

SUMMARY

BIOLOGICAL OPINION ON THE EFFECTS TO RAZORBACK SUCKER, COLORADO SQUAWFISH AND SOUTHWESTERN WILLOW FLYCATCHER FROM LIVESTOCK GRAZING ON THE SKELETON RIDGE/IKE'S BACKBONE ALLOTMENTS, TONTO NATIONAL FOREST, YAVAPAI COUNTY, ARIZONA

Date of the opinion: June 25, 1997

Action Agency: U.S. Forest Service/Tonto National Forest

Proposal: To graze livestock on Federal lands adjacent to the Verde River

Listed species and critical habitat: Razorback sucker and designated critical habitat, southwestern willow flycatcher

Proposed species or critical habitat: Colorado squawfish (experimental non-essential population), proposed critical habitat for southwestern willow flycatcher

Biological opinion: non-jeopardy, no destruction or adverse modification of designated critical habitat.

Incidental take statement:

Level of take anticipated: Surrogate measure of riparian recovery and upland watershed condition improvement for take to razorback sucker and southwestern willow flycatcher.

Reasonable and prudent measures: Measures involve monitoring of livestock use of riparian areas, removal of livestock from these areas if overuse is occurring, and measures to improve watershed condition.

Terms and conditions: For livestock use of riparian areas, monitoring will occur at least three times while livestock are in the pasture and, once livestock leave the pasture, utilization of riparian forage and conditions of streambanks will be measured. For overuse of riparian areas by livestock, the Forest Service should implement suitable management strategies to reduce livestock use of the riparian areas. For improvement of watershed conditions, the Forest Service will review and adjust management if improvements are not documented.

Conservation recommendations: It is recommended that the Forest Service participate in surveys of the Verde River for razorback suckers and consider a watershed-level examination of effects of livestock grazing and recreation.

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AESO/SE
2-21-94-I-559

June 25, 1997

Mr. Charles Bazan
Forest Supervisor
Tonto National Forest
2324 E. McDowell Road
Phoenix, Arizona 85006

Dear Mr. Bazan:

The Fish and Wildlife Service has reviewed the biological assessment and evaluation (BAE) dated July 3, 1996, and additional materials received on May 1, 1997, for the operation of the Skeleton Ridge and Ike's Backbone Allotments on the Tonto National Forest in Yavapai County, Arizona. Your April 9, 1997, request for formal consultation was received by this office on April 10, 1997. This document represents the Service's biological opinion on the effects of livestock grazing on the subject allotments on the endangered razorback sucker (*Xyrauchen texanus*) and southwestern willow flycatcher (*Empidonax traillii extimus*), and the experimental non-essential population of Colorado squawfish (*Ptychocheilus lucius*) in the Verde River. Designated critical habitat for the razorback sucker in the Verde River is found within the action area as is proposed critical habitat for the southwestern willow flycatcher. This biological opinion is prepared in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

This biological opinion is based on information provided by the Tonto National Forest in the BAE of July 3, 1996, other information provided on May 1, 1997, published and grey literature, data in our files and other sources of information. A complete administrative record of this consultation is on file in our office. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, livestock grazing, or other management activities considered in this opinion. Our review of the literature was extensive; however, literature cited is limited to that necessary to document the effects of the action.

CONSULTATION HISTORY

Informal consultation on the Skeleton Ridge/Ike's Backbone Allotments began in April 1994 with discussions between the Service and Forest Service regarding grazing and other activities in the project area. On September 12, 1994, the Service received the Forest Service's BAE covering several actions along the Verde River. The only species addressed at that time was the southwestern willow flycatcher. Discussions between the Forest Service and the Service on the magnitude and types of effects to the willow flycatcher were held. The Service advised the Forest Service in a letter dated April 20, 1995, that additional information was needed to complete the consultations and that the scope of the consultations should include all listed endangered and threatened species in the action area. The Forest Service provided additional information in a letter dated June 13, 1995, and withdrew the request for consultation on

August 24, 1995, because of the difficulty in defining critical habitat for the willow flycatcher along the Verde River and that the original BAE did not include information on the other listed species in the area of the proposed actions.

The Service received a revised BAE addressing the effects of these two allotments from the Forest Service dated September 13, 1996, on September 17, 1996. The Forest Service was requesting concurrence with findings of may affect, not likely to adversely affect for razorback sucker and Colorado squawfish. The willow flycatcher was not addressed in this new BAE. The Forest Service sent a letter to the Service dated January 31, 1997, concerning our concurrence. In a letter dated February 24, 1997, the Service informed the Forest Service that we did not concur with the may affect determination for the razorback sucker and willow flycatcher. The Service met with the Forest Service on March 28, 1997, to discuss the need for consultation. The Forest Service requested formal consultation in a letter dated April 9, 1997. On May 15, 1997, the Service issued a draft biological opinion to the Forest Service for review. Final Forest Service comments were received by facsimile on June 23, 1997.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Skeleton Ridge/Ike's Backbone Allotments contain approximately 47,773 acres of the Tonto and Coconino National Forests in Yavapai County, Arizona. The two allotments are operated in conjunction with each other for year round livestock use. Twenty miles of the Verde River flow through the pastures in these allotments, including a portion of that designated as a Wild and Scenic River. Portions of the allotments are in the Mazatzal and Pine Mountain Wilderness units.

The allotments are used by livestock year round with each allotment having a different function. The three pastures on the smaller Ike's Backbone Allotment are used as summer pasture for 20-30 replacement heifers. On Skeleton Ridge Allotment, 250-260 cows, plus their calves from January 1 to May 31, are present yearlong. Four pastures are used for the main herd. In addition, two pastures on this allotment provide winter and spring pastures for the replacement heifer herd.

In addition to the pastures, there are several holding facilities located on the allotments and are used from one to three days during pasture moves and shipping of cattle. There are nine of these facilities, four of which are adjacent to the river. Fences and water developments are in place in the pastures; additional facilities of these types are not contemplated as part of the proposed action.

On Ike's Backbone Allotment, two of the three pastures are used each year, the third is rested. Of the two used, one is grazed from April to mid-July and the other from mid-July through October. Livestock can access the Verde River at two locations in the Childs Pasture, the other two pastures do not border the river. The heifer herd is on the Powerhouse Pasture (November through February) and Hot Springs Pasture (March through May) in the Skeleton Ridge Allotment each year. Both of these pastures have access to the Verde River.

The main herd uses three of the pastures in a rest rotation (use two years out of three) with the fourth used as winter pasture every year (mid-October through mid-March). The rest rotation pastures may be used early (mid-March through June) or late (July through mid-October). The Long Mesa Pasture does not border on the Verde River and the Coldwater/Mud Springs Pasture is fenced to exclude livestock from the river. River access is available in the Black

Ridge/Houston Basin Pasture and the Winter-use Pete's Cabin Pasture.

Movement of livestock within pastures is encouraged by several strategies. Salt is used in areas of available forage to draw the animals away from other areas. Development of stock tanks and springs throughout the pastures also assists in keeping livestock from congregating in one area, especially since the livestock are "located" in small groups at these water sources. Monitoring of livestock locations within the pasture and herding them out of areas where congregations have occurred is also done.

DESCRIPTION OF THE ACTION AREA

Elevations within the allotments range from 2,200 feet to 6,800 feet, with the result that several distinct vegetation communities are present. Juniper grasslands dominate in the upper elevations. Mountain browse (chaparral) and desert scrub are significant components in the lower elevations. Creosote dominated communities are a small part of the total acreage, as are areas of mesquite bosque.

Range conditions on the allotments were dominated by poor and very poor conditions with half the areas still in a downward trend according to the 1981 range trend data.

The allotments contained 286 acres of riparian vegetation in 1981, dominated by cottonwood and willow communities. Floods since that time have altered the structure and location of significant amounts of the riparian communities. Riparian communities along the Verde River are limited in area by the narrow canyon floodplains along most of the river in the action area. The repeat cycle of flooding affects developing riparian stands and each event alters the pattern of the community. Community stability is greater in areas with a wider floodplain because the effects of velocity and depth are reduced. The effects of upstream developments on the floodflows experienced on the Verde River is discussed in the environmental baseline.

