Dennis Parker
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Patagonia, AZ 85624
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October 6, 2003

Mr. Glen Contreras,
Data Quality Team Leader ORMS Staff
USDA Forest Service
Mail Stop 1150 1S Yates Building
14th & Independence Avenue SW
Washington, D.C. 20250-1150

Re: Request for Reconsideration of USDA Forest Service's Denial of Request for Correction No. 3008, File Code 1300, Submitted on Behalf of Mr. Eddie Johnson of the Johnson Ranch in Arizona

Dear Mr. Contreras,

At this time, Mr. Eddie Johnson formally submits his Request for Reconsideration of the Forest Service's denial of his Request for Correction of USDA information made under the authority of the Data Quality Act. At the outset, it must be noted that the Forest Service did not comply with its own guidelines here by failing to provide Mr. Johnson with instructions regarding the procedure to follow for requesting reconsideration of that decision (see decision letter from Thelma J. Strong dated August 22, 2003, attached). As a result, Mr. Johnson relies on instructions provided in a previous letter received from the Forest Service for direction in submitting this Request for Reconsideration (see letter from Pamela Gardiner dated June 30, 2003, attached).

Mr. Johnson also relies on two separate arguments in support of his Request for Reconsideration and reversal of the Forest Service's decision. These arguments show that (1) the Forest Service has no lawful authority to exempt publicly disclosed information from Data Quality Act Challenge, and (2) even if the Forest Service did have such authority, it nevertheless initiated and sponsored distribution of the information here challenged when it made Mr. Johnson's agents aware of this information's existence and then provided them with a copy of this same information free of any charge.

A. The Facts

In March of 2003, Mr. Johnson submitted a petition to the Forest Service under the authority of the Federal Data Quality Act, 44 U.S.C. Sec. 3516, requesting the correction of data and information contained in the *"Guidance Criteria for Determining the Effects of On-Going Grazing and Issuing Term Grazing Permits on Selected Threatened and Endangered Species, and Species Proposed for Listing and Proposed and Designated Critical Habitat," April 15, 2002* (hereinafter, "Grazing Guidance Criteria"). Mr. Johnson became aware of this information generated by the Forest Service after his agents were informed of its existence and provided a copy of it free of charge by the Forest Service's Cave Creek Ranger District Office in the fall of 2002. The Forest Service acknowledged receiving Mr. Johnson's Request for Correction of this Grazing Guidance Criteria in March of 2003, in a letter to Mr. Johnson dated June 30, 2003 (see Gardiner letter).

Mr. Johnson requested the correction of certain information within this Guidance Criteria to comport with the current state of knowledge regarding livestock presence and parasitism of Southwestern willow flycatchers by Brown-headed cowbirds. The current state of knowledge on this subject is that provided by ten years of scientific studies of the largest known population of Southwestern willow flycatchers conducted by private and Forest Service biologists on the U Bar Ranch in southwestern New Mexico. These studies reveal that on the U Bar Ranch, where Southwestern willow flycatchers and livestock occur either together or in close proximity to one another, flycatcher reproductive success rates are the highest and parasitism rates by cowbirds are the lowest known for this species.

These scientific facts directly contradict the Forest Service's assumptive and contrary conclusions contained within the April 15, 2002, Grazing Guidance Criteria. According to the Forest Service, proper "grazing guidance" in regard to Southwestern willow flycatchers necessitates the exclusion of all livestock within 2-5 miles of occupied or potential flycatcher habitats in the absence of an agency-approved cowbird trapping program. According to the Grazing Guidance Criteria, the imposition of such an extremely restrictive policy is necessary because of the perceived threat of increased cowbird parasitism posed to the flycatchers by the mere presence of livestock within 2-5 miles of either occupied or potential habitats.

By early 2003, Cave Creek District Ranger, Delvin Lopez, was relying exclusively on the flycatcher/livestock/cowbird information contained in the Grazing Guidance Criteria for justification of his continuing, permanent exclusion of Mr. Johnson's livestock from the Lower Chalk and Yearling pastures (see Lopez letter attached) on the Sears-Club / Chalk Mountain Allotment. Concurrently, District Ranger Lopez was relying on this same information to prepare an Environmental Assessment of livestock grazing on the Sears-Club / Chalk Mountain Allotment for purposes of permit renewal. Mr. Lopez was only days away from releasing his draft Environmental Assessment for public review when Mr. Johnson filed his Data Quality Act Request for Correction of this information on March 25, 2003. As a result, further action on this draft Environmental Assessment has been halted, pending the final outcome of Mr. Johnson's Request for Correction.

After receiving Mr. Johnson's Request for Correction in late March of 2003, the Forest Service twice refused to address the merits of this request. On June 30, 2003, the Forest Service informed Mr. Johnson that it would only address his petition in comment submitted during the public comment process for the draft Environmental Assessment it claimed was ongoing when Mr. Johnson's petition reached the Forest Service (see Gardiner letter in attachment). According to the Forest Service, the public comment process offered the advantage, apparently over the Data Quality Act, of placing its response in the context of other comments in a venue that is familiar and accessible to the public.

There was, however, no public comment process regarding the Environmental Assessment of livestock grazing on the Sears-Club / Chalk Mountain Allotment then ongoing when the Forest Service received Mr. Johnson's Request for Correction. Mr. Johnson lodged this objection with the Forest Service and demanded evidence from the Forest Service supporting its claim to the contrary (see Johnson letter of July 7, 2003, to Gardiner in attachment). No evidence of the alleged ongoing public comment process cited by the Forest Service as justification for not addressing the merits of Mr. Johnson's Request for Correction was ever provided to Mr. Johnson by the Forest Service.

Nearly two months passed before Mr. Johnson again heard from the Forest Service regarding the status of his Request for Correction. On August 29, 2003, in a letter dated August 22, 2003, the Forest Service informed Mr. Johnson that it had rejected his Request for Correction of the information contained within the Grazing Guidance Criteria because the information being challenged by Mr. Johnson had not been "disseminated" to the public by the Forest Service after all. No mention of any alleged, ongoing public comment process was made by the Forest Service in its letter of decision (see Strong letter).

According to the Forest Service, because the Grazing Guidance Criteria … "is for, and has been used as "intra- or inter-agency guidance," "it has not been disseminated to the public" – despite the fact that Mr. Johnson's agents were made aware of its existence and provided a copy of this same Grazing Guidance Criteria free of charge by the Forest Service in the fall of 2002. Thus, according to the Forest Service, because the Grazing Guidance Criteria does not meet the definition of information "disseminated" to the public under either OMB's or the Department of Agriculture's data quality guidelines, the Grazing Guidance Criteria and any information contained within it is exempted from a Request for Correction made under the authority of the federal Data Quality Act. From this decision, Mr. Johnson Appeals.

B. The Paperwork Reduction Act's Data Quality Guidelines Apply to All Information That Federal Agencies Have In Fact Made Public and Neither the OMB Nor the Forest Service Has Lawful Discretion to Create Any Exemptions

The Data Quality Act amends the Information Dissemination provisions of the Paperwork Reduction Act (PRA) by requiring the Office of Management and Budget (OMB) to issue interagency data quality guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of the information that federal agencies distribute to the public. OMB's guidelines require, among other things, that federal agencies subject to the PRA issue information quality guidelines for the information these agencies distribute to the public and that they also establish administrative

mechanisms allowing affected persons to seek and obtain correction of information disseminated on or after October 1, 2002, that does not comply with OMB's or the agency's guidelines.

Like the PRA's other Information Dissemination requirements, these new data quality guidelines apply to any and all information that federal agencies, such as the Forest Service, have in fact made public. Moreover, there are no statutory exemptions from the PRA's Information Dissemination requirements.

OMB's and the Forest Service's attempts to create exemptions by restricting the definition of "dissemination" in their interagency and intra-agency guidelines also contradict Congress's clear intent and preemptive usage of this term. The legislative history and statutory text of the Information Dissemination provisions of the PRA demonstrate Congress's clear intent that the only restriction on the terms "dissemination" or "disseminated" is that they apply to information that an agency has in fact made public. "Public Information," in turn, is defined by the PRA, for purpose of use in its Information Dissemination provisions, to mean "any information, regardless of form or format, that the agency discloses, disseminates, or makes available to the public." 44 U.S.C. Sec. 3502(12).

Here, Mr. Johnson's agents were made aware of the existence of the Forest Service's Region 3 Grazing Guidance Criteria by the Forest Service during a meeting with the Forest Service at the Cave Creek District Ranger's Office in the fall of 2002 (see copy of the Grazing Guidance Criteria, attached). At that meeting's end, the Forest Service provided Mr. Johnson's agents with a copy of this Grazing Guidance Criteria free of charge.

In March of 2003, District Ranger Delvin Lopez relied specifically on this same Grazing Guidance Criteria to justify the continued exclusion of Mr. Johnson's livestock from the Lower Chalk and Yearling Pastures. Concurrently, District Ranger Lopez relied specifically on this same Grazing Guidance Criteria as the basis for developing a draft Environmental Assessment of livestock grazing on the Sears-Club / Chalk Mountain Allotment (see Lopez letter). The development of this draft Environmental Assessment was put on hold, however, when Mr. Johnson filed his Request for Correction of this same information, and has yet to be released for public review.

Thus, because the Forest Service disclosed the existence of Region 3's Grazing Guidance Criteria to Mr. Johnson's agents and then in fact made this same information public by providing Mr. Johnson's agents with a copy of it, the Forest Service caused this Grazing Guidance Criteria to meet the PRA's definition of "public information." When the Forest Service then disclosed its reliance on this same Grazing Guidance Criteria in March, 2003, for purposes of continued livestock exclusion from the Lower Chalk and Yearling pastures and for purposes of developing and Environmental Assessment of livestock grazing on the Sears-Club / Chalk Mountain Allotment, the Forest Service also re-disseminated this information after October 1, 2002. Thus, because Region 3's Grazing Guidance Criteria was in fact made public by the Forest Service, and because the Forest Service continued to re-disseminate this Grazing Guidance Criteria after October 1, 2002, Region 3's Grazing Guidance Criteria meets the PRA's definition of disseminated information and, as such, is therefore subject to appropriate challenge by Mr. Johnson under the authority of the federal Data Quality Act. It must necessarily follow then, that the Forest Service's decision to the contrary is wrong and therefore must be reversed.

C. Even If the OMB and the Forest Service Had Discretion To Create Exemptions in Their Guidelines, Region 3's Grazing Guidance Criteria Would Still Meet Both the OMB's and the Forest Service's Definitions Of "Dissemination" Under Current OMB and Forest Service Guidelines

OMB's guidelines define "dissemination" as "agency initiated or sponsored distribution of information to the public." 67 F.R. at 8460. Not included within OMB's definition of "dissemination" is distribution of information limited to "government employees or agency contractors or grantees; intra- or inter-agency use or sharing of government information; and responses to requests for agency records under the Freedom of Information Act, the Privacy Act, the Federal Advisory Committee Act or other similar law." *Id.* Also not included in OMB's definition of "dissemination" is information "distribution limited to correspondence with individuals or persons, press releases, archival records, public filings, subpoenas or adjudicative processes." *Id.*

Similarly, the USDA's guidelines do not include information "intended only for intra-agency or inter-agency use or sharing of government information" within its definition of "disseminated" information "***unless*** the receiving agency disseminates the information to the public." USDA Quality of Information Guidelines (emphasis mine). According to the Forest Service, because the Grazing Guidance Criteria challenged by Mr. Johnson "is for, and has been used as "intra- or inter-agency guidance" ... [i]t has not been disseminated to the public." (See Strong letter)

Just because the Grazing Guidance Criteria "is for, and has been used as "intra- or inter-agency guidance" does not, in and of itself, render this information unchallengeable. This is particularly true when, as here, the information is disseminated to the public by a receiving agency.

Here, the Grazing Guidance Criteria was developed at the Region 3 level in Albuquerque, New Mexico, by the Forest Service. This information was then received by the various National Forests in Arizona and New Mexico within Region 3, and by each of the many District Ranger Offices located within the National Forests of the Region.

The Cave Creek Ranger District in Arizona was thus a receiving agency of this information. Therefore, when the Cave Creek Ranger District made Mr. Johnson's agents aware of this Grazing Guidance Criteria's existence and then provided those agents with a copy of it free of charge, as a receiving agency of the Forest Service, the Cave Creek Ranger District disseminated the Grazing Guidance Criteria to the public, and thus rendered that information subject to proper Data Quality Act challenge by Mr. Johnson.

Moreover, the Cave Creek Ranger District's distribution of the Grazing Guidance Criteria also meets the definition of "dissemination" contained in OMB's guidelines regardless of whether the Cave Creek Ranger District is characterized as a receiving agency. This is because OMB's guidelines define "dissemination" as "agency initiated or sponsored distribution of information to the public." 67 F.R. at 8460. Here, the Cave Creek Ranger District of the Forest Service initiated distribution of the Grazing Guidance Criteria to the public by informing Mr. Johnson's agents of this information's existence. The Cave Creek Ranger District then also sponsored distribution of the Grazing Guidance Criteria to the public when it provided Mr. Johnson's agents a copy of this same

information free of charge. Thus, because the Cave Creek Ranger District's distribution of the Grazing Guidance Criteria here challenged also meets OMB's definition of publicly disseminated information, the Grazing Guidance Criteria is subject to proper Data Quality Act challenge on this additional basis as well.

Additionally, the Forest Service's Information Quality Guidelines "apply not only to information the USDA generates, but also to information that USDA disseminates that was provided by or obtained from outside parties and which USDA adopts, endorses, or uses to formulate or support a regulation, ***guidance***, or other agency decision or position. USDA Quality of Information Guidelines (emphasis mine). Here, the Forest Service relied on information obtained from outside parties – in this case nothing more than a personal communication from a former Fish and Wildlife Service employee – to formulate and support a policy of livestock exclusion within 2-5 miles of potential and occupied Southwestern willow flycatcher habitat through generation of the Grazing ***Guidance*** Criteria here challenged. Thus, because the Grazing Guidance Criteria is also information subject to USDA's Information Quality Guidelines on this basis, it is thus also disseminated information, and as such, is therefore also subject to proper challenge made under the authority of the federal Data Quality Act.

Further, because the Grazing Guidance Criteria here challenged has been used extensively by the Forest Service for decision making and has been relied on by USDA agencies or offices and the public as official, authoritative, government information, this information has, in effect, been constantly re-disseminated. Thus, the Forest Service's Grazing Guidance Criteria for Region 3 is also subject to USDA's Quality of Information Guidelines on this additional basis.

Finally, yet one more reason argues strongly for a finding that this Grazing Guidance Criteria is in fact subject to USDA's Information Quality Guidelines. That reason is public policy.

The public policy that Congress intended to serve by its passage of the Data Quality Act was to ensure that federal agencies use and disseminate accurate information. Federal agencies are required by the Data Quality Act to issue information quality guidelines that ensure the quality, utility, objectivity and integrity of information that they disseminate and to provide mechanisms for affected persons to correct such information.

From a public policy position, the Forest Service's contorted interpretation of the word "disseminated," if followed to its illogical and accountability avoiding conclusion, would make mockeries of both the Data Quality and Administrative Procedure Acts. Under the Forest Service's current interpretation of the term "disseminated," any information developed by the USDA that is intended only for intra- or inter-agency use or sharing would be immune from Data Quality Act challenge – even when, as here, that information is in fact made public by the Forest Service.

Moreover, according to the Forest Service's position, "dissemination" is not actually a physical action, but a function of subjective intent for determining whether the Forest Service will address the merits of any particular Request for Correction of information it receives. Evidently, the same would hold true even when, as here, the guidance policy in question was adopted by the Forest Service in violation of the APA by not being promulgated as a rule and without the knowledge of nor

input from the regulated public that would be and has been substantially impacted by that guidance policy's adoption.

Apparently, according to the Forest Service, no challenge of this APA-violating policy would be possible under the Data Quality Act because even though private citizens were made aware of this policy's existence by the Forest Service, and even though the Forest Service then provided those same private citizens with a copy of that policy free of charge, the agency nevertheless did not disseminate that policy to the public – under either OMB's or USDA's information quality guidelines – because the Forest Service *never actually intended* that the public become aware of the APA-violating policy it had adopted!

Clearly, use of such a contorted interpretation of the term "disseminated" by the Forest Service in an obvious attempt here to avoid addressing the quality, utility, objectivity and integrity of information it has in fact made available to the public serves neither public policy nor Congress's clearly expressed intent in passing the Data Quality Act. Thus, because public policy also argues strongly against the Forest Service's contorted interpretation of the term "disseminated," the Grazing Guidance Criteria here challenged should be subject to USDA's information quality guidelines, and therefore the subject of proper, Data Quality Act challenge, from a public policy perspective as well.

D. Relief Requested

For all of the reasons heretofore stated within, Mr. Johnson requests that the USDA act on his Request for Reconsideration by reversing the Forest Service's rejection of his Request for Correction of Region 3's Grazing Guidance Criteria. Mr. Johnson also requests that the USDA then address the merits of his Request for Correction and adopt the changes to this information stated in that Request. Because this Request for Reconsideration involves influential scientific and regulatory information, Mr. Johnson further urges the Forest Service to designate a panel of officials to perform this function. Typically, such a panel would include a Reconsideration Official from the agency that made the initial determination (the Forest Service) and two Reconsideration Officials from other USDA agencies. Procedure to Seek Correction of Information Disseminated by USDA.

United States Department of Agriculture | Forest Service | Washington Office | 14th & Independence Avenue, SW
Washington, DC 20250-0003

File Code: 1300
03-0010-R

Date: April 20, 2004

Mr. Dennis Parker
Post Office Box 1100
Patagonia, AZ 85624

Dear Mr. Parker:

This letter responds to your Request for Reconsideration filed pursuant to the United States Department of Agriculture (USDA) Information Quality Guidelines (IQG) and the Data Quality Act, Pub. L. No. 106-554 § 515. You originally sought correction of data and information in the "Guidance Criteria for Determining the Effects of On-Going Grazing and Issuing Term Grazing Permits on Selected Threatened and Endangered Species, and Species Proposed for Listing and Proposed and Designated Critical Habitat" (Guidance Criteria).

We have given your Request for Reconsideration careful examination and thoroughly reviewed your concerns. According to the USDA IQG, our review was based on the explanation and evidence you provided. You requested a panel of officials to review your request that you state involves influential and regulatory information. USDA reviewed your request and found the document at issue to be non-influential, and consequentially, did not convene a panel. Rather, your Request for Reconsideration was remanded to the Forest Service.

The Forest Service was charged to determine whether the initial agency review was conducted with due diligence. The Request for Reconsideration was reviewed for conformity to both Office of Management and Budget and USDA guidelines. Forest Service examined the original request for correction, the response document, information provided by Forest Service and USDA websites, and information provided in your Request for Reconsideration.

The Guidance Criteria was developed for internal and interagency use by biologists from the Forest Service and the Fish & Wildlife Service, Department of the Interior. The information was intended for internal guidance only and not planned for public dissemination. The regional guidance is advisory and does not require a modification of grazing permits; it was not intended to, and does not provide, allotment management direction.

Your position is that by providing an incidental copy of the Guidance Criteria to you, as your client's representative, and by similarly providing a copy of the Guidance Criteria to the New Mexico and Arizona Cattle Growers Association, the Forest Service has disseminated it to the public. The definitions within Office of Management and Budget and USDA guidelines foresee dissemination as agency action designed to make the information available to more than an extremely limited number of individuals. The plain meaning of "public" is related to a community or an aggregate of people. Additionally, the plain meaning of "disseminate" is to scatter or provide widely.

Thus, the Forest Service determined that your position is not well founded and that that no correction of information is necessary. The information you provided does not demonstrate that the challenged information is inconsistent with USDA's Information Quality Guidelines. The review of the Request for Correction was conducted with due diligence.

In conclusion, the information you provided was carefully considered. However, after full consideration and careful, thorough review, I conclude there is no correction of information necessary.

Sincerely,

/s/ Irving W. Thomas (for)
CHRISTOPHER L. PYRON
Deputy Chief for Business Operations

ATTACHMENT "A"

United States Department of Agriculture | Forest Service | Tonto National Forest | Cave Creek Ranger District
40202 No. Cave Creek Rd.
Scottsdale, AZ 85262

File Code: 1950

Date: 27 February 2003

Mr. Eddie Johnson
Johnson Ranch Partnership
1132 W. McLellan
Mesa, AZ 85201

Dear Eddie,

This letter responds to a letter from your attorney, Dennis Parker, dated February 21, 2003. I would also like to bring you up to date on recent meetings the Forest Service has conducted regarding future management of the Sears-Club/Chalk Mountain Allotment.

