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REPRODUCTIVE SUCCESS OF THE SOUTHWESTERN WILLOW FLYCATCHER IN THE CLIFF-GILA VALLEY

Summary Report for 1997 Field Season

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INTRODUCTION

The Southwestern Willow Flycatcher *(Empidonax traillii extimus)* is a neotropical migrant passerine that ranges from southern California and Baja California eastward through Arizona, southern Utah, southern Colorado, New Mexico, and trans-Pecos Texas (Unitt 1987). This species is an obligate riparian specialist, nesting in dense vegetation associated with watercourses. Southwestern Willow Flycatchers appear to be semi-colonial (much like the related Least Flycatcher, *E. minimus*: Briskie 1994), breeding in loose aggregations in appropriate habitat. Habitat patches as small as 0.5 ha may be occupied (Sogge et al. 1993). In the southwest, nesting is almost always in the vicinity of surface water or saturated soils (U.S. Fish and Wildlife Service 1995).

It has been suggested that in the southwest, the Willow Flycatcher has declined significantly during this century, due primarily to extensive loss and conversion of riparian breeding habitats (Unitt 1987, U.S. Fish and Wildlife Service 1995). Loss and modification of riparian habitats has been attributed to many factors, including water diversion and impoundment, changes in fire and flood frequency due to hydrological alterations, livestock grazing, replacement of native riparian vegetation by non-native species, urban development, and recreational activities (Rea 1983, Kreuper 1993, U.S. Fish and Wildlife Service 1995). Additionally, a high incidence of nest parasitism by Brown-headed Cowbirds (*Molothrus ater*) has been reported from several sites, resulting in low reproductive success. Cowbirds lay their eggs in the nests of other species (hosts), where cowbird chicks are raised by the host parents. For small hosts, parasitized nests rarely fledge any host young (Brittingham & Temple 1983). Nest parasitism levels of over 50% have been documented for populations at the Kern River, California (Harris 1991) and the Grand Canyon (Brown 1994). In many cases flycatchers respond to the laying of cowbird eggs in their nests by abandoning and renesting (Whitfield & Strong 1995).

Current Status of the Willow Flycatcher. — In 1993, the U.S. Fish and Wildlife Service (1993) proposed to list *E. t. extimus* as an endangered species and to designate critical habitat. In February of 1995, the USFWS listed *E. t. extimus* as endangered, although no designation of critical habitat was made (U.S. Fish and Wildlife Service 1995). The subspecies has also been listed at the state level in New Mexico, Arizona, and California (Arizona Game and Fish

Department 1988, New Mexico Department of Game and Fish 1988, California Department of Fish and Game 1992).

Since its listing as an endangered species, numerous surveys have been conducted across the range of the flycatcher to locate extant populations and to estimate their size. Flycatchers have been found breeding at about 75 sites throughout the southwestern United States (Sogge et al. 1997a). Approximately 78% of extant sites consist of 5 or fewer territories. The entire known breeding population in 1996 was estimated at between 300 and 500 pairs (Sogge et al. 1997a). The majority of these pairs occur in New Mexico, primarily in the southwestern portion of the state (Hubbard 1987).

The Cliff-Gila Valley population. — The largest known breeding concentration of Southwestern Willow Flycatchers is located in the Cliff-Gila Valley, New Mexico, with an estimated 150 pairs in 1996 (Hull & Parker 1996). These birds are located primarily on private property owned by the Pacific Western Land Company, a subsidiary of Phelps-Dodge Mining Co., and managed by the U-Bar Ranch. An additional 12 pairs occur on the adjacent Gila National Forest and other private holdings (Boucher 1994).

The Cliff-Gila Valley population of Southwestern Willow Flycatchers is of particular interest for several reasons. It contains about a third of all known breeding pairs of the subspecies, and is an order of magnitude larger than the next largest concentration located on the Kern River, California (with approximately 38 pairs in 1997: Whitfield pers. communication). Comparisons of recent population estimates (Hull & Parker 1996) with prior estimates (Hubbard 1987, and references therein) suggest the population has increased significantly over the past few decades. If so, the Cliff-Gila Valley may constitute a source population (Pulliam 1988), and may be the only population thought to be growing in size (c.f. Sogge 1997). Habitat preferences of flycatchers in this population differ from those reported elsewhere (Parker and Hull 1995), and from populations of other subspecies. Most studies of Willow Flycatchers have shown a strong association with willow thickets (e.g., Sedgwick & Knopf 1992) or other shrubby habitats. However, Cliff-Gila flycatchers are found primarily in tall, multi-layered stands of mixed broadleaf deciduous species. Boxelder (*Acer negundo*) is the most frequently used tree for nesting (Skaggs 1996). Paradoxically, the Cliff-Gila population occurs on a working cattle ranch that includes water diversion for irrigation, leveed river banks for flood control, and floodplain agriculture — all activities identified as potential threats to the existence of the flycatcher by the US Fish and Wildlife Sevice (U.S. Fish and Wildlife Service 1995).

Effective management and protection of Willow Flycatcher populations in the Cliff-Gila area requires a solid base of scientific knowledge. Unfortunately, almost all available data on the biology of Southwestern Willow Flycatchers come from small populations (≤38 pairs) that appear to differ significantly from the Cliff-Gila birds in habitat use, nest site characteristics, and in having low reproductive success (U.S. Fish and Wildlife Service 1995, Sogge 1997). Because of its size, the Cliff-Gila population may serve as a useful reference population for in-depth studies and recovery plans for the Southwestern Willow Flycatcher and its riparian habitat. To that end, this study was initiated to assess the reproductive success, demography, and habitat use of the Cliff-Gila population of flycatchers.

OBJECTIVES

The goals of this project are to characterize the habitat preferences of Southwestern Willow Flycatchers in the Cliff-Gila Valley; monitor nesting success and rates of cowbird parasitism to assess the reproductive health of the population; monitor other breeding bird species to assess "background" rates of predation and parasitism; and determine whether reproductive success of the flycatcher varies in relation to habitat or avian community structure, landscape design, or nest site characteristics. This report summarizes the results of the first year of the project. In addition, results from the Cliff-Gila Valley are compared to other flycatcher populations to provide perspective on the importance and health of the population.

METHODS

Study area. — The Cliff-Gila Valley of Grant County, NM, comprises a broad floodplain of the Gila River, beginning near its confluence with Mogollon Creek and extending south-southwest towards the Burro Mountains. The study was conducted in a subsection of the valley extending from Gila National Forest land (Fort West Ditch site) below the confluence of Mogollon Creek. and extending downstream to the US Route 180 bridge (approximately 10 km). This valley consists of irrigated and non-irrigated pastures used for livestock grazing and hay farming. Elevations range from 1420 to 1400 m (Figure 1).

The Gila River floodplain contains numerous patches of Broadleafed Riparian Forest, with a canopy composed primarily of *Populus fremontii*, *Platanus wrightii*, *Salix gooddingi*, *Acer negundo*, and *Juglans major*. Most patches support an understory of shrubs, including *Rhus trilobata*, *Amorpha fruticosa*, *Salix* spp., *Baccharis glutinosa*, *Alnus oblongifolia*, *Elaeagnus angustifolia*; forbs, and grasses. Most habitat patches are less than 5 ha in area. The FS Fort West Ditch site is generally more open than patches on the U-Bar. In addition to the primary patches of riparian woodland along the Gila itself, numerous stringers of riparian vegetation extend along many of the earthen irrigation ditches. These stringers contain the same plant species as larger forest patches, but rarely exceed 10 m in width.

In this first year, the study focused on two large riparian patches and two stringer patches on the U-Bar Ranch (see Figure 1: SE1, SW Stringer, NW Stringer, and NE1) and the FS Fort West Ditch site. Focal patches were chosen that had been occupied by Willow Flycatchers in previous years (Hull & Parker 1995). In addition, flycatchers were studied in other patches on the U-Bar as time allowed.

Spot mapping. — Territories of all breeding land birds were determined using the spot mapping method (Robbins 1970, Bibby et al. 1992, Ralph et al. 1993). In each focal patch, a grid of 100 ft squares was established and marked with flagging tape. Grids were of varying sizes and configurations depending on the size and shape of the patch. Each plot was mapped 10 - 12 times during the season, approximately every 2-3 days. Spot mapping sessions began within 15 minutes of dawn at a different random corner of the grid each time, and lasted 2 to 5 hours

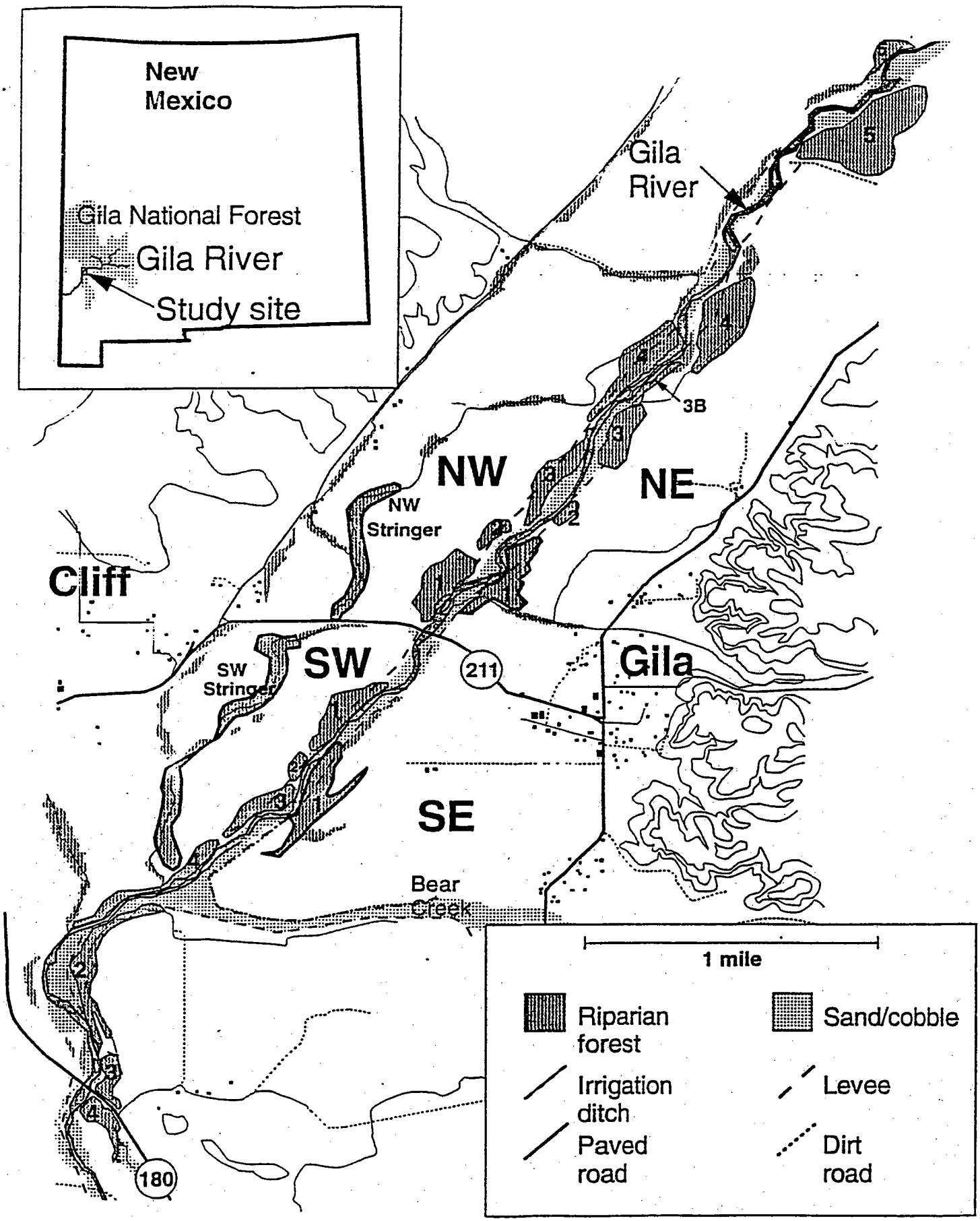

Figure 1 - Study site in the Cliff-Gila Valley, NM. The Forest Service Fort West Ditch site is off of the ma

(Bibbie et al., 1992). Weather conditions, such as cloud cover, wind speed, and precipitation were recorded on each mapping day. A new map was used for each mapping session. Following mapping, observations were transferred from the daily map to master maps for each species.