The Verde River is perennial within the action area. Upstream depletions for agriculture and municipal/industrial purposes have altered the historic flow regime. Gradients in the river within the action area are generally steep, resulting in the formation of rapids and riffles. Pool areas are found between riffles and associated with gravel and cobble bars in the channel. The narrow floodplain generally restricts meandering, although in the vicinity of the East Verde River confluence, Houston Creek, Goat Canyon and below Mule Shoe Bend the wider floodplain allows for some movement of the active channel. Small, mostly seasonal, backwaters are found below the East Verde River and Houston Creek confluences with the Verde River and upstream of Pete's Cabin Mesa (Sullivan and Richardson 1993).

Substrates throughout the reach are reflective of the higher gradient in this portion of the Verde River. Cobble, gravel and sand areas dominate, yet there are localized areas with sediment loads higher than desirable. Bank stability in many areas results from the rocky substrates and to an extent from the presence of reeds, sedges and horsetail growing in the shallow areas along the banks. Riparian vegetation also serves to stabilize the banks, as does the annual herbaceous vegetation in years with sufficient water to support that growth (Sullivan and Richardson 1993).

STATUS OF THE SPECIES

Razorback Sucker

Listing History

The razorback sucker was first proposed for listing under the ESA on April 24, 1978, as a threatened species. The proposed rule was withdrawn on May 27, 1980, due to changes to the listing process included in the 1978 amendments to the ESA; the amendments required all listings to be completed within two years of publication of the proposed rule and that deadline was not met. The 1978 amendments also required that critical habitat be included in the listing of most species; however, no critical habitat package had been developed for the proposed listing of the species.

In March 1989, the Service was petitioned by a consortium of environmental groups to list the razorback sucker as an endangered species. The Service made a positive finding on the petition in June 1989, that was published in the Federal Register on August 15, 1989. The finding stated that a status review was in progress and provided for submission of additional information through December 15, 1989. The proposed rule to list the species as endangered was published on May 22, 1990, and the final rule was published on October 23, 1991, with an effective date of November 22, 1991.

In the final rule to list the razorback sucker as endangered, the Service stated that critical habitat was not determinable at the time of listing. This gave the Service an additional year to obtain further habitat information. On October 30, 1991, the Service received a notice of intent to sue from the Sierra Club Legal Defense Fund over failure to designate critical habitat at the time of listing. After review of additional information available, the Service concluded on December 6, 1991, that designation of critical habitat was both determinable and prudent. The proposed rule was published on January 29, 1993. The final rule was published on March 21, 1994, with an effective date of April 20, 1994. Critical habitat included portions of the Colorado, Duchesne, Green, Gunnison, San Juan, White, and Yampa Rivers in the Upper Colorado River Basin; and the Colorado, Gila, Salt, and Verde Rivers in the Lower Colorado River Basin. All critical habitat reaches were considered to be occupied by the species at the time of the designation.

Species Description

The razorback sucker is the only representative of the genus *Xyrauchen* and was described from specimens taken from the "Colorado and New Rivers" (Abbott 1861) and Gila River (Kirsch 1889) in Arizona. This native sucker is distinguished from all other suckers by the sharp edged, bony keel that rises abruptly behind the head. The body is robust with a short and deep caudal peduncle (Bestgen 1990). The razorback sucker may reach lengths of one meter and weigh five to six kilograms (Minckley 1973) and are a long lived species, reaching the age of at least the mid-40's (McCarthy and Minckley 1987).

Life History

Life history information for the razorback sucker was recently summarized in the status review for the species (Bestgen 1990), in *Battle Against Extinction: Native Fish Management in the American West* (Minckley and Deacon 1991), and in the biological support document for critical habitat designation (USFWS 1993). The life history information presented in this biological opinion is primarily taken from these sources.

The razorback sucker was once abundant in the Colorado River and its major tributaries throughout the Colorado River Basin, occupying 3,500 miles of river in the United States and Mexico (USFWS 1993). Records from the late 1800's and early 1900's indicated the species was abundant in the lower Colorado and Gila River drainages (Kirsch 1889, Gilbert and Scofield 1898, Minckley 1973, Bestgen 1990).

Adult razorback suckers utilize most of the available riverine habitats, although there may be an avoidance of whitewater type habitats. Main channel habitats used tend to be low velocity ones such as pools, eddies, nearshore runs, and channels associated with sand or gravel bars (summarized in Bestgen 1990). Backwaters, oxbows, and sloughs were well-used habitat areas adjacent to the main channel; flooded bottomlands are important to the species in the spring and early summer (summarized in Bestgen 1990). Razorback suckers are somewhat sedentary; however, considerable movement over a year has been noted in several studies (USFWS 1993). Spawning migrations have been observed or inferred in several locales (Jordan 1891, Minckley 1973, Osmundson and Kaeding 1989, Bestgen 1990, Tyus and Karp 1990).

Spawning takes place in the late winter to early summer depending upon local water temperatures. Various studies have presented a range of water temperatures at which spawning occurs. In general, temperatures between 10° and 20° centigrade are appropriate for spawning (summarized in Bestgen 1990). Spawning areas include gravel bars or rocky runs in the main channel (Tyus and Karp 1990), and flooded bottomlands (Osmundson and Kaeding 1989). There is an increased use of higher velocity waters in the spring, although this is countered by the movements into warmer, shallower backwaters and inundated bottomlands in early summer (McAda and Wydoski 1980, Tyus and Karp 1989, Osmundson and Kaeding 1989).

Habitat needs of larval razorback suckers are not well known. Warm, shallow water appears to be important. Shallow shorelines, backwaters, inundated bottomlands and similar areas have been identified as nursery habitats (Sigler and Miller 1963, Marsh and Minckley 1989, Tyus and Karp 1989, 1990, Minckley et al. 1991). For the first period of life, larval razorback suckers are nocturnal and hide during the day. Diet during this period is mostly plankton (Marsh and Langhorst 1988, Papoulias 1988). Young fish grow fairly quickly, with growth slowing once adult size is reached (McCarty and Minckley 1987). Little is known about habitat preferences of juvenile razorback suckers.

Population Dynamics

The razorback sucker is adapted to the widely fluctuating physical environments characteristic of rivers in the pre-settlement Colorado River Basin. Adults can live 45-50 years and, once reaching maturity between two and seven years of age (Minckley 1983), apparently produce viable gametes even when quite old. The ability of razorback suckers to spawn in a variety of habitats, flows and over a long season are also survival adaptations. In the event of several consecutive years with little or no recruitment (due to either too much or too little water), the demographics of the population as a whole might shift, but future reproduction would not be compromised. Average fecundity recorded in studies ranged from 46,740 to 100,800 eggs per female (Bestgen 1990). With a varying age of maturity, and the fecundity of the species, it would be possible to quickly repopulate after a catastrophic loss of adults.

Rangewide Present Status

The razorback sucker was listed as an endangered species due to declining or extirpated populations throughout the range of the species. The causes of these declines are changes to

the biological and physical features of the habitats. The effects of these changes have been most clearly noted by the almost complete lack of natural recruitment to any population in the historic range of the species. Populations are generally small and composed of aging adults.

Recovery efforts under the Recovery Implementation Program in the Upper Colorado River Basin have begun but significant recovery results have not yet been achieved. In the Lower Colorado River Basin, efforts to reintroduce the species to the Gila, Salt and Verde Rivers have not been successful in establishing self-sustaining populations. Reintroduction efforts continue in the Verde River. Augmentation programs along the lower Colorado River are working to replace the aging razorback sucker populations in Lakes Havasu and Mohave with young fish from protected-site rearing programs. These activities may prevent the imminent extinction of the species in the wild, but appear less capable of ensuring long term survival or recovery. Overall, the status of the razorback sucker in the wild continues to decline.

Southwestern Willow Flycatcher

Species Description

Listing History

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.

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, the lower is light yellow grading to black at the tip.

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

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).

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 (BLM, unpubl. data), Colorado River through Grand Canyon National Park (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994), lower Colorado River (Muiznieks *et al.* 1994, Spencer *et al.* 1996), Verde River tributaries (Muiznieks *et al.* 1994), and Cienega Creek (BLM, *in litt.*). These observations probably include subspecies *E.t. brewsteri* and *E.t. adastus*. *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 reneesting after nest failure (Whitfield 1990, Sogge and Tibbitts 1992, Sogge *et al.* 1993, Sogge and Tibbitts 1994, Muiznieks *et al.* 1994, Whitfield 1994, Whitfield and Strong 1995).