We have tried to involve you to solicit information that only you or your ranch manager could provide in discussions regarding alternatives and effects of implementation on livestock management on the Sears-Club/Chalk Mountain Allotment. I have no doubt that better decisions are reached when there is input and active participation from the grazing permittee. We are continuing at this time with publication of a final Environmental Assessment, and selection of an alternative that best addresses issues on the allotment.

We held a meeting on January 31, with Cave Creek Ranger District and Forest Supervisor's Office personnel, Glen Knowles from Fish & Wildlife Service, and Deb Finch from Rocky Mountain Research Station in Albuquerque. The purpose of the meeting was to determine which alternatives in the E.A. were still viable, and what research/monitoring would be necessary to determine effects of the action.

At this time, formal consultation with Fish & Wildlife Service will continue, shifting to Alternative D as evaluated in the most recent E.A. mailed to you on December 3, 2000. Regional Grazing Guidance Criteria and the most recent draft of the Southwestern Willow Flycatcher Recovery Plan provided guidance in selection of this alternative. The Recovery Plan states that if grazing were an ongoing activity when new flycatcher nests became established, it should be allowed to continue, with monitoring. Lower Chalk has not been grazed since 1998, while the Davenport Pasture has been grazed every winter since then. Both pastures allow access to new nesting territories. Therefore, according to the Recovery Plan, grazing should not be reinitiated in the Lower Chalk Pasture, and it can be allowed to continue in the Davenport Pasture. In addition, as Dennis Parker discusses in his letter, Horseshoe lakebed does indeed contain occupied, suitable unoccupied, and potential (developing) habitat for the flycatcher.

The Regional Grazing Guidance Criteria states that an action may be categorized as "May Affect, Not Likely to Adversely Affect" if grazing will not occur within 2 miles of occupied habitat during the breeding season and an approved cowbird research program is in place.

Since Alternative D calls for grazing in the Davenport Pasture through the month of April, and much of the pasture is within 5 miles of the flycatcher territory Dennis Parker found at Mesquite Campground, we have solicited a research proposal from Rocky Mountain Research Branch to monitor flycatcher nests for cowbird parasitism and other possible effects. Naturally, there will be a cost associated with this research/monitoring. A number of possible sources for funding were discussed briefly at the meeting in October that Dale and Dennis attended.

We would certainly welcome any information you can provide on feasibility, environmental effects, and effects to your livestock operation of Alternative D. We would also appreciate any ideas you have for funding sources for the study that will be needed for implementation of this alternative.

I understand from Mr. Parker's letter that SRP has no inclination at this time to spend funds on mitigation of impacts to flycatchers by their operation of Horseshoe Dam by developing habitat on the Johnson Ranch private property. This does not preclude our need to initiate research on effects of grazing management.

Please respond by March 15 if you would like to provide input for this upcoming research proposal and management decision.

Sincerely,

DELVIN R. LOPEZ
District Ranger

Cc: S.O.

ATTACHMENT "B"

GUIDANCE CRITERIA
for
DETERMINING THE EFFECTS OF
ON-GOING GRAZING
AND ISSUING TERM GRAZING PERMITS
on
SELECTED THREATENED AND ENDANGERED SPECIES, AND SPECIES PROPOSED FOR LISTING
and
PROPOSED AND DESIGNATED CRITICAL HABITAT

REGION 3

WILDLIFE, FISHERIES, AND RARE PLANTS
USDA FOREST SERVICE

APRIL 15, 2002

CONTENTS

INTRODUCTION

The purpose of these guidance criteria is to streamline consultation under section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) (ESA). This document contains guidance in the form of criteria for use in making ESA section 7 effects determinations for selected threatened, endangered, and proposed (TEP) species and/or proposed or designated critical habitat for livestock grazing activities in the U.S. Forest Service's Southwestern Region (FS). These guidance criteria do not constitute an amendment to forest plans nor do they require a modification of grazing permits; these guidance criteria are not intended to provide allotment management direction. The criteria described in this document can also be used by qualified FS fish and wildlife biologists and botanists to assist in preparing regional grazing consultation forms for each grazing allotment containing federally listed or proposed species and/or proposed or designated critical habitat as required under section 7(a)(2) of the ESA.

The use of these criteria will result in **one of three ESA effects determinations**: 1) no effect, 2) may affect, not likely to adversely affect, or 3) may affect, likely to adversely affect. Consultation under ESA is not required if no TEP species or their habitat, or critical habitat, occur on the allotment or would be affected by the grazing activity directly or indirectly. In that situation, all that is required is a notation to the file or to the appropriate NEPA document. Biological assessments resulting in a determination of **"no effect"** do not require consultation with the U.S. Fish and Wildlife Service (FWS). The ESA conclusion of "no effect" is appropriate when a TEP species and/or critical habitat is present in the affected area and it is determined that the proposed action will not affect proposed or listed species and/or proposed or designated critical habitat.

Biological assessments that result in a determination of "may affect, not likely to adversely affect" **require concurrence from the FWS**, and that concurrence concludes informal consultation. The ESA determination of **"may affect, not likely to adversely affect"** is appropriate when effects to TEP species and/or critical habitat are expected to be insignificant, discountable, or completely beneficial. **Beneficial effects** are contemporaneous positive effects without any adverse effects to the species. **Insignificant effects** relate to the size of the impact and should never reach the level where take occurs. **Discountable effects** are those effects that are extremely unlikely to occur. Based on best judgment, a person would not: 1) be able to meaningfully measure, detect, or evaluate insignificant effects; or 2) expect discountable effects to occur.

For both the "no effect" and the "may affect, not likely to adversely affect" determination to remain in effect for the life of the term permit (up to 10 years), **annual confirmation** throughout the lifetime of the permit must take place to ensure the criteria for those findings continue to be met. **This requires each user/Forest to prepare an annual report for the FS regional office.**

Biological Assessments, which result in a determination of **"may affect, likely to adversely affect"** will require formal section 7 consultation with the FWS. A determination of "may affect, likely to adversely affect" is appropriate if any adverse effect to listed species and/or designated critical habitat may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effects are not discountable, insignificant, or completely beneficial. If both adverse and beneficial effects are anticipated to occur, the appropriate determination is **"may affect, likely to adversely affect"**.

A **"conference"** is required when an action is likely to jeopardize the continued existence of a proposed species or destroy or adversely modify proposed critical habitat. However, Federal action agencies may request a conference on any action that may affect proposed species or proposed critical habitat. The FWS can request a conference after reviewing available information suggesting an action is likely to jeopardize proposed species or destroy or adversely modify proposed critical habitat.

For documentation purposes, use of the **regional grazing consultation forms** is recommended. These forms are intended to aid in documenting the appropriate information necessary for FWS concurrence. They do not provide a "short cut" in the consultation process. Specific documentation supporting the determination of effects is always required. A **point-by-point** discussion of how management on the allotment is specifically consistent with the appropriate determination for a given species is mandatory. Discussion of resource background should be sufficiently detailed for the FWS to adequately analyze the environmental baseline and assess project effects. Range condition and watershed data should be less than 10 years old. Watershed data, older than 10 years, must be validated by appropriate resource specialists, to ensure that the data is still an accurate reflection of current conditions.

The guidance criteria are divided into **four sections**: 1) a plant section for vascular plants and their habitats, 2) an aquatic section for fish, amphibians, and their habitats, 3) a terrestrial mammals section for carnivores, bats and their habitats, and 4) a birds section for birds and their habitats. The discussion for each species includes information on its ESA status, where it occurs on FS lands, and basic biological information on the species and/or its designated critical habitat. The application of these criteria is mandatory unless there is detailed site-specific information available on species needs, habitat conditions, and/or grazing activities that would allow the field unit to make a determination of effect outside these criteria. If the field unit chooses to make a determination outside these criteria, then standard ESA section 7 consultation procedures should be followed.

DEFINITIONS

ALLOTMENT: A designated area of land available for livestock grazing.

EMBEDDEDNESS: The degree to which larger particles (boulder, rubble, or gravel) are surrounded or covered by fine sediment in a water channel. This allows evaluation of channel substrate suitability for fish spawning and egg incubation, and channel habitats for aquatic invertebrates and young fish.

ENDANGERED SPECIES: Any species in danger of extinction throughout all or a significant portion of its range.

ENVIRONMENTAL BASELINE: The past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process.

FORAGE UTILIZATION: The portion or degree of the current year's forage production that is consumed or destroyed by animals (including insects). The term may refer to a single plant species, a group of species, or to the vegetation community as a whole (must be measured at the end of the growing season for the species or vegetation community for which utilization is being determined).

INDIRECT EFFECTS: Those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur.

INCIDENTAL TAKE: Take of listed fish or wildlife species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by a Federal agency or applicant.

LIVESTOCK MANAGEMENT ACTIVITIES: Any activity or program designed to improve production of forage including treatments or facilities constructed or installed for the purpose of improving the range resource or the management of livestock. This includes non-structural improvements, which are practices and treatments undertaken to improve range condition. Structural improvements are permanent features designed to facilitate management and control distribution and movement of livestock. Some examples of structural improvements are dams, impoundments, ponds, pipelines, fences, corrals, wells, and trails. Some examples of non-structural improvements are cutting, chaining, planting, and herbicide applications.

PROPOSED SPECIES: Any species of fish, wildlife, or plant that is proposed in the Federal Register to be listed under section 4 of the ESA.

QUALIFIED FISHERIES BIOLOGIST: A qualified fisheries biologist may be: 1) a person currently classified at a GS-482 grade 11 or 12, or 2) a person classified at below the GS-482 grade 11 who has extensive field experience and knowledge of fish habitat needs as determined by the FS's Regional Director of Wildlife, Fisheries and Rare Plants.

TAKE: To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. Harm is further defined by FWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by FWS as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

TEP SPECIES: Species designated by the FWS as endangered or threatened and those species that are proposed for listing as endangered or threatened under provisions of the ESA.

TEP SPECIES HABITAT: For the purposes of these criteria, TEP species habitat includes occupied habitat, unoccupied suitable habitat, unoccupied potential habitat, and/or proposed and designated critical habitat.

THREATENED SPECIES: Any species, which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

STREAMBANK: That portion of the channel cross-section that restricts lateral movement of water. The bank usually has a gradient steeper than 45° and exhibits a distinct break in slope from the stream bottom. An obvious change in stream bottom substrate may be a reliable delineation of the bank.

STREAM CHANNEL: That portion of the channel cross-section containing the stream that is obviously distinct from the surrounding area due to breaks in the general slope of the land, lack of terrestrial vegetation, and changes in the composition of the substrate materials. The stream bottom or active channel is that portion of the channel between the banks where annual bedload transport occurs.

SUBWATERSHED: Subwatershed means a 5th code watershed. These typically range from 5,000 ac to greater than 100,000 ac in size. Natural Resources Conservation Service (NRCS) Hydrologic Unit Code (HUC) maps entitled "Conservation Needs Inventory Watersheds" form our reference.

3 Implement management strategies that will restore good conditions to degraded riparian communities as soon as possible.

DETERMINATIONS FOR THE MEXICAN SPOTTED OWL

No Effect

1. No livestock grazing or livestock management activities will occur within protected and restricted habitats, as defined by the species' recovery plan.

May Affect, Not Likely to Adversely Affect (must meet all of the criteria)

1. Livestock grazing or livestock management activities will occur within PACs, but no human disturbance or construction actions associated with the livestock grazing will occur in PACs during the breeding season.

2. Livestock grazing and livestock management activities within protected and restricted owl habitats will be managed for levels that provide the woody and herbaceous vegetation necessary for cover for rodent prey species, the residual biomass that will support prescribed natural and ignited fires that would reduce the risk of catastrophic wildfire in the Forest, and regeneration of riparian trees.

3. In mountain meadows (subject to seasonal livestock use May-October), which are owl foraging areas, livestock grazing will be at a level that maintains a minimum cover height of 4 in. of herbaceous vegetation, providing cover for the owls' prey species. The 4 in. stubble height minimum will be met 10 days after the onset of summer rains or August 1, whichever comes first, and maintained through the end of the grazing season.

SOUTHWESTERN WILLOW FLYCATCHER *(Empidonax traillii extimus)*

Endangered Species Act Status:	Endangered (March 29, 1995)
Forest Occurrence:	Apache-Sitgreaves, Cibola, Carson, Coconino, Gila, Prescott, Santa Fe, Tonto
Recovery Plan:	Yes (Draft April 2001)
Critical Habitat:	No

Description. The southwestern willow flycatcher is a small passerine bird about 5.75 in (15 cm) in length and weighing 0.4 oz (11 gm). Its song is a sneezy-fitz-bew or fit-za-bew, and the call is a repeated whit. Flycatchers typically produce these or variations of these calls when disturbed or agitated.

Life History. One of four currently recognized flycatcher subspecies (Phillips 1948, Unitt 1987), the southwestern willow flycatcher is a neotropical migrant that breeds in the southwestern

United States and migrates to Mexico, Central America, and extreme northern South America during the nonbreeding season (Phillips 1948). This subspecies begins arriving on breeding grounds in Arizona and New Mexico in late April and early May (Maynard 1994, Sferra *et al.* 1995). Flycatchers generally leave the United States by mid-September. It is an insectivorous bird and hunts by perching on a branch and making short, direct flights, also called sallies, to capture flying insects. Nesting begins in late May and early June, and renesting attempts can continue into late July (with late fledging to mid-August). Flycatchers lay three to four eggs (smaller clutch sizes with successive renests) and incubate for 12-13 days. Fledging occurs in 12-15 days.

Habitat. The flycatcher is a riparian obligate, nesting along rivers, streams, and other wetlands where dense growths of willow (*Salix* spp.), baccharis (*Baccharis* spp.), buttonbush (*Cephalanthus occidentalis*), boxelder (*Acer negundo*), saltcedar (*Tamarix* spp.) or other plants are present, often with a scattered overstory of cottonwood (*Populus* spp.) and/or willow. Historic nest locations of the flycatcher throughout its range are not well known. It is not known whether the habitats where they are located today are representative of all the different habitat types they could use for nesting. The flycatcher's use of dense salt cedar at the inflows or perimeter of human-made lakes in Arizona, along with canopy use of mature box elders along water ditches in southwestern New Mexico, are indicative of how this subspecies uses a variety of habitats. Understanding the full range of potential flycatcher habitats is complicated by human-caused watershed changes, patchy flycatcher distribution, and low flycatcher population numbers.

As populations recover, flycatchers could occupy riparian habitats that today might be considered marginal or unsuitable. Patches of dense, multi-storied vegetation found on broad portions of otherwise steep, narrow creeks, may become secondary habitat for nesting southwestern willow flycatchers after preferred habitats are occupied. Applying rigid requirements for flycatcher potential habitat based on current understanding may not be the most appropriate way to recover the species. The following habitat descriptions should be used as guidance, due to the need for further information about factors that lead to flycatcher site occupation.

Suitable Habitat

The flycatcher nests in dense riparian vegetation that is generally taller than 3-4 m, depending on elevation and vegetation types, with a high percentage of canopy cover, and often along rivers, streams, swamps, seeps, irrigation ditches, or other wetlands. Perennial flow, surface water, or saturated or moist soil is usually located in, adjacent to, or nearby nesting areas from April through September. The distance between the nest and these hydrologic conditions is documented to be as far as 120-150 m, especially when subsurface flow is keeping soils moist around the site. More typically, the nest is within 50-100 m of these hydrologic conditions. Farther distances have also been observed, especially in situations where reservoirs have receded.

Vegetation species composition and structure vary across the range of the flycatcher. The variation ranges from homogenous patches of one or several species with a single canopy layer to heterogeneous patches of numerous species with distinct under-, mid-, and over-stories. Canopy cover is consistently high (greater than 90%) throughout the range (Spencer *et al.* 1996, Cooper 1996). Flycatchers are known to nest in mature, dense coyote willow (*Salix exigua*) patches, sometimes with a sparse overstory of cottonwood, as well as habitat that is a mixture of native and nonnative riparian species, including tree willow (*Salix goodingii*), saltcedar (*Tamarix* sp.), Russian olive (*Elaeagnus angustifolia*), box elder (*Acer negrundo*), and various other species. Along the Gila River near Cliff, New Mexico, flycatchers nest in mature boxelder with a relatively open understory. At this site, nests are typically located much higher (20-60 ft) than the average range-wide nest height. Flycatchers have also been found in large stands of monotypic saltcedar in Arizona, Nevada, and California. Along the Rio Grande in New Mexico, nesting flycatchers have been found in predominantly saltcedar vegetation, with other nonnative species also occurring in the patch (D. Ahlers, Bureau of Reclamation, pers. comm. 1999). Many areas that are predominant or monotypic saltcedar or Russian olive in New Mexico have not yet been surveyed, as of 2000.

Channels associated with flycatcher-preferred streams are often wide and shallow, with a well-defined floodplain and broad valley. Many of the streams are either not or slightly entrenched, with well-defined meanders and riffle/pool bed features. Gradients are often less than 1%. Headwaters are usually not suitable unless they are low in gradient. Quiet water dominates, as in backwaters, pools, beaver ponds, or non-riffle stream stretches. Beaver ponds may be of particular importance in areas where the stream gradient is above 1%. In the case of wetlands and shorelines, water levels can fluctuate significantly. Water may recede from the nesting area by the end of the nesting season.

There are no observed patch-age requirements, but structure must meet perching and nesting needs for height and density. Song perches are necessary, but can be provided by snags or taller branches of a relatively even patch. Large overstory trees may be present and used for singing, hunting, and observation. Nests are built in shrubs or trees in willow thickets and deciduous woodlands along watercourses. Typically, nests are placed 1.5-8.5 m above ground level, most often in a branch fork, but occasionally on a horizontal branch (Sferra *et al.* 1995). Flycatcher nests have also been found as high as 19 m above ground level.

Distribution. The historical range of the southwestern willow flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and the States of Sonora and Baja California Norte in extreme northwestern Mexico. Current known breeding distribution has a similar extent, and includes southern California and Baja California, Arizona, New Mexico, extreme southern portions of Nevada and Utah, and southwestern Colorado (Unitt 1987). Using data collected between 1993 and 1999, estimated State totals throughout the current distribution included about 328 territories in New Mexico, 298 in Arizona, 173 in California, 54 in Colorado, 17 in Utah, and 44 in

Nevada, for a total of about 914 territories range-wide (Paradzick *et al.* 2000; M. Sogge, U.S. Geological Survey, pers. comm. 2000; Williams and Leal 1999; Spencer *et al.* 1996; Sferra *et al.* 1995; Parker and Hull 1995; Maynard 1994; Whitfield 1994; Whitfield and Strong 1995; Holmgren, *in litt.*). The number of territories represents the approximate number of singing or displaying males located, but does not necessarily equal the number of breeding pairs. In 1998, applying the same data used to estimate the approximate number of territories, the estimated number of pairs of southwestern willow flycatchers was 550-650 (Sogge 1999).

In Arizona, the flycatcher historically ranged along major river systems and probably major tributaries. Historical records exist from the Colorado River near Lee's Ferry and near the Little Colorado River confluence (A. Phillips, pers. comm., cited in Unitt 1987), the Santa Cruz River near Tucson (Swarth 1914, Phillips 1948), the Verde River at Camp Verde (Phillips 1948), the Gila River at Fort Thomas (W.C. Hunter, pers. comm., cited in Unitt 1987), the White River, the upper and lower San Pedro River (Willard 1912, Phillips 1948), and the Little Colorado River headwaters area (Phillips 1948). Currently, resident flycatchers occur along 12 drainages in Arizona, including the Colorado, Bill Williams, Verde, Salt, Tonto Creek, Big Sandy, Gila, San Pedro, Santa Maria, Little Colorado, San Francisco, and Hassayampa drainages (Paradzick *et al.* 2000, Sferra *et al.* 1995, Spencer *et al.* 1996). The flycatcher occurs in Arizona on the Apache-Sitgreaves and Tonto NFs, and on private land near the Prescott and Coconino NFs.

In New Mexico, breeding flycatchers occur along major river systems, tributaries and creeks. Flycatchers are known to breed in eight major drainages, with records from the Rio Grande, Chama, Zuni, Coyote Creek, Gila, Rio Nutria, Bluewater Creek, and San Juan drainages (Hubbard 1987, Cooper 1996, Maynard 1994). Territorial males have also been located in the San Francisco River drainage (Williams and Leal 1999). Currently, the flycatcher occurs on the Carson, Cibola, and Gila NFs, and on non-FS land near the Santa Fe and Gila NFs in New Mexico.