From the master maps we determined the number of breeding territories of all species for each patch. We calculated estimates of the density of breeding birds (all species) for the areas that were spot-mapped, using the following caveats. First, because the territories of large and/or wide-ranging birds (e.g., quail, raptors, crows, ravens, swallows, jays, and cuckoos) could potentially cover two or more patches and/or surrounding non-forested land, a territory was assigned to a particular patch only if the nest was located within the patch. Second, Mourning Doves (*Zenaida macroura*) breed in high densities in riparian habitats but forage mainly in open areas. Because including all doves found in a patch in calculations is likely to bias estimates of density, we followed Anderson et al. (1983) in using only 10% of the observed dove population.

Nest searches. — Nest searches were conducted on a daily basis following spot-mapping sessions. Within focal patches, searches were conducted for nests of all species. Only flycatcher nests were searched for in additional patches. Nests were monitored every 3-5 days. Nest contents were observed using pole-mounted mirrors when possible, or 15X spotting scopes. The use of scopes limited the amount of information that could be gathered at high nests. Nests that were abandoned or destroyed were examined for evidence (e.g., cowbird eggs, mammal hairs) to ascertain causes of nest failure. Nest predation was assumed if nest contents disappeared before fledging of young was possible (about 12 d after hatching). Nests were considered successful if they fledged one or more flycatcher young.

To assess flycatcher use of nest trees, we calculated an index of availability for each nest tree species. At each nest, we counted the number of stems of woody vegetation 10 cm DBH (diameter at breast height) or greater within a 0.02 ha circle (radius = 8 m) centered on the nest tree, by species. In addition, we counted the number of woody stems between 1 and 10 cm DBH within a smaller circle of 4 m radius. Because flycatcher nests were found in vegetation of all size classes 1 cm DBH and greater, we pooled all size classes > 1 cm DBH as potential nest substrates. A total stem count for each species was calculated from all nest sites. The relative availability of a particular plant species was calculated as: total number stems species *x* / total number of all stems.

Flycatchers used only 5 plant species as nesting substrates, so not all stems should be considered as potential nest substrates. Therefore, we calculated another availability index as the proportion of stems of known nest plant species represented by a particular species. This was calculated as : total # stems species x / total number stems of 5 known substrate species.

RESULTS

Willow Flycatcher Breeding

Nesting substrates. — A total of 92 willow flycatcher nests were found. The majority of nests were in boxelder (84%), with lesser numbers in willows (two species, 5%), Russian olive (9%),

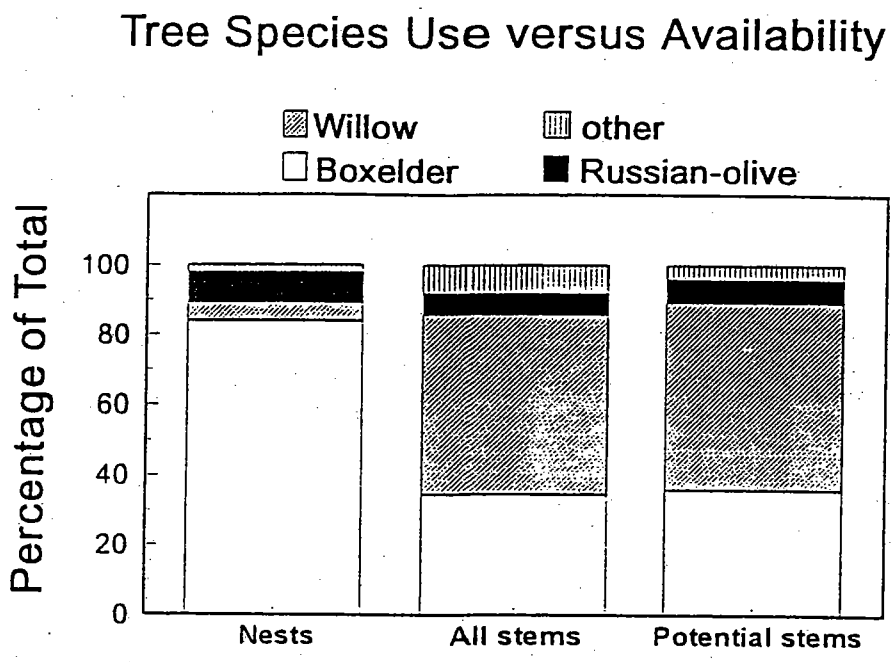

Figure 2 — Nest tree use versus availability for 78 circular plots of 0.02 ha area centered on flycatcher nest trees.

Arizona alder (1%) and saltcedar (1%).

Trees used for nesting by Willow Flycatchers averaged 13.2 ± 5.8 m in height, and 23.4 cm dbh (n=85). Boxelders were significantly higher on average (14.7 ± 5.2 m) than other tree species used for nesting (6.4 ± 2.8 m, n=15; F = 35.6, df = 1,83, P<0.001).

Tree species were not used for nesting in proportion to their availability within territories (Figure 2). Flycatchers used boxelder more and willow species less than would be expected if nest trees were chosen randomly (G=28.8, df=1, P<0.0001). This holds true whether one considers all stems or just known nest substrates. Russian Olive was used in proportion to its occurrence (G=0.71, df=1, P=0.40). Thus, the high incidence of boxelder nests in the Gila Valley appears to be due not to the predominance of boxelder in flycatcher territories, but rather to active preference by flycatchers for boxelder over other substrates.

Flycatcher nests. — The mean height of flycatcher nests was 7.0 ± 3.9 m (n=90), and ranged from 1.2 to 16.4 meters. Nests in boxelder were significantly higher on average (7.7 ± 3.8 m, n=75) than those in other species (3.2 ± 1.6 m, n=15; F=20.3, df=1,88, P<0.001). The

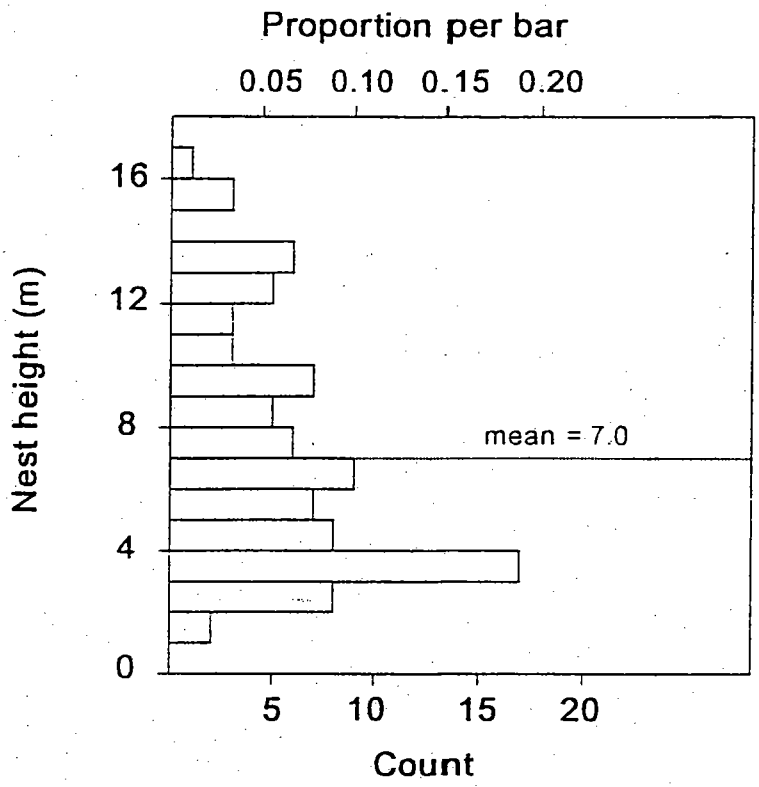

Figure 3 — Distribution of Southwestern Willow Flycatcher nest heights in meters.

distribution of nest heights is illustrated in figure 3.

The mean distance between flycatcher nests and the canopy was 6.2 ± 4.1 m, and ranged from 0.30 to 18.2 m. Again, nests in boxelder were significantly further from the canopy (mean = 6.8 ± 4.2 m, n=70) than nests in other trees (mean = 3.2 ± 2.1, n=15; $F_{1,83}$ =10.45, P=0.002).

Willow Flycatcher nesting success. — Because most nests were too high to monitor directly (by visual inspection using mirror poles), and because we limited the frequency of nest visits to minimize disturbance to breeding birds, we have incomplete data for some nests. Therefore, for the following summary statistics, a range of possible values is presented based on different assumptions.

For the 68 flycatcher nests of known outcome, nesting success (percent of nests that fledged at least one young) was relatively high — 55.2%. Overall, a minimum of 83 fledgling flycatchers were produced from nests on the U-Bar and Forest Service sites in 1997, although the true number is probably much higher. Of the 68 nests of known outcome, 21 were located in patches that are open to cattle (SWS, NWS, NW4, and the southern tip of SE1). Nesting success in these patches (13/21 = 61%) did not differ significantly from that in patches excluded from cattle (24/47 = 51%; χ^2 = 0.69, df=1, P = 0.41).

Cowbird Parasitism. — In 1997, Willow Flycatchers in the Gila Valley were occasionally parasitized by cowbirds, although the exact frequency is unknown for reasons outlined above. We were able to examine the contents of 34 nests. Of these, 5 contained cowbird eggs (14.7%). Three of the five were immediately abandoned after receiving a cowbird egg, while the remaining two were incubated but failed due to predation. If all nests of known outcome are included, and the assumptions are made that (1) no parasitism occured in nests that were depredated well into incubation or after hatching, and (2) no parasitism occurred in nests that successfully fledged young, then the nest parasitism rate was 11.1% (6/54). If we include post-fledging family groups for which no nest was found, then the rate was 11.4% (8/70). Three nesting attempts were known to produce cowbird fledglings; for two of these no nest was found. It is very unlikely that any of the 24 nests of uncertain outcome produced cowbird fledglings, because cowbirds are exceptionally noisy and obvious, and would be difficult to miss.

Avian Community Structure

Population Density. — Birds of 64 species were recorded on 5 plots during 200.5 man-hours of spot-mapping. The number of species recorded per plot ranged from 32 for SWS to 45 for both NE1 and SE1. The total number of bird breeding territories ranged from 80 to 146 per plot, for a total of 502 territories. Conservative estimates, which exclude 90% of doves and large birds without nests (see Methods), are given in Table 1. See Appendix I for a breakdown by species. Population densities of breeding birds were very high on all plots. Estimated densities ranged from 773.0 prs/40 ha on the FS Fort West Ditch site to 1114.0 prs/40 ha at the SE1 patch (see Table 1).

Table 1— Parameters and results of spot-mapping censuses at five riparian patches.