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

Walkinshaw (1966), who studied *E.t. traillii* in Michigan, estimated that 40.9% of the males at his study site returned to breed for at least two years, 22.7% returned for at least three years, 13.6% returned for at least four years, and at least 4.5% returned during their fifth year. Female return rates were substantially lower. Only 22.6% returned to breed for one year. 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 feet in Arizona and southwestern Colorado. Throughout its wide geographic and elevational range, its riparian habitat can be broadly described based on plant species composition and habitat structure (Sogge *et al.* 1997). These attributes are among the most conspicuous components of flycatcher habitat but not necessarily the only important components. They are easily identified from photographs or during field visits and have been useful in conceptualizing, selecting, and evaluating suitable survey habitat. Photographs and accompanying text provided in Sogge *et al.* (1997) characterize the considerable variation in habitat structure and plant species composition found at breeding sites throughout the southwestern willow flycatcher's range. Two components that vary less across this subspecies' range are vegetation density and the presence of surface water. Those and other characteristics, such as size and shape of habitat patches, are described further below.

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

Monotypic willow: Nearly monotypic, dense stands of willow (often *S. exigua* or *S. geyeriana*) 3 to 7 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.

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

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

There are other potentially important dimensions or characteristics of southwestern willow flycatcher habitat, including: size, shape, and distribution of vegetation patches; hydrology; prey types and 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 longterm data that correlate or experimentally verify which combination of the above attributes contribute to population growth, habitat descriptions should be viewed broadly and considered descriptors of "suitable survey habitat."

The size and shape of occupied riparian habitat patches vary considerably. Southwestern willow flycatchers have been found nesting in patches as small as 0.8 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 in the vicinity of flycatcher territories and nests; flycatchers sometimes nest in areas where nesting substrates were in standing water (Maynard 1995, Sferra *et al.* 1995, 1997). However, hydrological conditions

at a particular site can vary remarkably 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 as a result of changes in river channel configuration after flood events (Spencer *et al.* 1996).

Nest Placement and Nesting Substrate

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

Nest height relative to the base of nest substrate also varies across the southwestern willow flycatcher's range and may be correlated with height of nest substrate and/or overall canopy height. Appendix 1 presents data on nest heights in different riparian habitat types across the flycatcher's range. Southwestern willow flycatcher nests have been found as low as 0.6 m above the ground to 14 m above the ground. The data presented in Appendix 1 demonstrate that flycatchers using predominantly native broadleaf riparian habitats nest relatively low to the ground (between 1.8 m and 2.1 m on average), whereas those using mixed native/exotic and monotypic exotic riparian habitats nest relatively high above the ground (between 4.3 m and 7.4 m on average).

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

Phillips (1948) first described *E.t. extimus* from a specimen collected by Gale Monson on the lower San Pedro River near Feldman, 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 was comprised of 500 to 1000 pairs. Below is a state by state comparison of historic and current data for the southwestern willow flycatcher. Since 1992 more than 800 historic

and new locations have been surveyed rangewide to document the status of the southwestern willow flycatcher (some sites in southern California have been surveyed since the late 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 have 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 (Appendix 2). 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.).

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 completely eliminated in 1996 when expansion of agricultural fields resulted in clearing of riparian vegetation (USFWS *in litt.*). A programmatic section 7 consultation on Marine Corps Camp Pendleton resulted in a conservation target of 20 southwestern willow flycatcher pairs (Appendix 3). The Base currently has approximately 22 pairs of flycatchers, in contrast to the 348 pairs of the sympatric and endangered least Bell's vireo (*Vireo bellii pusillus*), which through the Base's conservation efforts increased from a low of 27 pairs in 1984. 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 prior to inundation and lies downstream of one of California's largest

southwestern willow flycatcher breeding groups on the Kern River Preserve.

Arizona

Historic records for Arizona indicate the former range of the southwestern willow flycatcher included portions of all major river systems (Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro) and major tributaries, such as the Little Colorado River and headwaters, and White River. Unitt (1987) noted that "probably the steepest decline in the population levels of *extimus* has occurred in Arizona." The bird has been extirpated, or virtually extirpated from the Santa Cruz River (Pima Co.), upper San Pedro River (Cochise Co.), lower San Pedro River at PZ Ranch (Pinal Co.), Blue River (Greenlee Co.), Colorado River at Lees Ferry (Coconino Co.), Colorado River (Yuma Co.), Gila River (Yuma Co.), and Verde River at Tuzigoot Bridge (Yavapai Co.). Currently, 150 territories are known from 39 sites along nine drainages statewide, including the Colorado River (Appendix 2). 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 surveyed in Arizona are comprised of single, unmated territorial birds.

Permitted activities and stochastic events also continue to adversely affect the distribution and extent of occupied and potential breeding habitat throughout Arizona. The Bureau of Reclamation's operation of the new conservation space at Roosevelt Lake could totally inundate the riparian stands occupied by Arizona's largest breeding group (Appendix 3). As a result of Reclamation's operations on the lower Colorado River, the 445-ha Goodding's willow stand at the inflow to Lake Mead has been partially inundated since September 1995. Despite partial inundation, approximately eight pairs of flycatchers were documented nesting at the inflow during the 1996 breeding season. As of April 1997, 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 in the vicinity of Safford during 1996. It is not known whether that area was occupied by southwestern willow flycatchers; however, it was located just downstream of an occupied patch that was partially eliminated as a result of the section 7 consultation on the Solomon Bridge (Appendix 3). The anticipated effects 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.

On the Verde River in Clarkdale, a 1.4 ha site surrounding the bridge to Tuzigoot National Monument supported at least four territorial flycatchers when first discovered in 1992. The number of flycatchers declined in subsequent years and in 1996 no flycatchers returned to breed at the Tuzigoot site.

New Mexico

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

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

Unitt (1987), Hubbard (1987), and more recent survey efforts have documented extirpation or virtual extirpation in New Mexico on the San Juan River (San Juan Co.), near Zuni (McKinley Co.), Blue Water Creek (Cibola Co.), Rio Grande (Dona Ana Co. and Socorro Co.). Survey and monitoring efforts since 1993 have documented 173 flycatcher territories on eight drainages (Appendix 2). Approximately 135 of these territories occur in remnant strips of riparian forest within a 20-mile stretch of the Gila River in Grant Co (Skaggs 1996). This area contains the largest known breeding group rangewide. Outside of Grant County, however, few flycatchers remain. Statewide, 84% (16) of the 19 sites with flycatchers contain five or fewer territorial birds. Six sites are comprised of single pairs or unmated territorial flycatchers, and six others are comprised of two pairs or two unmated territorial birds.

Texas

The Pecos and Rio Grande rivers in western Texas are considered the easternmost boundary for the southwestern willow flycatcher. Unitt (1987) found specimens from four locations in Brewster, Hudspeth, and Loving counties where the subspecies is no longer believed to be present. Landowner permission to survey riparian areas on private property has not been obtained, thus current, systematic survey data 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 (Appendix 2). Two locations have single, unmated males; two locations have single pairs, and the remaining two locations are comprised of four to seven territories each.

On March 9, 1997, a fire started by an adjacent landowner burned a 32-ha portion of the Escalante Wildlife Area 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 were 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 Appendix 2.

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.*)(Appendix 2).

Rangewide Status

Rangewide, the current known population of southwestern willow flycatchers stands at approximately 454 territories (Appendix 2). These results indicate a critical population status; more than 75% of the locations where flycatchers have been found are comprised of five or fewer territorial birds and up to 20% of the locations are comprised of single, unmated individuals. The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances (e.g., approximately 88 km straight-line distance between breeding flycatchers at Roosevelt Lake, Gila Co., AZ, 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 Appendix 2 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 analyses introduces a bias that may overestimate the number of breeding groups and overall population size. In addition, females have been documented singing as frequently as males. Because the established survey method relies on singing birds as the entity defining a territory (Tibbitts *et al.* 1994), double-counting may be another source of sampling error that biases population estimates upward. The figure of 454 southwestern willow flycatcher territories is an approximation based on considerable survey effort, both extensive and intensive. Given sampling errors that may bias population estimates positively or negatively (e.g., incomplete survey effort, double-counting males/females, composite tabulation methodology), natural population fluctuation, and random events, it is likely that the total population of *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 suggests the southwestern willow flycatcher may already be subject to a combination of these factors (e.g., uneven sex ratios, low probability of finding mates in a highly fragmented landscape).