Effects Analysis. In the final rule to designate the flycatcher as endangered, the FWS describes activities that could potentially harm the flycatcher and result in take of the subspecies. The activities listed that involve livestock grazing are: 1) livestock grazing that results in direct or indirect destruction of riparian habitat; and 2) activities such as continued presence of livestock and fragmentation of flycatcher habitat that facilitate brood parasitism by the brown-headed cowbird (U.S. Fish and Wildlife Service 1995a). On NF lands, the main cause of decline in flycatcher habitat can be attributed to the destruction, modification, and fragmentation of habitat. Livestock grazing has contributed to the destruction, modification, and in some cases, fragmentation of flycatcher habitat. Nest parasitism by brown-headed cowbirds (*Molothrus ater*) is also partly responsible for declines in flycatcher populations. Individual populations are threatened by small size, nest parasitism by brown-headed cowbirds, and nest predation. A critical season (April 1 through July 31), rather than the breeding season, has been delineated for situations in which brown-headed cowbird parasitism is a concern (Rob Marshall, FWS, pers. comm.; U.S. Fish and Wildlife Service 1995b). The removal of cowbird attracting activities by the beginning of the critical season in April allows a period of approximately one month for

cowbirds to depart from the area before flycatchers arrive for breeding. Restricting activities until July 31 minimizes the presence of cowbirds during the egg-laying and incubation period (mid-June to end of July) and will decrease the potential for nest parasitism.

Livestock grazing in occupied areas may pose a direct threat to flycatchers by physically disturbing or damaging the nest, or spilling contents of the nest as they walk by (U.S. Fish and Wildlife Service 1993). This is especially true in single-story or regenerating stands. Livestock grazing in potential flycatcher habitat can retard the growth of woody vegetative species, slowing or arresting progression towards suitable habitat. Livestock overgrazing in suitable habitat may not allow for retention of vegetative characteristics needed for flycatcher nesting.

Livestock overgrazing in riparian areas indirectly affects the flycatcher through habitat degradation and modification of riparian areas (U.S. Fish and Wildlife Service 1993a). If given the opportunity, livestock can first overuse the herbaceous component and if they are not removed or redirected, they will begin feeding on riparian shrubs and young trees. This results in changes in plant structure and reduction of plant diversity and density (Bock *et al.* 1992). Year-round or summer livestock grazing appear to be particularly damaging to riparian habitats (Bock *et al.* 1992). During these periods, regeneration of critical tree species such as willow, boxelder, and cottonwood may be curtailed (U.S. Fish and Wildlife Service 1993a). In addition to direct herbivory of woody species, livestock can destroy riparian habitat by bedding, trampling, and trailing through it. These effects can be significant, especially if livestock concentrate in an area and the plants are small.

Other impacts that livestock overgrazing has on riparian habitats include compaction of surface soil that reduces infiltration and increases surface runoff, reduction of bank stability which leads to accelerated erosion and increased sedimentation, and removal of organic material due to reduction in plant vigor and density (Verde Natural Resources Conservation District 1993). These impacts result in increased susceptibility to destruction of a riparian area during heavy flow events. Livestock grazing during the sprouting and regeneration of the cottonwood/willow community after these flood events has led to increased fragmentation, reduced or eliminated recruitment, and ultimately, total degradation. As native plant species try to compete with non-natives, livestock's preference for native plants favors establishment of nonnatives. Changes in riparian areas as a result of livestock overgrazing are often linked to more widespread changes in watershed hydrology.

Increases in flycatcher populations have been observed where livestock grazing has been reduced, modified, or eliminated in riparian areas. Harris *et al.* (1987) observed flycatchers increase by 61% over a 5-year period after grazing was reduced. Dramatic increases in other avian species associated with cottonwood/willow habitat were found on Arizona's San Pedro River 4 years after the removal of livestock.

Brown-headed cowbird parasitism is known to have detrimental effects on neotropical migratory birds including the flycatcher (Robinson *et al.* 1992). Cowbirds are brood parasites and

parasitize smaller songbirds. Cowbird parasitism can impact host populations in several ways: 1) upon laying eggs, female cowbirds dispose of one or more host eggs; 2) the thick eggs of cowbirds often break the host eggs when laid; 3) cowbird eggs hatch earlier than host eggs; and 4) cowbird young are larger than host young and grow faster, beg louder, and have larger gapes (Robinson *et al.* 1992).

Detrimental effects of cowbird parasitism have increased throughout the Southwest and these effects are directly associated with settlement of the west. Development of livestock and agricultural operations have allowed expansion of brown-headed cowbird habitat by providing feeding areas where grazing livestock concentrate. Livestock feedlots, dairy operations, ranch headquarters, and other agricultural operations where grains and forage are fed to livestock provide food sources near host species nesting habitats (Hanna 1928, Mayfield 1977). Other human attractants to cowbirds also include bird feeders, lawns, golf courses, and agricultural fields.

The expansion of agriculture, livestock grazing, and widespread human activities have caused fragmentation of forest and woodland habitats. Habitat fragmentation has been documented to increase edge effects, increasing the potential for predation, including parasitism by the brown-headed cowbird. Riparian habitats in the Southwest are linear and naturally have a high amount of edge (Spencer *et al.* 1996). Tall, dense, impenetrable vegetation and large patch sizes will minimize the ability of cowbirds to see down through the canopy or in from the edge, and this may reduce parasitism rates.

The distance cowbirds travel from feeding areas to riparian areas where females lay their eggs vary among sites, depending on numerous factors, including cowbird attracting activities on surrounding lands, location and abundance of suitable feeding areas in relation to suitable breeding and egg laying areas, land ownership patterns, and other factors. Due to variability in cowbird traveling distances and lack of research specific to the Southwest, there is considerable controversy on designating a set distance in which cowbird parasitism is considered a concern. However, for this guidance document, a set distance in which to evaluate the possibility of cowbird parasitism as related to livestock grazing is required. After reviews of the literature and discussions with experts on cowbird behavior in the Southwest, the Southwestern Willow Flycatcher Recovery Team determined that restricting livestock activities within 2 mi of an occupied site during the critical season would remove the majority of threat of cowbird parasitism. As the Southwestern Willow Flycatcher Recovery Team's guidelines are applied and results are monitored, the 2-mile criterion may change. This may precipitate a need to re-evaluate any effects determinations made in this guidance document.

Trapping brown-headed cowbirds has been documented to reduce parasitism rates on the flycatcher and other host species. On the Kern River in California, parasitism rates dropped from between 50-80% to below 10% after the implementation of a trapping program (Whitfield 1993, Spencer *et al.* 1996).

Poor watershed conditions in the uplands can have adverse indirect effects on flycatcher habitat. Livestock grazing (as well as other activities such as timber harvesting, roads and trails construction, off-road-vehicle use, heavy recreational use in concentrated areas, large-scale fires, resource extraction, and other ground-disturbing activities) can contribute to poor watershed conditions. Such activities result in the removal of organic material on the soil surface. Removal of vegetation cover, in addition to compaction, decreases infiltration of the soil, which enhances surface runoff (U.S. Fish and Wildlife Service 1993b). Increased runoff in turn then results in increased silt loads, increased turbidity, decreased water quality, increased scouring during high flows, and altered pH levels. All of these impacts can have an indirect adverse effect to riparian areas, including flycatcher habitat.

Assessing the effects of various activities on the flycatcher requires consideration of the dynamic interactions within riparian ecosystems and their watersheds. Management of riparian ecosystems should consider their adaptation to flood events and the necessity of floods for regeneration of species like cottonwoods and willows. Fully functioning, healthy riparian ecosystems can readily absorb and quickly recover from relatively major flood events. Degraded systems cannot withstand flood events, and additional resource damage often occurs. Uplands degraded by overgrazing often promote surges that are flashier, with higher peak flows and reduced low flows. While flooding is very important to riparian habitat, unnaturally flashy flooding can be damaging and prevent further recruitment, particularly in degraded riparian systems.

DETERMINATIONS FOR THE SOUTHWESTERN WILLOW FLYCATCHER

No Effect

1. Livestock grazing on the allotment will not occur within any subwatershed that drains into southwestern willow flycatcher habitat.

May Affect, Not Likely to Adversely Affect (must meet all of the of the criteria)

1. Livestock use will not occur within 5 miles of occupied habitat during the breeding season, or will not occur within 2 miles if cowbird trapping and monitoring or an approved cowbird research program is in place.

2. Livestock grazing in unoccupied suitable habitat will not reduce the suitability, nor reduce the likelihood of suitable habitat to expand to the site's potential.

3. No livestock grazing will occur in potential habitat.

4. Subwatershed condition in the presence of livestock grazing will be maintained or improved and indicators of watershed health and TEP species habitat demonstrate that effects will be insignificant or discountable.

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ATTACHMENT "C" 9/16/97

Gila Valley Willow Flycatcher Study: Summary of 1997 Season

Five sites were chosen as focal patches for this study: one on Forest Service property upstream from the U-Bar Ranch, and two stringers and two larger patches on the U-Bar itself. Within the 5 patches, breeding birds were surveyed approximately every 3 days, and nest searches were conducted for all species. In addition, searches were conducted for flycatcher nests in non-focal plots on the U-Bar every 1-2 weeks.

Avian Community Structure

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 (30), Lesser Goldfinch (15), Western Wood Pewee (12), and Black-chinned Hummingbird (10). An additional 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 monitor adequately most warbler nests due to their height (mean = 9.7 m). Other species parasitized by Cowbirds were Vermilion Flycatcher, Plumbeous Vireo, Summer Tanager, Lucy's Warbler, Lesser Goldfinch, Spotted Towhee, Abert's Towhee, and Blue Grosbeak.

Willow Flycatcher Breeding

Nests: A total of 92 flycatcher nests were found. The majority of nests were in boxelder (84%), with lesser numbers in willows (all species 5%), Russian olive (9%), Arizona alder (1%) and salt cedar (1%). Mean nest height was 7.0 m, and ranged from 1.2 to 16.4 meters. Nests in boxelder were significantly higher on average (7.7 m) than those in other species (3.2 m).

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 many 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 -- 53%. If all 24 nests of unknown outcome are assumed to have failed, the minimum nesting success of this population in 1997 would be 39% (fairly typical for a small migratory songbird). The corresponding maximum nesting success rate would be 65%. Overall, a minimum of 78 fledgling flycatchers were produced from nests on the U-Bar and Forest Service sites in 1997.

Cowbird Parasitism: The exact frequency of cowbird parasitism on flycatchers 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. Anecdotal information suggests low nests were more heavily parasitized than higher nests, and those we could see into were low nests. Therefore the overall rate of nest parasitism is probably lower than the observed rate. Three nesting attempts were known to produce cowbird fledglings; for two of these no nest was found.

Nest Site Characteristic Mensuration

Vegetation was measured at 72 flycatcher nests and 29 null points (grid points in focal plots ≥100ft from an active nest or singing perch). At each point we quantified plant species composition and abundance, canopy height, canopy and ground cover, and vertical foliage density. Analyses will determine (1) if and how flycatcher nest sites differ from unused (null) sites within occupied plots; and (2) if flycatcher breeding success is correlated with measures of habitat structure.

Future Directions

If adequate funding is available, future research will:

- continue surveying avian community in focal patches.
- increase flycatcher monitoring efforts to obtain better estimates of nesting success and parasitism.
- band adult and fledgling flycatchers.
- address landscape-level questions of habitat use by flycatchers, by comparing physical and vegetative characteristics of occupied and unoccupied riparian patches.

ATTACHMENT "C"

Reproductive Success of Southwestern Willow Flycatchers in the Cliff-Gila Valley, New Mexico

Summary report for the 1998 Field Season

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March, 1999

INTRODUCTION

The Species. — 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. In the southwest, nesting is almost always in the vicinity of surface water or saturated soils (U.S. Fish and Wildlife Service 1995).

Populations of the southwestern willow flycatcher are thought to have 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 have 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 nonnative 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 more than 50% have been documented for populations at the Kern River, California (Harris 1991) and the Grand Canyon (Brown 1994). Frequently flycatchers respond to the laying of cowbird eggs in their nests by abandoning and renesting (Whitfield & Strong 1995).

In 1993, the U.S. Fish and Wildlife Service 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).

The Cliff-Gila Valley population. — 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 109 sites throughout the southwestern United States (Marshall, in review). Approximately 78% of extant sites consist of 5 or fewer territories. The entire known breeding population in 1996 was estimated at just over 500 pairs (Marshall, in review). By far the largest known breeding concentration of Southwestern Willow Flycatchers is located in the Cliff-Gila Valley, Grant County, New Mexico. This population was estimated at 184 pairs in 1997 (Parker 1997), and at 235 pairs in 1998 (P. Boucher, personal communication; Stoleson and Finch, unpublished data). These birds are located primarily on private property owned by the Pacific Western Land Company, a subsidiary of Phelps Dodge Corporation, and managed by the U-Bar Ranch. An additional 24

pairs occur on the adjacent Gila National Forest and other private holdings. Habitat preferences of flycatchers in this population differ from those reported elsewhere (Hull and Parker 1995, Skaggs 1996, Stoleson and Finch 1997), and from populations of other subspecies.

OBJECTIVES

The goals of this study are (1) to monitor nesting success and rates of cowbird parasitism to assess the reproductive health of Willow Flycatchers in the Cliff-Gila Valley; (2) characterize and quantify the habitat preferences of this population; (3) describe and quantify the riparian bird community at the site to assess the health of the riparian habitat and to determine background rates of nest predation and cowbird parasitism among alternate cowbird host species. This report summarizes the results of the second year of the study, and presents preliminary analyses of habitat characterization.

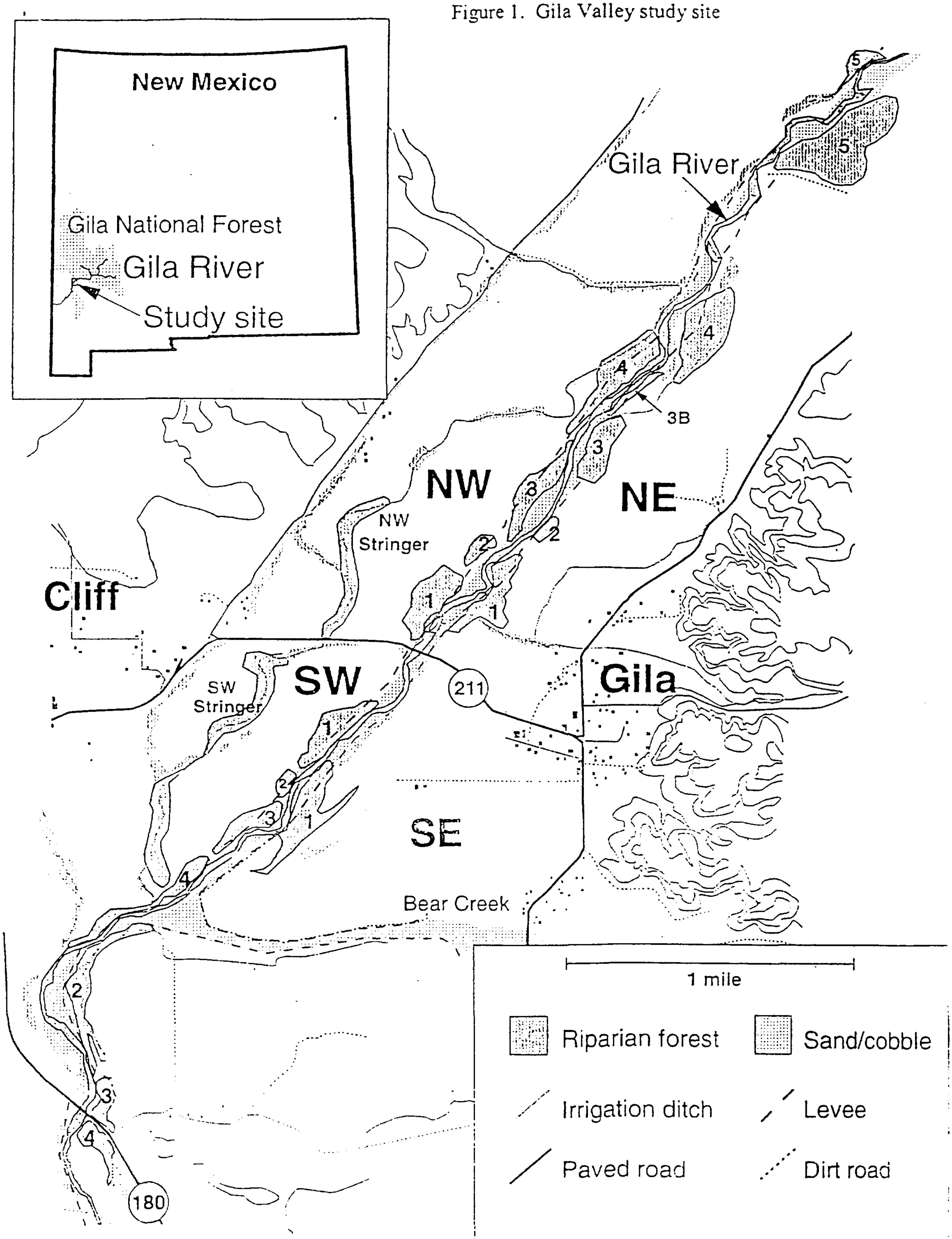
METHODS

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 toward the Burro Mountains. The study was primarily conducted from just below the US Route 180 bridge upstream to the north end of the U-Bar Ranch (approximately 5 km). In addition, flycatchers were studied in two disjunct sections of the valley: (1) the Fort West Ditch site of the Gila National Forest and adjacent holdings of The Nature Conservancy's Gila Riparian Preserve, located about 9 km upstream of the Route 180 bridge, and (2) the Gila Bird Area, a riparian restoration project comprising lands of the Gila National Forest and Pacific-Western Land Company, located some 8 km downstream of the Route 180 bridge. Most of the upper GilaValley consists of irrigated and non-irrigated pastures used for livestock grazing and hay farming. Elevations range from 1350 to 1420 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 and the Gila Bird Area are 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.

The study concentrated on three large riverine patches and two stringer patches on the U-Bar Ranch (see Figure 1: SE1, NW1, NE1, SW Stringer, and NW Stringer) 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 riparian patches as time allowed.

Figure 1. Gila Valley study site



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 (Bibby *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 nonforested 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 and cuckoo nests were searched for in additional patches. Nests were monitored every 3-5 days. Nest contents were observed using pole-mounted mirrors or videocameras, or 15X spotting scopes. 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.

Habitat Measurements. — Vegetation characteristics were sampled at nest sites and at unused points using a modified BBIRD methodology (Martin *et al.* 1997). Unused points were defined as points on the spot-mapping grid that were at least 100 ft away from the nearest Willow Flycatcher nest; we based this definition on the fact that most flycatcher territories appeared to have radii much smaller than 100 ft. Within each patch, a subset of about 50-70% of potential unused points were chosen randomly for sampling.

At each unused point and nest site, a 0.02 ha plot (radius = 8 m) was placed centered on the nest tree, or on the nearest tree to the gridpoint for unused points. Standard methodology uses 0.04 ha plots, but we used smaller plots in this study to minimize problems of nonindependence of points around nests that would result from the very small territories used by flycatchers in this area. At the center of the plot and eight other points (4 and 8 m from the center in each of the four cardinal directions), we measured canopy height using clinometers, percent canopy cover using densiometers, and estimated percent ground cover. Vertical foliage

density was measured at 2, 4, 6 and 8 m in each direction from the center tree by counting hits of vegetation against a 10 m vertical pole marked in 1 m increments. Within the 0.02 ha plot, trees (≥ 10 cm dbh) of all species were counted and measured (dbh). Shrubs and saplings (< 10 cm dbh) were counted and measured within a 4 m radius of the center tree. For nest sites we also recorded nest plant species, nest height, and distance and direction from the trunk.

For each sample point we calculated average ground and canopy cover and average canopy height (all = mean of 9 measurements per point); foliage density index (sum of 1 m increments touched by foliage) for understory (0-3 m in height, for a maximum score of 48 per point) and mid-canopy (3-10 m in height, for a maximum score of 112 per point); the sum of shrub/sapling (<10 cm diameter) stems and tree (≥ 10 cm diameter) stems by species and size class (<1cm, 1-5 cm, 5-7.5 cm, 7.5-10 cm, 10-30 cm, 30-50 cm, 50-70 cm, >70 cm). From these values we also calculated the total number of stems of willow and boxelder per point, an estimate of the total basal area of woody species per point, woody plant species richness (number of species of trees and shrubs per point), and plant species diversity (using the Shannon-Weaver Diversity Index). We calculated several variables to estimate the degree of habitat heterogeneity at points: patchiness (the diversity of foliage density among the four cardinal directions, using the Shannon-Weaver Diversity Index); and the coefficient of variation in measures of canopy cover, canopy height, and ground cover at each point.

