels random demographic, environmental, and genetic events could lead to extirpation of breeding groups and eventually render this species extinct. The high proportion of unmated individuals documented during recent survey efforts suggest the southwestern willow flycatcher may already be subject to a combination of these factors (e.g., uneven sex ratios, low probability of finding mates in a highly fragmented landscape).**

**<u>Southwestern willow flycatcher reproductive success</u>**

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

**On the South Fork Kern River (Kern Co., CA), Whitfield (1993) documented a precipitous decline in the flycatcher breeding population from 1989 to 1993 (44 to 27 pairs). During that same period cowbird parasitism rates between 50 and 80 percent were also documented (Whitfield 1993) (Table 5). A cowbird trapping program initiated in 1993 reduced cowbird parasitism rates**

to < 20%. Flycatcher population numbers appear to have stabilized at 32 to 34 pairs in 1993, 1994, and 1995 (Whitfield 1994, Whitfield and Strong 1995). Predation rates have remained relatively constant from 33 to 47% (Table 5). Flycatcher nest success increased from 26% before cowbird trapping to 48% after trapping was started (Whitfield and Strong 1995). In addition, the number of young fledged also increased from 1.01 young/pair to 1.73 young/pair during the same period.

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

The number of unmated, territorial flycatchers and paired flycatchers detected on the Colorado River in the Grand Canyon has remained low since monitoring began in 1982. Brown (1994) reported that at least 50% of flycatcher nests monitored in the Grand Canyon between 1982 and 1987 were parasitized by brown-headed cowbirds. Brown (1994) did not report data on productivity. Given that the probability of successfully fledging a single flycatcher chick is low when a nest is parasitized and the high proportion of nests parasitized during Brown's study, it is likely that flycatcher productivity during that period was also low. In 1992, when comprehensive nest monitoring was initiated, two pairs were present, with only one establishing a nest. That nest successfully fledged three 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 (Table 5). No flycatchers were successfully reared in Grand Canyon in 1993 (Sogge *et al.* 1993). Four pairs and one unpaired male occupied Grand Canyon in 1994. Nine nests were attempted, at least four of which were parasitized by cowbirds. All nesting attempts eventually failed due to predation or abandonment (Sogge and Tibbitts 1994). In 1995, one breeding pair and three unpaired males were detected (Sogge *et al.* 1995). One nest was found with a single cowbird egg on May 23. On June 4, three 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. This low rate of reproduction indicates that, even with the protections provided annually by the National Park Service (i.e., camping and other activities are

**Table 5. Nest predation and brood parasitism rates documented for the southwestern willow flycatcher across its range[1].**

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

Sources: Sogge and Tibbitts (1992), Sogge *et al.* (1993), Brown (1994), Maynard 1994, Muiznieks *et al.*(1994), Sogge and Tibbitts (1994), Cooper (1996), Skaggs (1995), Sogge (1995a), Sogge *et al.* (1995), Spencer *et al.* (1995), Whitfield and Strong (1995).
[2] Proportion of nests containing at least one brown-headed cowbird egg.
[*] Brown-headed cowbird control program implemented.

**prohibited at flycatcher breeding sites), this area is a population sink (Pulliam 1988) where reproduction is not adequate to replace adults and population persistence requires emigration from other breeding areas.**

**On the Verde River in Yavapai County, Arizona, Ohmart (pers. comm.) discovered four pairs of flycatchers in 1992 at Clarkdale. The breeding status and reproductive success of those birds was not determined. In 1993, two pairs were present and one nest was documented. The nest contained a single cowbird nestling and eventually failed (Muiznieks *et al.* 1994) (Table 5). 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 a more limited monitoring effort in 1995 indicate that two unpaired males occupied the Clarkdale site (Sogge 1995a). Surveys during the 1996 breeding season failed to detect any southwestern willow flycatchers at the Clarkdale site. However, one nesting pair of flycatchers was discovered at Tavasci Marsh approximately 2.4 km east of the Clarkdale site. Thus, although since its discovery the Clarkdale site has had only several pairs, cowbird parasitism and nest loss due to depredation resulted in poor reproductive success and may have been responsible for abandonment or extirpation at this site.**

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

**On the Little Colorado River in Apache Co., Arizona, a cowbird parasitism rate of 22% was documented in 1994 (Table 5). In 1995 the parasitism rate was zero. Nest loss due to depredation, however, remained relatively constant (Table 5). On the Rio Grande in Socorro Co., NM, parasitism rates increased from 20% in 1994 to 66% in 1995. In 1996, water was diverted above that breeding location and no flycatchers were present (D. Leal, pers. comm.). It is not known whether those birds dispersed elsewhere or if that breeding group was extirpated. Finally, on the Gila River in Grant Co., New Mexico, Skaggs (1995) monitored 46 nests from a breeding**

group of approximately 135 pairs. From a subset of 25 nests whose contents were checked directly or inferred through observation, Skaggs estimated a cowbird parasitism rate of between 16 and 27% for 1995 (Table 5).

The data presented above and in Table 5 demonstrate that cowbird parasitism and nest depredation are affecting southwestern willow flycatchers throughout their range. Cowbirds have been documented at more than 90% of sites surveyed (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Camp Pendleton 1994, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, T. Ireland 1994 *in litt.*, Whitfield 1994, C. Tomlinson 1995 in *litt.*, Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, Maynard 1995, McDonald *et al.* 1995, Sferra *et al.* 1995, Sogge 1995a, Sogge 1995b, Sogge *et al.* 1995, Cooper 1996, San Diego Natural History Museum 1995, Stransky 1995, Whitfield and Strong 1995, Griffith and Griffith 1996 in *litt.*, Skaggs 1996, Spencer *et al.* 1996). Thus, the potential for cowbirds to be a persistent and widespread threat remains high. Cowbird trapping has been demonstrated to be an effective management strategy for increasing reproductive success for the southwestern willow flycatcher and for other endangered Passerines (e.g., least Bell's vireo *[Vireo bellii pusillus]*, black-capped vireo [*V. atricapillus]*, golden-checked warbler *[Dendroica chrysoparia]*. It may also benefit juvenile survivorship by increasing the probability that parents fledge birds early in the season. Expansion of cowbird management programs has the potential not only to increase reproductive output and juvenile survivorship at source populations, but also potentially to convert small, sink populations into breeding groups that contribute to population growth and expansion.