PATCH	Area (ha)	Survey hours	No. of Territories[a]	Pop. Density (prs/40 ha)
FS Fort West Ditch	4.55	43.0	88	773
U-Bar: NE1	3.25	34.5	77	947
U-Bar: NW Stringer	3.44	30.0	78	907
U-Bar: SW Stringer	2.70	60.0	72	1064
U-Bar: SE1	4.74	33.0	132	1114
Total	18.68	200.5	447	957

[a] These are conservative estimates and include only 10% of dove territories found. See text.

Nests. — A total of 267 nests were found of 30 species in the 5 focal patches. Ten or more nests were found for each of 6 species: Mourning Dove: 67; Willow Flycatcher: 58; Yellow-breasted Chat (*Icteria virens*): 30; Lesser Goldfinch (*Carduelis psaltria*): 15; Western Wood-Pewee (*Contopus sordidulus*): 12; and Black-chinned Hummingbird (*Archilochus alexandri*): 10. In addition, 34 flycatcher nests were located in 10 non-focal patches.

Cowbird Parasitism. — Two species, Yellow-breasted Chats and Yellow Warblers, were heavily parasitized by Brown-headed Cowbirds. Of 23 nesting attempts by chats for which we know the outcome, 11 (48%) were parasitized by cowbirds. In some chat nests, 4 of 5 eggs were of cowbirds. Six of 10 (60%) nesting attempts of known outcome by Yellow Warblers were parasitized. This figure may be inaccurate because we were unable to adequately monitor most warbler nests due to their height (mean = 9.7 m). Other species parasitized by cowbirds were Vermilion Flycatcher (*Pyrocephalus rubinus*), Plumbeous Vireo (*Vireo plumbeus*), Summer Tanager (*Piranga rubra*), Lucy's Warbler (*Vermivora luciae*), Lesser Goldfinch, Spotted Towhee (*Pipilo maculatus*), Abert's Towhee (*Pipilo aberti*), and Blue Grosbeak (*Guiraca caerulea*).

DISCUSSION

Willow Flycatchers in the Cliff-Gila Valley

Willow Flycatchers constituted one of the most common breeding species in the habitat patches surveyed. Compared to other studied populations of Southwestern Willow Flycatchers, birds in the Cliff-Gila valley exhibited relatively high levels of nest success and low levels of cowbird parasitism. They also differed substantially in their nest characteristics.

Nesting substrate. — Most Willow Flycatcher populations nest in streamside shrubs or low trees. Willow tends to be the most common nest plant, except in areas where willows are uncommon or absent (Table 2). In the Cliff-Gila valley, however, Willow Flycatchers nested primarily in boxelder, apparently by preference (Figure 2). Though willows were abundant and formed a major component of the woody riparian vegetation, they were little used by flycatchers for nesting. Because of the frequency of boxelder as a nesting substrate, nests in the Cliff-Gila valley averaged higher than any other known site. Also, the average distance from nests to canopy was greater than reported in other populations. As a result, Willow Flycatcher nests at the site tended to be further removed from potential terrestrial and aerial predators than in most populations. Preliminary analyses of vegetation sampling at nests sites suggest boxelders have significantly denser foliage than willows or other plants, which might serve to conceal nests from predators or cowbirds.

Reproductive success. — Perhaps as a consequence of the nest site characteristics, Willow Flycatchers in the Cliff-Gila valley exhibited relatively high rates of nesting success (55%) and relatively low rates of cowbird parasitism (14.7% or less). Although nest success and parasitism rates vary from year to year, the nesting success rate reported here is unlikely to represent an

Table 2 — Comparison of Willow Flycatcher nesting characteristics among different sites.

Area	Nest substrate	N	Nest Height		Source
			Ave.	Range	
Cliff-Gila Valley, NM	boxelder 84%, Russian-olive 8%, willow 5%	92	7.0	1.2 - 16.4	**this study**
Kern River, CA	willow 100%	19	2.2	1.0 - 6.4	Harris 1991
Grand Canyon, AZ	saltcedar 100%	17	4.8	4.0 - 6.0	Sogge *et al.* 1997
AZ low elev. 93-96	saltcedar 76% willow 17% buttonbush 7%	203	4.9	1.5 - 10.5	Sferra *et al.* 1997
Truckee River, CA	willow 100%	11	1.3	0.9 - 1.8	Flett & Sanders 1987
Palouse hills, WA	rose 36% hawthorn 19%	42	0.8	0.4 - 1.7	King 1955
Michigan	dogwood 48% willow 15%	93	1.3	0.6 - 2.8	Walkinshaw 1966
Wisconsin	elderberry 58% dogwood 26%	619	1.4	0.8 - 2.6	McCabe 1991

abnormally high level, because it is almost identical to that reported for the same site by Skaggs (1996). The cowbird parasitism rate is similar, although it is unclear how Skaggs calculated his estimates. It should be noted that due to the inaccessability of high nests, the observed nest parasitism rate (14.7%) is based on the lower nests only. The true rate is likely to be lower, as numerous studies have documented that the probability of parasitism is inversely correlated with nest height (e.g., Best & Stauffer 1980, Briskie et al. 1990).

Although the nest success rates reported here are higher than almost all other reported for the southwestern race of the Willow Flycatcher, they are similar to rates reported for other, healthier subspecies (Table 3). In fact, the only site in the Southwest known to have greater nest success is San Luis Rey in California, where intensive cowbird control has been practiced for several years. It may not be coincindental that flycatchers at San Luis Rey also nest unusually high. Even the maximum estimate of cowbird parasitism in the Cliff-Gila Valley (14.7%) is well below the threshold value of 30% considered to be unsustainable (Laymon 1987). These facts further support our preliminary assessment that the Cliff-Gila valley population is healthy.

Although superficially different in habitat preferences, the Cliff-Gila population may not differ much from other sites in ways that are critical to the Southwestern Willow Flycatcher. All

sites share certain characteristics: abundant insects, open water, appropriate twig structure for nest placement, and dense, heterogeneous foliage structure. The birds in the Cliff-Gila valley may prefer boxelder over willows for nesting because boxelder appears to be superior in providing the latter two needs. In most localities, willow appears to be the preferred nesting substrate, but that may be only because those sites lack boxelder. Boxelder is a secondary successional species, and therefore is scarce in most disturbance-dominated, early successional riparian habitats in the Southwest. Thus, the mature mixed broadleaf riparian forests found on the U-Bar ranch may not be completely typical of Willow Flycatcher habitat, but they may constitute the optimal habitat for the bird in the southwest.

Table 3 —Comparative nest success among populations of Willow Flycatchers.

Species	Site	% nest success	No. nests	Source
E. traillii extimus	**Cliff-Gila Valley, NM**	**55.2**	**68**	**this study**
	Kern River, CA	15.8	19	Harris 1991
	Kern River, CA[a]	36.4	324	Whitfield, unpub. data
	Grand Canyon, AZ	18.0	17	Sogge et *al.* 1997
	San Luis Rey, CA[a]	64	11	Griffith & Griffith 1995
	statewide, AZ[a]	42.9	163	Sferra et *al.* 1997
E. t. adastus	North Park, CO	40.7	27	Sedgwick & Knopf 1988
E. t. brewsteri	Truckee River, CA	54.5	11	Flett & Sanders 1987
E. t. traillii	Ohio & Nebraska	39.5	91	Holcomb 1972
	Michigan	69.5	209	Berger 1967
	Michigan	65.2	92	Walkinshaw 1966
	Wisconsin	68.6	459	McCabe 1991

[a] Cowbird trapping conducted in some years and sites.

Avian Community Structure

As is typical of intact riparian areas in the Southwest, the Cliff-Gila Valley supports a very diverse and populous community of breeding birds. The density of breeding birds calculated for the site (773 to 1114 pairs per 40 ha) is the highest density ever recorded for non-colonial birds in

North America. Prior to this study, the highest recorded density was reported by Carothers *et al.* (1974) for similar riparian woodlands along the Verde River in Arizona. They found densities ranging from 193 to 847 pairs per ha. It should be noted that non-native species made up from 7.2% to 32.0% of their two most dense plots, inflating their figures above what might be considered natural. In contrast, in the Gila habitat patches, non-natives comprised 0% to 2.0% of birds. The Gila figures also do not include any night birds, such as owls and nightjars, which were rather common at the site (personal observations).

FUTURE RESEARCH DIRECTIONS

We will continue to monitor nests of flycatchers and other riparian species to obtain better estimates of nesting success and cowbird parasitism, and to get an indication of the level of year to year variation in those parameters. In particular, we will use a newly-developed pole-mounted video camera to get a better handle on the fates of high nests.

In 1997, vegetation characteristics were measured at 78 flycatcher nest sites and 30 null sites (sites at least 100 feet from any Willow Flycatcher nest or song perch). We will continue to collect these data in the upcoming year to develop sufficiently large sample sizes to (1) conduct multivariate analyses of habitat preferences, and (2) assess relationships between habitat features and nesting success and nest parasitism.

We will begin to quantify habitat features in (the few) patches not occupied by flycatchers to be used in multivariate analyses of landscape-level effects on flycatcher occupancy and nesting success.

We finally received all appropriate state and federal permits for color-banding Willow Flycatchers after the end of the 1997 field season. Therefore, we will begin a color-banding program this year to allow measures of survival, mate and site fidelity, and dispersal in the Cliff-Gila population.

SUMMARY

The U-Bar ranch and adjacent lands in the Cliff-Gila Valley supports the largest and perhaps healthiest known population of Willow Flycatchers in the Southwest. Willow Flycatchers exhibited high levels of nesting success and relatively low levels of cowbird parasitism in 1997. It should be noted, however, that both rates show year-to-year variation within a population. Continued monitoring may reveal rates of nest success and parasitism that are significantly higher or lower than those observed in 1997. In addition to the largest population of Southwestern Willow Flycatchers, the site supports very healthy populations of Common Black Hawks, *Buteogallus anthracinus*, (state listed as threatened), Yellow-billed Cuckoos, *Coccyzus americanus*, (under consideration for national listing as endangered), and Abert's Towhees (state listed as threatened). In addition, the Cliff-Gila Valley supports what may be the highest density of non-colonial breeding birds in all of North America, indicating a very healthy, functioning riparian ecosystem. Data from this study should prove invaluable as bases for Willow Flycatcher recovery and riparian management.

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Appendix I. Numbers of bird territories in riparian patches in the Cliff-Gila Valley, 1997.