Analyses. — We compared habitat values of unused points (n=40) to those at nest sites (n=152) using independent sample t-tests. Although we performed multiple statistical comparisons from the single set of data, we did not adjust our experiment-wise alpha level to minimize the risk of Type I errors because the modest sample sizes used for unused points are already prone to Type II errors, and we wanted to maximize our ability to detect trends.

To assess whether flycatchers used nest substrates randomly, we calculated an index of availability for each nest tree species to compare usage with availability. 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 *x* was calculated as: total number of stems for species *x* / total number of all stems. The numbers of used versus unused stems were compared using chi-square analyses.

RESULTS

WILLOW FLYCATCHERS

Willow Flycatcher nest substrates. — We found a total of 130 willow flycatcher nests on the U-Bar ranch in 1998. An additional 35 nests were found on nearby Forest Service and Nature Conservancy lands. In the combined data set of all 257 nests found in 1997-1998, the majority of nests (76.7%) were located in boxelder (Fig. 2). In 1998, nests were found in several

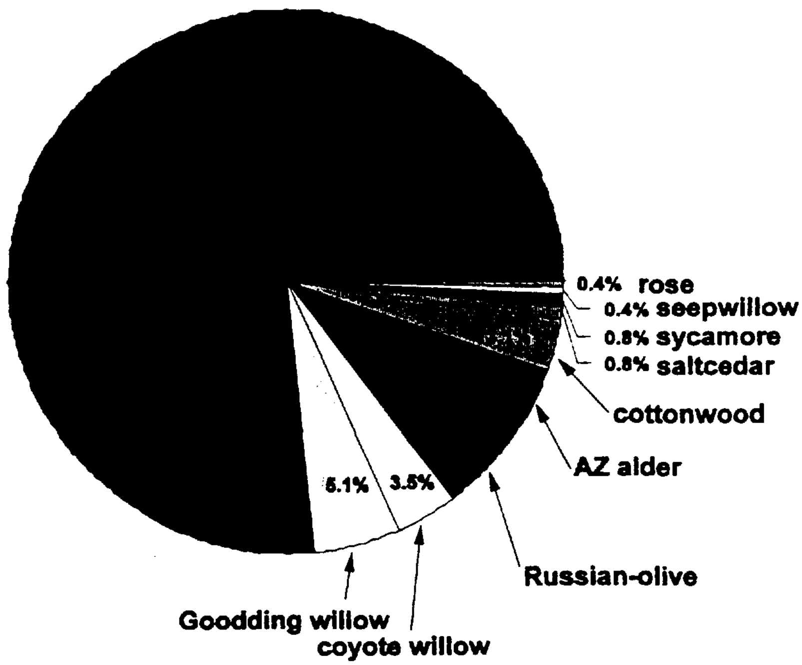


Figure 2. Nesting substrates of 257 nests of the Southwestern Willow Flycatcher in the Cliff-Gila Valley, 1997-98.

substrates not encountered previously in the Cliff-Gila Valley, including Fremont cottonwood, Arizona sycamore, seepwillow, and a nonnative climbing rose (*Rosa multiflora*). The sycamore nests represent the first recorded nests in this substrate anywhere in the Southwest (Stoleson and Finch in press). Nests in cottonwood and seepwillow were located in early successional riparian patches on FS and TNC properties. Boxelder was even more dominant (85%) as a substrate among the 213 nests found in the more mature woodlands found on the U-Bar Ranch.

Substrate use versus availability. — Plant species were not used for nesting in proportion to their availability within flycatcher territories. Boxelder and Russian olive were used significantly more than would be expected if birds chose nest trees randomly (Likelihood Ratio test G=271.8 and 5.2, P<0.001 and P=0.023, respectively). Boxelders comprised less than 35% of woody stems, yet contained more than 75% of all the nests found (Fig. 3). In contrast, willows were used less than expected by chance (G=60.6, P<0.001). The two willow species made up more than 40% of woody stems within flycatcher territories, but only 8.6% of nests were placed in either willow species. These results indicate an active preference by flycatchers for boxelder and Russian olive, and active avoidance of willow, as a nest substrate.

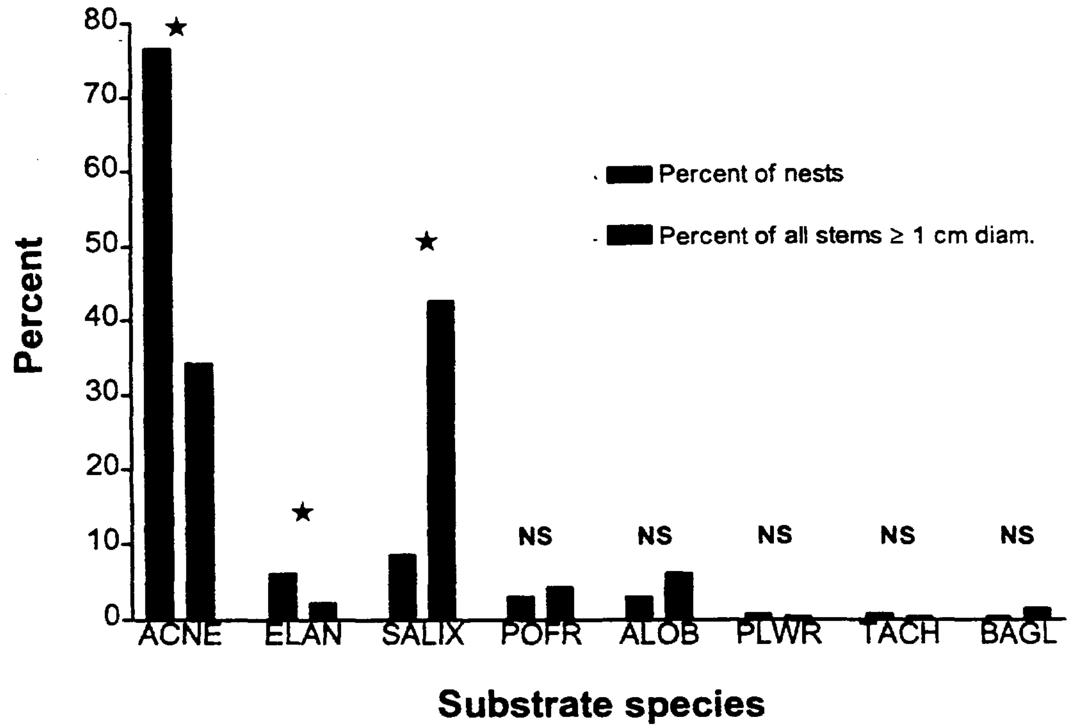


Figure 3. Use versus availability of nest substrates by Willow Flycatchers in the Cliff-Gila Valley, 1997-98. Significant (P<0.05) overutilization is indicated by red stars, underutilization by black stars, NS = not significant. ACNE = boxelder, ELAN = Russian olive, SALIX = willow species, POFR = cottonwood, ALOB = Arizona alder, PLWR = Arizona sycamore, TACH = salt cedar, and BAGL = seepwillow.

Nest heights. — Flycatcher nests ranged from 1.2 to 18.5 m in height. The mean height of all nests found in 1997-98 was 7.4 ± 3.8 m, with a median height of 6.8 m (Fig. 4). Average nest heights varied among different nest substrates (Fig. 5). Boxelder nests were significantly higher (8.3 ± 3.7 m) than nests in all other substrates combined (4.6 ± 2.6 m; $t = -8.57$, df = 138.9, $P<0.001$). Nests also tended to be higher than average in sycamore.

Willow Flycatcher nest success. — Of 103 nests of known outcome found on the U-Bar in 1998, 45 (42.7%) successfully fledged one or more flycatcher young. The outcome of 27 nests was uncertain. Of 34 nests of known outcome found on lands other than the U-Bar Ranch, 14 (41.2%) were successful. Of the failed nests on the U-Bar, fourteen appeared to have been deserted during or immediately after building, but before any eggs were laid in them. The cause

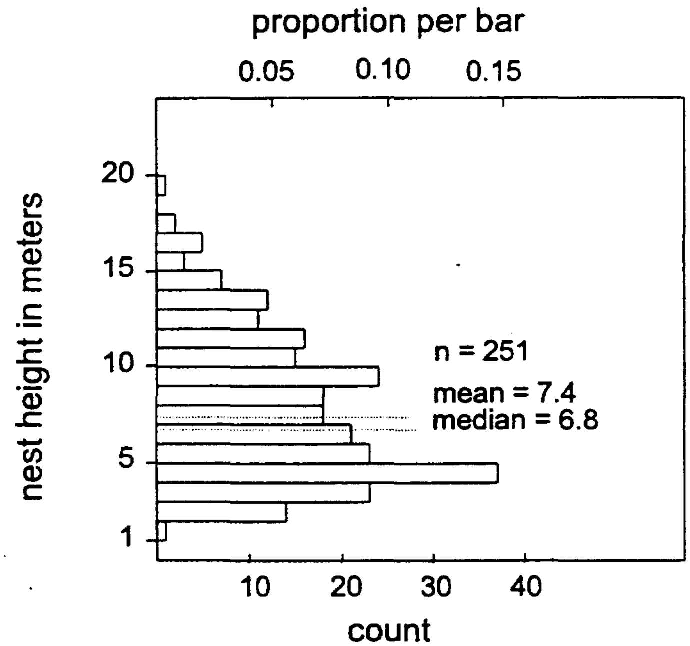


Figure 4. Distribution of heights of Willow Flycatcher nests in the Cliff-Gila Valley, 1997-98.

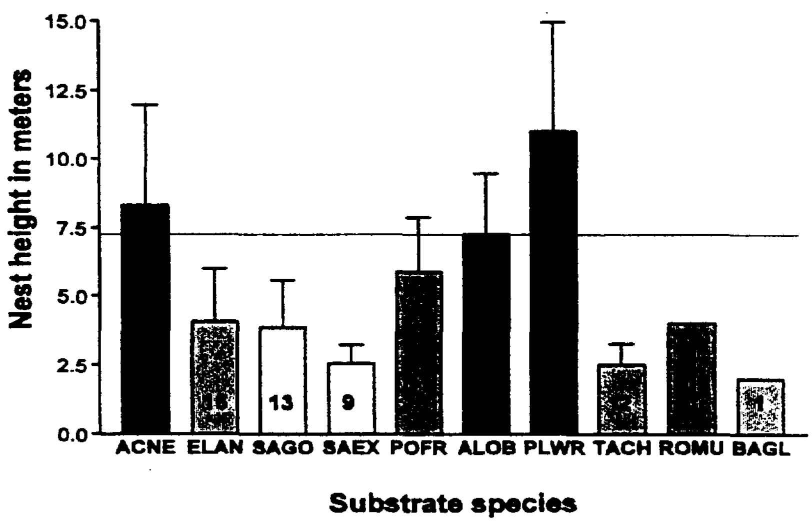


Figure 5. Heights (mean + SD) of 251 Willow Flycatcher nests in different nest substrates. Horizontal line indicates the overall mean, and numbers in bars are samples sizes. ROMU=multiflora rose, other substrate acronyms as in Figure 3.

of this high rate of desertion is unclear, but may have been related to (1) the repeated presence of humans in the vicinity of nests, (2) a high incidence of cowbirds near nests, or (3) damage from high winds. The first suggested cause is unlikely, as nests were visited at a similar rate in 1997, when only one instance of desertion was noted. The second suggestion may be possible, as a higher rate of cowbird parasitism was recorded in 1998 than in 1997 (see below). Alternatively, winds may have been responsible as we recorded numerous nests of other species being either deserted or blown out of trees entirely, including species such as the Western Wood-Pewee which is rarely parasitized by cowbirds. If deserted nests are discounted, then the nest success rate on the U-Bar was 45% in 1998.

The overall nest success rate for all nests (including those abandoned) from 1997-98 was 46.6%. The likelihood of a nest being successful varied among nest substrates (Fig. 6). Nests in Goodding's willow and Russian olive were less likely to be successful than average, while nests in boxelder, coyote willow, alder, and cottonwood were more likely to be successful than average. For the remaining plant species, sample sizes are too small to make any generalizations. The likelihood of a nest being successful showed a strong correlation with nest height: the higher the nest, the more likely it was to be successful (Fig. 7). This correlation and the fact that nests tended to be placed at different heights in different substrates may explain the differential nest success among substrates.

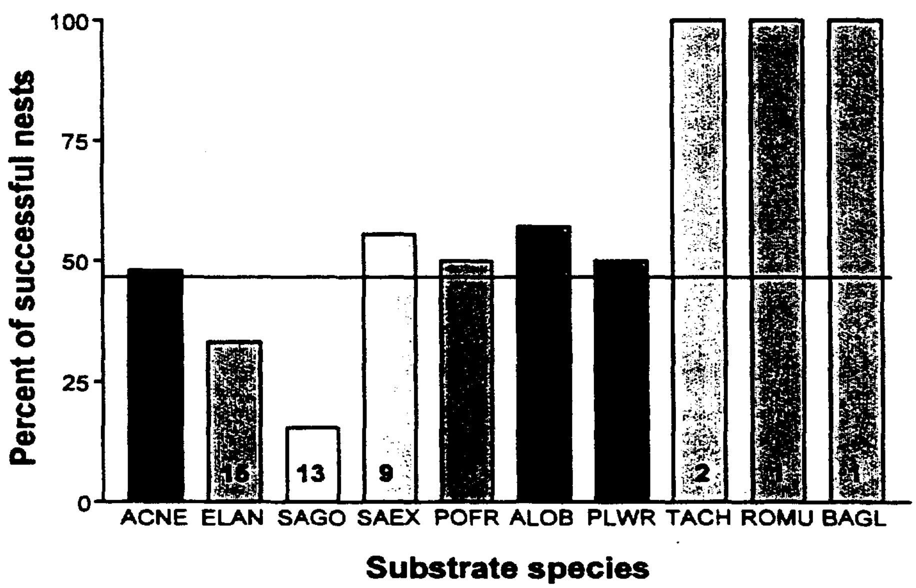


Figure 6. Nesting success as a function of nest substrate. Horizontal line indicates overall mean success rate, and substrate acronyms as in Figure 5.

A total of 74 nests of known outcome from 1997 and 1998 were located in patches that were open to cattle for at least part of the year (SW Stringer, NW Stringer, NW4, SW1, SW2, SW3, SW4, and the south end of SE1). Of these, 37 (50.0%) were successful. On the U-Bar, 88 nests of known outcome were located in patches excluded from cattle. Of these, 40 (45.5%) were successful. We found no significant effect of grazing on nesting success (G=0.33, P=0.56). Nest parasitism rates in the grazed patches (17.4%) did not differ significantly from the parasitism rate in excluded patches (21.8%; G=0.31, P=0.58). All patches at the site were within 1 km of grazed pastures for at least part of the breeding season.

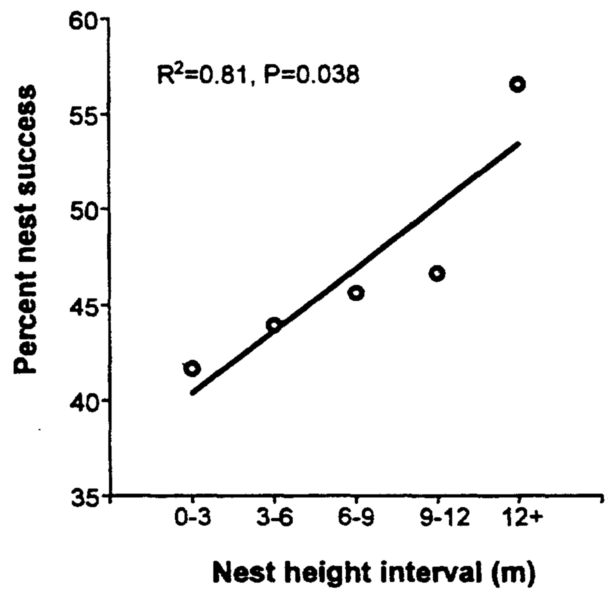


Figure 7. Correlation of nest height interval and average nesting success rate for each interval.

Causes of nest failure. — A total of 110 flycatcher nests were known to have failed during 1997-1998. Of these, the cause was not determinable for 24 (21.8%). More nests were lost to predators than to any other cause (Fig. 8). Other than one nest lost to a Great Horned Owl (*Bubo virginianus*) in 1997, we did not witness any failures due to predation, so the identity of nest predators can only be speculative. However, nests of other bird species were observed being depredated by Common Ravens (*Corvus corax*), Western Scrub-Jays (*Aphelocoma californica*), and a rock squirrel (*Spermophilus variegatus*). Desertion (defined here as nest abandonment prior to egg-laying) was the next most frequent cause of nest failure, followed by abandonment (after the onset of laying). Thirteen nests were known to have failed due to cowbird parasitism.

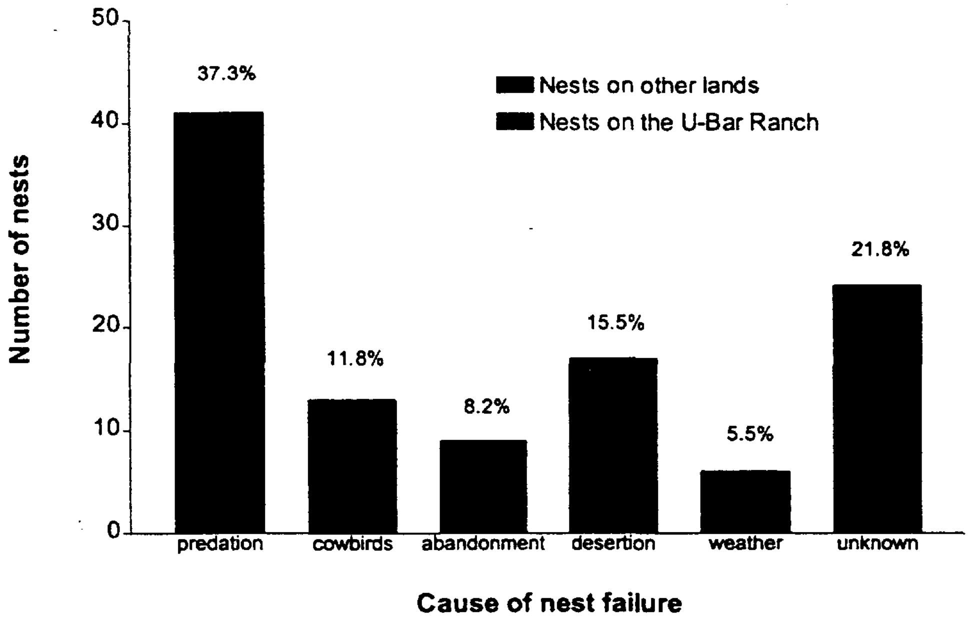


Figure 8. Causes of nest failure for 110 Willow Flycatcher nests in the Cliff-Gila Valley, 1997-98. Desertion = abandonment of nest prior to egg-laying, abandonment = after the first egg is laid.

Cowbird parasitism. — A total of 28 out of 129 nests (27.1%) of known status were parasitized by cowbirds in the Cliff-Gila Valley in 1997-1998. Observed parasitism rates were higher in 1998 than in 1997 (Fig. 9). In both years, nests on the U-Bar were somewhat less likely to be parasitized by cowbirds than nests on other lands, though this trend was not statistically significant ($G<0.95$, $P>0.25$).

The probability of a nest being parasitized by cowbirds was not significantly correlated with nest height (P=0.65), although there was a nonsignificant trend for nest parasitism to decrease with increasing nest height (Fig. 10). These data may be suspect because of the difficulties in determining whether high nests were parasitized or not.

The likelihood of a nest being parasitized varied among nest substrates. About 14% of the boxelder nests were parasitized, while nests in willow, Russian olive, and cottonwood were much more likely to be parasitized (Fig. 11). Other substrates were too infrequently used to make any generalizations.

The proportion of parasitized nests varied among the six focal patches. Surprisingly, there was a strong and almost statistically significant *negative* correlation between patch-wise parasitism rates and the estimated density of female cowbirds in a patch (Fig. 12). That is, the higher the estimated density of cowbirds within a patch, the *lower* the proportion of flycatcher nests in the patch that were parasitized.