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

## 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 that are contemporaneous with the consultation process. The environmental baseline defines the 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.

Southeastern Arizona has been influenced by Europeans and their descendants for centuries and by Native Americans for much longer (Bahre 1991). The effect of this use, though not always

**obvious, has been pervasive and widespread. These changes can be seen on the Empire-Cienega Resource Conservation Area (RCA). Cattle grazing has occurred in southern Arizona since the 1600's (Allen 1989). In the 1880's, there were 6,000 cattle and 23,000 sheep grazed on the Empire and Cienega Ranches (Wagoner 1960).**

**The Empire-Cienega RCA is situated just north of Sonoita and between the Santa Rita and Whetstone Mountains. The RCA contains 36,498 acres of public land and 37,462 acres of State owned land. The average elevation of the ranch is about 4,600'. The annual rainfall is extremely variable from year to year but averages 15 inches. Thermal maximums periodically reach 100°F in the summer and freezing temperatures are common in the winter.**

**The public lands within the Empire-Cienega RCA were acquired through private land exchange. Interim management guidelines for this area were developed to preserve, protect, and enhance the multiple-use values of the Empire-Cienega RCA properties, including the extensive riparian areas along Cienega Creek. Present and past activities, including cattle grazing, road building, and stream diversions, have influenced stream function along Cienega Creek, thus affecting the federally endangered Gila topminnow.**

**Based on two separate watershed evaluations, watersheds on the RCA are considered to be in satisfactory condition (Bureau files, Smith et. al 1975). Overall, the watersheds exhibit a low susceptibility to erosion due to the high amount of coarse fragments in the surface and the existing vegetative cover. The deep clay and loamy soils immediately next to portions of Cienega Creek and some major tributaries are highly susceptible to gully erosion and soil piping. Several areas have large active gullies and deep holes resulting from continuing soil movement. The soils of the loamy and clay bottom range sites are generally deep, overlaying unconsolidated alluvium. Without sufficient vegetation cover these soils have a high potential for soil erosion. Bed materials consist of sand, gravel, and silt/clay.**

**Soil and water resources have been altered by past activity. The segment of stream adjacent to the Cienega Ranch was altered for agricultural operations some time in the 1970's. A drag line was used to dig a canal to divert large flood flows around the areas of Cienega Creek bottom lands that were brought under cultivation. This canal bisected an existing marsh draining a large portion of its surface water. Today, this marsh exists as an altered remnant near the Cienega Ranch. Over the years the unlined canal has eroded due to its lack of sinuosity, channel roughness, and bank stability. This has resulted in severe erosion from channel adjustments of the canal brought on by flooding. Below a concrete ford that acts as a control to channel adjustment, the canal has widened to over 100' wide and 20' deep. More erosion is evident with each subsequent large flood. Where the canal diversion begins, deposition has begun to fill the now intermittent Cienega Creek channel and scouring has deepened the canal. As a result a sand bag dam has been installed to keep some base flow in the Cienega Creek Channel to maintain the existing riparian vegetation. During the 1970's, three dikes were installed adjacent to the farmed bottom lands for pumping irrigation water. These dikes back-up water but have largely filled with sediment over the years. The last dike is eroding at a low point (make-shift overflow spillway) which will short-cut a meander in the creek when it finally breaches.**

**The Bureau continues to pursue land acquisitions in the watershed that will benefit the ecosystem by improving its ability to better manage the watershed and improve riparian function to benefit fish and wildlife resource. The acquisition program has put new lands into public ownership with aquatic resources that provide opportunities for expanding the distribution of the Cienega Creek population of Gila topminnow.**

## Status of the Species within the Action Area

### Gila Topminnow

**Cienega Creek is one of the last places in Arizona supporting an intact native fish fauna that is uncontaminated by exotic fish. Cienega Creek provides habitat essential for the survival for the Gila topminnow. It is one of nine remaining natural topminnow sites (Bagley *et al.* 1991), and one of only three natural sites not contaminated by mosquitofish. Protection of Cienega Creek from nonnative fish incursion and protection and restoration of Gila topminnow habitat in the creek is considered fundamental to the survival and recovery of the species (USFWS 1994b).**

**In addition, Cienega Creek supports by far the largest population of topminnow in the U.S. A fall population estimate for Cienega Creek was about 2.5 million topminnow, conservatively, for 6.5 miles of perennial habitat sampled. Another 1.1 miles of topminnow habitat in Mattie Canyon and 0.9 miles in Empire Gulch, tributaries to Cienega Creek, were not included in this estimate. Some areas of warmer groundwater discharge held extremely high densities of topminnow (566/square meters)(Simms and Simms 1992).**

**Open water fish and amphibian habitats along Cienega Creek and its tributaries Mattie Canyon and Empire Gulch include small, shallow off-channel ponds; deep, narrow, vertical walled pools; shallow, bowl shaped pools; low gradient riffles; narrow, swift runs; water falls; cascades; sheet flow over bedrock slabs; and dense marsh. Common fish habitat associations in Cienega Creek are deep, vertical walled, slit-like pools connected by narrow, swift runs surrounded by several feet of marsh on both sides. Riffles with gravel or cobble substrate are less common. Mattie Canyon has a more typical pool, riffle, and run habitat association. Marsh habitat is less developed along this tributary. Empire Gulch has a minimal base flow with large pools connected by marsh or runs. Stream gradients are low, usually less than 1%.**

**Fine textured alluvium (silt, sand, and clay) and marsh adapted plants fill shallow channels with low banks and wide flood plains. These aquatic habitats are bordered by Goodding willow, cottonwood, ash, and other riparian trees. The broad floodplains are covered with extensive stands of sacaton grass.**

**Fish habitat was inventoried in 1989 and 1990 using a basin type survey method where all habitat on perennial portions of Cienega Creek were measured. The habitats were broken into categories with the following percentages based on length: Marsh 49.9%, pool 22.1%, glide 13.0%, riffle 11.6%, rapid (fast run) 1.6%, backwater pool 1.1%, and all others (cascade, fall, chute, run)**

0.7%. All pool habitat types lumped together equal 36.2%. Pool habitats are abundant; these are used heavily by all three species of fish. This mix of habitats suggests that habitat diversity is adequate. However, studies concerning stream habitat diversity and desert fishes are limited.