SPECIES	FS	NE1	NWS	SWS	SE1	Total
Cooper's Hawk *Accipiter cooperii*	1	0	0	0	0	1
Common Black Hawk *Buteogallus anthracinus*	0	0	0	0	1	1
Red-tailed Hawk *Buteo jamaicensis*	0	0	1	0	0	1
American Kestrel *Falco sparverius*	0	0	2	1	1	4
Gambel's Quail *Callipepla gambelii*	2	2	0	0	1	5
Mourning Dove *Zenaida macroura*	4	11	13	9	15	52
Yellow-billed Cuckoo *Coccyzus americanus*	0	1	2	1	1	5
Black-chinned Hummingbird *Archilochus alexandri*	4	2	3	3	3	15
Ladder-backed Woodpecker *Picoides scalaris*	1	1	1	0	1	4
Northern Flicker *Colaptes auratus*	1	2	2	2	1	8
Western Wood-Pewee *Contopus sordidulus*	4	5	4	1	4	18
Southwestern Willow Flycatcher *Empidonax traillii extimus*	9	6	6	11	31	63
Vermilion Flycatcher *Pyrocephalus rubinus*	0	4	3	0	3	10
Ash-throated Flycatcher *Myiarchus cinerascens*	1	1	1	0	1	4
Brown-crested Flycatcher *Myiarchus tyrannulus*	1	0	0	0	0	1
Cassin's Kingbird *Tyrannus vociferans*	1	4	4	1	2	12
Violet-green Swallow *Tachycineta thalassina*	1	0	0	0	0	1
Western Scrub-Jay *Aphelocoma coerulesens*	1	0	0	0	0	1
American Crow *Corvus brachyrhynchos*	0	0	0	0	1	1
Bridled Titmouse *Parus wollweberi*	1	0	0	0	1	2
White-breasted Nuthatch *Sitta carolinensis*	1	2	1	2	1	7
Bewick's Wren *Thryomanes bewickii*	3	4	7	7	6	27
American Robin *Turdus migratorius*	0	1	2	1	1	5
European Starling *Sturnus vulgaris*	0	2	1	0	3	6
Plumbeous Vireo *Vireo plumbea*	2	1	0	0	1	4
Lucy's Warbler *Vermivora luciae*	5	2	4	5	4	20
Yellow Warbler *Dendroica petechia*	8	12	10	9	15	54
Common Yellowthroat *Geothlypis trichas*	2	1	0	0	3	6
Yellow-breasted Chat *Icteria virens*	13	5	0	5	14	37
Summer Tanager *Piranga rubra*	3	3	4	2	4	16
Northern Cardinal *Cardinalis cardinalis*	1	1	0	0	2	4
Black-headed Grosbeak *Pheucticus melanocephalus*	1	1	2	2	4	10
Blue Grosbeak *Guiraca caerulea*	5	2	4	5	2	18
Indigo Bunting *Passerina cyanea*	4	0	0	0	0	4
Spotted Towhee *Pipilo maculatus*	7	1	0	1	5	14
Abert's Towhee *Pipilo aberti*	0	1	0	1	1	3
Brown-headed Cowbird *Molothrus ater*	0	0	0	0	0	0
Bullock's Oriole *Icterus bullockii*	1	5	3	3	3	15
House Finch *Carpodacus mexicanus*	2	3	7	2	1	15
Lesser Goldfinch *Carduelis psaltria*	4	4	5	6	9	28
TOTAL # spp	30	29	24	22	33	40
TOTAL # territories	94	90	92	80	146	502

Study Plan RM-XXXX

THE REPRODUCTIVE STATUS OF THE SOUTHWESTERN WILLOW FLYCATCHER IN THE CLIFF-GILA VALLEY

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INTRODUCTION

The Southwestern Willow Flycatcher *(Empidonax traillii extimus*) is a Neotropical migrant passerine that ranges from southern California and Baja California eastward through Arizona, southern Utah, southern Colorado, New Mexico, and trans-Pecos Texas (Unitt 1987). This species is an obligate riparian specialist, nesting in dense vegetation associated with watercourses. Willow Flycatchers appear to be semi-colonial, breeding in loose aggregations in appropriate habitat. Habitat patches as small as 0.5 ha may be occupied (Sogge et al. 1993). In the southwest, nesting is almost always in the vicinity of surface water or saturated soils (U.S. Fish and Wildlife Service 1995).

Evidence suggests the Southwestern Willow Flycatcher has declined significantly during this century, primarily due to extensive loss and conversion of riparian breeding habitats (Unitt 1987, U.S. Fish and Wildlife Service 1995). Loss and modification of riparian habitats has resulted from livestock grazing, water diversion and impoundment, changes in fire and flood frequency due to hydrological alterations, replacement of native riparian vegetation by non-native species, urban development, and recreational activities (Rea 1983, Kreuper 1993, U.S. Fish and Wildlife Service 1995). Additionally, a high incidence of nest parasitism by Brown-headed Cowbirds (*Molothrus ater*) has been reported from several sites, resulting in low reproductive success. Nest parasitism levels of over 50% have been documented for the Kern River, California (Harris 1991) and for the Grand Canyon populations (Brown 1994). In many cases Willow Flycatchers respond to the laying of cowbird eggs in their nests by abandoning and renesting (Skaggs 1995). However, because clutch size tends to decrease with each nesting attempt, the potential productivity of renests also decreases (U.S. Fish and Wildlife Service 1995).

In 1993, the USFWS (U.S. Fish and Wildlife Service 1993) proposed to list *E.t. extimus* as an endangered species and to designate critical habitat. In February of 1995, the USFWS listed *E.t. extimus* as endangered, although no designation of critical habitat has yet been made (U.S. Fish and Wildlife Service 1995). The subspecies has also been listed at the state level in New Mexico, Arizona, and California (Arizona Game and Fish Department 1988, New Mexico Department of Game and Fish 1988, California Department of Fish and Game 1992).

Since its listing as an endangered species, numerous surveys have been conducted across the range of the flycatcher to locate extant populations and to estimate their size. Flycatchers

have been found breeding at about 75 sites throughout the southwestern United States (Sogge et al. 1997). Approximately 78% of extant sites consist of 5 or fewer territories. The entire known breeding population in 1996 was estimated at between 300 and 500 pairs (Sogge et al. 1997). The majority of these pairs occur in New Mexico, primarily in the southwestern portion of the state (Hubbard 1987). The largest known breeding concentration is located in the Cliff-Gila Valley, New Mexico, with an estimated 150 pairs in 1996 (Parker & Hull 1996). These birds are located primarily on private property owned by Phelps-Dodge Mining Co., with about 12 pairs on the adjacent Gila National Forest and other private holdings (Boucher 1994).

The Cliff-Gila Valley population of Willow Flycatchers is of particular interest for several reasons. It is large, containing about a third of all known breeding pairs of the subspecies, and is an order of magnitude larger than the next largest concentration located on the Kern River, California (Unitt 1987). Comparisons of recent population estimates (Parker & Hull 1996) with prior estimates (Hubbard 1987, and references therein; D.A. Zimmerman, personal communication) suggest the population may have increased significantly over the past few decades. If so, the Cliff-Gila Valley may constitute a source population (Pulliam 1988), and may be the only population considered to be growing in size (c.f. Sogge 1997). Habitat preferences of flycatchers in this population differ from those reported elsewhere (Parker and Hull 1995), and from populations of other subspecies. Most studies of Willow Flycatchers have shown a strong association with willow thickets (e.g., Sedgwick & Knopf 1992). However, Cliff-Gila flycatchers are found primarily in tall, multi-layered stands of mixed broadleaf deciduous species. Boxelder (*Acer negundo*) is the most frequently used tree for nesting (Skaggs 1995).

Effective management and protection of Willow Flycatcher populations in the Cliff-Gila area requires a solid base of scientific knowledge. Unfortunately, almost all available data on the biology of Southwestern Willow Flycatchers come from small populations (≤30 pairs) that appear to differ significantly from the Cliff-Gila birds in habitat use and nest site characteristics (Skaggs 1995), and that exhibit poor reproductive success (U.S. Fish and Wildlife Service 1995, Sogge 1997). Because of its size, the Cliff-Gila population may serve as a useful reference population for in-depth studies and recovery plans for the Southwestern Willow Flycatcher and its riparian habitat. To that end, the goal of this study is to assess the reproductive success, demography, and habitat use of the Cliff-Gila population of flycatchers.

OBJECTIVES

The proposed research is designed to characterize the habitat preferences of Southwestern Willow Flycatchers in the Cliff-Gila Valley and identify critical habitat components at both microhabitat and landscape levels; monitor nesting success and rates of cowbird parasitism to assess the reproductive health of the Cliff-Gila Valley population; and determine whether reproductive success of the flycatcher varies in relation to habitat or avian community structure, landscape design, or nest site characteristics.

Specific objectives include:

1. Survey and monitor population densities and nesting success of all breeding bird species in habitat patches occupied by Willow Flycatchers to characterize avian community structure, identify and quantify potential competitors and alternate cowbird hosts, and to establish background rates of cowbird parasitism.

2. Evaluate reproductive success of Willow Flycatchers in the Cliff-Gila Valley, and determine if success is correlated with habitat structure, nest site characteristics, or community structure; determine basic rates of fecundity; and determine levels and consequences of cowbird parasitism.

3. Quantify nest site characteristics of Willow Flycatchers, and compare to literature values from other sites; quantify differences in habitats between nest sites and unused sites within riparian patches occupied by flycatchers.

4. Quantify floristic and landscape-level characteristics of patches of riparian forest in the Cliff-Gila Valley; test for differences between patches used and not used for breeding by Willow Flycatchers.

5. Color-mark adult and fledgling Willow Flycatchers with unique combinations of bands to enable quantification of basic demographic processes of survival, dispersal, return rates, multiple brooding, nest site and mate fidelity.

6. Contingent on finding high rates of cowbird parasitism in the Willow Flycatcher population, initiate an experimental program of cowbird trapping with the goal of reducing rates of nest parasitism. In addition, fit locally-caught cowbirds with radio collars and release them to determine home range size and identify major feeding sites that might be managed to reduce the carrying capacity of the area for cowbirds.

METHODS

Study area. — The Cliff-Gila Valley of Grant County, NM, comprises a broad floodplain of the Gila River, beginning near its confluence with Mogollon Creek and extending south-southwest towards the Burro Mountains. The proposed research will be conducted in a subsection of the valley extending from Gila National Forest land below the confluence of Mogollon Creek, and extending downstream to the US Route 180 bridge (approximately 10 km). This valley consists of irrigated and non-irrigated pastures used for livestock grazing and hay farming. Elevations range from 1372 to 1415 m.

The Gila River floodplain contains numerous fragments of Broadleafed Riparian Forest, with a canopy composed primarily of *Populus fremontii*, *Platanus wrightii*, *Salix gooddingi*, *Acer negundo*, and *Juglans major*. Most patches support a dense understory of shrubs, including *Rhus triloba*, *Amorpha fruticosa*, *Salix* spp., *Baccharis glutinosa*, *Alnus oblongifolia*, *Elaeagnus angustifolia*; forbs, and grasses. Most habitat patches are less than 5 ha in area. In addition to the primary patches of riparian woodland along the Gila itself, numerous stringers of riparian vegetation extend along many of the earthen irrigation ditches. These stringers contain the same plant species as larger forest patches, but rarely exceed 10 m in width.

Spot mapping. — The spot mapping method (Robbins 1970, Bibby et al. 1992, Ralph et al. 1993) will be used to identify territories of all land birds within study plots and estimate densities of breeding birds. Spot mapping will be done in each of 3 focal riparian patches plus 2 focal stringer patches, beginning as soon after May 15 as possible, and continuing through July of each year. In 1998 and 1999, additional patches may be censused as well. Focal patches will be chosen that have been occupied by Willow Flycatchers in previous years (Hull & Parker 1995). Accessibility and other logistical considerations prevent patches from being chosen completely at

random. In each focal patch, a grid of 100 ft squares will be established and marked with flagging tape. Grids will be variable in length and width, depending on the size and shape of the patch. Grids of 50-m or 100-m squares are the convention for spot-mapping (Robbins 1970), but smaller squares may be more appropriate in this case due to the small size of the habitat patches in the study area, and to the high densities of birds in southwestern riparian woodland (Johnson & Carothers 1974, Knopf et al. 1988). For each plot, maps will be drawn (1:1200 scale) indicating the grid, landmarks, and other features.

Each plot will be mapped a minimum of 10 times during a season, approximately every 2-3 days. Each observer will be provided a detailed protocol with explicit instructions for all procedures. Spot mapping sessions will begin within 15 minutes of dawn at a different random corner of the grid each time. Observers will walk entire grids in 2-4 hours, noting all birds seen and heard on the map using established codes and symbols (Bibby et al. 1992). Weather conditions, such as cloud cover, wind speed, and precipitation will be recorded on each mapping day. A new map will be used for each mapping session. Following mapping, observers will transfer observations from the daily map to master maps for each species. Analysis of master maps will yield estimates of densities for each breeding species (territories/km^2) and species diversity for each patch.