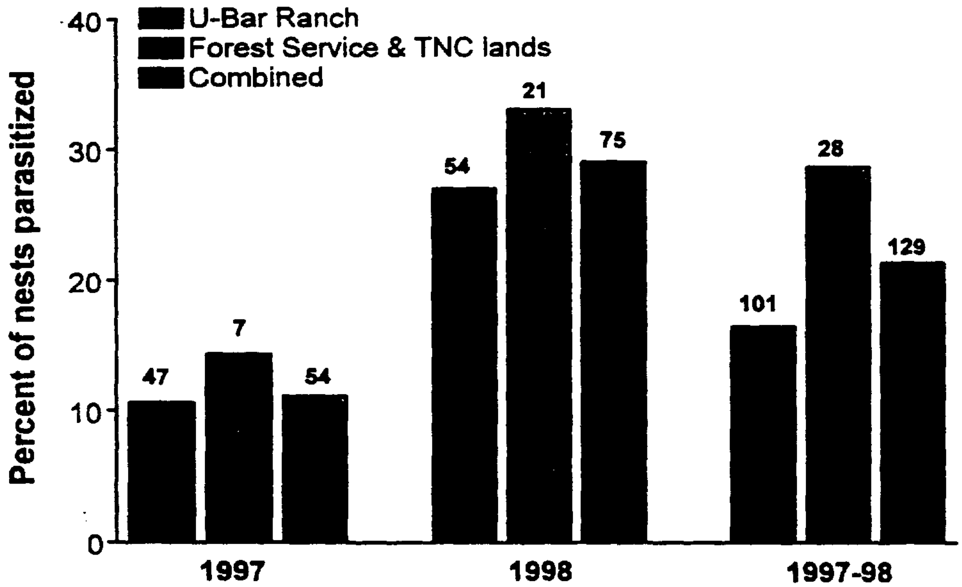


Figure 9. Rates of cowbird parasitism on Willow Flycatcher nests as a function of year and land ownership. Numbers above bars are sample sizes of all nests known to parasitized or not.

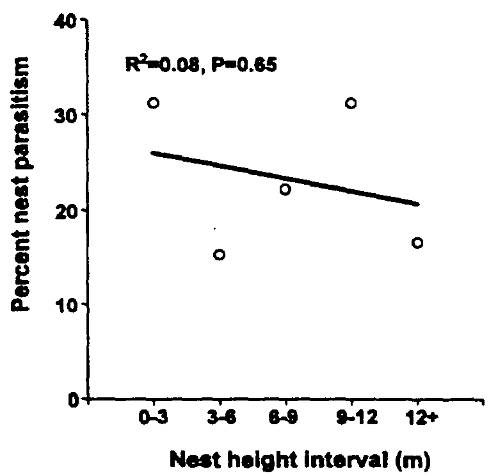


Figure 10. Correlation of nest height interval and average nest parasitism rate for each interval.

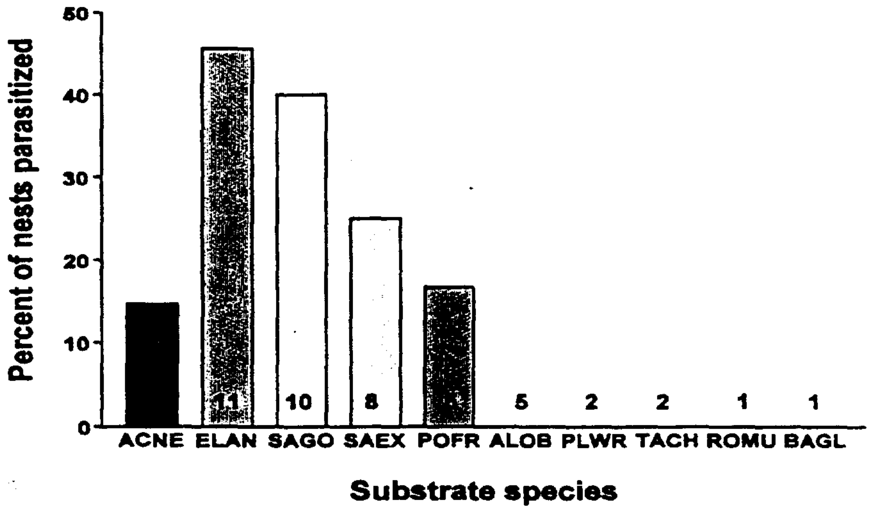


Figure 11. Average rate of nest parasitism as a function of nest substrate; acronyms as in Figure 5.

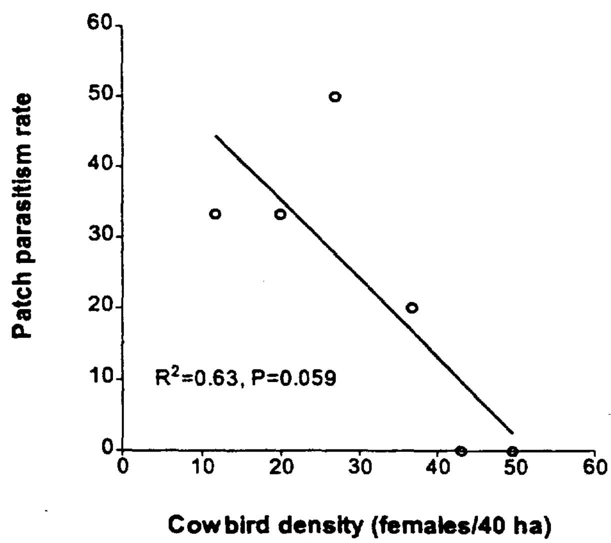


Figure 12. Correlation between average density of cowbirds per patch and patch parasitism rate.

Of the 28 flycatcher nests known to have been parasitized in 1997 and 1998, nine (32%) were abandoned immediately by the flycatchers (Fig. 13). Of those nests where cowbird eggs were accepted, most were depredated. Five nests fledged a single cowbird chick, and two fledged just flycatcher young despite having been parasitized. One nest was known to have fledged two flycatcher young in addition to a cowbird chick. The parents at this nest were seen to preferentially feed their own nestlings after the cowbird had fledged; it is unknown whether the cowbird fledgling survived. We were unable to determine the outcome of two parasitized nests in which both cowbird and flycatcher young had hatched.

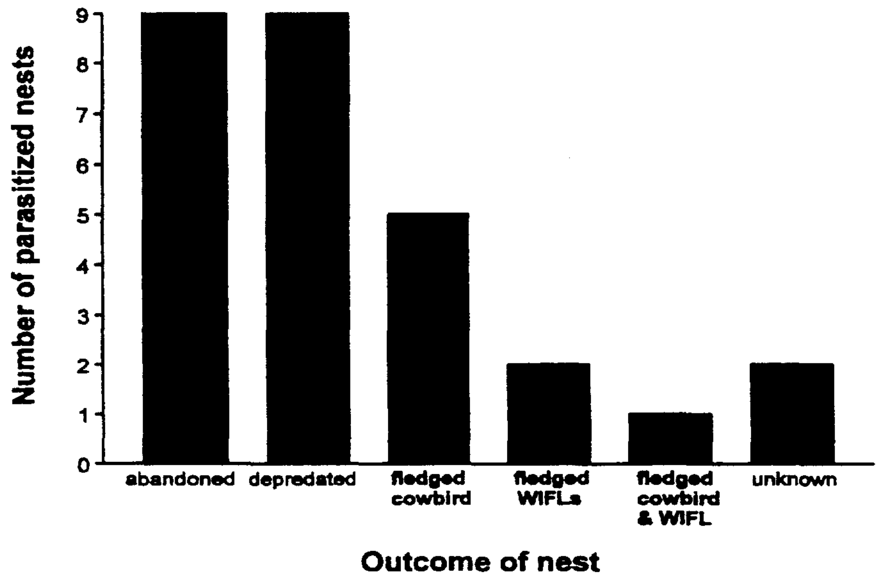


Figure 13. Fate of 28 Willow Flycatcher nests parasitized by cowbirds 1997-1998.

Willow Flycatcher nest site characteristics. — The habitat around Willow Flycatcher nests typically exhibits moderate ground cover, but high canopy cover and foliage density (Table 1). Canopy heights are moderate for the valley, averaging less than 15 m. Thus, flycatcher areas do not usually include the tall cottonwood galleries with canopies in excess of 25 m. Nor do they generally include the low, young growth of coyote willow and seepwillow. Flycatcher habitat also typically has a well-developed understory, as indicated by the high average stem count for shrubs (Table 1).

Flycatcher nesting habitat on the U-Bar Ranch, which was primarily in older, mature riparian woodland, differed significantly in some respects from nesting habitat elsewhere in the Cliff-Gila Valley. Specifically, the habitat on the U-Bar had, on average, a higher canopy, higher

foliage density above 3 meters, fewer stems of shrubs or trees, more boxelders, fewer willows, and fewer woody plant species than did habitat elsewhere (Table 1). These differences emphasize the fact that much of the rest of the valley supports habitat that is younger, early-successional woodland and thickets, characterized by more shrub stems and species.

Table 1. Habitat characteristics (mean ± SD) at Willow Flycatcher nest sites on the U-Bar Ranch and elsewhere in the Cliff-Gila Valley, New Mexico, 1997-1998. Sample sizes are 136 nests (U-Bar) and 25 nests (other). Significant differences (*P*<0.05, based on independent-samples t-tests) are indicated in bold face. See Methods for definitions of variables.

Variable	U-Bar nests	Other nests	*P* value
Average ground cover (%)	32.4 ± 23.3	34.1 ± 33.5	0.83
Average canopy cover (%)	84.1 ± 11.2	85.6 ± 15.4	0.69
Average canopy height (m)	13.4 ± 4.8	10.2 ± 4.8	**0.009**
Foliage density @ 0-3 m	12.0 ± 6.6	12.9 ± 6.4	0.53
Foliage density @ 3-10 m	42.9 ± 13.0	35.8 ± 11.7	**0.01**
Foliage height diversity	1.5 ± 0.1	1.4 ± 0.3	0.10
Total number of shrub stems	27.1 ± 30.9	87.8 ± 100.7	**0.006**
Total number of tree stems	9.9 ± 4.6	12.1 ± 8.8	0.23
Number of boxelder stems	25.0 ± 28.9	3.3 ± 6.7	**<0.001**
Number of willow stems	5.4 ± 16.1	61.6 ± 93.0	**0.006**
Number of cottonwood stems	0.6 ± 1.9	2.5 ± 4.9	0.08
Number of woody plant species	3.0 ± 1.7	4.1 ± 2.5	**0.04**
Plant species diversity (Shannon-Weaver Index)	0.587 ± 0.470	0.794 ± 0.645	0.14

Comparisons of used versus unused sites within occupied patches. — We compared habitat variables from 152 Willow Flycatcher nest sites with 40 Unused sites (defined here as gridpoints in occupied patches >100 ft from the nearest flycatcher nest). Nest sites differed significantly from unused sites in a variety of ways; these are summarized in Table 2, and Figures 14, 15 & 16. In general, in the patches where they occur, Willow Flycatchers prefer to nest in microsites that have high canopy closure, moderate canopy height, dense foliage in the subcanopy, a high density of trees but few very large trees, and many boxelders and willows (Figs. 14 & 15). Foliage density was significantly more patchy around nest sites than at unused sites (Fig. 16), suggesting that flycatchers key in to heterogeneous foliage, rather than just dense foliage *per se*. Microsite heterogeneity is also suggested by the higher variation in ground cover found at nest sites (Fig. 14). However, there was relatively little variation in canopy cover or height at nest sites (Fig. 14).

Table 2. Summary of habitat variables found to differ significantly (P<0.05) between Willow Flycatcher nest sites and unused sites (random points >100 ft. from nest sites) within occupied patches, and the direction of those differences.

Variable	value at nest sites relative to unused sites
Average ground cover (%)	lower
Coefficient of variation in % ground cover	higher
Average canopy cover (%)	higher
Coefficient of variation in % canopy cover	lower
Average canopy height	lower
Coefficient of variation in canopy height	lower
Foliage density @ 3 - 10 m	higher
Patchiness	higher
Number of tree stems	higher
Total basal area of woody stems	lower
Number of boxelder stems	higher
Number of willow stems	higher

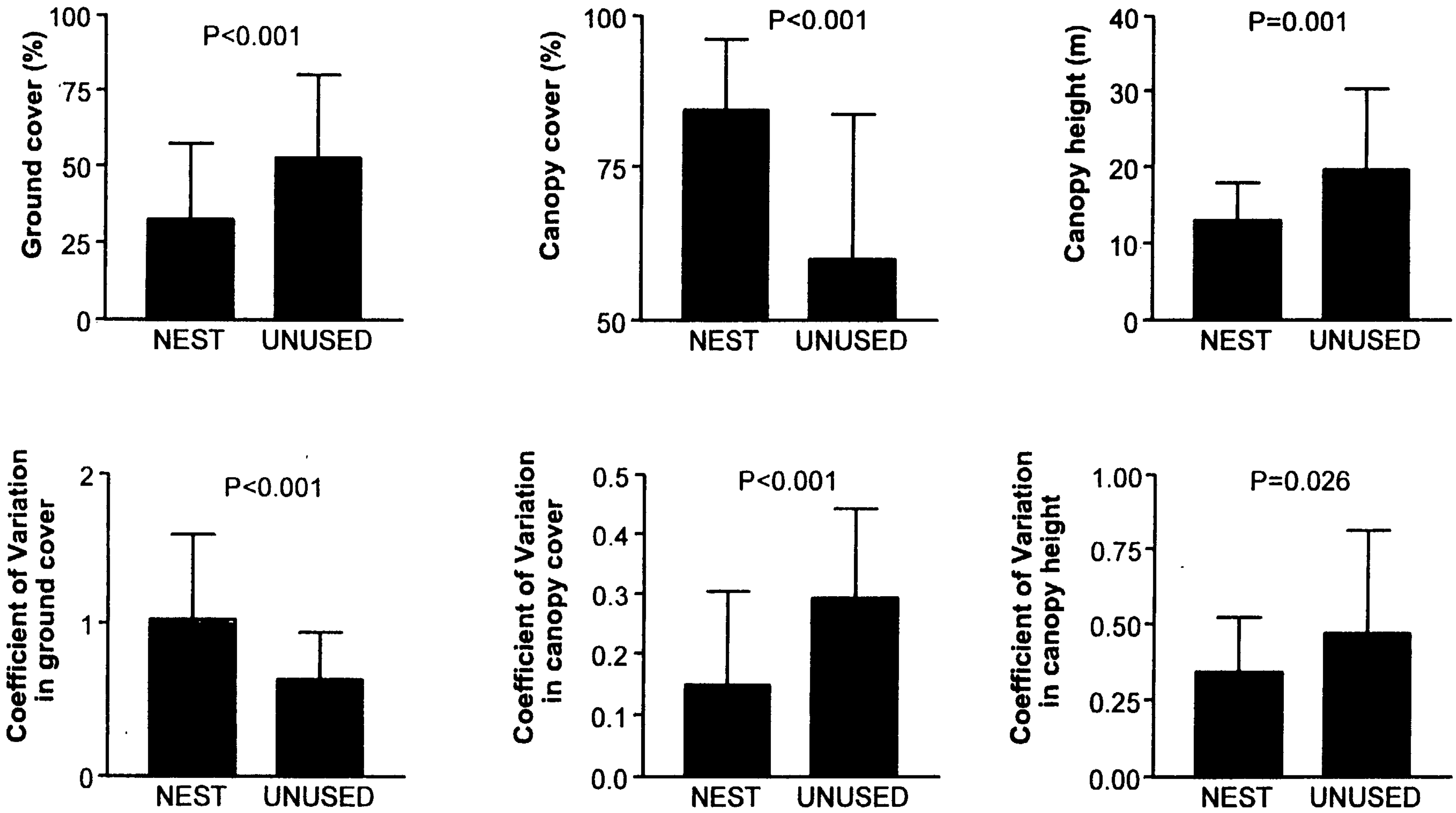


Figure 14. Comparisons of canopy cover, canopy height, and ground cover values and variation between Willow Flycatcher nest sites and unused sites. See Methods for variable definitions.

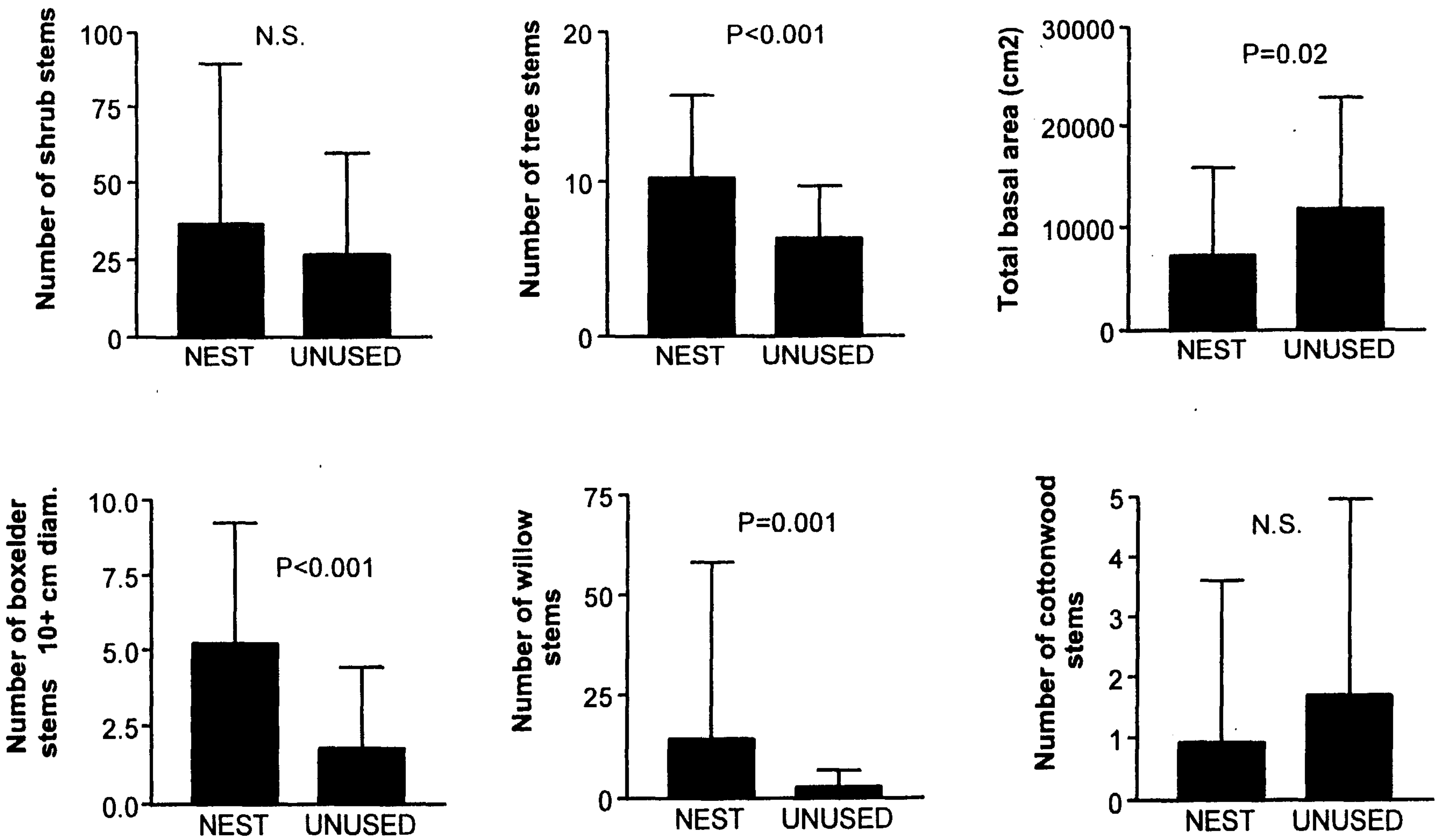


Figure 15. Comparisons of stem counts and basal area values between Willow Flycatcher nest sites and unused sites. See Methods for variable definitions.