The fall fish inventory was conducted annually over a five-year period in selected sites throughout Cienega Creek (Table 6). Sites were blocked from ingress and egress and systematically sampled until approximately 90% of the Gila topminnow were removed. These data show that relatively large numbers of Gila topminnow and longfin dace are consistently collected but that average density varies widely. This information suggests that the habitat supports a large fall topminnow population in Cienega Creek. Because adult Gila chub are not effectively caught with seines, this data largely represents the incidental capture of juvenile chub.

Simms and Simms (1992) found the densities of Gila topminnow in Cienega Creek to be greater in pool, glide and backwater habitats and less dense in marsh, riffle, chute, cascade, and fall habitats. They occurred more frequently over sand substrates than over other substrates.

Gila topminnow occur throughout Cienega Creek on Bureau managed lands except for the intermittent segment through the project area where they occur seasonally during wet years. Gila topminnow have been monitored by Bureau personnel at five or more locations annually since 1990. The population trend is relatively stable and topminnow widespread and abundant.

**Southwestern Willow Flycatcher**

**Numbers of Individuals/populations in the Action Area Affected**

The project area is part of an important migratory bird nesting area for many neo-tropical birds. Cienega Creek may provide suitable habitat for the endangered southwestern willow flycatcher. The Bureau has 30 banding records of willow flycatchers along Cienega Creek from 1987 through 1993; five of these records are from the spring while 34 are from the fall. However, there are no breeding records for this species from Cienega Creek. In May of 1993 a survey was conducted using the accepted recorded call play back method. No willow flycatchers were discovered during this survey. However, sampling has not been adequate to discount the presence of nesting willow flycatchers. No breeding birds were observed on public land in the Cienega Creek riparian areas despite three years of call survey (Whetstone 1996). Very few individual birds are found along the Cienega Creek. There are no known breeding flycatchers on public land on Cienega Creek (Sferra et al. 1997, Bureau).

Table 6. Summary of fall fish monitoring data 1989 through 1994, Cienega Creek, Pima County, Arizona. Fish numbers do not represent population estimates but, rather, depletion totals (% of years total catch).

| Year | No. Sites | Total Fish | Number (%) | | | POOCOC/ Sq.ft |
|---|---|---|---|---|---|---|
| | | | POOCOC | AGCH[2] | GIIN | |
| 1989 | 5 | 8,456 | 7,819 (92.5) | 611 (7.2) | 26 (0.3) | 5.3 |
| 1990 | 3 | 651 | 440 (67.6) | 210 (32.3) | 1 (0.1) | 0.7 |
| 1992 | 5 | 12,421 | 10,602 (85.4) | 1,756 (14.1) | 63 (0.5) | 4.1 |
| 1993 | 8 | 4,043 | 1,669 (41.3) | 2,308 (57.1) | 66 (1.6) | 3.2 |
| 1994 | 8 | 9,172 | 7,563 (82.5) | 1,503 (16.4) | 106 (1.1) | 2.5 |

POOCOC = Gila topminnow [2] AGCH = Longfin dace [3] GIIN = Gila chub

## EFFECTS OF THE ACTION

Habitat conditions are generally good at Cienega Creek as indicated by a habitat inventory in 1989 and subsequent annual fish population sampling. Riparian area function ranges from unsatisfactory to satisfactory. Riparian Area Condition Evaluations in 1993 indicate that riparian area health is improving and banks are generally stable. The creek has areas that are not functioning well such as the reach with headcut erosion that threatens to channelize 2.5 miles of creek and the 2.5 mile reach in the project area. The watershed was evaluated for erosion and ground cover in 1974 and 1991 and was found to be in satisfactory condition on both occasions. Vegetative ground cover comprised 49 and 57 percent, while bare ground was 17 and 23 percent in 1974 and 1991 respectively. No unsurveyed potential habitat has been identified in the project area.

Should the intermittent flows in this segment allow topminnow to migrate into areas where heavy equipment is working there is some risk of mortality. This could occur in the canal or historic stream channel following reconnection. The proposed mitigation features, however, makes this unlikely.

Short-term increased sedimentation immediately following project completion may affect Gila topminnow through decreased productivity of food items and filling of pool habitat. The filling

of pool habitats where topminnow reside is very unlikely due to the sediment catching nature of one mile length of moist, well vegetated channel between the project area and surface water with fish. The impact of sediment that could cover food items used by the Gila topminnow is likely to be minimal as well. About 3/4 of a mile of habitat located above the confluence of Mattie Canyon would receive greater quantities of flood water and sediment once the dike is plugged and flood flows are allowed to move through the project stream reach. This additional water and sediment would in-crease the disturbance in this reach making it more dynamic. Dense herbaceous vegetation and willow tree cover is already well established in this reach and has been determined to be in "proper functioning condition" by the Bureau. It is possible that some minor channel adjustment may occur to accommodate the larger volumes of water and sediment that the channel has to pass. The changes in this reach may be negligible due to the wide flood plain ( > 1/4 mi.) that would absorb the energy of large flood events and the high vigor of the riparian plant community. It is very likely that more trees would establish through the project area down to the confluence of Mattie Canyon due to increased seed bed formation as a result of re-establishing a natural flood pattern. As a result, it is anticipated that the hydrologic function of the creek will improve to the point that perennial surface water is established in the project reach. The hydrologic function will be improved both by increased infiltration because of higher water surface elevations during run-off events, and increased retention times of floods from increased channel roughness from increasing riparian vegetation density (Jacobson and Froehlich 1992).