Nest searches. — Nest searches will be conducted on a daily basis following spot-mapping sessions and by personnel not engaged in spot-mapping. Within focal patches, searches will be conducted for nests of all species. Only flycatcher nests will be searched for in additional patches. Nests will be monitored every 3-5 days. Non-flycatcher nests will be flagged to facilitate relocation. Flycatcher nests will not be flagged unless necessary for relocation, to avoid any possible disturbance or attraction of predators or brood parasites. A list of common breeding birds in the Gila Valley and descriptions of their nests is presented as Table 1.

Nest contents will be observed using pole-mounted mirrors when possible, or using 15X spotting scopes. The use of scopes will limit the amount of information that can be gathered at high nests. Nests that are abandoned or destroyed will be examined for evidence (e.g., cowbird eggs, mammal hairs) to ascertain causes of nest failure. Nest predation will be assumed if nest contents disappear before fledging of young is possible (about 12 d after hatching). Nesting success will be estimated in two ways: number of young fledged per nest, and successful versus

failed. Nests that fledge at least one young will be considered successful. Nest data sheets (Table 2) will contain an observation section to be used to record progress of nest contents (e.g., no. eggs, no. nestlings, egg or nestling losses, cowbird parasitism, parental behaviors) in order to compute nesting success. Basic nest site information will be gathered for all nests; a more complete habitat assessment will be made at flycatcher nests (Table 3).

Because nests may be found at any stage, nesting success rates will be calculated using the modified Mayfield method (Mayfield 1975, Johnson 1979, Hensler & Nichols 1981). Rates of nesting success and cowbird parasitism for Willow Flycatchers will be compared to rates for other passerines within the Cliff-Gila Valley as well as with literature values for flycatchers from other areas. Nest site characteristics and nesting success will be summarized for each individual species. For species with sufficient sample sizes ($n > 10$ nests), the effects of nest site variables on nesting success will be analyzed using stepwise logistic regression (Trexler & Travis 1993).

Nest site characteristics. — Within habitat patches occupied by Willow Flycatchers, some areas remain unused for breeding by flycatchers (D. Parker, personal communication). Sites not used by flycatchers will be determined from spot-mapping data of focal habitat patches. For this study, unused sites will defined as those grid points ≥100 feet from an active flycatcher nest (after Sedgwick & Knopf 1990). All unused sites will be assigned numbers; n unused sites will be chosen randomly for habitat mensuration, where n = number of flycatcher nest sites found during the season. For measuring unused site characteristics, the tree nearest the grid point will function as the nest tree.

At each nest site and unused site, microhabitat features will be measured using a combination of the methods of James and Shugart (1970), Noon (1981), and Martin and Roper (1988), similar to the methodology used by M. Whitfield at the Kern River, California (Whitfield & Strong 1995). Nest site characteristics will be measured after nesting has terminated.

At each site, a 0.02 ha plot (radius = 8 m) will be placed centered on the nest tree (standard methodology uses 0.04 ha plots, but smaller plots will be used in this study because of the very small territories defended by flycatchers in this population). At the center of the plot and eight other points (4 and 8 m from the center in each of the four cardinal directions), canopy height will measured using clinometers, and canopy cover will be estimated using densiometers. The nine values will be averaged to obtain final estimates. Vertical foliage density will be

measured at 2 m, 4 m, 6 m, and 8 m in each direction from the nest tree, by counting hits of vegetation against a 10 m vertical pole marked in 1 m increments. These values will be averaged to obtain final estimates. In addition, nest plant species, nest height, azimuth, distance to nearest edge, and distance to nearest water will be measured. Within the 0.02 ha plot, trees (≥ 10 cm dbh) of all species will be counted and measured (dbh, height in m), and noted if alive or dead. Shrubs and saplings (< 1-10 cm dbh) will be counted and measured within a 5 m radius of the nest tree. The dominant species of ground cover (grasses or forbs) in the plot will be recorded.

Landscape characteristics. — All riparian habitat patches ≥1.0 ha within the study area will be identified using aerial photographs (scale 1:1200), and assigned a number. Habitat patches on Phelps-Dodge land in the Cliff-Gila Valley have been surveyed for breeding Willow Flycatchers by Mr. Dennis Parker and associates, Applied Ecosystem Management, Inc., as part of an ongoing population survey (Parker & Hull 1994, 1996, Hull & Parker 1995). Presence or absence of breeding Willow Flycatchers within patches will be determined each year by Parker. Ground-truthing will be used to verify occupation status. Generally about 20 patches have been occupied by flycatchers in each year (Parker & Hull 1994, Hull & Parker 1995). A subset of 20 patches that contain no territorial flycatchers will be chosen randomly as "unused sites".

All patches, used and unused, will be quantified in terms of vegetation and landscape characteristics. Landscape features to be measured include patch size (ha), maximum patch width (m), proximity to water (m), proximity to nearest patch (m), proximity to nearest occupied patch (m), and proximity to nearest grazed land (at time of breeding) (Freemark et al. 1995). Patch size and proximity to water, grazed land and other patches will be estimated from aerial photos. Within each patch, five vegetation sampling stations will be selected: the approximate patch center, and four points at random distances and random compass directions from the center. Points that fall outside of patches will be facultatively adjusted to remain within forest patches. At each point a variety of vegetation variables will be measured, as described for nest site characteristics. These will include canopy cover, foliage density, tree species abundance, tree species diversity, and shrub and ground cover. In occupied patches, if sampling points fall within 10 m of a flycatcher nest, vegetation data from the nest site will be used.

Analyses. — Habitat and landscape characteristics will be compared between used and unused sites and patches. Continuous habitat and landscape variables will be examined using

univariate analyses of variance. Variables that do not satisfy assumptions of normality or homogeneity of variances will be transformed appropriately (Sokol & Rohlf 1981). Variables found to differ significantly ($P < 0.05$) between used and unused sites will be used in a discriminant function analysis to identify key habitat features (after Sedgwick & Knopf 1992).

Banding. — When possible, adult and fledgling flycatchers will be banded to facilitate study of demographic parameters such as return rates, survivorship, age structure, recruitment, dispersal, nest site fidelity, and mate fidelity. To band endangered flycatchers, special-use permits will be obtained from the National Biological Service Bird Banding Laboratory and from the New Mexico Game and Fish Department. All netting will be conducted under the auspices of Master Permit 21722 held by Deborah M. Finch. All netting and banding would be done under the supervision of Dr. Finch or Scott Stoleson, a subpermittee under Dr. Finch's permit.

To capture flycatchers, standard mist nets will be erected in flycatcher territories near singing perches or near nest sites. Netting would only be conducted following fledging of young. Upon capture, flycatchers will banded using a combination of NBS numbered aluminum bands and a unique combination of colored plastic bands. Aluminum bands are needed to document records through the Bird Banding Laboratory, and color bands are necessary to distinguish individuals after release. For every captured bird, morphological measurements, color/contrast scores, body mass, and body fat scores using a standard 6-pt. system would be taken (Yong & Finch 1997). Recapture and resighting data for subsequent years will be used to estimate survival rates (Lebreton et al. 1992), individual health, and population age structure.

Cowbirds. — Brood parasitism by Brown-headed Cowbirds has severely inhibited the reproductive success of Willow Flycatchers in several other sites (Harris 1991, Sogge 1997). Rates of cowbird parasitism on flycatchers within the Cliff-Gila Valley will be estimated in each year of the study, and related to vegetation structure and patch characteristics. All interactions of cowbirds with Willow Flycatchers, including no response to cowbird presence by flycatchers, will be recorded in the field (Uyehara & Narins 1995).

If significant rates of nest parasitism are detected (>25%; Robinson et al. 1993) in the first year of the study, an experimental program of cowbird trapping will be initiated. Trapping of cowbirds has the potential to be effective in this case because the Willow Flycatcher population is concentrated in a relatively small area. Four traps will be built following established patterns

(Robinson et al. 1993). Cowbirds of both sexes will be live-trapped and placed in the traps to act as decoys. Traps will be placed in open pastures adjacent to riparian patches in one half of the study site (north or south of the route 211 bridge). Rates of parasitism will be compared between trapped and untrapped areas using chi-square contingency tables.

A minimum of 10 male cowbirds caught in traps will be fitted with radio transmitters and released. Radio-telemetry data will be used to identify and locate primary feeding areas for cowbirds.

APPLICATION OF RESEARCH RESULTS

The listing of the Southwestern Willow Flycatcher in 1995 curtailed customary riparian management practices of the U.S. Forest Service and other government agencies. The proposed research will provide scientific guidelines for identifying, conserving and restoring flycatcher habitat under their jurisdictions, and for addressing regulatory requirements under the Endangered Species Act. The Gila National Forest is currently restoring the Gila Bird Area downstream from the study site, with a primary goal of establishing new breeding habitat for Willow Flycatchers. The proposed research will identify specific habitat and landscape characteristics for flycatchers that can be used to guide the restoration efforts. Research results should also prove useful in managing riparian habitats elsewhere and in recovering the total flycatcher population.

PUBLICATION OF RESEARCH RESULTS

Research results will be disseminated through talks and publication in peer-reviewed journals, and to users and managers through workshops, symposia, and seminars. A Conservation Assessment and other papers will be produced as less technical publications targeted toward users, including biologists and managers within the National Forest system, state and federal Game and Fish and Fish and Wildlife personnel, land management agencies, consulting firms, and private landowners.

SAFETY AND HEALTH

To maintain contact between personnel and Gila dispatch, each individual will carry a two-way radio. Instructions and field locations will be assigned on a daily basis so the exact whereabouts of each individual is always known.

When lives and equipment could potentially be endangered by flash floods, lightning, etc., personnel will delay or postpone their field duties. Field personnel will be trained to recognize and avoid potentially hazardous or injurious organisms (e.g., poison ivy, nettles, africanized honeybees, rattlesnakes). Locations of stationary hazards (e.g., bee hives) will be announced to all personnel verbally and noted on maps. First aid materials will be kept in the project vehicle at all times.

PERSONNEL, TIME, COSTS

Scott H. Stoleson will be responsible for the study and will supervise all temporary personnel. Deborah M. Finch will be the Project Leader. Each year, a field crew composed of two (GS-3) temporary summer technicians will be hired. Employment for the temporary personnel will typically begin 15 May and end 1 September each year.

Labor	Person days, three years
Grid layout	100
Spot mapping	200
Collection of avian field data (other than spot-maps)	400
Collection of habitat field data	500
Collection of landscape data from maps	50
Data entry and analysis	400
Manuscript preparation	150
	1650

Timeline of research activities

Establishment/repair of study grids: year 1, (& years 2, 3, if necessary)

Spot mapping: years 1, 2, 3

Nest searching/monitoring: years 1, 2, 3

Quantify nest site characteristics: years 1, 2, 3

Quantify patch characteristics: years 2, 3

Color-banding of flycatchers: years 2, 3 (& year 1 if permits received in time)

Cowbird trapping/ radio-tracking: years 2, 3, contingent on results of year 1

Data input: years 1, 2, 3

Analysis of data: years 1, 2, 3

Publication of results:

Conservation Assessment: year 1

Preliminary descriptions of nest site characteristics: year 1

Other publications: year 3

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TABLE 1. NEST CHARACTERISTICS OF COMMON BIRD SPECIES IN THE CLIFF-GILA AREA (C.S. = clutch size, Dia. = outside diameter of nest).