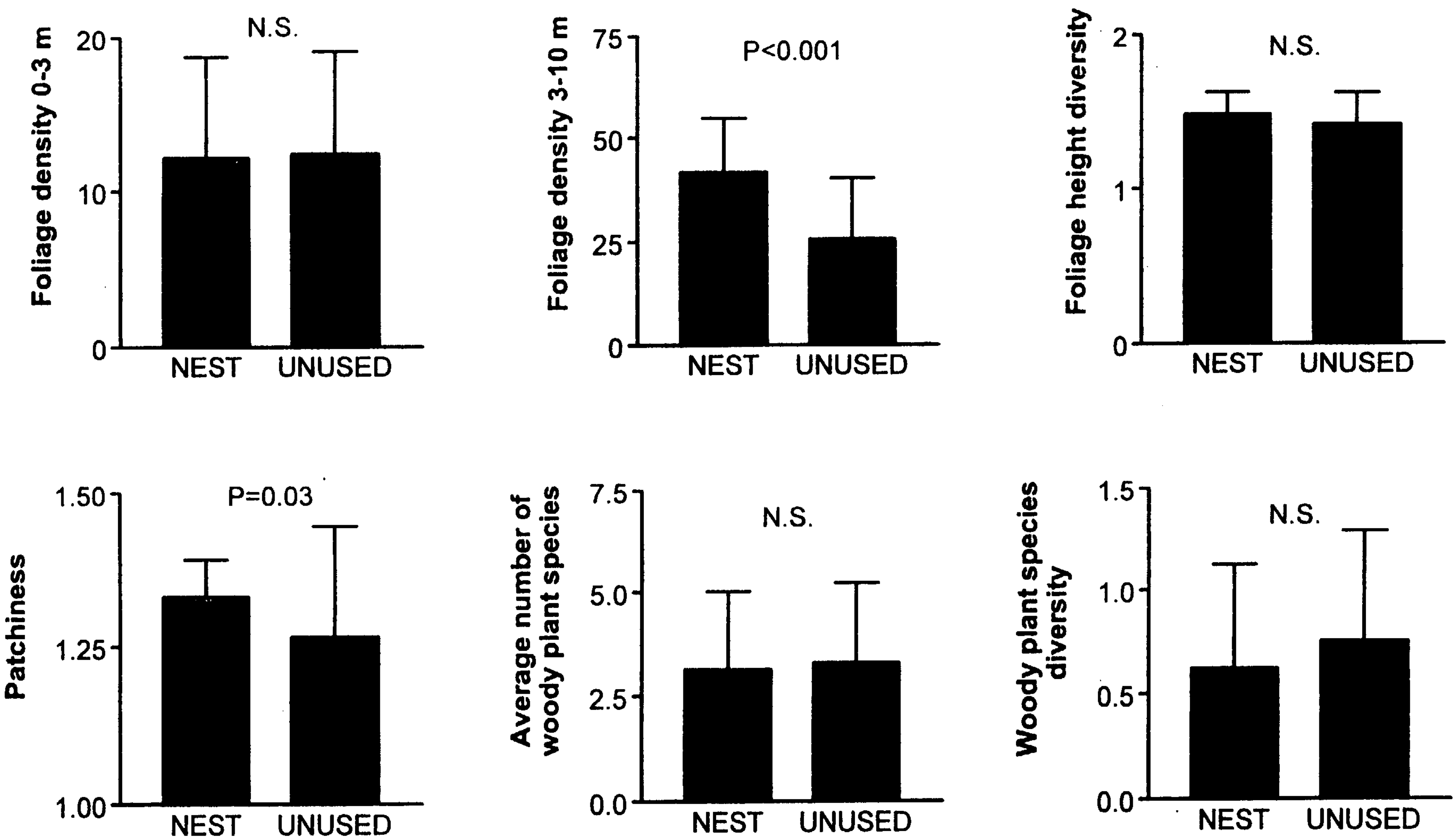


Figure 16. Comparisons of foliage density, foliage diversity, and woody plant species diversity between Willow Flycatcher nest sites and unused sites. See Methods for variable definitions.

Willow Flycatcher banding. — In 1998, we netted Willow Flycatchers in the Fort West Ditch site and in the SE1 patch. A total of 37 adult and one fledgling flycatcher was caught, color-banded, and released. Of the adults that could be sexed, nine were males and thirteen were females. Eighteen individuals were caught more than once. One individual banded on the Fort West Ditch was later found breeding (successfully) in patch NW3, a distance of approximately 3.5 km. No other banded bird appeared to move during the course of the breeding season.

AVIAN COMMUNITY STRUCTURE

Territorial birds. — A total of 78 bird species were recorded while spot-mapping the six focal patches. Of these, 49 were positively identified as breeding within the plots (Appendix). Most of the other 29 species were known to breed nearby on the U-Bar, either locally in small numbers (e.g., Zone-tailed Hawk *Buteo albonotatus*), in habitats other than riparian woodland (e.g., Cliff Swallow *Hirundo pyrrhonota*), or prior to the start of spot-mapping (e.g., Great Horned Owl). The number of breeding birds ranged from 23 to 33 species per plot (Table 3). The number of breeding bird species was directly and strongly correlated with patch size: the larger the patch, the more species were present (Fig. 17). The pattern of species diversity among patches did not mirror exactly the species richness. The most speciose patch, SE1, had the second lowest diversity value, while the NE1 patch, with fewer species, had a much higher diversity value (Table 2). This apparent paradox is because the Shannon-Weaver Diversity Index weights species number by evenness of distribution. Thus, a patch with a moderate number of species that are more-or-less uniformly common (like NE1) has a higher diversity index than a patch like SE1 that has more species, some of which are abundant but many that are uncommon or rare. In the case of SE1, the abundant species were Willow Flycatcher and Yellow-breasted Chat (see Appendix).

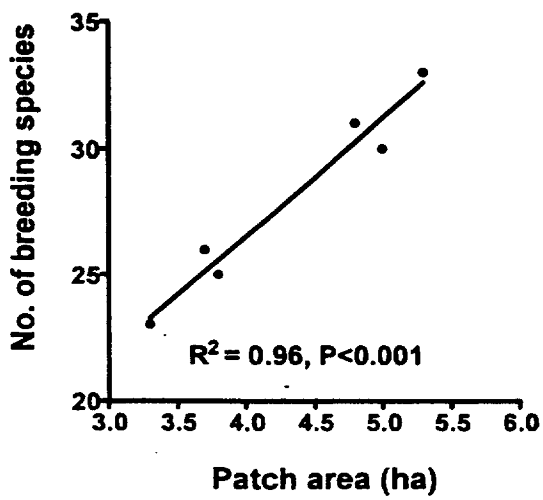


Figure 17. Correlation of patch area and number of bird species breeding in the patch.

The total number of breeding territories ranged from 99 to 190.5 per patch (Table 2). Estimated densities of breeding birds were very high, ranging from 815 prs/40 ha at the Fort West Ditch site to 1343 prs/40 ha in the SE1 patch.

Table 3. — Breeding bird densities and diversity in six focal riparian patches in the Cliff-Gila Valley, based on averages of 1997 and 1998 data.

Patch	No. breeding bird species	No. all bird territories	Sp. diversity[1]	No. WIFL territories[2]	Density (prs/ 40 ha)[3]
Fort West Ditch	30	109.5	3.02	8	815
NE1	25	111.0	3.01	3	1061
NW1	31	171.0	2.85	7	1319
NWS	26	121.0	2.93	5	1176
SE1	33	190.5	2.84	41	1343
SWS	23	99.0	2.77	9	1107

[1] Calculated using the Shannon-Weaver Diversity Index.
[2] Differences between these values and those reported from protocol survey results are because these represent the number of territories falling within spot-mapping grids, which did not cover the entire area of patches.
[3] Conservative estimates include only 10% of dove territories; see Methods.

Nests. — A total of 435 nests were found for 38 species other than Willow Flycatcher in the six focal patches; in addition, two Yellow-billed Cuckoo nests were located in nonfocal patches. Twenty or more nests were found for 7 species: Mourning Dove: 75; Lesser Goldfinch (*Carduelis psaltria*): 44; Black-chinned Hummingbird (*Archilochus alexandri*): 43; Western Wood-Pewee (*Contopus sordidulus*): 35; Yellow-breasted Chat (*Icteria virens*): 29; European Starling (*Sturnus vulgaris*):25; and Yellow Warbler (*Dendroica petachia*): 22. Of the species listed at the state or federal level as threatened, endangered, or sensitive, we found 2 nests of Common Black-Hawk (*Buteogallus anthracinus*), 6 nests of Yellow-billed Cuckoo (*Coccyzus americanus*), 1 nest of Gila Woopecker (*Melanerpes uropygialis*); and 4 nests of Abert's Towhee (*Pipilo aberti*).

Cowbird Parasitism. — We observed cowbird parasitism of several species in the Cliff-Gila Valley in 1998. Yellow Warblers were the most frequently parasitized species, with

approximately 25% of nests that we could see into containing cowbird eggs. Other species that we know were parasitized are Vermilion Flycatcher (*Pyrocephalus rubinus*), Plumbeous Vireo (*Vireo plumbeus*), Lucy's Warbler (*Vermivora luciae*), Yellow-breasted Chat, and Blue Grosbeak (*Guiraca caerulea*). The majority of cowbird fledglings observed were fed by Yellow Warblers. Other species that successfully fledged cowbirds included Vermilion Flycatcher, Lucy's Warbler, and Yellow-breasted Chat, in addition to Willow Flycatcher.

DISCUSSION

Willow Flycatcher nesting success. — As in 1997, Willow Flycatchers constituted one of the most common breeding species in the habitat patches surveyed. The observed nesting success rate (43%) was lower than that observed in 1997 (55%). This reduction in nesting success may be due to several factors, including stochastic variation in predator numbers or other factors affecting flycatcher breeding, increased rates of weather-induced nest failure, or a larger sample of nests found in suboptimal habitat due to population growth and/or increased numbers of observers. This level of nest success still compares favorably with other sites that lack cowbird control programs, as well as a number of sites (e.g., Kern River) with extensive cowbird control programs (McCarthey *et al.* 1998). It is a typical success rate for a small migratory songbird (Martin 1995). Predation was the major cause of nest failure by far (Fig. 8)

Cowbird parasitism rates were higher in 1998 (27%) than in 1997 (14.7%), although both figures are suspect because of the uncertain status of the many high nests. It is likely that the actual parasitism rate is lower than the observed rate because the probability of parasitism decreases with nest height in almost all species (Best & Stauffer 1980, Briskie *et al.* 1990). Not all flycatcher parents accepted cowbird eggs (approximately 64%). Many abandoned their nests immediately when a cowbird egg appeared. Few parasitized nests produced cowbird fledglings, as most of those where cowbird eggs were accepted were depredated.

The patch-wise parasitism rate was negatively correlated with the estimated density of female cowbirds within a patch — the more cowbirds, the less likely a Willow Flycatcher nest was to be parasitized. This reason for this counter-intuitive result is unclear. One possibility is that cowbird density may be correlated with the total number of potential host species within a patch, and that higher densities of alternate hosts serves to dilute the effect of more cowbirds on flycatchers. Further analyses are needed to verify this hypothesis.

Nesting success appeared to vary among nest substrates, perhaps because nest heights varied among substrates and nest success was correlated with nest height (Figs. 5 & 7). Parasitism rates also varied among substrates (Fig.11). Over 45% of nests in Russian olive were parasitized; these nests tended to be on patch edges. Nests in willows were also parasitized relatively frequently, and also tended to be on patch edges (Fig. 11). In contrast, nests in boxelder were parasitized only about 15% of the time (or less, as most of the highest nests of uncertain content were in boxelder).

Habitat preferences. — Our vegetation analyses suggest that Willow Flycatchers have very distinct microhabitat preferences, even within individual patches. They actively prefer boxelder and avoid willow as a nesting subtrate (Fig. 3). Willows are a favored nesting substrate in other regions (Harris 1991, McCarthey *et al.* 1998), but in few if any other areas do flycatchers have the choice of both boxelder and willow. Flycatchers may prefer boxelder in the Cliff-Gila Valley because they have higher canopy cover and denser foliage than willows.

Within occupied patches, flycatchers prefer areas with dense canopy cover, dense subcanopy foliage, moderate canopy height, large numbers of trees, boxelders, and willows. Heterogeneity in ground cover and foliage density appear to be preferred as well (Table 2).

Avian community structure. — The Cliff-Gila Valley supports a diverse and extremely populous community of breeding birds. The densities of birds found in 1998 exceeded those reported in 1997, probably because of better estimates of the number of early-breeding species at the site (e.g., Lucy's Warbler, Abert's Towhee). The site contains the highest densities of non-colonial breeding birds ever recorded in North America (Carothers *et al.* 1974, Anderson *et al.* 1983, R.R. Johnson, personal communication).

Conservation implications. — The Cliff-Gila Valley provides critical habitat for the largest population of Southwestern Willow Flycatchers. In addition, the area supports significant numbers of other sensitive, threatened and endangered species, such as Common Black-Hawk, Yellow-billed Cuckoo, Gila Woodpecker, Brown-crested Flycatcher (*Myiarchus tyrannus*), Bell's Vireo (*Vireo bellii*), and Abert's Towhee.

It is noteworthy that the numbers of birds and nesting success rates tended to be higher, and cowbird parasitism rates lower, in the taller, mature riparian woodland on the U-Bar than in younger, lower vegetation elsewhere in the valley. These mature habitats appear to be associated with the earthern levees along the river that were built for flood control. Although the levees certainly hinder the natural flood regime of the Gila, they allow the growth of secondary successional species such as boxelder that are favored by flycatchers at this site.

The NW1 patch is severely threatened by erosion, due to cutting of the riverbank by the Gila River. The nest tree for one probable flycatcher nest discovered in 1997 (when the patch was not a focal patch) was lost due to bank erosion between 1997 and 1998. Further losses are likely unless the river course changes or the bank is stabilized. In addition to Willow Flycatchers, this patch supports single breeding pairs of several threatened and endangered species: Common Black-Hawk, Yellow-billed Cuckoo, Gila Woodpecker, and Abert's Towhee, which remain at risk.

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 a better handle on year to year variation in those parameters. We will continue to sample vegetation at nests and unused

sites to develop sufficiently large sample sizes to (1) create a logistic regression model of habitat preferences and habitat correlates of nesting success and nest parasitism.

We will quantify habitat features in patches not occupied by flycatchers to be used in multivariate analyses of landscape-level effects on flycatcher occupancy and nesting success. Those data will be incorporated into a GIS program (Geographic Information System) to create spatially-explicit models. Landscape-level effects have been recognized as a priority resarch need by Arizona Partners in Flight.

We will expand our color-banding program in the coming year to increase sample sizes for estimates of survival, mate and site fidelity, and dispersal in the Cliff-Gila population. These data have also been identified as a priority research need, and the large population in the Cliff-Gila Valley provide a unique opportunity to develop robust sample sizes. By increasing banding of young birds we can document that this population is indeed a source population.

ACKNOWLEDGMENTS

We thank G. Bodner, K. Brodhead, P. Chan, J. Garcia, B. Gibbons, D. Hawksworth, M. Means, and H. Walker for field assistance; P. Boucher, J. Monzingo, and R. Pope of the Gila National Forest and T. Bays, T. Shelley, and C. Rose of Phelps Dodge for logistical support; D.A. Zimmerman and R. Shook of Western New Mexico University for oversight and guidance, D. Parker for sharing his expertise; and T. and D. Ogilvie for their hospitality and for allowing us to use their livelihood as a laboratory. Funding was provided by the Gila National Forest, Phelps Dodge Corporation, and The Nature Conservancy.

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Appendix

Number of territories and density (pairs/40 ha) per patch, and total number of nests found, of breeding birds in the Cliff-Gila Valley, 1997-98.

	FWD		NE1		NW1		NW Stringer		SE1		SW Stringer		total
SPECIES	terr.	density	terr.	density	terr.	density	terr.	density	terr.	density	terr.	density	nests
Mallard	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	12.3	2
Cooper's Hawk	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1
Common Black-Hawk	0	0.0	0	0.0	1	8.3	0	0.0	1	7.6	0	0.0	2
Red-tailed Hawk	0	0.0	0	0.0	0	0.0	1	10.8	0	0.0	0	0.0	2
American Kestrel	0	0.0	0	0.0	1	8.3	1	10.8	2	15.1	1	12.3	6
Wild Turkey	1	8.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Gambel's Quail	2	15.9	1	10.5	1	8.3	0	0.0	1	7.6	0	0.0	1
Mourning Dove	8	6.4	11	11.5	13	10.8	13	14.0	14	10.6	10	12.3	143
Yellow-billed Cuckoo	0	0.0	1	10.5	1	8.3	1	10.8	2	15.1	2	24.6	8
Western Screech Owl	0	0.0	1	10.5	0	0.0	0	0.0	0	0.0	1	12.3	1
Black-chinned Hummingbird	7	55.8	6	63.0	5	41.4	6	64.6	7	52.9	5	61.5	53
Gila Woodpecker	0	0.0	0	0.0	1	8.3	0	0.0	0	0.0	0	0.0	2
Ladder-backed Woodpecker	1	8.0	1	10.5	0	0.0	1	10.8	0	0.0	0	0.0	1
Hairy Woodpecker	0.5	4.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Northern Flicker	1	8.0	2	21.0	2	16.6	2	21.5	2	15.1	1.5	18.4	8
Western Wood-Pewee	4	31.9	6	63.0	15	124.2	4	43.0	6	45.3	1	12.3	47
Willow Flycatcher	8	63.8	3	31.5	7	57.9	5	53.8	41	309.6	9	110.7	257
Vermilion Flycatcher	0	0.0	4	42.0	7	57.9	3	32.3	1	7.6	0	0.0	21
Ash-throated Flycatcher	1	8.0	0	0.0	3	24.8	1	10.8	2	15.1	1	12.3	4
Brown-crested Flycatcher	1	8.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2
Cassin's Kingbird	0	0.0	4	42.0	6	49.7	3.5	37.7	1.5	11.3	1	12.3	22
Western Kingbird	0	0.0	0	0.0	1	8.3	0	0.0	1	7.6	0	0.0	3
Violet-green Swallow	3	23.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4
Western Scrub-Jay	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1
American Crow	0	0.0	0	0.0	0	0.0	0	0.0	1	7.6	0	0.0	1
Bridled Titmouse	1.5	12.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
White-breasted Nuthatch	1	8.0	2.5	26.2	1	8.3	2	21.5	2	15.1	1	12.3	5
Bewick's Wren	4	31.9	4.5	47.2	6	49.7	8	86.1	7	52.9	7	86.1	22
American Robin	0	0.0	1	10.5	1	8.3	2	21.5	1	7.6	0	0.0	4
European Starling	0	0.0	3	31.5	12	99.3	4	43.0	7	52.9	0	0.0	30
Bell's Vireo	0	0.0	0	0.0	0	0.0	0	0.0	1	7.6	0	0.0	0
Plumbeous Vireo	1	8.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2
Lucy's Warbler	7.5	59.8	8	84.0	15	124.2	11	118.4	7	52.9	10	123.0	6
Yellow Warbler	8	63.8	11	110.2	14	115.9	11.5	123.7	17	128.4	10	123.0	30
Common Yellowthroat	3	23.9	0	0.0	0	0.0	0	0.0	4	30.2	0	0.0	3
Yellow-breasted Chat	13	103.6	7	73.5	5	41.4	0	0.0	20	151.0	7	86.1	59
Summer Tanager	3	23.9	3.5	36.7	4	33.1	3	32.3	4	30.2	3	36.9	13
Northern Cardinal	1	8.0	0	0.0	0	0.0	0	0.0	2	15.1	0	0.0	3
Black-headed Grosbeak	2	15.9	2	21.0	2	16.6	4	43.0	3	22.7	4	49.2	8
Blue Grosbeak	3	23.9	2	21.0	3	24.8	4	43.0	3	22.7	5	61.5	14
Indigo Bunting	2	15.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1
Spotted Towhee	5	39.9	2	21.0	4	33.1	0	0.0	6	45.3	0	0.0	10
Abert's Towhee	0	0.0	0	0.0	1	8.3	0	0.0	1	7.6	1	12.3	5
Lark Sparrow	0	0.0	0	0.0	1	8.3	1	10.8	0	0.0	0	0.0	0
Brown-headed Cowbird	5	39.9	7	73.5	6	49.7	5	53.8	3	22.7	7	86.1	NA
Bullock's Oriole	1	8.0	6	63.0	7	57.9	4	43.0	3	22.7	0.5	6.1	18
House Finch	4	31.9	5	52.5	11	91.0	12	129.1	2	15.1	3	36.9	23
Lesser Goldfinch	7	55.8	8	84.0	14	115.9	8	86.1	15	113.3	8	98.4	59

ATTACHMENT "C"

REPRODUCTIVE SUCCESS AND HABITAT REQUIREMENTS OF THE SOUTHWESTERN WILLOW FLYCATCHER IN THE CLIFF-GILA VALLEY, NEW MEXICO

Final Report for the 1999 Field Season

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EXECUTIVE SUMMARY

Due to a strong La Niña pattern, 1999 was a year of weather extremes in the Cliff-Gila Valley. An extended and windy drought lasting from autumn of 1998 through June 1999 was finally broken by exceptionally heavy monsoon rains beginning in late June. This adverse weather appeared to have a negative impact on nest success of Willow Flycatchers. In 1999, we located 146 flycatcher nests. Of these, 92 were known to have failed. Many early nests were either damaged by wind or abandoned prior to egg-laying. Excluding those known to have been abandoned prior to laying, simple nest success was about 33%, well below the levels recorded in 1997-98. Anecdotal observations suggest that this low level of per-nest success may reflect a high incidence of multiple nesting attempts per pair. Estimated rates of cowbird parasitism were 15.6 %, the lowest recorded in the three years of this study. Predation was the most frequent cause of nest failure for nests where causes were known.