It is possible that the topminnow could be affected by limited siltation for up to three years following the project. Food production and availability may be temporarily diminished after flooding. Should the intermittent flows bring topminnow into the project area there is the possibility of mortality occurring if mitigation measures are not taken.

If the project is successful, it may lead to the improvement of more than two miles of riparian and aquatic habitat that will have a long-term and lasting benefit to the Gila topminnow. In addition, the proposed project will preclude the possibility that a future flood may remove the modest cement Cienega Ranch ford; thereby allowing the head cut currently stopped at this point to degrade miles of occupied topminnow habitat upstream. This project implements the Sonoran topminnow recovery plan part 1.212 - enhance and improve existing habitat (USFWS 1984).

In addition, the removal of Dikes # 1 and #3 would eliminate ponding that provides an attractive opportunity to stock non-native fish or frogs. These organisms would be very detrimental to populations of Gila topminnow.

The southwestern willow flycatcher may be affected by the cutting of poles and removal of deer grass plants from the canal for rehabilitation of areas scarred by heavy equipment. The surveys in the area have shown that this species passes through this area but no nesting activity has been reported. A survey of the project area conducted in June of 1997 did not reveal the presence of willow flycatchers and an examination of the habitat indicated that it was of insufficient density to hold breeding willow flycatchers. The canal and Mattie Canyon provide about 2.1 miles of habitat (41.0 acres) that has some potential for colonization by willow flycatcher. The canal would have flood flows curtailed leading to a decline in recruitment of trees; this would lead to

a decline in habitat quality over the 3/4 mile reach with 11.2 acres of riparian habitat. Mattie Canyon is likely to progress toward marsh (or cienega) type habitat once flood flows are curtailed. This conversion may provide vegetative characteristics conducive to colonization by willow flycatcher. Other areas that have "cienega" habitat often have patches of dense willow growth even though seed beds from scouring floods do not occur. Cottonwoods will become rare as marsh habitat expands in the reach. In addition, the creek channel through and below the project area is anticipated to have improved riparian function is about two miles. This reach is likely to have vegetative characteristics suitable for colonization by willow flycatchers. Heavy equipment operating in May or June could be disruptive to this sensitive bird. However, the activity would be restricted to the project area and adjacent stream reaches that afford denser breeding cover and normally provide more solitude than the project reach even without project activities. Monitoring of the success of the project after the project is completed may result in some short term disturbance for a few minutes or hours annually. This disruption level is incidental and not likely to have any lasting effect.

Because of the loss of the stream crossing at dike #3, traffic will increase on the road on the west side of Cienega Creek. The added traffic on this road may result in additional recreational activity occurring along portions of this segment of creek. Additional human activity may disturb flycatchers during the breeding season should this species begin to colonize Cienega Creek. Offsetting this affect is the effect of improved riparian function. After 3 or more years this reach of Cienega Creek is anticipated to improve in tree density and structure that may promote colonization by the willow flycatcher.

Poling of trees for revegetation efforts during the stream restoration may degrade about 3/4 mile of potential habitat (11.2 acres) along the canal, thereby diminishing its potential for its eventual colonization. In addition, the activity of heavy equipment for 2 to 3 months during the breeding and post-breeding season may disturb this bird. Blasting to remove the dike also has the potential to disturb migrating flycatchers. Blasting outside the migration periods will minimize the chance that flycatchers are present. Some increase in human activity may occur in the project area because of the rerouting of traffic.

The magnitude of these effects is negligible, however. The trees in the canal will survive once the canal is plugged because there is subirrigation from subsurface seepage. However, without flood flows, these trees will not be replaced by natural regeneration. Heavy equipment will be working in discrete areas with intermittent flow and less than average vegetative structural diversity and density (J. Whetstone, pers. comm.); this makes encountering willow flycatchers unlikely. The road on the west side of the creek will handle a small increase in traffic and may result in a small increase in human activity along this reach of creek.

**Cumulative Effects of the Proposed Action**

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities on endangered or threatened species or critical habitat that are reasonably certain to occur during the Federal activity subject to consultation. Future Federal actions are subject to the

**consultation requirements established in section 7 and, therefore, are not considered cumulative in the proposed action.**

**The private and state land in the area have little protection from possible development that could result in loss of habitat for this species. Increased levels of groundwater pumping as the area is developed in the future is clearly a threat to the continued existence of riparian habitat in the Cienega Creek basin (Knight 1996, Huth 1996).**

**Stocking of private waters with non-native fish and fish placed in the watershed by the county health department or public could result in contamination of Cienega Creek. This has resulted in severe population reductions or extirpation in the past in other locations (Hendrickson and Brooks 1991).**

**In addition to the public and State Trust lands which make up the grazing allotment, several parcels of private land occur within the allotment boundaries. The 320-acre parcel of private land in Fresno Pasture is grazed as a part of the pasture.**

**Adjacent to the allotment are also National Forest lands and extensive private lands, which include the town of Sonoita. Areas around Sonoita have been subdivided and are being developed as "ranchettes." Potential impacts associated with growth in the Sonoita area include changes in the watershed/water balance of the Cienega Creek subbasin, the presence and transport of exotic fish and bullfrogs, and increased recreation in the RCA. Ground water use in the Sonoita area would increase with growth and runoff patterns would also change. Sedimentation associated with land clearing activities and increased runoff may also occur. How much of the area could be developed and at what densities; however, is not known at this time. Additional uses that could occur on private lands are livestock grazing and small scale agriculture.**

**Adjacent National Forest lands are managed for multiple use. The primary uses are recreation and grazing and are not subject to cumulative effects analysis.**

**Summary**

**The environmental baseline shows that the project area has undergone extensive modification both historically and currently. The action proposed by the Bureau would improve habitat for both species. The Gila topminnow has few extant natural populations and Cienega Creek is by far the largest natural population remaining. The southwestern willow flycatcher would experience improved habitat suitability. The cumulative effects appraisal illustrates that the ecosystem of which the RCA is a part, is experiencing a broad array of pressures associated with human activities.**

## CONCLUSION

**After reviewing the status of the Gila topminnow and southwestern willow flycatcher, the environmental baseline for the action area, the effects of the proposed stream restoration project,**