Mourning Dove (Zenaida macroura): usually in a tree, rarely on ground; loose platform of twigs, eggs can frequently be seen through bottom. C.S. almost always 2 eggs. Dia. 4-6". Multiple broods throughout nesting season.

Yellow-billed Cuckoo (Coccyzus americanus): 1-15 m high in shrub or tree, flimsy platform of twigs. Eggs pale blue, C.S. 2-3; young leave nest very rapidly (4-7 d) well before they can fly. Dia. 5"

Black-chinned Hummingbird (Archilochus alexandri): tiny cup on top of small branch, fibers bound with spider silk, covered with lichens. cryptic. Males have nothing to do with nesting or feeding young. Dia. 1-1¾".

Cassin's Kingbird (Tyrannus vociferans): in canopy, bulky cup placed on horizontal branch; parents very defensive at nest. Dia. 8" x 3" deep.

Willow Flycatcher (Empidonax traillii): tightly woven, flat-topped cup of grasses, fibers, often looks silvery gray; in thin, multi-twigged crotch; may have fibers or other material hanging from bottom. Dia. 2½-3", eggs whitish-buff with brown spots.

Western Wood-Pewee (Contopus sordidulus): shallow, well-woven cup, camouflaged with lichens, spider silk; placed on horizontal branch (often dead), midddle to high canopy. Dia. 3¾ X 2½" deep. Eggs whitish, spotted.

Vermilion Flycatcher (Pyrocephalus rubinus): shallow cup, rather like Pewee's, on horizontal limb, frequently high. Eggs heavily spotted.

White-breasted Nuthatch (Sitta carolinensis): natural or old woodpecker cavity, almost any height.

Bewick's Wren (Thryomanes bewickii): bulky mess of sticks, grass, fibers, almost always in cavity or hollow in tree.

European Starling (Sternus vulgaris): natural or woodpecker cavity, usually very noisy.

Bell's Vireo (Vireo bellii): well-built cup suspended in fork, pointy at bottom; low. Dia 2¾ X 3½" deep.

Solitary Vireo (Vireo solitarius): well-built cup hanging by rim from low fork, less compact than other vireos. Eggs whitish with brown blotches at one end. Dia. 3¼ X 3¼" deep.

Warbling Vireo (Vireo gilvus): Neatly woven cup suspended in fork, usually well below canopy. Both sexes incubate (all vireos) and may sing while on nest. Dia. 3½" X 2¼"; widest in middle (ball-shaped).

Lucy's Warbler (Vermivora luciae): in old woodpecker holes or natural cavities; wary around nest.

Yellow Warbler (Dendroica petechia): finely woven cup of fibers and fine grasses, usually in upright fork of shrub or tree, can be high -- MUCH LIKE WIFL NEST but generally a bit neater. Dia. 2¼-3" X 2-4" deep. Eggs bluish or grayish white with speckles. Frequent cowbird host.

Yellow-breasted Chat (Icteria virens): bulky but neatly woven cup of grasses, leaves, usually low in thick shrubs or vines, often near edge. Eggs off-white with heavy brown speckling. Dia. 5" X 3-4" deep. Frequent cowbird host.

Bullock's Oriole (Icterus bullockii): finely woven, deep pouch of fibers and grasses; terminal ends of in tree branches.

Summer Tanager (Piranga rubra): Somewhat sloppy, shallow cup, mostly of grass, usually well out from trunk of tree. Dia. 3¼-4¼ X 2¼" deep. Eggs grayish blue-green, dotted brown.

Black-headed Grosbeak (Pheucticus melanocephalus): bulky, sloppily-built cup of twigs, grasses, thin lining, usually in low fork of tree or shrub; both sexes may sing from nest. Dia. 5½ X 3¼" deep. Eggs bluish green with brown spots.

Blue Grosbeak (Guiraca caerulea): deep, compact cup of grasses, frequently snakeskin, usually low in shrubs adjacent to open areas, well-hidden. Eggs pale bluish white with NO spots. A frequent cowbird host.

House Finch (Carpodacus mexicanus): well-built cup of grasses, twigs, can be placed almost anywhere, usually fairly high in tree. Size varies. Eggs pale blue-green, few markings.

Lesser Goldfinch (Carduelis psaltria): small, well-woven cup of fibers, down, usually well-hidden in foliage; any height; resembles small WIFL nest. Dia. 2½" X 2" deep; eggs pale blue, unmarked.

Spotted Towhee (Pipilio maculatus): bulky cup of bark strips, leaves, grass, usually well hidden on or near ground, often in brush piles. Eggs off-white, spotted with reddish-brown.

Brown-headed Cowbird (Molothrus ater): No nest, lays eggs in other species' nests. Eggs usually larger than hosts', white or off-white with reddish-brown speckles.

Table 2. NEST DATA SHEET

BIRD SPECIES:_____ DATE DISCOVERY:_____ OBSERVER:_____

PLOT:_____ GRID COORDINATES_____ FOUND DURING_____

NEST PLANT

Substrate Type:_____

Nest Plant Height (m):_____

Tree DBH or Shrub CD:_____

Distance to Water:_____

Distance to Edge:_____

Nest Plant Species:_____

CAVITY FEATURES

Hole Diameter (cm):_____

Site Diameter (cm):_____

Hole Orientation(°):_____

Intact/broken:_____

Alive/dead: _____

LOCATION MAP:

NEST CHARACTERISTICS

Nest Height (m):_____

Compass Direction:_____

Nest Type:_____

Distance from trunk (cm):_____

Nest materials:_____

_____

NESTING SUCCESS

Nesting Outcome:_____

Type of Nest Failure:_____

Cowbird Parasitism:_____

No. Cowbird eggs:_____

DATE OBSERVER NEST CONTENTS OBSERVATIONS

VARIABLES IN NEST DATA SHEET

Bird Species: 4 letter banding code

Date Discovered: 6 digit format, e.g., July 4, 1997 = 070497

Observer: 3 initials, e.g., Dale A. Zimmerman = DAZ

Plot: which patch, e.g., SW1

Grid Coordinates: closest stake to nest

Found During: M=spot mapping, S=searching, I=incidental

NEST PLANT

Substrate Type: ground=1, shrub=2, tree trunk=3, tree branch=4, cavity=5, other=6 (describe).

Nest Plant Height (m): measured using meter stick or clinometer.

Tree DBH or Shrub CD : use DBH tape to measure diameter (xxx.x cm) at breast height. Use meter stick or tape measure to measure shrub crown diameter (CD) (=horizontal width at widest part of shrub).

Distance to Water: estimate distance in meters to nearest source if known, otherwise write unk.

Distance to Edge: 1=≤25m to opening or edge, 2=≤50m; 3=≤100m, 4=>100m.

Nest Plant Species: 4-letter code for scientific name. Also write out common name. If unsure, take a sample for identification later.

NEST CHARACTERISTICS

Nest Height (m): Height above ground, measured using meterstick or clinometer.

Compass Direction: Record direction of nest (open or cavity) in degrees using hand-held compass positioned at center of tree or shrub. Cavities in trunks will have "0" values.

Nest Type: 1 = cup, 2 = natural cavity, 3 = excavated cavity, 4 = dome.

Distance from trunk (cm): Record distance from trunk in cm (000.0). For nests in shrubs, indicate distance from center of shrub. Ground nest, leave blank; cavity on main stem = 0.

Nest materials: If recognizable, note types of materials (e.g., grass and twigs, rootlet lining).

CAVITY FEATURES

Hole Diameter (cm): If a cavity nest, measure (or estimate if unreachable) hole width in cm.

Site Diameter (cm): Use DBH tape to measure diameter of branch or trunk at nest site; estimate if cavity can't be reached.

Hole Orientation(°): Record direction of cavity nest opening using hand-held compass at hole.

Intact/broken: Cavity nest tree is intact = 1, or broken-topped = 2.

Alive/Dead: Cavity in live portion of live tree = AA, in dead portion of live tree = DA, in dead tree = DD.

NESTING SUCCESS

Nesting Outcome: at least one young successfully fledged from nest = S; nest failed due to disease, abandonment, predation = F; outcome unknown = U. Avoid use of "U" whever possible.

Type of Nest Failure: If nest failed, P = predation (eggs or nestlings disappeared before fledging possible), A = abandonment (w/out cowbird parasitism), W = weather related (e.g., knocked down by rain), D = disease, C = cowbird parasitism, O = other (describe).

Cowbird Parasitism: N = not parasitized (no cowbird eggs in nest); P = parasitized (cowbird eggs present..

No. Cowbird eggs: record number of cowbird eggs in clutch.

LOCATION MAP: Sketch/describe a quick map of the nest location so other observers can find the nest at a later date. Include compass direction to nearest stake of grid, distance to stake, flag color used, any landmarks.

NEST STATUS

Record date, observer (3 initials), nest contents where E= eggs, N= nestlings, CE=cowbird eggs, CN=cowbird nestlings (e.g., 4E1CE); and notes on adult behavior, unusual observations (e.g., punctured eggs below nest, or female BHCO flew from nest), etc. Nests should be revisited every 3-5 days when time permits. On revisits, record date and status of nest contents. If nest is empty, attempt to determine what happened (e.g., evidence of nest destruction or predation, fledglings in area, etc.). Remove nest flagging after last visit of season (after fledging or nest failure).

Table 3. WIFL NEST VEGETATION DATA SHEET

TERR#_____ DATA ENTERED_____

Distance to nearest edge (m)_____

Distance to nearest water (m)_____

Distance to nearest territory _____

Distance to next nearest nest _____

Dist. to active grazing _____

SHRUBS & SAPLINGS (4 m)

SPP.	<1cm	1.1-5	5.1-7.5	7.6-10
_____	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____

OF TREES WITHIN 8 m

SPP.	10-30	31-50	51-70	>70
_____	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____

NEST LOCATION WITHIN TREE

Vertical: _____

GROUND & CANOPY COVER

	%GRCVR	%C.CVR	C.HT
NEST	_____	_____	____m
4N	_____	_____	____m
4E	_____	_____	____m
4S	_____	_____	____m
4W	_____	_____	____m
8N	_____	_____	____m
8E	_____	_____	____m
8S	_____	_____	____m
8W	_____	_____	____m
AVG	_____	_____	____m

DOMINANT GROUND COVER:

1._____

2._____

3._____

4._____

5. _____

Horizontal: _____

FOLIAGE DENSITY

Height Interval

Point	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
2N										
4N										
6N										
8N										
2E										
4E										
6E										
8E										
2S										
4S										
6S										
8S										
2W										
4W										
6W										
8W										

NESTING SUCCESS

Nesting Outcome:_____ Type of Nest Failure:_____

Cowbird Parasitism:_____ No. Cowbird eggs:_____

WIFL Conservation Team Meeting

July 22-23, 1997

Present: Debbie Finch, Mary Whitfield, Mark Sogge, Tracy McCarthey, Paul Boucher, Jeff Kelly, Janie Agyagos.

The goal of the meeting was to develop management recommendations to mitigate known threats.

Brown-headed Cowbird Parasitism

Evaluate the potential for threat
Threshold 10% parasitism rate (Whitfield in press)
>If 10% threshold is reached, conduct cowbird trapping and productivity analysis

a) cowbird presence- count/monitor
b) nest monitoring
c) determine parasitism rate - does it meet threshold?
-vary with site, patch size, population size of WIFL and BHCO, annually.
d) threshold may vary based on conditions.