Southwestern Willow Flycatcher Reproductive Success

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

On the South Fork Kern River (Kern Co., CA), Whitfield (1993) documented a precipitous decline in the 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) (Appendix 4). 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 in the range of 33 to 47% (Appendix 4). Flycatcher nest success increased from 26% prior to cowbird trapping to 48% after trapping was implemented (Whitfield and Strong 1995). In addition, the number of young fledged also increased from 1.01 young/pair to 1.73 young/pair during the same period.

Whitfield and Strong (1995) found that, besides lowering nest success, fecundity, and the number of young produced, cowbird parasitism may also lower survivorship of 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 and/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 (Appendix 4). 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 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 Co., 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) (Appendix 4). 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 followup surveys in 1995, and a flycatcher observed at Ister Flat on the Verde River was not detected in followup 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., AZ, a cowbird parasitism rate of 22% was documented in 1994 (Appendix 4). In 1995 the parasitism rate was zero, but in 1996 it increased to 57% (Sferra *et al.* 1997). Nest loss due to depredation, however, has remained relatively constant (Appendix 4). On the Rio Grande in Socorro County, New Mexico, 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 County, 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 (Appendix 4).

The data presented above and in Appendix 4 demonstrate that cowbird parasitism and nest depredation are affecting southwestern willow flycatchers throughout their range. Cowbirds have been documented at more than 90% of sites surveyed (Sogge and Tibbitts 1992, Sogge *et al.* 1993, Camp Pendleton 1994, Muiznieks *et al.* 1994, Sogge and Tibbitts 1994, T. Ireland 1994 *in litt.*, Whitfield 1994, C. Tomlinson 1995 *in litt.*, Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, Maynard 1995, McDonald *et al.* 1995, Sferra *et al.* 1995, 1997, 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 as well as for other endangered passerines (e.g., least Bell's vireo [*Vireo bellii pusillus*], black-capped vireo [*V. atricapillus*], golden-cheeked warbler [*Dendroica chrysoparia*]). It may also benefit juvenile survivorship by increasing the probability that parents fledge birds early in the season. Expansion of cowbird management programs has the potential to not only increase reproductive output and juvenile survivorship at source populations, but also to potentially convert small, sink populations into breeding groups that contribute to population growth and expansion.

Nest loss due to predation is common among small passerines. The rates documented for southwestern willow flycatchers are also typical for small passerines (i.e., rates < 50%). However, even at these "typical" levels nest loss due to predation is a significant factor contributing to low reproductive success. Nest predation presents a difficult management challenge, because of the variety of potential 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, and private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

The portion of the Verde River and its watershed found in the action area is part of the middle or lower watershed area and is thus influenced by activities taking place upstream as well as those within the immediate area. The Verde River watershed supports a variety of land uses that have had considerable effect on flows and the physical parameters of the river and its channel. The baseline conditions in the Verde River were reviewed and discussed in Sullivan and Richardson (1993) and information from that discussion is briefly summarized in the following section.

Land uses in the Verde River watershed that have had effects to the river include mining (including sand and gravel), livestock grazing, irrigated agriculture, and urban development. Some land uses alter the characteristics of the watershed through changes in vegetation cover and community components, compaction of soils, and the resultant changes to runoff and

retention patterns for rainfall or snowmelt events. Changes to sediment loads coming off the watershed are also to be expected from these uses. Once these altered flows reach the river, changes to the hydrograph, especially in regard to flood events, are observed. Increased runoff over a set period translates to higher flow velocities that affect patterns of erosion and deposition of substrate materials, movements of the active channel, and establishment of riparian vegetation along the banks and terraces. Activities in the riparian area, such as livestock grazing, that reduce the vigor of riparian plant species, contribute to bank instability and increase the risk of damage from a high flow event.

Development of irrigated agriculture and municipal/industrial water supplies from the river flows has a significant effect on the historic hydrograph. Creation of diversion dams and water storage reservoirs alter aquatic habitats both upstream and downstream of the structure. During some high water use periods, virtually the entire flow of the Verde River is diverted above the action area. Irrigation return flows, spring and aquifer inflows, and tributary sources replenish the flows to some extent, but the resultant pattern may not be comparable to the historic hydrograph. Changes in flood flows from changes to the watershed also influence flows at certain times of the year.

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

The Verde River watershed is dominated by federally owned lands, particularly Forest Service lands. There are also several Federal programs that are not land based that have been implemented in the watershed. An example is the Federal Emergency Management Agency and Natural Resources Conservation Service flood damage repair programs. All activities on Federal lands or implemented through Federal programs require consultation under the ESA to assess the effects of the action on listed species. Consultation on the land management plan for the Tonto National Forest addressed, in a general sense, the effects of multiple-use management on the listed species. For livestock grazing, biological opinions have been prepared for some allotments, especially those that border the Verde River, and concurrences with findings of may affect, not likely to adversely affect have been provided on others where appropriate. Other biological opinions addressed bank stabilization in the Cottonwood/Camp Verde area, bridge construction, and new water diversions or exchanges.

Status of the Razorback Sucker in the Action Area

The razorback sucker was a significant part of the historic fish fauna of the Verde River. Declines in the population were noted in the early part of the century, and the last fish to be recorded was taken from Peck's Lake in 1954 (Minckley 1973). In 1980, a memorandum of understanding was signed by Arizona Game and Fish Department and the Service to stock razorback suckers into the Gila, Salt and Verde Rivers in an effort to restore the populations to those portions of the historic range. Early stockings were made with very small, juvenile fish and due to very high predation rates on the released fish by resident non-native fish species, were considered largely unsuccessful. In recent years, larger fish (approximately 250 millimeters total length) have been used instead to reduce predation risks. The stocking program and its results was recently reviewed by Hendrickson (1993).

Stockings were made throughout the Verde River including portions of the river in the project area. Recaptures have been made in most stocking locations, mostly soon after the stocking took place, generally in pools or other sheltered habitats (Hendrickson 1993).

Using telemetry, habitat use by the larger stocked razorback suckers in the Verde River has been studied. Razorback suckers tend to move downstream after release. Larger fish did not move as much from the stocking site as did smaller fish (Clarkson et al. 1993). Deeper water areas in the river, sand bottomed substrates, and lower velocities were selected proportionately higher than their occurrence in the system (Clarkson et al. 1993).

The population of razorback suckers in the Verde River is probably very small. The stocking of sub-adults in recent years has improved survivorship of stocked fish. As these fish mature, it would be expected that spawning areas would be selected in suitable habitats within the Verde River. The location of such areas is difficult to predict but could occur anywhere the proper substrates are available. Backwaters and shallow nearshore areas could provide nursery habitat for young fish. Predation would continue to be a problem for survival of young razorback suckers.

Razorback Sucker Critical Habitat

The Verde River and its 100-year floodplain through the project area were designated as critical habitat for the razorback sucker. Not all lands within the designated boundaries is considered to meet the criteria for critical habitat, that is, meeting one or more of the constituent elements that were deemed essential to species conservation. Constituent elements include water, physical habitat, and biological environment. Additional selection criteria were also developed during the designation process to address the special needs of the razorback sucker. These criteria were: (1) the presence of known or suspected wild spawning populations; (2) areas where juvenile razorback suckers had been collected or which could provide suitable nursery habitats; (3) areas presently or historically occupied that had the potential for establishment of a population; (4) areas required to maintain rangewide distribution under a diversity of physical, chemical and biological conditions; and (5) areas in need of special management to provide for the survival and recovery of the razorback sucker.

Although the historic conditions in the Verde River have been altered by water and land uses in the watershed, the river continues to have flows and physical habitat conditions that are suitable for the development of a razorback sucker population. Suitable habitat for all life stages appears to be present. Normal flooding in the Verde River occurs during the spawning period of the razorback sucker, thereby providing flooded bottomlands that have been shown to be important to young fish.

It is in the area of biological environment that the Verde River, like most rivers within the historic range of the razorback sucker, has significant deficiencies. The lower portion of the Verde River, which includes the project area, is dominated by non-native fish species that have been implicated in the declines of the razorback sucker populations throughout the historic range. In addition, the introduction of these non-native fish species is likely also responsible for the introduction of the parasitic copepod *Lernaea* to the river. The presence of this copepod may have an effect on the survival of sub-adult and adult razorback suckers (Clarkson et al. 1993).