**and the cumulative effects, it is the Service's biological opinion that the Cienega Creek stream restoration project, as proposed, is not likely to jeopardize the continued existence of these species. No critical habitat has been designated for the Gila topminnow, therefore, it will not be affected. Although critical habitat has been designated for the southwestern willow flycatcher, there is no designated critical habitat within the action area; and, therefore, it will not be affected.**

## INCIDENTAL TAKE

**Sections 4(d) and 9 of ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defmed 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. Harass means actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, 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 if such taking is in compliance with the terms and conditions of this incidental take statement.**

**The measures described below are non-discretionary, and must be implemented by the agency so 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. The Bureau has a continuing responsibility to regulate the activity covered by this incidental take statement. If the Bureau (1) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.**

## AMOUNT OR EXTENT OF TAKE

**The Service anticipates that the proposed Cienega Creek stream restoration project will result in incidental take of Gila topminnow and southwestern willow flycatchers. Incidental take of the Gila topminnnow will be difficult to detect for the following reasons: dead fish are difficult to fmd, cause of death may be difficult to determine, and losses may be masked by seasonal fluctuations in numbers or other causes. However, take of Gila topminnow may occur if flow into the project reach during construction activities occurs. Take may also occur downstream of the project due to changes in water quality *(ie.* increased sedimentation). Take will be considered exceeded if (1) more than 10 dead Gila topminnow are found in the project area; or 2) new headcuts begin at the present location of the dikes. An unlimited number of Gila topminnow may be incidentally taken by capture when they are moved from the project area to permanent water in Cienega Creek.**

The Service believes that the proposed action may result in take of southwestern willow flycatchers. Incidental take of southwestern willow flycatchers is difficult to detect or determine because the number and location of flycatchers varies from season to season. Migrants may occur during construction activities in the fall. Harassment may occur at this time. Take will be considered exceeded if surveys detect two southwestern willow flycatchers using the area during construction activity.

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Gila topminnow or southwestern willow flycatcher nor will it result in adverse modification of critical habitat.

## REASONABLE AND PRUDENT MEASURES

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

1. Conduct all proposed actions in a manner that will minimize take of Gila topminnow and southwestern willow flycatchers.

2. Monitor the fish and bird community and associated habitat in the project reach.

3. Maintain complete and accurate records of fish and avian populations and habitat monitoring of the riparian zone and all actions taken to implement the terms and conditions of this biological opinion.

### Terms and Conditions for Implementation

To be exempt from the prohibitions of Section 9 of the Act, the Bureau's Safford District, Tucson Resource Area is responsible for compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary and should be included in any permit or lease.

1. The following terms and conditions implement reasonable and prudent measure 1.

    1.1. Implement the stream restoration project as outlined in the description of the proposed action contained in this opinion.

        a. If water enters the project site in either the stream or the canal, all work within the floodplain will cease until the water is gone, or a qualified fisheries biologist must be called to remove any Gila topminnow that may have entered the project site.

**b. To minimize the chance of the dike removal causing catastrophic headcuts, construct the new road crossing before the dikes are removed. Leave the canal open and the berm that is the present stream crossing in place to shunt flood flows away from the area of dike removal.**

**c. To minimize the chance of migrant southwestern willow flycatchers being harassed, blasting of the cement dike will occur before September 1, 1998. Conduct a survey for southwestern willow flycatchers before work commences in June or recommences in the fall beginning September 1.**

**d. A biologist familiar with the project will inspect active construction at least once a week.**

**2. The following terms and conditions implement reasonable and prudent measure 2.**

**2.1. The Bureau will include this reach in current fish monitoring and surveys done annually.**

**2.2. A station in this reach will be established for the riparian condition monitoring sites, which were established in 1989 and reread in 1994. These will be assessed every five years.**

**2.4. The proposed cross sections will be monitored annually the first three years after the project is complete. Thereafter, they will be monitored every five years until this stream reach is considered in proper functioning condition. Photos will be taken at the six stations before the project starts.**

**2.5. Conduct surveys before the project commences in June. Conduct additional surveys before the project recommences, beginning September 1, to ensure that migrating flycatchers are not present.**

**a. If flycatchers are detected at any time of year, cease all activity, contact the Service, and determine their breeding status using the following criteria,:**

- **repeated presence of a non-singing southwestern willow flycatcher, or a southwestern willow flycatcher using vocalizations other than the primary song next to an individual exhibiting territorial behavior;**
- **observation of a southwestern willow flycatcher carrying nesting material;**
- **observation of southwestern willow flycatchers copulating; verification of a willow flycatcher nest;**
- **observation of a southwestern willow flycatcher carrying food items; and/or**

- observation of a juvenile southwestern willow flycatcher.

b. If breeding status is confirmed or suspected, continue monitoring efforts by visiting breeding locations at least once during each of the three 10-day periods of June and July or until observation indicates that southwestern willow flycatcher have stopped breeding efforts. Collect breeding and habitat data as outlined in the survey protocol (Tibbitts *et al.* 1994) and submit the completed data forms to AGFD Partners in Flight Program.

3. The following terms and conditions implement reasonable and prudent measure 3.

3.1. Maintain complete and accurate records of fish populations and habitat monitoring. Report on actions taken to implement the terms and conditions of this biological opinion. The report will include an assessment of the effectiveness of the project and the effectiveness of the terms and conditions and other monitoring and mitigation actions.

3.2. Copies of the records required in 3.1 above will be provided annually to the Service by July 1, beginning in 1999.

## CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the Act's purposes 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.

1. As has been previously discussed and agreed upon, the Bureau begin consultation on road maintenance in the Empire-Cienega RCA. Road maintenance and road closures be addressed in the land use plan.

2. The Bureau identify unoccupied sites on the Empire-Cienega RCA that are suitable for Gila topminnow. Populations apart from Cienega Creek are beneficial in that they provide refugia in case of unforeseen impacts to the Cienega Creek population. This effort be in consultation and coordination with the Service, AGFD, and Cienega Creek allotment permittee.