If cowbird parasitism does not exceed threshold, keep monitoring
If threshold criteria met, control cowbird parasitism:

Short-term:
- Trap cowbirds (Griffith trapping protocol). Need to monitor cowbirds and parasitism rates during trapping effort.
- Remove livestock or other cowbird attractants from WIFL breeding sites. Other attractants include trash, food, agricultural fields, feeders, plowed fields, feedlots, dairies, pack stations. Possible actions: Remove attractant if possible. Cover trash and have more frequent pickups, use attractants as sites for trapping if not possible to remove attractant.
- Evaluate site-specific conditions to remove attractants from lands adjacent to occupied sites (FWS- 4.5 mile radius, FS - 2.0 mile radius). This needs to be tested. Is it economical?
- In addition to cowbird trapping, shake or remove eggs. Requires an endangered species permit and some people won't be experienced enough.
- In addition to trapping, shoot cowbirds.

Long-term
- Increase habitat patch size and reduce edge.
- Public education about birdfeeders

When do we stop trapping cowbirds? Depends on site specific conditions and the recovery of populations at each site. May need maintenance trapping.

Need to illustrate pros/cons of each method.

Catastrophic Fire

Lost six WIFL sites in 97 due to fires.

Before Fire: Site by site fire evaluation/management plant at occupied breeding site (proactive)
Signing
Coordination with local fire folks
Pre-attack plan
Campfire/camping restrictions in high risk areas.
Fuel reduction (seasonal grazing, fuel breaks, prescribed burning except in salt cedar, herbicide)

During Fire: Implementation of pre-attack plan
Emergency consultation initiated

After Fire: Habitat restoration may be needed
Conclude emergency consultation

Genetics

- Tools unknown/testing required
- Determine if genetic effects/inbreeding is occurring
- Incidence of deformities documented (need tissue samples) to evaluate genetic problems.
- Report problems to FWS, send specimens to FWS
- Analysis of tissues to Disease Lab in Madison WI.
- Use standard habitat/population restoration tools to increase WIFL abundance, distribution.
- Research need - cross eggs among areas.

Pesticides/Contaminants

-Evaluate pesticide use in the area
-Water quality testing
-Document effects on site
-Report deformities/unusual behavior to FWS
-Pesticide reduction plan
-Public education
-Drawings/photos of deformities in CA
-Migration banders report deformities
-Research need - use abandonded eggs/surrogate species for testing. Infer where pesticides are based on distribution.

Predation

-Control attractants such as trash, food
-Use sensitive techniques when conducting nest monitoring.
-Education about cats and dogs
-Trapping domestic feral cats, when a problem
-Improve habitat - increase patch size, reduce isolation of patch
-If monitored nests have high predation rates, evaluate signs to determine how to reduce predators, vary monitoring path scheme, scent.
-If possible, identify predation during nest monitoring.

-Research need - develop effective control measures for identified predators.

Parasites/Disease

-Little evidence of a problem and limited management capability to address problem.
-In cases where other birds are being studied in area, intensively study for evidence of parasitism/disease.
-Record evidence of parasitism if detected by nest surveyors
-Carcass collection and analysis
-Field form for documenting evidence of parasites, etc.
-Research need - collect nests to evaluate incidence of botfly larvae.

Livestock

In occupied habitat:
If birds occur at site, then these rules apply:
Complete exclosure to all livestock and other ungulates year-round at all occupied sites, except if fire risk is high during non-breeding season then light grazing may be OK to reduce fuel (avoid cattle use of woody plants) prior to mandatory exclusion.

In potential habitat:
Evaluation of site conditions prior to mandatory exclusion.
If site conditions suitable, grazing permitted during dormant season of woody species.
To allow regeneration of habitat, exclude ungulates during the growing season (at minimum) of woody species.
Priorities for ungulate exclusion are higher for potential sites adjacent to occupied sites than for distant sites. Site conditions at grazed, adjacent sites should be evaluated prior to mandatory exclusion.

In suitable habitat:
exclude livestock during growing season. Cattle permitted during dormant season.
monitor vegetation to be sure it isn't degraded by grazing during growing season.

For all excluded sites, conduct frequent inspections to identify trespass livestock. Remove them by drawing them out using attractants (hay, mineral blocks) rather than herding - in occupied sites only. Wait until September 1 if can't attract livestock out before driving applied.

Habitat definitions: (these will be in the habitat section)

Suitable	unoccupied suitable conditions without manipulation - similar habitat to occupied but just no birds.
Potential	needs something, can be manipulated to make site suitable for occupancy. Two types: 1) regenerating, close to suitable; 2) less close to suitable.

Recreation

- Evaluate recreational impacts at occupied, suitable, potential for any habitat damage, cowbird presence, etc.
- Year round closure of ORV's in occupied, suitable and potential.
- Exclude human access from occupied sites; use "Area closed" signs.
- Fence off occupied habitat, do not allow entry during breeding season.
- If area closures are implemented, ensure that closure orders are written to allow entry by authorized personnel (eg. researchers, surveyors, etc.)
- Day use only, no campfires during the non-breeding season (no entry during breeding season).
- Avoid construction of new campground or day use facilities in occupied, suitable, or potential.
- Evaluate if recreational impacts are occurring to habitat during non-breeding season. Limit use with permits if needed. Year round closure if impacts warrant.
- No product harvest within occupied or suitable habitat during the breeding season. The demand for willow and cottonwood seedlings may be met, but allow product harvest outside of the breeding season and only where it will have beneficial results (increased vigor and resprouting in decadent stand).
- Provide adequate trash recepticals and frequent trash pick-up in developed campgrounds and dispersed campsites adjacent or near occupied sites.
- Use interpretive signs with a message such as "prevent fires to avoid destruction of wildlife habitat".
- No construction of new roads or trails in or adjacent to occupied, suitable, or potential WIFL habitat.
- For habitats accessible by boats, use speed limits, buoys, closures, etc. to restrict boating use and access. Disturbance to nests located close to water level by waves from boats. Also, fishing lines and lures may disturb nests and/or birds.

Water Management

- Enforcement of existing laws for water rights.
- Evaluate effects of goundwater withdrawl/pumping on riparian habitat. If a problem exists, work with water users to mitigate water loss by using financial incentives, public education, etc.
- Where applicable or possible, maintain or acquire instream flow water rights.
- Evaluate the installment of new diversions in relation to WIFL habitat.
- Work with users to maintain and increase existing WIFL habitat and to create new WIFL habitat.
- Along rivers, streams, lakes, etc., eliminate phreatophyte control at occupied sites and minimize control at suitable and potential sites.
- Along ditches, encourage vegetative growth by avoiding mowing and clearing along banks. Evaluate mowing cycles.
- Evaluate dredging plans for waterways, including rivers, streams, ditches, ponds, and lakes in order to minimize habitat damage.
- Need public education on water uses (switching to drip systems rather than irrigation).
- Healthy riparian systems are capable of sustaining high runoff events.
- Develop plans to minimize destructive effects of catastrophic floods, including those caused by poor riparian conditions. Do this by

emphasizing: improvement/restoration of healthy riparian habitat. Refer to habitat restoration section. Small scale flood events may be desirable to create backwater habitat for WIFL and to control salinity.

- Develop plans to minimize impacts to WIFL habitat at dams and impoundments.
- Avoid dam construction that will inundate WIFL habitat.
- Evaluate potential for creating WIFL habitat below dams by releasing water to mimic natural hydrology and water condition conducive to WIFL use.

Working with Private Lands

- Make acquisition of WIFL habitat high priority using base for exchange.
- Develop conservation easements.
- Develop conservation agreements and plans to prevent damage to WIFL habitat while maintaining profits for private land owner.
- Large parcel ownership encouraged over small parcel ownership.
- Avoid forcing land transactions that may result in subdivisions.
- Work cooperatively with private landowners to maintain/enhance healthy riparian.
- Provide expertise and information to landowners to assist them in making informed decisions about WIFL habitat.

Exotic Plant Species (Salt Cedar, Russian Olive, Tree-of-Heaven, Giant Reed)

- In occupied sites, leave exotics as is, unless exotics are significantly increasing and detramentally altering habitats (see below)
- If exotics are encroaching on previously occupied sites, consider removing exotics and restoring site.
- If exotics encroach on occupied sites that were exotic-free, eradicate exotics without disturbance (ie. during the non-breeding season).
- Monitor effects of increasing exotics presence at occupied sites. If signs of negative effects on the number of WIFLs or nesting success (such as type conversion, structural alterations), remove invasive exotics.
- In suitable and potential habitats dominated by native plants, suppress encroachment of exotics.
- In suitable habitat dominated by exotics, survey for WIFL for at least three years prior to removal of exotics. It is recommended that removal be conducted in incremental blocks of < or = to 25% annually at surveyed sites in potential and suitable WIFL sites.
- Success of native restoration at potential and suitable WIFL sites by removing exotics must be evaluated by measures of watertable depth, salinity, geomorphology, hydrology. If site is amenable for restoration, exotics may be removed. If not amenable, management of exotics not cost-effective and may be detrimental to other animal species.
- In potential habitat dominated by exotics, removal of exotics can be considered if site is amenable to restoration.
- Exotic plant type conversion fragments native habitat.

Beaver

- If beaver are present at occupied, suitable, or potential sites, determine if they are benefiting WIFL (dams creating backwater) or damaging habitat

(by removing vegetation - more likely to be a problem at high elevation small patch sites or where dams cause inundation of habitat).

- If beavers are determined to be beneficial to WIFL, leave beaver and monitor site.
- If beavers are determined to be detrimental to WIFL, consider active reduction or removal of beaver population. Site specific analysis is needed.
- As part of habitat restoration, beaver re-introduction may be used to enhance site for WIFL.

Direct Disturbance by Management

- Habitat maintenance or maintenance of man-made structures (such as fences, powerlines, dams, roads, trails, facilities, houses, etc) that occur in or adjacent to occupied sites should be scheduled preferably during the non-breeding season with minimum damage to habitats. If damage occurs, restore habitat. If emergency repair is needed, minimize disturbance to nesting birds.
- Evaluate effects of upland management activities (such as grazing, mining, development, wood cutting, ORV uses, prescribed fires, road construction, etc.) on riparian habitats in watersheds that have occupied, suitable, or potential habitat.
- If impacts of upland management activities are identified, develop plan to minimize effects prior to implementation or while management is on-going.

Mining

- Proposed mining (eg. sand/gravel) sites in riparian areas should be surveyed for WIFLs and habitat suitability and potentiality.
- If habitat is occupied, suitable, or potential, select alternative sites.
- Where mining is ongoing or started, develop mitigation plan to minimize disturbance to WIFL habitat during mining operations. Develop reclamation plan that requires restoration of WIFL habitat. Implement plan.

Information and Education

- Request AZ, NM, CA Partners In Flight Information and Education committees to take the lead on WIFL I&E.
- Encourage agencies and organizations to develop I&E materials on WIFL.
- Slide show and script prepared and duplicate, sold at cost.
- Video of WIFL and habitat, interviews with experts.
- Brochures, posters, newspaper and magazine articles, interpretation signs at campsites, interpretive talks, paragraph at PIF web site, other creative efforts.
- Develop funding sources for I&E materials.
- Market and distribute Conservation Assessments (with drawings and photos to make more friendly and useable).
- Encourage scientists to promptly publish results and distribute reprints.
- Encourage organizations to distribute progress reports and updates to other organizations and interested parties.
- Periodic information sharing sessions.