Status of the Southwestern Willow Flycatcher in the Project Area

No current flycatcher survey data is available for the Skeleton Ridge allotment. The BAE

indicates that surveys were conducted in 1993 by the Arizona Game and Fish Department and in 1994 by the Forest Service, but no indication of the locations, extent, timing, or number of visits is provided.

Of the three locations on the Verde River where southwestern willow flycatchers have been documented since 1993, only one location is extant. Approximately 9.6 km south of the Skeleton Ridge allotment a single flycatcher was detected at Ister Flat during 1993 surveys. No flycatchers have been detected at that location since 1993. Two other flycatcher breeding groups have been documented approximately 32 km (Camp Verde) and 58 km (Clarkdale) northwest of the allotment. The Clarkdale site was extirpated in 1996. The Camp Verde site remains extant with approximately six flycatcher territories. Of 13 nest attempts during 1996 at the Camp Verde site, nine (69%) failed. Six nests (46%) were parasitized by brown-headed cowbirds.

Effects of the Action

General Effects of Livestock Grazing

The effects of livestock grazing on riparian and aquatic habitats has been well documented and discussed in recent years (Platts 1990, Meehan 1991, Fleischner 1994). Effects can be categorized into upland/watershed effects, streambank effects, streamflow and channel effects and effects to riparian vegetation. The references cited above and in the BAE for this project goes into greater detail on these effects and those discussions are incorporated here by reference.

Unsatisfactory range and watershed conditions due to past overgrazing contribute to changes in overland flows and sediment transport to the river. Soil compaction, changes to root structures in overused plants, changes in plant species composition and overall biomass and loss of soil from erosion can result from overuse by livestock. In some cases, restoration of the historic condition may not be possible within a reasonable time period.

Along rivers and streams, congregation by livestock causes mechanical damage to shorelines and banks, soil compaction, possible overuse of riparian plant species, and increased nutrient loading. There may also be direct effects to individual fish through trampling. Trampling and sediment inflow from mechanical damage on banks can also affect populations of aquatic invertebrates that provide food for the fish species.

Some degree of streamflow and stream channel morphology changes can be attributed to livestock grazing through the effects grazing has on the watershed and riparian areas. Watershed conditions in the watershed within the action area are generally not satisfactory, and for much of the watershed, there are few other land use activities except livestock grazing to account for these conditions. Any effects from livestock use of uplands or riparian areas are additive to the effects from forest practices, livestock grazing, water diversions, urban development and other actions on the watershed upstream. The effects to downstream reaches are the sum of all upstream effects plus effects from the area under review.

Effects to Habitats in the Project Area (Direct and Indirect)

Range and Watershed Condition

Range and watershed conditions on these allotments in the 1960's to 1980's were generally declining or static. In 1981, 49 percent of the range was in a downward trend, and 33 percent

was static. Very poor conditions were found on 28 percent of the range, poor conditions on 54 percent, fair conditions on 14 percent and only four percent was in good condition. Readings taken on a variety of indicators since then have indicated that the management changes instituted in 1985 and 1990 have resulted in improvements to conditions at nine of twelve monitoring locations. The improvements have been in increased vegetative groundcover and litter, improved plant vigor and an increase in the diversity of desired species.

The proposed action does not alter the management as established in 1990. The Forest Service believes that maintaining the improved management will continue to provide improvement to range trend and conditions. This may well be true, however, by continuing to graze on the watershed, some measure of recovery of these vegetative communities is foregone. This results in maintaining the range at a less than its potential. Runoff from storms may be higher than would be seen in an ungrazed situation because considerable biomass is being removed by livestock and there is at least localized trampling and compaction of soils. Sediment loads off the somewhat erosive soils on the watershed is also increased.

Riparian Condition

The establishment of riparian areas along the Verde River in the action area is heavily influenced by the narrow floodplain available for most of the length of the river and the periodic high waters that come with flood events. The gradient of the river is higher in the area of the proposed action, so velocities are higher and erosive forces more intense. Mature stands of cottonwood or willow are not often seen; however, regeneration of young trees is common.

For the heifer herd (20-30 animals), riparian areas are accessible in Powerhouse and Hot Springs Pastures during the winter and spring (October to May) and at two locations in the Childs Pasture during the summer or fall (June to September). Dense stands of young willow were noted on the floodplains through this area (Sullivan and Richardson 1993). Whether these young trees survived the later flooding, their presence indicates that conditions for establishment of similar stands in the future exists. Access to the riparian areas in this reach is largely through the two Skeleton Ridge pastures and would occur in the winter and spring.

Summer use of the Child's Pasture would have effects to riparian vegetation in that portion of the Verde River. Use would be in two years out of three. Although access is limited to two points, livestock can use some amount of the surrounding area as well. The livestock would be in the pasture for four months, and while 20-30 head is not a large number, even a small number of livestock, in a small area, can do considerable damage to growing riparian vegetation. If insufficient vegetative growth is retained by the plants, their vigor may be reduced and their ability to hold during floods compromised. For the Powerhouse and Hot Spring Pastures, used during the winter and spring, there is concern that overuse of newly growing riparian plants could occur, reducing the opportunity for bank stability, influencing sediment loads, and reducing the opportunity for the riparian area to develop. Plants may still be growing well at the start of this period and depending upon the conditions of the uplands, livestock may elect to remain at the more lush riparian sites. Because these pastures do not have fences barring access to the river, livestock could remain in the area for the entire length of the season. For part of that, riparian vegetation is dormant and use likely is minimal during this period. Plants that have been too heavily grazed do not acquire those resources at the same rate as ungrazed plants. Mechanical damage from hoof shear, trampling and soil compaction is not a significant issue in these pastures because of the predominance of rock, cobble and boulder substrates (Sullivan and Richardson 1993).

In the Skeleton Ridge Allotment, the Black Ridge/Houston Basin Pasture is alternatively grazed early (March-June) or late (July-November) for the main herd (cows and calves). There is river access along the entire reach, including the area on the opposite side of the river from the Child's Pasture. The steep topography limits the amount of floodplain present in this reach, although there is a wider channel downstream of Fossil Creek that provides for some meandering, and allows for riparian vegetation to develop. Cottonwood trees are on the lower terraces and narrow stringers of willows are also lining the banks. These willows are especially prone to flood damage. Livestock can remain in the riparian areas for three and one-half months, early or late in the season. As stated previously, overuse of riparian plants has effects to plant vigor and grazing over the growing season may not allow for sufficient regrowth before the dormant period to provide for the next year's growth. The present grazing strategy does allow for a year of rest, in which plants may grow for a full year with no grazing pressure from livestock on this allotment. The only exception would be if Child's Pasture was in use and the river on both sides could be reached. The river channel in this pasture is also resistant to mechanical damage due to the rock, cobble and boulder substrates that dominate the reach.

The Pete's Cabin Pasture is used every year from October to March. Access to the Verde River exists through most of the pasture, with local exceptions due to steep cliffs or other natural barriers. As with the upstream reaches, the topography limits the extent of floodplain riparian vegetation present, however, some more mature stands were identified in 1993 (Sullivan and Richardson 1993), but flooding since then may have removed or altered the stands. Winter use of the riparian areas is probably the least damaging since growth has stopped and there is little palatable forage on the trees. Also, the season of use influences the degree to which livestock tend to congregate in the riparian areas. Sullivan and Richardson (1993) observed signs of livestock use on the upper terraces but no significant use of the lower riparian. While considerable areas of the reach are dominated by rock, cobble, and boulder substrates, there are some areas of soft banks that are naturally erosive. These contribute sediment to the river and are more vulnerable to the effects of mechanical damage. Use of the pasture during the winter when rains are more likely to occur, increases the risk to these banks because moisture makes them easier to damage.

Aquatic Habitats

Aquatic habitats in the Verde River reach contained in the allotments are a mix of high gradient reaches with rapids and riffles, pools, backwaters and ephemeral inundated floodplains formed by overbank flows. Substrates are diverse and bank stability varies considerably. The higher velocities move sediments through the system except when overbank flooding provides low velocity, shallow areas where sediments can be deposited.

Although adapted to large rivers, razorback suckers actually use specific types of habitat within the river. Fast water, rapids, and shallow riffles are not preferred. Pools, side channels, mid-channel bars, backwaters, and flooded bottomlands are more preferred. Spawning habitats are gravel/cobble bars or beaches. Nursery areas include backwaters and flooded bottomlands. Livestock can affect these types of habitats in several ways.