3. The Bureau conduct a riparian ecological site inventory as planned. These data will aid planning and management for this area.

4. The land use plan in preparation address management strategies that enhance the probability of southwestern willow flycatchers establishing a breeding population on the

**Empire-Cienega RCA. The establishment of a breeding population of willow flycatchers on the RCA may constitute new information that would require reinitiation of consultation. In addition, management of candidate (and former candidate) species be addressed in the land use plan.**

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

**This concludes formal consultation on the actions outlined in the January 24, 1995, request for formal consultation on the proposed Cienega Creek Interim Grazing Plan for the Empire-Cienega Allotment. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is later modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.**

**If we can be of further assistance, please contact Doug Duncan (520-670-4860) or Angie Brooks (602-640-2720).**

**Jerry J. Brabander**

cc: **Regional Director, Fish and Wildlife Service, Albuquerque, NM (ES)**

**Director, Arizona Game and Fish Department, Phoenix, AZ**
**W.L. Minckley, Recovery Team, Phoenix, AZ**

# REFERENCES CITED

Abarca, F. J., D. Hendrickson, and J. R. Simms. 1994. Draft revised Gila topminnow recovery plan.

Aldrich, J. 1951. A review of the races of the Traill's flycatcher. Wilson Bulletin 63:192-197.

American Ornithologists' Union. 1983. Checklist of North American birds. 6th ed. Allen Press, Lawrence, Kansas. 877pp.

Arizona Game and Fish Department. 1996. Wildlife of special concern in Arizona (Draft). Nongame and Endangered Wildlife Program. Arizona Game and Fish Department, Phoenix. 23pp.

Bagley, B.E., D.A. Hendrickson, F.J. Abarca and S.D. Hart. 1991. Status of the Sonoran topminnow *(POECILIOPSIS OCCIDENTALIS)* and desert pupfish *(CYPRINODON MACULARIUS)* in Arizona. Rept. on Proj. E5-2, Job 9, Title VI of the Endangered Species Act. Arizona Game and Fish Dept., Phoenix. 64pp.

Behle, W. H., and H .G. Higgins. 1959. The birds of Glen Canyon. Pages 107-133 *in* A. M. Woodbury, ed. Ecological Studies of Flora and Fauna in Glen Canyon. University of Utah.

Bent, A. C. 1960. Bent's life histories of North American birds. Vol. II, Land Birds. Harper & Brothers, New York. 555pp.

Blake, E. R. 1953. Birds of Mexico. University of Chicago Press, Chicago,. 644pp.

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.

- - . 1994. Rates of brood parasitism by brown-headed cowbirds on riparian passerines in Arizona. J. Field Ornithology 65:160-168.

Browning, M. R. 1993. Comments on the taxonomy of *Empidonax traillii* (willow flycatcher). Western Birds 24:241-257.

California Department of Fish and Game. 1992. State and Federal endangered and threatened animals of California (Revised July 1992). California Dept. Fish and Game, Natural Heritage Division, Sacramento. 13pp.

Camp Pendleton. 1996. Biological Assessment, riparian and estuarine habitat on Marine Corps Base Camp Pendleton.

Constantz, G. D. 1980. Energetics of viviparity in the Gila topminnow (Pisces: Poeciliidae). Copeia 1980:676-678.

Cooper, C. A. 1996. Summary of 1995 surveys for willow flycatchers in New Mexico. New Mexico Dept. Game and Fish, Sante Fe. 27pp.

Deacon, J. E. and W. L. Minckley. 1974. Desert fishes. Pages 385-488, In Desert Biology, Vol.2. Academic Press, New York.

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

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 Pendelton, California. Final Rept. October 18, 1994, P.O. NO. M00-681-M4840. Griffith Wildlife Biology, Calumet, Michigan.

Grinnell, J., and A. H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna 27.

Harris, J. H. 1991. Effects of brood parasitism by brown-headed cowbirds on willow flycatcher nesting success along the Kern River, California. Western Birds 22:13-26.

— –, S. Sanders, and M. A. Flett. 1987. Willow flycatcher surveys in the Sierra Nevada. Western Birds 18:27-36.

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. 279pp.

Hendrickson, D. A., and J. E. Brooks. 1991. Transplanting short-lived fishes in North American deserts: review, assessment, and recommendations. Pages 283-298 In W. L. Minckley, and J.E. Deacon, eds., Battle Against Extinction: Native Fish Management in the American West. University of Arizona Press, Tucson.

Holmegren, M. A., and P. W. Collins. 1995. Distribution, breeding status, and habitat associations of several federal special-status bird species and brown-headed cowbirds at Vandenberg Air Force Base, Santa Barbara County, CA. Environmental Report No. 3. Mus. of Systematics and Ecol., Dept. of Ecol., Evol., and Marine Biol., University of California, Santa Barbara.

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

Hubbard, J. P. 1987. The status of the willow flycatcher in New Mexico. Endangered Species Program, New Mexico Dept .of Game and Fish, Sante Fe. 29pp.

Hubbs, C. L., and R. R. Miller. 1941. Studies of the fishes of the order Cyprinodontes. IVII — Genera and species of the Colorado River system. Occas. Papers Mus. Zool., Univ. Mich. 433:1-9.

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 Corp. 25pp.

Huth, J. H. 1997. Hydogeochemical modeling of western mountain front recharge, upper Cienega Creek sub-basin, Pima County, Arizona. MS Thesis, University of Arizona, Tucson. 120pp.

Jacobson, H. E., and D. E. Froehlich. 1992. Basic principles of open-channel flow. U.S. Geologic Survey, open-file report 88-707, Reston, West Virginia.

Knight, E. L. 1996. A water budget and land management recommendations for upper Cienega Creek basin. MS Thesis, University of Arizona, Tucson. 119pp.

King, J. R. 1955. Notes on the life history of Trail's Flycatcher *(Empidonax traillii)* in southeastern Washington. The Auk 72:148-173.

Kus, J. 1995. The status of the least Bell's vireo and southwestern willow flycatcher at Camp Pendleton, California, in 1995. Dept. Biol., San Diego State Univ., San Diego.