Western New Mexico University

Department of
Natural Science

12 July 1997

Subject: Meeting of the Habitat Assessment team for the Southwestern Willow Flycatcher

Dr. Deborah M. Finch
United States Forest Service
Rocky Mountain Research Station
2205 Columbia Dr., SE
Albuquerque, NM 87106

Dear Debbie:

Circumstances prevent my attending the meeting in Flagstaff, but I very much appreciate the invitation to attend, and I had hoped to do so. In lieu of my presence, I herewith furnish some detailed comments, illustrated with a few slides, which I hope can be presented at the meeting.

At intervals over the past four decades I have recorded Willow Flycatchers in the Gila River Valley of Grant and Hidalgo counties. My early observations were not particularly directed toward that species, but were made in connection with general bird surveys, hundreds of birding visits and numerous field trips with my ornithology classes (over a 30-year period). During the past few years greater attention has been given to the breeding population (assumed to be *Empidonax traillii extimus*), on the limited occupied areas of the Gila National Forest (often with Paul Boucher), and especially on private property owned by Phelps Dodge Corporation and managed by the U Bar Ranch. The latter has been part of my traditional local birding grounds since 1958. In recent years I have visited this property (as a guest of U Bar manager David Ogilvie) often accompanying my colleague Dr. Roland Shook and/or Mr. Dennis Parker who is specifically monitoring Willow Flycatchers on the U Bar for Phelps Dodge Corporation.

For many years I associated this flycatcher (during breeding season) almost exclusively with riparian shrub willows, the latter sometimes mixed with low trees such as Goodding's willow, young Fremont's cottonwoods and boxelders plus seepwillow shrubs (*Baccharis glutinosa*) or, more locally, alders; but invariably in the immediate vicinity of the Gila River itself or along adjacent backwaters. **[See Slide 1]**

During the late 80's and early 90's I visited the Gila Valley less frequently, and when there I recorded few flycatchers--reflecting, I assumed, the subspecies' general decline. Consequently, it came as a surprise when I began devoting more time to the Gila during the mid-1990's, to learn from Dennis Parker, and later from my own field observations, that these birds were present in appreciable numbers in habitat that I considered to be atypical for the species. This habitat was of two intergrading sub-types: (1) **[Slides 2-4]**, patches or blocks of tall floodplain forest or woodland dominated by cottonwood and boxelder but mixed with some sycamore, ash, hackberry, mulberry, Russian olive, and occasional tamarisk or honey locust (2) **[Slides 5-6]** narrow to very narrow corridors or "stringers" of the same woody plant species, though often with Russian Olive as a major component, alongside water diversion ditches amid cattle pastures and former agricultural land **[Slide 7]**.

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In both the larger woodland patches and the narrow strips, boxelder is the most frequently used plant species for Willow Flycatcher nest placement. Certain patches with their adjacent radiating "stringers" contain surprisingly high densities of breeding flycatchers. One such plot of *ca.* six or seven acres (Parker's # 1 SE) has supported between 40 and 50 pairs in each of the past two years. **[Slides 8-10]**

Although not concentrating on Willow Flycatchers in earlier years, it is unlikely that I would have overlooked them in these habitats, as I often birded along the dikes and ditches and particularly in the wooded areas with their diverse birdlife. I had been birding in many of these same patches of woods, which today support flycatchers,over an appreciable span of years. My hearing was particularly acute, and I was ever alert for *fitz-bew* calls. I consider it equally significant that John Hubbard did not encounter numbers of Willow Flycatchers in these habitats when he surveyed the Gila Valley specifically for this species in the mid-1980's. Dr. Hubbard, one of my former students, has had extensive first-hand experience in the area. He knows these sites as well as I.

Acceptance of the reasonable assumption that two experienced field ornithologists did not overlook large numbers of these birds forces one to seek alternative explanations for the present population figures. It would seem that Willow Flycatcher habitat preferences in this area have changed over the years, and/or that their numbers have significantly increased locally during recent years *despite* the subspecies' apparent continued decline in most or all other portions of its range.

The fact remains that in this portion of the Gila Valley, specifically on U Bar Ranch land, the Willow Flycatcher has become a *fairly common* bird. This year's breeding population exceeds 150 pairs. (Dennis Parker informs me that his final survey last week disclosed 174 pairs.) Interestingly, the limited amount of "traditional" habitat of shrub willow and alder on adjoining Gila National Forest land supports only about a dozen pairs. Scott Stoleson's single survey this summer disclosed no Willow Flycatchers on similar Nature Conservancy property between the National Forest boundary and private land downstream, although a few nested there some years ago. This year, for the first time, three pairs are present in low riparian growth downstream from Bill Evans Lake on the boundary between U Bar Ranch and Gila National Forest land, an area where the Forest Service has been enhancing Willow Flycatcher habitat through plantings and exposing the water table on select sites. **[Slides 11-12]** Perhaps two dozen pairs or more are present downstream around Redrock, according to Dennis Parker some of them in wooded ditch corridors. Virtually all are on private land not accessible to investigators, so information about these birds is (and doubtless will continue to be) limited. Flycatcher habitat near Redrock contains considerably more tamarisk than that upstream in the Cliff-Gila area.

Generally, except near Cliff and Gila, the valley's Willow Flycatchers appear to be composed of small groups of birds, typically only a few pairs, that persist on a site for several years and then often move or disappear. Probably the large population on the U Bar serves as a source from which birds disperse to other sites up and down the valley. The existing habitat there seems far from saturated. If it can be maintained, and if habitat in other portions of the valley can be significantly improved, the outlook for the flycatcher's future in this part of New Mexico would seem encouraging.

Water diversion from streams is a commonly cited threat to Willow Flycatcher habitats, but this does not apply to the Cliff-Gila region of the Gila River Valley. There, recent rehydration of pasture and field ditches, combined with protection of naturally occurring woody vegetation along these ditches, has created a significant portion of the important flycatcher habitat discussed above. In many respects, including general vegetation structure, this ditch-bank habitat resembles natural riparian forest or woodland, although it is typically only one to five

trees (*ca.* 6-12 m) wide. Conclusions must await analysis of detailed data gathered by Dennis Parker and Scott Stoleson, but my discussions with these investigators and my own observations suggest that at least half of all Willow Flycatchers in the Gila Valley now nest along these water diversion ditches. This year, for example, one ditch **[Slides 13-14]** about 1.5 miles in length (including several bare expanses with no flycatcher habitat) supports over 20 pairs of this species. Thus the population along only this one ditch may be greater than the total number of Willow Flycatchers breeding in "typical" streamside shrub willow habitat in this entire middle portion of the Gila Valley.

Few of the U-Bar irrigation ditches supported flycatchers 25 or 30 years ago. The present-day type of habitat was then scarce. Land-use practices at that time typically involved active clearing of woody vegetation from the ditch banks. Only in relatively recent years have most of these ditches been rehydrated and allowed to develop sufficient tree growth to attract breeding flycatchers. Today, these form a network of wooded strips connecting many of the floodplain woodlots with one another and with the often extensive fringe of true riparian habitats along the river itself. **[Slide 15]** These together form a mosaic of considerable overall acreage that occupies a significant portion of the valley in the Cliff-Gila area. The importance of this extensive habitat lies not only in its size but also in its continuity which permits free movement of Willow Flycatchers throughout. This doubtless facilitates genetic mixing of local populations, and it allows for easy movement of birds into additional habitat whenever required. The extent of this valley woodland mosaic may be important for post-breeding dispersal prior to autumn migration.

Cattle grazing has been almost universally viewed as a threat to the habitat of breeding Willow Flycatchers, and studies from some other regions support this view. However, as with water diversion regimes, a distinction must be made between properly managed grazing programs, such as that on the U Bar Ranch, and environmentally unsound practices which exist elsewhere in the Southwest. *Moderate numbers of cattle can and do co-exist with a large, healthy and increasing population of breeding Willow Flycatchers* in the Gila Valley. On the U Bar, grazing is a prominent activity. Under present management, overgrazing has been largely eliminated, the riparian woods are in good to excellent condition (with impressive reproduction of important plant species), and the impact of cattle on flycatcher habitats appears to be negligible. In essence, Willow Flycatchers are thriving. We have here the largest and healthiest of all known populations of the subspecies, with cattle all around them.

Incidentally, although occasional animals may enter any of the nesting plots, high nest placement (see below) virtually precludes direct damage to Willow Flycatcher nests by cattle on the U Bar Ranch.

Although this meeting is primarily concerned with habitats, mention of livestock leads to consideration of Brown-headed Cowbirds, another commonly cited threat to Willow Flycatchers. Undoubtedly important in impacting some flycatcher populations, cowbirds appear to be of little or no significance in the Gila Valley, at least north of Redrock. My observations, like those of Roland Shook and Dennis Parker, show cowbirds to be widespread but nowhere abundant during the breeding season. I have seen no evidence of serious parasitism.

Scott Stoleson informs me that of some 40 Willow Flycatcher nests he has seen this year, only two or three were parasitized, and as of the present date no young cowbirds are known to have fledged from flycatcher nests. Dennis Parker's studies from 1994 through 1997 also show a very low rate of parasitism--this despite an active, ongoing cattle operation throughout the flycatcher's range within the valley.

Although few flycatcher nests are parasitized, local parasitism of certain other passerines (e.g. Yellow Warbler, Yellow-breasted Chat) is moderately heavy. I suspect that in a generally

healthy habitat supporting a high number of bird species, cowbird parasitism is spread out among so many other hosts as to be of negligible importance to Willow Flycatchers. Although obviously not *typical* Willow Flycatcher habitat, that on the U Bar Ranch may prove to be *optimal* habitat for the species. The parasitism situation here probably differs greatly from that in a fragmented and deteriorating habitat with lower bird numbers and species diversity.

With reference to cattle, cowbird expert Stephen Rothstein points out that if parasitism rates are low there may be no justification for grazing restrictions. This supports my view that unless cowbird and cattle numbers are excessive, Willow Flycatchers can do very well providing no other negative factors exist.

Nest placement is of interest and may be significant. *Most* Willow Flycatcher nests on the U Bar Ranch are four to five meters or higher above ground. I have seen a dozen or more as high as 10 m, **[Slide 16]** and two between 15 and 18 m. For various riparian bird species in Iowa, the percentage of nests successfully fledging young increased significantly with nest height (see Best and Stauffer, *Condor* 1980). Whether or not nest height itself is important for Willow Flycatchers, I suspect that those nesting in floodplain forests and wooded corridors are less likely to be parasitized than those in low streamside willows. Although many wooded tracts in the Gila Valley are narrow, these may be less rewarding to nest-seeking female cowbirds than nearby shrubby or open areas.

In summary, the thrust of my comments is to caution against assuming that threats to the southwestern race of Willow Flycatcher are necessarily the same throughout its range. If I have learned anything in the past few years of observation along the Gila it is that automatic condemnation of such practices as "grazing" or "water diversion" *per se* is unwarranted. Yet, without any modifiers or qualifying statements, virtually every Willow Flycatcher paper, report, or agency briefing perfunctorily brands these practices as avowed detriments to flycatcher habitat--much to the frustration and concern of *responsible* land stewards such as those on the U Bar. As biologists we would do well to temper our preconceived judgement of all factors and carefully analyze the circumstances that have permitted development of a large and thriving population of Willow Flycatchers in the midst of a working cattle ranch.

Indeed, this is by far the largest and most productive population of the subspecies known, but without the current prudent management of Phelps Dodge lands in the Gila Valley, southwestern New Mexico's Willow Flycatchers might well be sharing the plight of those in California and Arizona. With the vast majority of our flycatchers on private properties, any management plans must actively promote genuine cooperation and mutual trust between agencies and landowners if we expect the birds to prosper.

Sincerely,

Dale

Dale A. Zimmerman Ph.D.
Professor Emeritus