As in previous years, flycatchers nested most frequently and preferentially in box elder. They tended to avoid willow except in mostly pure stands of either coyote or Goodding's willow. We recorded the first known nests placed in canyon grape and the exotic Siberian elm. Flycatchers placed their nests high (mean = 7.5 m). The average relative height of nests within the nest plant was 63.9%, almost the same as the relative height in native plants in Arizona and for the eastern subspecies (*E. t. traillii*) in shrubby habitats in Wisconsin. This congruence suggests relative nest height, rather than absolute height, may be of importance to Willow Flycatchers.

Although not experimental tests, we were able to assess the effects on flycatchers of grazing and irrigation as practiced on the U Bar Ranch by comparing data from patches that were grazed versus not grazed, and patches that were on or not on a ditch. Grazing had no apparent impact (positive or negative) on flycatcher density, nest success, or cowbird parasitism. In contrast, flycatchers appeared to benefit from irrigation: they occurred in significantly higher densities in patches associated with irrigation ditches.

INTRODUCTION

The Species. — 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. In the southwest, nesting is almost always in the vicinity of surface water or saturated soils (U.S. Fish and Wildlife Service 1995).

Populations of the southwestern willow flycatcher are thought to have 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 have been attributed to many factors, including water diversion and impoundment, changes in fire and flood frequency due to hydrological alterations, livestock overgrazing, replacement of native riparian vegetation by nonnative 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 more than 50% have been documented for populations at the Kern River, California (Harris 1991) and the Grand Canyon (Brown 1994). Frequently flycatchers respond to the laying of cowbird eggs in their nests by abandoning and renesting (Whitfield & Strong 1995).

In 1993, the U.S. Fish and Wildlife Service 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).

The Cliff-Gila Valley population. — 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 109 sites throughout the southwestern United States (Finch 1999). Approximately 78% of extant sites consist of 5 or fewer territories. The entire known breeding population in 1996 was estimated at just over 500 pairs (Finch 1999). By far the largest known breeding concentration of Southwestern Willow Flycatchers is located in the Cliff-Gila Valley, Grant County, New Mexico. This population was estimated at 184 pairs in 1997 (Parker 1997), and at 235 pairs in 1998 (P. Boucher, personal communication; Stoleson and Finch, unpublished data). These birds are located primarily on private property owned by the Pacific Western Land Company, a subsidiary of Phelps Dodge Corporation, and managed by the U-Bar Ranch. An additional 33 pairs occur on the adjacent Gila National Forest and other private holdings. Habitat preferences of flycatchers in this population differ, at least superficially, from those reported elsewhere (Hull and Parker 1995, Skaggs 1996, Stoleson and Finch 1997), and from populations of other subspecies.

OBJECTIVES

Our goals for this study in 1999 were:

1. locate and monitor nests of Willow Flycatchers to assess levels of nesting success, cowbird parasitism and predation.
2. characterize and quantify vegetation at nests sites, territories, and unused sites within occupied habitat patches.
3. band adult and nestling Willow Flycatchers to allow individual identification.

This report presents the results of the third year of the study.

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 toward the Burro Mountains. The study was primarily conducted from just below the US Route 180 bridge upstream to the north end of the U-Bar Ranch (approximately 5 km). In addition, flycatchers were studied in two disjunct sections of the valley: (1) the Fort West Ditch site of the Gila National Forest and adjacent holdings of The Nature Conservancy's Gila Riparian Preserve, located about 9 km upstream of the Route 180 bridge, and (2) the Gila Bird Area, a riparian restoration project comprising lands of the Gila National Forest and Pacific-Western Land Company, located some 8 km downstream of the Route 180 bridge. Most of the upper Gila Valley consists of irrigated and non-irrigated pastures used for livestock grazing and hay farming. Elevations range from 1350 to 1420 m.

The Gila River and nearby earthen irrigation ditches are lined with riparian woodland patches of various ages and composition. Most patches support a mature woodland (>25 m canopy) of Fremont cottonwood (*Populus fremontii*), with a subcanopy of mixed deciduous trees including box elder (*Acer negundo*), Goodding's willow (*Salix gooddingii*), velvet ash (*Fraxinus velutinus*), Arizona walnut (*Juglans major*), Arizona sycamore (*Platanus wrightii*), Arizona alder (*Alnus oblongifolia*) and Russian olive (*Elaeagnus angustifolia*). The understory is composed of shrubs including three-leaf sumac (*Rhus trilobata*), false indigo (*Amorpha fruticosa*), New Mexico olive (*Forestieria neomexicana*), forbs, and grasses. Fewer patches support a shrubby, early successional growth of seepwillow (*Baccharis glutinosa*), coyote and bluestem willows (*Salix exigua* and *S. irrorata*), and saplings of the species mentioned above. Most habitat patches are less than 5 ha in area. The FS Fort West Ditch site and the Gila Bird Area are 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.

This study concentrated on three large riverine patches and two stringer patches on the U-Bar Ranch (see Fig. 1: SE1, NW1, NE1, SW Stringer, and NW Stringer) and the FS Fort West Ditch site. In addition, flycatchers were studied in other riparian patches as time allowed.

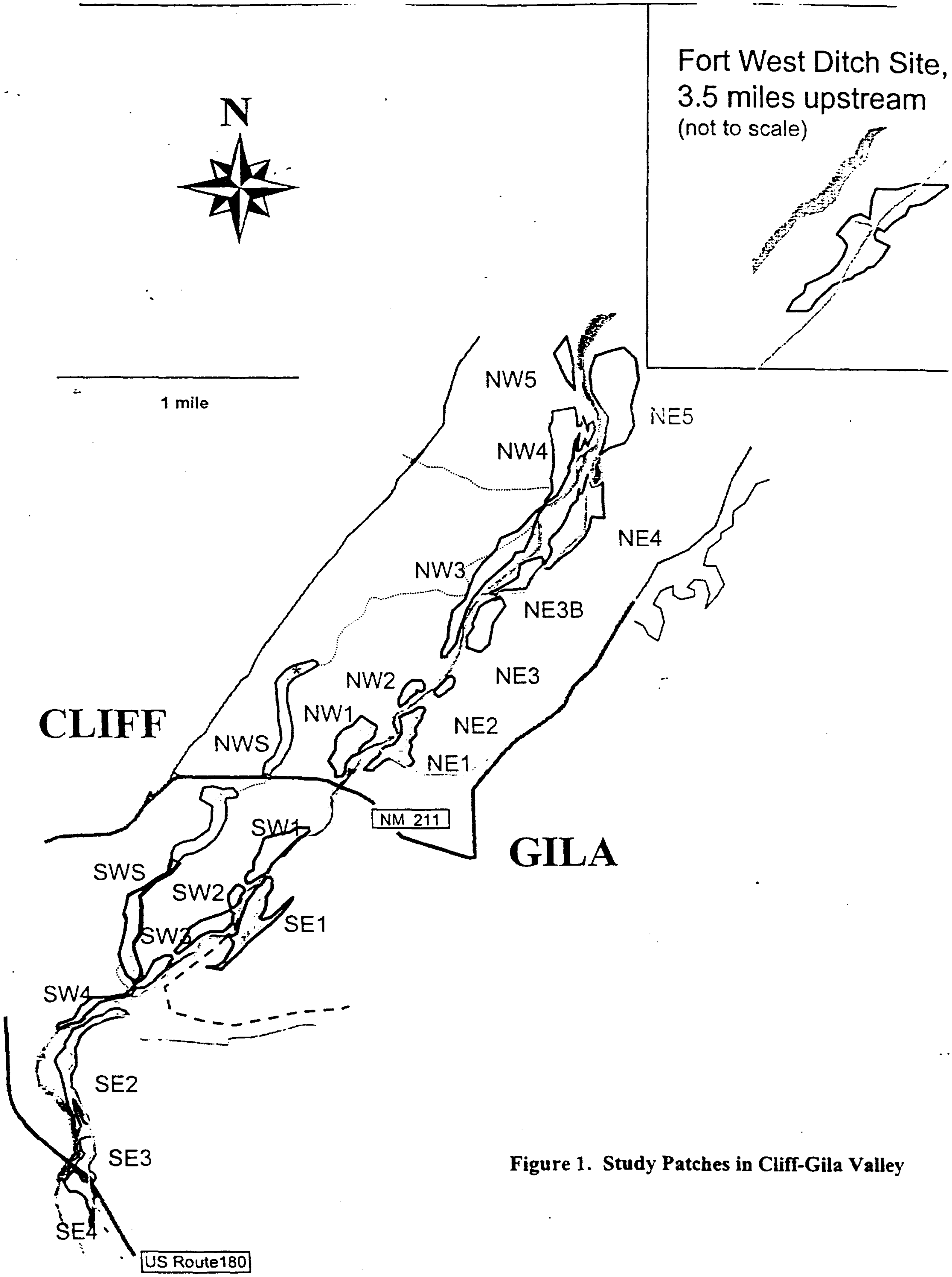

Figure 1. Study Patches in Cliff-Gila Valley

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. We conducted spot-mapping censuses within each grid every 2-3 days, beginning within 15 minutes of dawn (Bibby et al. 1992). 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. 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 nonforested 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 monitoring. — 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 and cuckoo nests were searched for in additional patches. Nests were monitored every 3-7 days, following a modified version of proposed protocols suggested by the Arizona Game and Fish Department (Rourke et al. 1999). Nest contents were observed using pole-mounted mirrors or videocameras, or 15X spotting scopes. Nests that were abandoned or destroyed were examined for evidence (e.g., cowbird eggs, mammal hairs) to ascertain causes of nest failure. We considered a nest successful if: (1) parent birds were observed feeding one or more fledged young; (2) parent birds behaved as if dependent young were nearby when the nest was empty (defensive or agitated behavior near nest); or (3) nestlings were in the nest within one or two days of the estimated fledge date. We considered a nest failed if: (1) nest contents disappeared before fledging of young was possible, assuming 10-12 d required for fledging (depredation), (2) the nest contained no Willow Flycatcher young but contained cowbird eggs or chicks (parasitized), (3) the nest was deserted after eggs had been laid (desertion), or (4) the nest was abandoned prior to egg laying (abandonment).

Habitat Measurements. — We continued sampling vegetation at flycatcher nests and unused points within the focal patches in 1999, using a modified BBIRD methodology (Martin et al. 1997). Unused points were defined as points on the spot-mapping grid that were at least 100 ft away from the nearest Willow Flycatcher nest; we based this definition on the fact that most flycatcher territories appeared to have radii much smaller than 100 ft. At each unused point and nest site, a 0.02 ha plot (radius = 8 m) was placed centered on the nest tree, or on the nearest tree to the gridpoint for unused points. At the center of the plot and eight other points (4 and 8 m from the center in each of the four cardinal directions), we measured canopy height using clinometers, percent canopy cover using densiometers, and estimated percent ground cover. Vertical foliage density was measured at 2, 4, 6 and 8 m in each direction from the center tree by counting hits of vegetation against a 10 m vertical pole marked in 1 m increments. Within the 0.02 ha plot, trees ($\geq$ 10 cm dbh) of all species were counted and measured (dbh). Shrubs and saplings (< 10 cm dbh) were counted and measured within a 4 m radius of the center tree. For nest sites we also recorded nest plant species, nest height, and distance, direction from the trunk.

For each sample point we calculated average ground and canopy cover and average canopy height (all = mean of 9 measurements per point); foliage density index (sum of 1 m increments touched by foliage) for understory (0-3 m in height, for a maximum score of 48 per point) and mid-canopy (3-10 m in height, for a maximum score of 112 per point); the sum of shrub/sapling (<10 cm diameter) stems and tree (≥ 10 cm diameter) stems by species and size class (<1cm, 1-5 cm, 5-7.5 cm, 7.5-10 cm, 10-30 cm, 30-50 cm, 50-70 cm, >70 cm). From these values we also calculated the total number of stems of willow and box elder per point, an estimate of the total basal area of woody species per point, woody plant species richness (number of species of trees and shrubs per point), and plant species diversity (using the Shannon-Weiner Diversity Index). We calculated several variables to estimate the degree of habitat heterogeneity at points: patchiness (the diversity of foliage density among the four cardinal directions, using the Shannon-Weiner Diversity Index); and the coefficient of variation in measures of canopy cover, canopy height, and ground cover at each point.

Analyses. — We compared habitat values of unused points (n=89) to those at nest sites (n=127) using independent sample t-tests when data were normally distributed, or Mann-Whitney U-Tests when they were not. Although we performed multiple statistical comparisons from the single set of data, we did not adjust our experiment-wise alpha level to minimize the risk of Type I errors because the modest sample sizes used for unused points are already prone to Type II errors, and we wanted to maximize our ability to detect trends. Those variables found to differ significantly between unused and nest points were included in a logistic regression analysis. When high correlation between pairs of variables suggested problems of collinearity, we dropped the variable we considered to be less biologically relevant. We chose as a final regression model that which explained the greatest deviance with the least number of parameters; we used likelihood-ratio tests between nested models to assess the explanatory power of individual variables (Menard 1995).

To assess whether flycatchers used nest substrates randomly, we calculated an index of availability for each nest tree species to compare usage with availability. 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 *x* was calculated as: total number of stems for species *x* / total number of all stems. The numbers of used versus unused stems were compared using chi-square analyses.

RESULTS & DISCUSSION

CLIMATE IN 1999

Due to a strong La Niña pattern, 1999 proved to be a year of weather extremes in the Cliff-Gila Valley (Table 1). Severe drought began in late 1998 and persisted into June. Precipitation remained less than 30% of normal during this time, and water levels were very low in the Gila River. By late May, water flow in the Gila and Fort West irrigation ditches became irregular. Strong winds typical of early spring lasted well into June (pers. observation). Monsoon rains

began earlier than normal in mid-June, and became torrential in July. Sufficient rain fell in July (182% of normal for the month) to make up for the water deficit of the previous 10 months. It seems likely that the extreme wind and drought followed by heavy rains had a negative impact on reproductive success of Willow Flycatchers in the area.

Table 1. Precipitation measured at Cliff, NM for January-August 1999, compared to averages for 1936-1999. Data are from the Western Regional Climate Center.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.
1999 precipitation (in.)	0.11	0.00	0.35	0.39	0.08	0.93	5.09[a]	1.88
Average precipitation (1936-1999)	1.01	0.96	0.86	0.33	0.36	0.50	2.79	2.84
Deviation from normal (in.)	-0.90	-0.96	-0.51	0.06	-0.28	0.43	2.30	-0.96
Cumulative deviation from normal	-0.90	-1.86	-2.37	-2.31	-2.59	-2.16	0.14	-0.82
Expected cumulative total	1.01	1.97	2.83	3.16	3.52	4.02	6.81	9.65
% of normal (cumulative)	10.9	5.6	16.3	26.9	26.4	46.3	102.1	91.5

[a] data set is missing one day.

WILLOW FLYCATCHERS

Nests. — We found a total of 146 nests in 1999, including 120 on the U-Bar Ranch and an additional 26 on nearby lands of the Gila National Forest, The Nature Conservancy, and other private landowners (Fig. 2). As in previous years, flycatchers used box elder most frequently for nesting (70.3% of nests). Willows (17.8%) and cottonwoods (6.2%) were also used frequently as nest substrates. Flycatchers also placed nests in Arizona alder (3), seepwillow (2), Russian olive, canyon grape, and Siberian elm (1 each). The last two plants have not been previously reported as willow flycatcher nesting substrate in the Southwest.

Substrate use versus availability. — As in previous years, flycatchers did not use substrates in proportion to their availability within the habitat. Flycatchers showed a strong preference for nesting in box elder ($\chi^2 = 123.5$, df = 1, $p < 0.001$). Box elder comprised 32.1% of the woody stems over 1 cm diameter, yet contained 70% of all nests found. Use of cottonwood, Arizona alder, and Russian olive were in proportion to their overall abundance (all $p > 0.5$). In contrast, willows (both species pooled) and all other species combined were used less than expected by chance ($\chi^2 = 10.7$ and 24.3, respectively, df = 1, $p < 0.001$ for both). The two willow species used made up more than 35% of all stems but were used for less than 12% of nests (Fig. 3). We found no flycatcher nests in the shrubby bluestem willow.

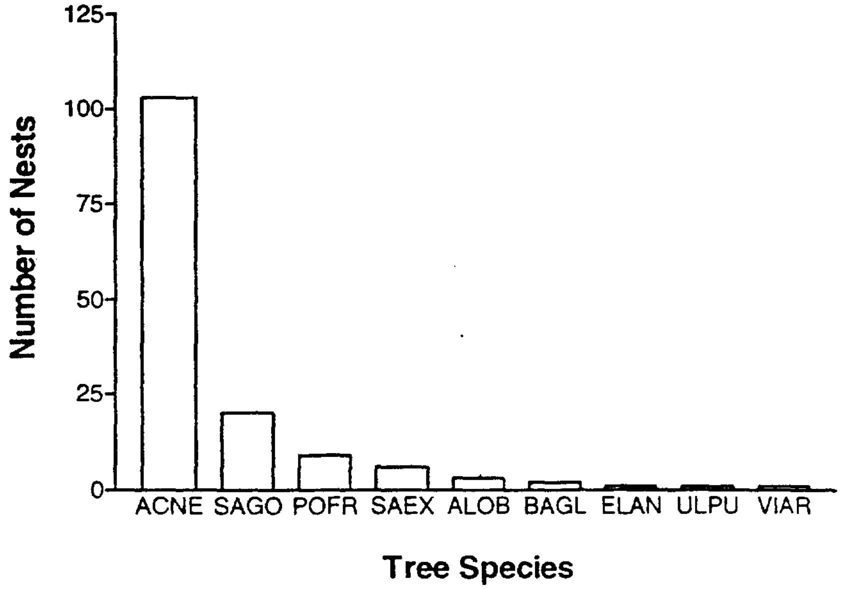

Figure 2. Nesting substrates by southwestern willow flycatchers in the Cliff-Gila Valley, 1999. ACNE = box elder, SAGO = Goodding's willow, POFR = Fremont cottonwood, SAEX = coyote willow, ALOB = Arizona alder, BAGL = seepwillow, ELAN = Russian olive, ULPU = Siberian elm, and VIAR = canyon grape.

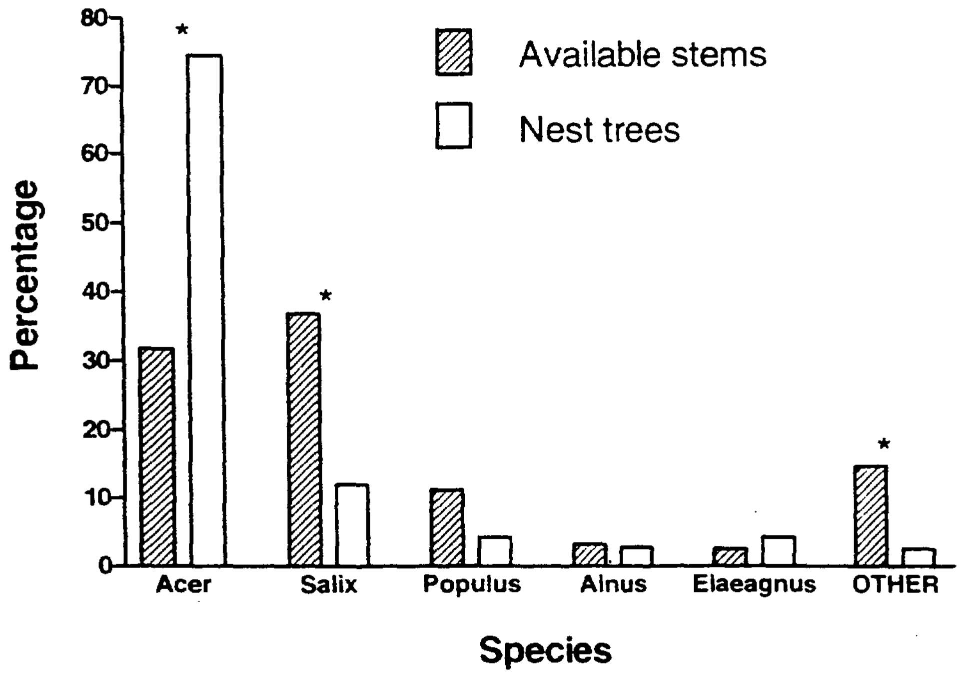

Figure 3. Use versus availability of willow flycatcher nesting substrates. Compared to abundance within the habitat, box elder (*Acer*) was used significantly more, and willows (*Salix*) and all others were used significantly less than expected by chance.