Ligon, J. S. 1961. New Mexico Birds and where to find them. The University of New Mexico Press, Albuquerque.

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 Dept. Game and Fish, Sante Fe, New Mexico. 48pp.

McCabe, R. A. 1991. The little green bird: ecology of the willow flycatcher. Palmer Publications, Inc., Amherst, Wisconsin. 171pp.

McDonald, K. P., J. Snider, L. C. Peterson, M. St. Germain, and S. Stmts. 1995. Results of 1995 southwestern willow flycatcher surveys in the Virgin River drainage and southern Utah. Publ. No. 95-17, Utah Div. of Wildlife Resources, Cedar City, Utah. 28pp.

McGeen, D. S. 1972. Cowbird-host relationships. The Auk 89:360-380.

Meffe, G. K. 1983. Attempted chemical renovation of an Arizona springbrook for management of the endangered Sonoran topminnow. N. Am. J. Fish. Manage. 3:315-321.

— -, and F. F. Snelson, Jr. 1989. An ecological overview of poeciliid fishes. Pages 13-31 *in* G. K. Meffe and F. F. Snelson, Jr., eds., Ecology and Evolution of Livebearing Fishes. Prentice Hall, Englewood Cliffs, New Jersey.

— -, D. A. Hendrickson, and W. L. Minckley. 1983. Factors resulting in decline of the endangered Sonoran topminnow POECILIOPSIS OCCIDENTALIS (Atheriniformes: Poeciliidae) in the United States. Biol. Conser. 25:135-159.

Miller, R. R. 1961. Man and the changing fish fauna of the American Southwest. Pap. Michigan Acad. Sci., Arts, Lett. 46:365-404.

Minckley, W. L. 1969. Aquatic biota of the Sonoita Creek basin, Santa Cruz County, Arizona. Ecol. Stud. Leafl. 15:1-8.

--. 1973. Fishes of Arizona. Arizona Game Fish, Phoenix. 293pp.

—. 1985. Native fishes and natural aquatic habitats in U.S. Fish and Wildlife Region II west of the Continental Divide. Rept. to U.S. Fish and Wildlife Service, Albuquerque, New Mexico. Dept. of Zoology, Arizona State University, Tempe. Pp.ix + 158.

——, J. N. Rinne, and J.E. Johnson. 1977. Status of the Gila topminnow and its cooccurrence with mosquitofish. U.S. Forest Service Research Paper RM-198.

Monson, G., and A. R. Phillips. 1981. Annotated checklist of the birds of Arizona. The University of Arizona Press, Tucson. 240pp.

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. Tech.l Rept. 52. Arizona Game and Fish Dept., Nongame and Endangered Wildl. Prog., Phoenix. 25pp.

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

Oberholser, H. C. 1974. The bird life of Texas. University of Texas Press, Austin. 1069pp.

**Paxton, E., J. Owen, and M. K. Sogge. 1996. Southwestern willow flycatcher response to catastrophic habitat loss. Colorado Plateau Research Station, U.S. Geological Survey Biological Resources Division, Northern Arizona University. 12pp.**

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

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

**Petterson, J. R., and M. K. Sogge. 1996. Distribution and breeding productivity of the southwestern willow flycatcher along the Colorado River in Grand Canyon - 1996. Summary Report. Grand Canyon National Park, Grand Canyon, AZ and National Biological Service, Colorado Plateau Research Station/N. Arizona University. 3Opp.**

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

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

**Prichard, D., H. Barrett, J. Cagney, R. Clark, J. Fogg, K. Gebhardt, P. L. Hansen, B. Mitchell, and D. Tippy. 1993. Riparian area management. Process for assessing proper function and condition. USDI BLM TR 1737-9. Denver. 51pp.**

**Pulliam, H. R. 1988. Sources, sinks, and population regulation. American Nat. 132:652-661.**

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

**Rosgen, D. 1997. River restoration and channel design course manual. Wildland Hydrology Consultants. Pagosa Springs, Colorado.**

**San Diego Natural History Museum. 1995. *Empidonax traillii extimus* in California. The willow flycatcher workshop. San Diego Natural History Museum, San Diego, California.**

**Schlorff, R. W. 1990. Status review of the willow flycatcher *(Empidonax traillii)* in California. Rept. to the Calif. Dept. of Fish and Game, Dept. Candidate Species Status Report 90-1, Sacramento. 23pp.**

**Schoenherr, A. A. 1974. Life history of the topminnow *POECILIOPSIS OCCIDENTALIS* (Baird and Girard) in Arizona and an analysis of its interaction with the mosquitofish *GAMBUSIA AFFINIS* (Baird and Girard). Ph.D. Diss., Ariz. State Univ., Tempe.**

Sferra, S. J., T. E. Corman, C. E. Paradzick, J. W. Rourke, J. A. Spencer, and M. W. Sumner. 1997. Arizona Partners In Flight southwestern willow flycatcher survey: 1993-1996 summary report. Arizona Game and Fish Department, Technical Report 113.

— –, 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. 46pp.

Simms, J. R., and K. M. Simms. 1992. What constitutes high quality habitat for Gila topminnow (*POECILIOPSIS OCCIDENTALIS OCCIDENTALIS*)? An overview of habitat parameters supporting a robust population at Cienega Creek, Pima Co., AZ. Proc. Desert Fish. Council 22-23:82.

Skaggs, R. W. 1995. Population size, breeding biology, and habitat of willow flycatchers in the Cliff-Gila Valley, New Mexico. New Mexico Dept. of Game and Fish, Sante Fe. 38pp.

Smith, E. L., P. R. Ogden, and E. B. Fish. 1975. Use of Earth Resources Technological Satellite - Data in a natural resource inventory. University of Arizona.

Sogge, M. K. 1995a. Southwestern willow flycatcher (Empidonax traillii extimus) monitoring at Tuzigoot National Monument. 1995 progress report to the Natl. Park Serv. Natl. Biol. Serv., Colorado Plateau Res. Stn./Northern Arizona University, Flagstaff, Arizona. 20pp.