While some of the overbank flooding areas are dominated by rocks that act to slow the water, the combination of rocks and riparian vegetation is more effective. The riparian vegetation provides structure and breaks up the water flow in addition to providing a source of nutrients to the river. Overuse of these areas that results in weakened plants that are less able to hold position and slow the flows, or reduces the biomass of the plants and thus the ability to slow

flows and hold sediment, reduces the value of these areas to fish.

Nearshore shallow waters and backwaters are likely to provide habitat for young razorback suckers in the future. The stocking of sub-adult fish provides opportunity for establishment of spawning populations. There is no evidence to suggest that the Verde River in the action area is more or less suitable for spawning or nursery habitat than other reaches. Livestock standing in water disturb substrates and instream cover for small fish and localized water quality degradation, especially in slow or non-flowing waters. Injury to larger fish from trampling is also possible.

Aquatic habitats are also affected indirectly by livestock use of the watershed and riparian areas. Poor watershed condition and increased sediment loads from the watershed or unstable banks alter stream channel morphology and natural flows. Changes to the configuration of the stream, the placement of pools, riffles and backwaters, depth of stream and degree of braiding, instream cover, and substrates are all influenced by flows off the watershed. Degraded riparian conditions also factor into the discussion and are also part of changes to how a flood affects a particular reach of stream.

Nutrient cycling and resource availability are also affected within the river. Reduced riparian vegetation reduces the input of invertebrates and vegetative material to the river. Vegetative materials are a primary source of food for various aquatic invertebrates, and, in a decayed state, to some fish including the razorback sucker. Altered flood flows may remove this material very quickly from the area and thus affect available resources. Increased sediment loads can reduce habitat for invertebrates that prefer clean gravel or rock substrates, also reducing biomass available. Nutrient loads coming off the watershed or deposited in the river due to livestock being present influence productivity of the system.

Interrelated/Interdependent Actions

As part of the analysis of the direct effects, the Service must include the effects of other actions that are related in some manner to the proposed action under consultation. These types of actions can be private, State or Federal actions. Interrelated actions are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those having no independent utility apart from the proposed action. The determination as to whether an action falls into one of these two categories is made based on whether the project would occur "but for" the proposed action. Federal actions that are shown to be interrelated or interdependent are incorporated into the effects of the proposed action, non-Federal actions are examined separately.

For the proposed action, no interrelated or interdependent actions have been identified. Additional fences or developed waters are not part of the proposed action having already been completed although these facilities will require regular maintenance. Roads and other transportation facilities are not expected to change and are used by parties other than the permittee so are not singularly tied to the action to allow livestock grazing on the allotments. Effects of these actions should not be significant.

Critical Habitat

Effects to the constituent elements and special selection criteria have largely been described in the preceding discussion. Continuation of the livestock grazing on the two allotments allows for some degree of continued degradation or foregone restoration opportunities in the river and floodplain.

Summary of Effects for the Razorback Sucker

The effects of permitting livestock grazing on the Skeleton Ridge/Ike's Backbone Allotments include effects to watershed condition, riparian condition, and aquatic habitats. The effects of the proposed action are difficult to separate from the combined effects from other actions in the watershed of the Verde River. These combined effects likely have a considerable influence on the flows and flow patterns of the Verde River, the sediment loads, and opportunity for riparian restoration in the reach. Further complicating the analysis is the topography of the reach itself, which for most of the length is not conducive to establishment of extensive stands of riparian vegetation. However, that lack only makes those areas where the floodplain is wider more important as riparian areas and for overbank flows.

After analysis of the effects to the razorback sucker and its designated critical habitat in the Verde River, the Service concludes that the effects of continuing livestock grazing on the two allotments has effects to the listed species and designated critical habitat in the Verde River and its watershed. These effects are discussed in this biological opinion. There is no question that the proposed action is a significant improvement over past livestock management on the allotments, and adverse effects of that past management are influencing the type and magnitude of effects expected in the future. However, the commitment to continue livestock grazing on the allotments has an impact, in effect, in that some degree of potential for restoration of degraded conditions is foregone.

Effects of the Action for the Southwestern Willow Flycatcher

Activities that disturb, remove, or modify flycatcher habitat characteristics may adversely affect the flycatcher. Present and past overuse by livestock has been a major factor in the degradation and modification of riparian habitats in the western U.S. The effects of livestock grazing in riparian areas within the action area are partially analyzed under "effects of the action" for the razorback sucker.

Approximately 11.2 km (7 mi) of river frontage within the allotment would be accessible to livestock. Approximately two km (1.3 mi) in the Powerhouse pasture would be grazed during the non-growing season only by 20 to 30 replacement heifers. The remaining river frontage would be grazed during the growing season by 20 to 30 replacement heifers (Hot Springs and Childs) or the main herd of 260 cattle plus progeny (Black Ridge/Houston Basin). Thus, the potential remains for livestock to browse cottonwood, willow, and other woody riparian species that are present currently within the allotment or that occur after spring flood events.

Eliminating or reducing the extent of recruitment in the project area, where potential woody riparian areas are relatively small to begin with, can affect the flycatcher in several ways. First, flycatcher habitat can develop in as little as three growing seasons. Even on the Verde River, where scouring floods come every four to seven years on average, flycatcher habitat may develop and persist for several or more years between scouring flood events, absent other limiting factors. As flycatcher abundance and distribution improves in the Verde Valley, the importance of riparian areas for flycatcher use within the action area also increases. Because a breeding population remains extant upstream in Camp Verde, flycatchers are more than likely migrating through the project area. Thus, there is a high probability that returning flycatchers would encounter and possibly use suitable habitat that develops in the project area.

Second, managing the river bottom to enable as much recruitment as possible would reduce the

effects of scouring floods. As the distribution and abundance of woody species increases in the river bottom, floodplain development will be enhanced. Riparian stands trap sediment and woody debris which builds banks and adds sinuosity to a river. Small backwater areas comprised of emergent marsh and woody species also occur on the Verde River. These areas dampen the effects of flood flows and increase the probability that riparian habitat will persist. Although the conventional wisdom is that scouring floods will continue to preclude development of significant riparian resources on the Verde River, no comprehensive watershed/drainage management plan has been developed and implemented to evaluate the alternative hypothesis that changes in a variety of watershed management activities can improve the diversity, abundance, and distribution of riparian and aquatic habitats.

While the average scouring flood event on the Verde River is estimated to occur once every four to seven years, the actual number of years between scouring floods may be much greater. The most recent scouring floods occurred during an "El Nino" event that lasted for an unusually long period of five years. Thus, periodic high flows would be expected. If the corresponding "La Nina" period were also to persist, then the likelihood of scouring floods decreases and the potential for riparian stands to develop into more mature and persistent habitats increases. If scouring floods eliminated riparian potential on the Verde River, then no riparian habitats would occur. However, riparian and backwater marsh habitats of various sizes and ages do persist (116 ha were documented in the allotment in 1981) and their extent might increase if management were modified to take advantage of favorable environmental periods (i. e. those with non-scouring flood events that result in recruitment of riparian vegetation). The possibility of current riparian habitat developing into suitable flycatcher habitat is addressed in the BAE, which states:

No suitable habitat for willow flycatchers was found. Potential habitat for flycatchers occurs in isolated patches along the river... , but the likelihood of suitable habitat developing... was found to be low as a result of frequent scouring floods and heavy recreational impacts.

The Service agrees that scouring floods and recreation are problems on the Verde River. Effects to potential flycatcher habitat from recreation can be remedied through Forest Service management actions. The rationale for the "not likely to adversely affect" determination in the BAE is that no suitable habitat exists. Based on that determination the Forest Service did not analyze the potential effects of livestock grazing in these riparian areas. However, the above excerpt from the BAE indicates that potential habitat does exist. Thus, the Service believes that an analysis of the effects of livestock grazing in riparian areas should have been included in the BAE.