1995b. Southwestern willow flycatcher surveys along the San Juan River, 1994 - 1995. Final report to Bureau of Land Management, San Juan Resource Area. Natl. Biol. Serv., Colorado Plateau Res. Stn./Northern Arizona University, Flagstaff, Arizona. 27 pp.

-----. 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. USDI, National Biological Service, Washington, DC.

—, R. M. Marshall, S. J. Sferra, and T. J. Tibbitts. 1997. A southwestern willow flycatcher survey protocol and breeding ecology summary. National Park Service/Colorado Plateau Res. Station/N. Arizona University, Tech. Rept. NRTR-97/xx.

— -, 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. NPS CPSU/N. Arizona University, Flagstaff, Arizona. 43pp.

— –, and 1994. Distribution and status of the southwestern willow flycatcher along the Colorado river in the Grand Canyon - 1994. Summary Report. Natl. Biol. Serv., Colorado Plateau Res. Stn./N. Arizona Univ., Flagstaff, Arizona. 37pp.

— –, 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. Natl. Park Serv. Coo. Park Studies Unit/N. Ariz. Unversity, U.S. Fish and Wildlife Service, and Arizona Game and Fish Department., Flagstaff, Arizona. 69pp.

• ——, 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. Natl. Biol. Serv., Colorado Plateau Res. Stn./N. Arizona Univ. 26pp.

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. 69pp.

Stiles, F. G., and A. F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock, Ithaca, New York. 364pp.

Stransky, K. 1995. 1995 field survey by the Colorado Division of Wildlife, southwestern willow flycatcher. Colorado Division of Wildlife, Grand Junction. 21pp.

Tibbitts, T. J., M. K. Sogge, and S. J. Sferra. 1994. A survey protocol for the southwestern willow flycatcher *(Empidonax traillii exams)*. Tech. Rept. NPS/NAUCPRS/NRTR-94/04. Natl. Park Service, Colorado Plateau Research Station, Flagstaff, Arizona. 24pp.

U.S. Bureau of Reclamation. 1996. Description and assessment of operations, maintenance, and sensitive species of the lower Colorado River. Final biological assessment prepared for the U.S. Fish and Wildlife Service and Lower Colorado River Multi-Species Habitat Conservation Program. Boulder City, Nevada.

U.S. Fish and Wildlife Service. 1984. Gila and Yaqui topminnow Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

▪ 1989. Notice of review animal candidate review for listing as endangered or threatened species. Federal Register 54:554.

----. 1991. Biological Opinion 2-21-90-F-196: Cienega Creek diversion dam maintenance and repair. Arizona Ecological Services, Fish and Wildlife Service, Phoenix, Arizona.

----. 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.

1995. Yaqui fishes recovery plan. Albuquerque, New Mexico.

1995. Final rule determining endangered status for the southwestern willow flycatcher. Federal Register 60:10694-10715.

Unitt, P. 1984. The birds of San Diego County. San Diego Society of Natural History.

Unitt, P. 1987. *Empidonax traillii extimus:* An endangered subspecies. Western Birds 18:137-162.

Walkinshaw, L. H. 1966. Summer biology of Traill's flycatcher. Wilson Bulletin 78:31-46.

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.

Whetstone, J. 1996. Tucson resource area willow flycatcher survey results 1993 -1995. San Pedro NCA office files. Sierra Vista, Arizona. 6pp.

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

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. 1 lpp.

----. 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. 12pp.

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

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

Willett, G. 1912. Birds of the Pacific slope of southern California. Pacific Coast Avifauna 7.

-----. 1933. A revised list of the birds of southwestern California. Pacific Coast Avifauna 21.

**2-21-98-F-373**

# SUMMARY
# BIOLOGICAL OPINION ON THE
# CIENEGA CREEK STREAM RESTORATION PROJECT

**Date of the opinion/report: June 3, 1998**

**Action agency:** **US Bureau of Land Management**

**Project:** **Biological Opinion on the Cienega Creek Stream Restoration Project**

**Listed species and critical habitats: Gila topminnow *(Poeciliopsis occidentalis occidentalis),* southwestern willow flycatcher *(Empidonax trailii extimus)***

**Biological opinion: Proposed action is not likely to jeopardize the continued existence of either species or result in adverse modification of any critical habitat.**

**Incidental take statement:**

**Level of take will be exceeded if: (1) more than 10 dead Gila topminnow are found in the project area; 2) or if new headcuts begin at the present location of the dikes. An unlimited number of Gila topminnow may be incidentally taken by capture, when they are moved from the project area to permanent water in Cienega Creek. Take will be considered exceeded if two southwestern willow flycatchers are found during construction activity.**

**Reasonable and prudent measures and terms and conditions: Reasonable and prudent measures: 1) Conduct all proposed actions in a manner that will minimize take of Gila topminnow and southwestern willow flycatchers; 2) Monitor the fish and bird community and habitat in the project reach; 3) Maintain complete and accurate records of fish and avian populations and habitat monitoring of the riparian zone and all actions taken to implement the terms and conditions of this biological opinion.**

**Conservation recommendations: 1) As has been previously discussed and agreed, it is recommended that the Bureau will begin consultation on road maintenance in the Empire-Cienega Resource Conservation Area (RCA), road maintenance and road closures be addressed in the land use plan. 2) It is recommended that the Bureau identify unoccupied sites on the Empire-Cienega RCA that are suitable for Gila topminnow. Populations disjunct from Cienega Creek are beneficial in that they provide refugia in the event that something happens to the Cienega Creek population. This effort would be in consultation and coordination with the Service, AGFD, and Cienega Creek allotment permittee. 3) It is recommended that the Bureau conduct a riparian ecological site inventory as planned. This data will aid planning and management for this area. 4) It is recommended that the land use plan in preparation should address management strategies that enhance the probability of southwestern willow flycatchers establishing a breeding population on the Empire-Cienega RCA. The establishment of a breeding population of willow flycatchers on the RCA may constitute new information that would require reinitiation of consultation. In addition, it is recommended that management of candidate (and former candidate) species be addressed in the land use plan.**