Livestock use of pastures that have access to the Verde River varies from use during half the growing season two out of every three years (Black Ridge/Houston Basin) to partial use every growing season (Powerhouse; March and April). The information provided in the BAE does not quantify effects of livestock grazing in riparian areas. No current riparian habitat inventory has been completed, nor have any experimental areas been established to evaluate livestock use of riparian areas. Photographs contained in the BAE and field observations by Service staff in March of 1997 indicate heavy use of herbaceous cover, but little use of several-year-old willow and cottonwood that occur throughout the project area. Some sandbars and banks are completely unvegetated. Use of non-seedling willow and cottonwood would not be expected except when herbaceous cover has been overutilized or is unavailable (e. g. under drought conditions or over-stocking). Recent range data show some improvement in upland cover and species diversity.

No quantitative data is available to assess livestock use of seedling willow and cottonwood. Because floodplain areas on the Verde River are typically small, livestock use of seedling willow or cottonwood (by even few head) would occur rapidly and would likely go undetected without frequent on-the-ground surveys to detect and monitor areas where seedlings establish, or a valid experimental approach to evaluate use (e.g. exclosures). Without additional data, the Service is left to conclude that livestock grazing within pastures that access the Verde River still poses a threat to recruitment of riparian habitat. Given that other factors contribute to the unfavorable baseline condition of riparian habitat on the Verde River (e.g. heavy recreational impacts and watershed conditions that contribute to scouring floods), additional threats that increase the vulnerability of riparian habitats are of serious concern to the Service.

Additionally, the distribution and extent of riparian habitats along the entire Verde River is important to migratory flycatchers. Flycatchers nesting upstream in Camp Verde and, formerly, Clarkdale would be expected to migrate up the Verde River corridor to reach breeding areas. Stopover sites for feeding and resting are critical for migratory birds and it is likely that flycatchers nesting upstream rely on riparian resources within the action area. Precluding recruitment of riparian habitat on the Verde River is likely to adversely affect migrating flycatchers.

Livestock grazing in the vicinity of nesting southwestern willow flycatchers can have indirect effects on the species by attracting brown-headed cowbirds. Cowbirds are nest parasites known to use willow flycatchers as a host species. In some areas, such as the Camp Verde flycatcher site mentioned above, cowbird parasitism resulted in total failure of 49% of nests. Persistent, high levels of parasitism are likely to result in extirpation of breeding groups. This is the likely cause of extirpation of the Tuzigoot breeding group, also mentioned above. Livestock grazing throughout the project area is likely to attract cowbirds. Given the pattern of cowbird parasitism elsewhere in the Verde Valley, it is highly probable that flycatchers occupying habitat within the project area will also experience parasitism.

Cumulative Effects

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section, because they require separate consultation pursuant to section 7 of ESA.

Most of the land in the action area is Federal land and subject to future section 7 consultation on projects that would occur. Changes to the existing uses on private lands and facilities within the project area are not anticipated within the near term. Flows in the Verde River, Fossil Creek and the East Verde River are not controlled by Federal interests. Existing diversions and uses are part of the environmental baseline for the area. In the future changes to diversions and use of water are very likely to occur as a result of urbanization in the Verde Valley and changes to other non-Federal actions. The magnitude of these changes is not clear at this time. Development also alters the way runoff reaches the river and may have an effect on base or flood flows.

CONCLUSION

After reviewing the status of the razorback sucker and its designated critical habitat in the action area, the environmental baseline, effects of proposed implementation of the livestock grazing strategy, and the cumulative effects, it is the Service's biological opinion that the actions described in the assessment and this opinion, are not likely to jeopardize the continued existence of the razorback sucker or adversely modify its designated critical habitat in the Verde River.

After reviewing the status of the southwestern willow flycatcher and its proposed critical habitat in the action area, the environmental baseline, effects of proposed implementation of the livestock grazing strategy, and the cumulative effects, it is the Service's biological opinion that the actions described in the assessment and this opinion are not likely to jeopardize the continued existence of the southwestern willow flycatcher nor adversely modify proposed critical habitat.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the Act, 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 defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding and sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7 (o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Amount or Extent of Take for the Razorback Sucker

There are two types of take resulting from the proposed action. One is harassment, through effects to individual fish, and the other is harm, through effects to habitats that alter their suitability to support individual fish. The small size of the razorback sucker population in the Verde River makes any estimate of these two types of take very difficult to make. Take in the action area is the result of effects of the proposed action and the effects of upstream watershed and river conditions, further complicating the analysis. In addition, take downstream of the proposed action area is influenced by effects of the action.

Because the type and extent of take for this proposed action is difficult to define and measure, the Service has determined that a surrogate measure is needed to define the take and when it has been exceeded. The Service concludes that incidental take from the proposed action will be considered to be exceeded if either of the following two conditions are met:

1. That riparian recovery is halted or significantly slowed within the reach of the river containing the proposed action by the action of livestock in the riparian areas. Riparian recovery can be defined through: (1) no more than light (less than 40 percent use of apical stems) use of riparian woody species by livestock, (2) utilization of herbaceous species in the riparian zone at less than 40 percent, and (3) minimal bank instability (in this case, by impact by livestock), defined as 20 percent or less of the total.
2. That watershed conditions do not continue to improve to a satisfactory condition under the proposed livestock management. Improving watershed conditions can be defined through improvements shown in trend and/or condition of rangelands on the allotments.

Effect of Take for the Razorback Sucker

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures for the Razorback Sucker

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the take of the razorback sucker:

1. Measures will be taken to monitor livestock use of the riparian areas of pastures to which livestock have access.
2. If livestock use in the riparian areas is excessive, measures will be taken to reduce or eliminate livestock use of these areas.
3. Measures will be taken to improve watershed conditions.

Terms and conditions for the Razorback Sucker

In order to be exempt from the prohibitions of section 9 of the ESA, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

The following terms and conditions are necessary to implement reasonable and prudent measure 1:

1. In all pastures with river access, monitoring of riparian conditions, including livestock use, will be accomplished at least two times while livestock are in the pasture, once during the mid-point of the grazing period and once at the end of the grazing period.
2. After livestock leave pastures with river access, the degree of use by livestock and condition of streambanks that are attributable to livestock will be measured using standard practices for such measurements.

The following terms and conditions are necessary to implement reasonable and prudent measure 2:

1. If monitoring under reasonable and prudent measure 1 indicates that livestock are having a significant adverse effect to riparian restoration, then the Forest Service must determine and implement suitable management strategies to reduce the effects to riparian areas.

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

1. If watershed conditions do not improve under the proposed grazing management, the Forest Service will review the management and develop new management that does result in improvement to watershed conditions.

Amount or Extent of Take for the Southwestern Willow Flycatcher

Take, in the form of harm to flycatchers, is anticipated through effects to riparian habitat that alter or preclude their suitability for migrating and breeding flycatchers. Take in the action area will result from both the effects of the proposed action and the effects of other activities not part of this consultation (e.g. recreational impacts, watershed conditions upstream). The extent of take for this proposed action is difficult to measure because current flycatcher survey data is not available. Thus, a surrogate measure is needed to define take and the threshold for exceeding take. The Service concludes that incidental take from the proposed action will be considered to be exceeded if one or more of the following conditions are met:

1. Standardized monitoring demonstrates that livestock are using excessive amounts of seedling woody riparian plant species for browse.
2. Standardized monitoring demonstrates that livestock are browsing on excessive amounts of non-seedling woody riparian plant species.
3. Standardized monitoring and mapping demonstrates that, in the absence of scouring flood events, the percentage of vegetated riparian habitats declines by more than 20% in areal extent from the baseline mapping study.

Effect of Take for the Southwestern Willow Flycatcher

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of proposed critical habitat.

Reasonable and Prudent Measures for the Southwestern Willow Flycatcher

The Service believes the following reasonable and prudent measures are necessary and

appropriate to minimize take of the southwestern willow flycatcher:

1. Measures shall be taken to monitor livestock use of the riparian areas to which livestock have access.
2. If excessive use of woody riparian vegetation is determined, measures will be taken to move livestock outside the riparian pastures and use of the affected pasture shall be deferred in the following year.
3. Measures shall be taken to monitor the entire river corridor through the allotment for livestock.
4. Any trespass livestock found shall be removed from riparian areas immediately and a reasonable effort shall be made to determine and eliminate the source or point of trespass.
5. Measures shall be taken to map the distribution, size, and areal extent of riparian habitats, in a standardized manner, along the river corridor through the allotment.

Terms and Conditions for the Southwestern Willow Flycatcher

In order to be exempt from the prohibition of section 9 of the ESA, the Forest Service needs to comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

The following terms and conditions are necessary to implement reasonable and prudent measure 1:

1. In all pastures with river access, standardized monitoring of riparian conditions, including livestock use, shall be accomplished at least two times during the grazing period; once at the mid-point of the grazing period and once at the end of the grazing period.

The following terms and conditions are necessary to implement reasonable and prudent measure 2:

2. If standardized monitoring under reasonable and prudent measure 1 indicates that use of the apical stems of woody riparian vegetation exceeds 40% (frequency of occurrence), then the Forest Service must remove livestock from the riparian area in the affected pasture immediately and shall defer use of the riparian area in the affected pasture in the following year.

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

1. In all pastures adjacent to the river for which river access is supposed to be precluded, sweeps of the river corridor shall be made monthly during the period each pasture is being grazed to monitor for livestock.
2. In all pastures adjacent to the river and abutting allotments managed by adjacent Prescott and Coconino National Forests, sweeps of the river corridor shall be made

twice a month to monitor for livestock.

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

1. If livestock are found during monitoring or during observations incidental to other activities, the Forest Service shall be responsible for removing livestock immediately.

The following terms and conditions are necessary to implement reasonable and prudent measure 5:

1. To establish a baseline from which to monitor take for the southwestern willow flycatcher, the Forest Service shall complete a standardized mapping study within three years of the date of this biological opinion to determine the distribution, sizes, extent, and types of riparian habitats (including non-vegetated areas that, absent other limiting factors, would support riparian vegetation) on the river corridor through the allotment. The mapping study should be completed using aerial photography taken during the growing season. Followup mapping and monitoring shall be conducted once every 5 years from the completion of the baseline mapping study to evaluate levels of take. Thus, the baseline study should be completed by 2000, and the first followup study completed by 2005, etc., for the life of the management plan. To remove the potential effects of scouring floods from analyses of take, the threshold for take will not be considered exceeded if a scouring flood event occurs during the two years preceding any of the followup mapping studies. Such scouring will be shown to have occurred by recording on-site observations made during monitoring, correlated with data from Tangle Creek gauging station, and documentation with photographs from permanent photo points, taken before and after the scouring.

Review requirements

The Forest Service will provide the Service with a yearly report on the livestock management and monitoring done for this proposed action.

CONFERENCE REPORT

In 1985, a determination for an experimental non-essential population of Colorado squawfish in the Verde River was published by the Service. Colorado squawfish have been stocked into the Verde River under this designation in the twelve years since. Although the Colorado squawfish is listed as an endangered species throughout its range, an experimental non-essential population does not have the full protection of sections 7 or 9 of ESA. This allows for more flexibility in management of the area containing the population. Experimental non-essential populations are considered, for the purposes of section 7, as if they were only proposed for listing as a threatened species.

Life history information for the Colorado squawfish was summarized in the biological support document for the designation of critical habitat (USFWS 1993). The following information is abstracted from that document.

The Colorado squawfish was historically found in the large rivers of the Colorado River Basin. It was listed as an endangered species in 1967 under a precursor to the current ESA. The largest minnow in North America, reaching lengths of nearly two meters, the Colorado squawfish preyed on the other native fish species in the basin. Significant spawning migrations are also characteristic of this species. Spawning takes place on the declining water levels of late spring and early summer in riverine habitats associated with whitewater canyons. Adults utilize all types of riverine habitats, including pools, eddies, backwaters and main channel habitats. Young Colorado squawfish use flooded bottomlands and other ephemeral embayments and backwaters.

Effects to the Colorado squawfish are not significantly different from those described under the effects section for razorback sucker either in magnitude or type. Formal conference is required when an action is likely to jeopardize the continued existence of a species proposed for listing. Based on the magnitude of effects to the Verde River from the proposed action, such a finding is not warranted for the Colorado squawfish.

Review requirement

The Forest Service shall provide the Service with a yearly report on the livestock management and monitoring done for this proposed action.

Notice: While the incidental take statement provided in this consultation satisfies the requirements of the Endangered Species Act, as amended, it does not constitute an exemption from the prohibitions of take of listed migratory birds under the more restrictive provisions of the Migratory Bird Treaty Act.

CONSERVATION RECOMMENDATIONS

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

The Service offers the following conservation recommendations for your consideration:

1. The Tonto National Forest participate in surveys for razorback sucker in the Verde River.
2. The Tonto National Forest complete a comprehensive evaluation of the effects of livestock grazing in the Verde River watershed in conjunction with the Prescott and

Coconino National Forests. Analysis on an allotment by allotment basis makes delineation of effects more complex.

3. The Tonto National Forest, in conjunction with the Prescott and Coconino National Forests complete a comprehensive basin-wide analysis on the effects of recreation on the establishment and maintenance of riparian habitats.

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.

REINITIATION STATEMENT

This concludes formal consultation on range permit issuance for the Skeleton Ridge/Ike's Backbone Allotments as outlined in your request for consultation. 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 retained (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 subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in the opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the extent or amount of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

In future communications on this project, please refer to consultation number 2-21-94-F-559. If there are any questions about this biological opinion, please contact Lesley Fitzpatrick or Rob Marshall.

Sincerely,

/s/ Sam F. Spiller
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (GM:AZ)(AES)
Project Coordinator, Fish and Wildlife Service, Parker, AZ
Director, Fish and Wildlife Service, Washington, D.C. (AES)

Director, Arizona Game and Fish Department, Phoenix, AZ

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Mr. Charles Bazan

43

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Mr. Charles Bazan

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

| Nest Ht. | | | | | Mean |
|---|---|---|------------------------|--|--|
| Habitat Type | Relative to Base of Nest Substrate [m] n | Mean Nest Substrate Height [m] ± 1 STD (range) | ± 1 STD (range) | | Source |
| Monotypic stands of Geyer willow (Apache Co., AZ) (1995) | 33 | 1.8 ± 0.3 (1.0 - 2.3) | 4.4 ± 0.5 (3.5 - 6.0) | | Muiznieks <i>et al.</i> (1994), Sferra <i>et al.</i> Spencer <i>et al.</i> (1996, 1997) |
| Mixed native broadleaf, predominantly Goodding's willow (Yuma Co., AZ) (<i>litt.</i>) | 28 | 2.1 ± 0.8 (1.2 - 4.9) | - | | H. Brown 1902 collections (T. Huels <i>in litt.</i>) |
| 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) (1995) | 70 | 4.8 ± 1.8 (1.5 - 10.5) | 7.4 ± 2.3 (3.5 - 17.0) | | Muiznieks <i>et al.</i> (1994), Sferra <i>et al.</i> Spencer <i>et al.</i> (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) (1995) | 43 | 4.3 ± 1.3 (2.7 - 8.0) | 7.7 ± 2.0 (3.4 - 12.0) | | Muiznieks <i>et al.</i> (1994), Sferra <i>et al.</i> Spencer <i>et al.</i> (1996, 1997) |

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

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

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

Mr. Charles Bazan

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

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

Mr. Charles Bazan

Appendix 3 (continued).

| Action | Year | Federal Agency ¹ | Incidental Take Anticipated |
|--|-------|-----------------------------|---|
| New Mexico | | | |
| Corrales Unit, Rio Grande (Bernalillo Co.) | 1995 | Corps | None |
| Rio Puerco Resource Area Management Plan | 1996 | BLM | Consultation in process |
| Caballo Res. Mgmt. Plan (Sierra, Sandoval Co.) | 1996 | BLM | Consultation in process |
| Farmington Res. Mgmt. Plan (San Juan Co.) | 1996* | BLM | Consultation in process |
| Mimbres Res. Mgmt Plan (Grant Co.) | 1996* | BLM | Consultation in process |
| San Acacia to San Marcial Levee (Socorro Co.) | 1996 | Corps | Consultation in process |
| Taos Res. Mgmt Plan (Sandoval, R. Arriba Co.) | 1997* | BLM | Take of 1 flycatcher pair due to cowbird parasitism |

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

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

Mr. Charles Bazan

Appendix 4. Nest predation and brood parasitism rates documented for the southwestern willow flycatcher across its range¹.

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

¹ Sources: Sogge and Tibbitts (1992), Sogge *et al.* (1993), Brown (1994), Maynard 1994, Muiznieks *et al.* (1994), Sogge and Tibbitts (1994), Cooper (1995), 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.

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