Nest heights. — As in previous years, Willow Flycatchers tended to nest high in the Cliff-Gila Valley. Nest heights ranged from 1.5 to 16.5 m in height, with a mean height of 7.7 ± 3.5 m. Trees and shrubs in which flycatchers built nests averaged 12.1 ± 4.4 m, and ranged from 2.3 to 24.5 m high. As with height, nest trees varied greatly in diameter, from 1.0 cm in coyote willow to 57.5 in box elder (mean = 21.3 ± 13.2 cm). Tree and shrub heights varied greatly among different species, and consequently, nest heights varied among different substrates (Fig. 4)

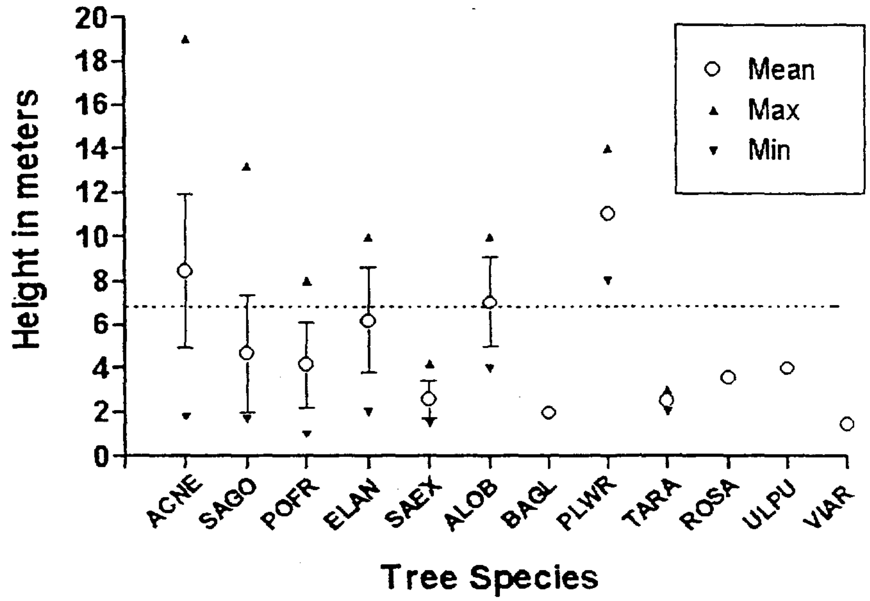

Figure 4. Nest heights (mean, SD, max. and min.) of Southwestern Willow Flycatchers as a function of nesting substrate, based on 403 nests found in the Cliff-Gila Valley 1997-1999. Acronyms as in Figure 1, plus PLWR = *Platanus wrightii*, ROSA = *Rosa multiflora*, TARA = *Tamarix ramosissima*.

In a study of the shrub-inhabiting *E. t. traillii* in Wisconsin, McCabe (1991) measured not only absolute heights but relative heights as well, which he calculated as nest ht/nest plant ht. He found the average relative height in his population to be 62.1 (n = 601); that is, nests were placed 62.1% of the way up the nest plant. In the Cliff-Gila Valley, we found the average in 1999 was 63.9 ± 16.0 (n = 122). Thus, despite the great differences in nest heights (means of 1.4 vs. 7.7 m), the relative vertical placement of nests within the nesting substrate was almost identical in the two populations. Interestingly, we calculated the average relative nest height in native or mixed native/exotic at low-elevation sites in Arizona in 1999 from published data (Paradzick et al. 2000), and found an average of 61.9. Whether this high level of congruence among very different sites is coincidental or not is unclear. Nevertheless, it suggests the possibility that in Willow Flycatchers, absolute nest height may be relatively unimportant compared to the relative nest height within a chosen nest substrate.

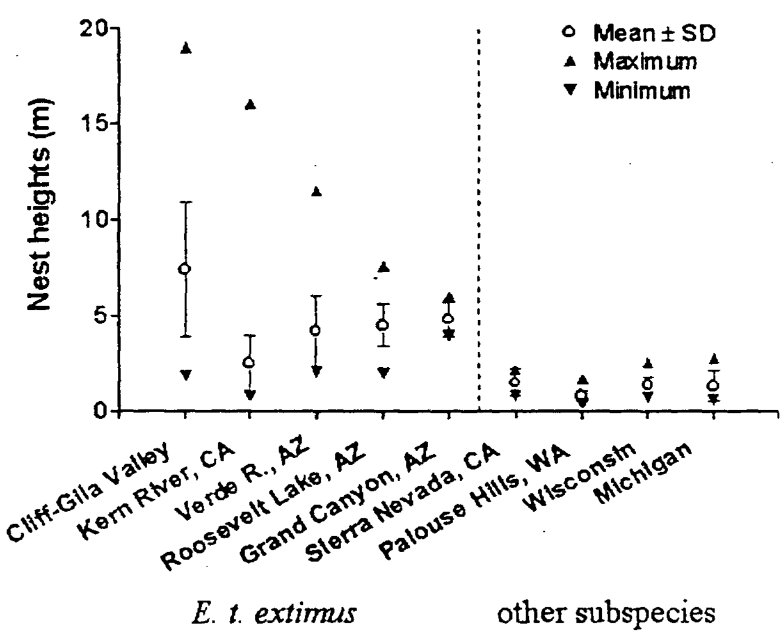

Figure 5. Range of nest heights among populations of Southwestern and other subspecies of Willow Flycatchers, from published data sources. Note that average nest heights are higher in all *extimus* populations than in any population of other subspecies.

Willow Flycatcher nest success. — 1999 was a relatively poor year for nesting by Willow Flycatchers in the Cliff-Gila Valley. Of 128 nests built for which we could determine the outcome, a total of 92 failed (28.1% simple nest success). Numerous nests were abandoned before any eggs were laid, most likely due to wind damage; these probably had little or no impact on seasonal reproductive success by flycatchers. Considering just those nests in which eggs were laid, 69 of 103 nests (67.0%) failed, suggesting a simple nest success rate of 33.3%.

Causes of nest failure. — As in previous years, we were unsure of the cause of most nest failures. Of those we do know, predation was the primary cause of failure for nests in which clutches had been initiated (n = 24). Seven nests failed because they were parasitized by cowbirds, and at least four failed due to direct effects of inclement weather (e.g., wind, heavy rain).

Cowbird parasitism. — Of 45 nests for which parasitism status was known, we found seven flycatcher nests that had been parasitized by brown-headed cowbirds (15.6%). At least one of those successfully fledged flycatcher young. In addition, we found two sets of parent flycatchers feeding cowbird fledglings for which no nest was ever found. This is the lowest level of parasitism we have recorded in three years of study.

Willow Flycatcher banding. — In 1999 we placed individually unique combinations of colored aluminum bands on 35 adult and 3 nestling Willow Flycatchers. Of 23 banded individuals of known sex, 13 were female, the remaining 10 males. We recaptured 4 of 31 birds banded in 1998, all approximately where they were first banded. Another 6 individuals banded in 1998 were resighted in 1999, all but one in approximately the same location as in 1998. We observed additional banded birds, but were unable to determine their band combinations definitively. Our sparse recapture data suggest that flycatchers at this site may exhibit strong site fidelity (unlike that reported from Arizona by Paxton et al. 1997).

Impacts of Cattle Grazing and Irrigation on Willow Flycatchers

Because of the concern over grazing impacts on riparian areas generally, and on Willow Flycatchers in particular, we tested several predictions using existing data on flycatcher populations and nesting success in the Gila River Valley, along with knowledge of grazing management on the U-Bar Ranch. On the ranch, 7 of 21 patches have been excluded from grazing since 1993 (exclusive of trespass cattle); the remainder are grazed primarily during the fall and winter. Additional information comes from ungrazed areas of the Gila National Forest and The Nature Conservancy. We compared average values of flycatcher density, nest success, and cowbird parasitism between patches that are grazed for at least part of the year ($n = 15$), and patches that are excluded from grazing ($n = 11$). Analyses of nest success and parasitism include nests on Forest Service and Nature Conservancy properties. We also compared the per-patch density of flycatchers between patches on the U-Bar associated with an irrigation ditch ($n = 14$) and those not ($n = 7$). All analyses include data from 1997-1999. It must be noted that these are *not* experimental tests of hypotheses, but rather correlative analyses, and therefore causation cannot be inferred. Further, as grazing and water management practices may differ elsewhere, it is unknown what their effects on flycatchers might be.

Effects of grazing on Willow Flycatcher densities. -- Grazing had no apparent impact on flycatcher density on a per-patch basis. The average density (pairs/ha) of breeding Willow Flycatchers did not differ significantly between grazed patches and those excluded from grazing ($t = 0.87$, df=1, $P = 0.40$; Fig. 6).

Effects of grazing on Willow Flycatcher nest success. – We detected no effect of grazing on nest success (Fig. 7). The proportion of nests of known outcome that produced young was similar between nests in grazed patches (37.4%, $n = 227$) and ungrazed patches (43.6%, $n = 101$; $\chi^2 = 1.1$, df = 1, $P = 0.30$). The slight difference is not statistically significant. If the nonsignificant trend reflects real albeit subtle differences, those differences may result from differences in density (see Fig. 6) rather than any impacts of grazing. Experimental data are required to assess this.

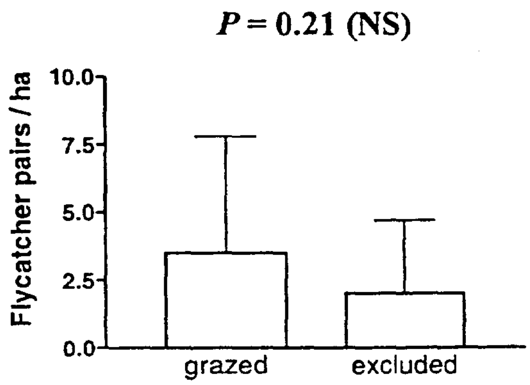

Figure 6. Flycatcher densities in riparian patches excluded from cattle versus patches grazed by cattle, based on population estimates from 1999 survey data.

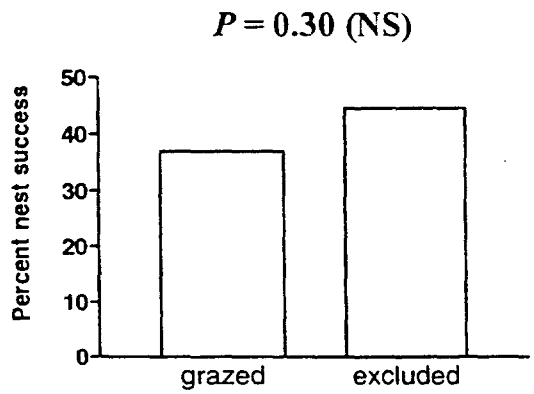

Figure 7. Average success of Willow Flycatcher nests from riparian patches open to cattle and patches excluded from cattle.

Effects of grazing on Willow Flycatcher nest parasitism. – Similarly, we detected no effect of grazing on the likelihood of nest parasitism. The proportion of nests that were parasitized in grazed patches (19.0%, n = 124) was almost identical to that in ungrazed patches (20.0%, n = 46; $\chi^2 = 0.01$, df = 1, $P = 0.91$; Fig. 8). It should be noted that for few of the nests in grazed patches were cattle in the patch while the nest was active. Thus, we find no evidence that livestock grazing, as practiced on the U Bar, has any detectable effect on Willow Flycatchers.

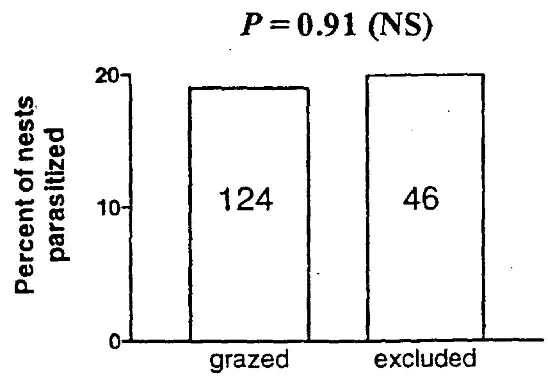

Figure 8. Average rates of cowbird parasitism of Willow Flycatcher nests in riparian patches grazed by cattle and excluded from cattle.

Effects of irrigation on Willow Flycatcher densities. -- In contrast to grazing, irrigation ditches did appear to have a pronounced effect on Willow Flycatcher density (Fig. 9). The density of breeding territories was significantly greater in patches associated with ditches (3.7 ± 4.3 terr/ha) than in patches not associated with ditches (1.3 ± 1.8 terr/ha; Mann-Whitney U = 26.0, 1-tailed p = 0.04). This result suggests that the small-scale diversion irrigation as practiced in the Cliff-Gila Valley may increase the quality of riparian habitat for flycatchers, presumably through increases in the extent and degree of hydration.

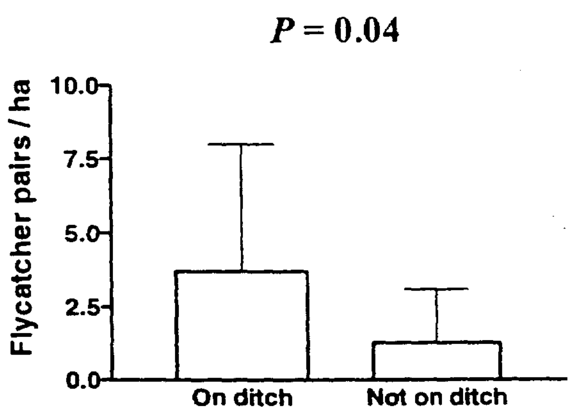

Figure 9. Average densities of Willow Flycatchers in patches associated and not associated with irrigation ditches, based on 1999 population survey data.

Habitat Analyses

Here we present updated assessments of microhabitat use by Willow Flycatchers based on vegetation data collected from 1997-1999.

Comparisons of used versus unused sites. — Microhabitat around Willow Flycatcher nest sites differed from that at unused sites within occupied patches. In univariate comparisons, 13 of 19 habitat variables differed significantly between the two types of plots (Table 2). Willow Flycatcher nest sites typically had greater and less variable canopy cover, less ground cover, canopy height, greater foliage density at both the shrub and subcanopy levels, greater foliage height diversity, more stems of shrubs, trees, and box elders; and fewer stems of cottonwood. Nest plots did not have significantly more willow stems than unused sites. Foliage density was significantly more patchy around nest sites than at unused sites. Nest sites were significantly closer to water, on average, than unused sites (Table 2).

Table 2. Univariate comparisons between Willow Flycatcher nest sites and unused sites of continuous habitat variables. Boldface values indicate differences are significant (p<0.05).

Variable	Nest sites (n = 127)	Unused sites (n = 89)	Test statistic[a]	df	p
Average ground cover (%)	30.0 ± 23.4	39.2 ± 19.3	t = 3.17	208.4	**0.002**
C.V. ground cover	0.99 ± 0.49	0.74 ± 0.42	t = 1.28[b]	214	0.20
Average canopy cover (%)	88.7 ± 7.9	78.8 ± 12.4	U = 2641.0		**<0.001**
C.V. canopy cover	0.11 ± 0.11	0.22 ± 0.16	U = 4952.0		**<0.001**
Ave. canopy height (m)	13.9 ± 4.7	17.4 ± 9.7	t = -0.22[b]	150.5	0.83
C.V. canopy height	0.31 ± 0.15	0.38 ± 0.25	t = 2.46	135.5	**0.015**
Foliage density 1-3 m	11.4 ± 12.6	13.8 ± 6.3	t = 2.87	214	**0.005**
Foliage density 3-10 m	41.7 ± 12.6	25.9 ± 13.7	t = -8.76	214	**<0.001**
Foliage height diversity	1.48 ± 0.16	1.14 ± 0.21	t = -2.42	157.9	**0.017**
Foliage density patchiness	1.34 ± 0.05	1.29 ± 0.13	U = 3573.0		**0.001**
Total of shrub stems (< 10 cm)	29.3 ± 44.5	19.7 ± 25.6	U = 5535.0		**0.009**
Total of tree stems (≥10 cm)	9.8 ± 4.7	5.8 ± 3.6	t = -4.69[b]	146.1	**<0.001**
Total of box elder trees	6.0 ± 4.1	1.6 ± 2.6	t = -6.10[b]	214	**<0.001**
Total of willow stems	9.9 ± 37.9	3.7 ± 8.0	U = 8023.0		0.61
Total of cottonwood stems	0.48 ± 1.74	1.61 ± 3.40	U = 6911.0		**0.002**
Plant species diversity	0.60 ± 0.47	0.68 ± 0.47	t = 1.26	214	0.21
No. of woody plant species	2.98 ± 1.71	2.92 ± 1.52	t = -0.28	214	0.78
Distance to nearest water (m)	41.2 ± 53.8	63.0 ± 58.9	t = 2.83	214	**0.005**
Distance to nearest edge	9.9 ± 8.6	9.7 ± 7.0	t = -0.18	423	0.86

[a] t-tests when data met assumptions of normality, Mann-Whitney U-Tests when data could not be normalized.
[b] t-test performed on values transformed to meet assumptions of normality.

significant preference for box elders and avoiding willows. Again, flycatchers tended to nest very high. When data from other nesting sites in the Southwest are compared with data from

other subspecies, it appears that *E. t. extimus* is consistently more arboreal in its nesting habits than are other subspecies. This apparent trend may be explained by availability of nesting substrates, if woodland riparian areas in the Southwest provide more suitable habitat than do shrubby sites. Alternatively, nest placement may be influenced by microclimatic considerations: in the arid Southwest, high nests may provide more suitable temperature or humidity conditions for nesting than may be available in lower, shrubby vegetation.

Comparisons of flycatcher nest sites with unused sites within occupied habitat patches revealed differences among almost all habitat variables examined. Notably, foliage density in the shrub layer (0-3 m) tended to be lower around nest sites than around unused sites. The most important of these, as indicated by a logistic regression, were canopy cover, number of box elder trees, and foliage density in the subcanopy. Comparisons of flycatcher numbers and nest success among habitat patches on the U Bar revealed no negative impacts of grazing on flycatchers, and positive impacts of ditch irrigation.

ACKNOWLEDGMENTS

We thank G. Bodner, K. Brodhead, P. Chan, J. Garcia, B. Gibbons, D. Hawksworth, M. Means, and H. Walker for field assistance; R. King for biostatistical guidance; P. Boucher, J. Monzingo, and R. Pope of the Gila National Forest, T. Bays, D. Meidinger, C. Rose, and T. Shelley of Phelps Dodge Corp., and L. and A. Ortiz for logistical support; and T. and D. Ogilvie for their hospitality and for allowing us to use their livelihood as a laboratory. The Gila National Forest, Phelps Dodge Corporation, and The Nature Conservancy of New Mexico provided funding.

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Used sites also differed from unused sites in the presence or absence of certain species of common understory herbaceous plants. Nest points were significantly more likely than unused points to have wetland forbs such as spearmint (*Mentha spicata*; $\chi^2 = 4.4$, df = 1, $P = 0.03$) and nettles (*Urtica dioica*; $\chi^2 = 9.0$, df = 1, $P = 0.003$). In contrast, unused points were significantly more likely to have horehound (*Marrubium vulgare*; $\chi^2 = 5.3$, df = 1, $P = 0.02$), four o'clocks (*Mirabilis* spp.; $\chi^2 = 16.8$, df = 1, $P < 0.001$), jimsonweed (*Datura wrightii*; $\chi^2 = 6.0$, df = 1, $P = 0.02$) and morning glories (*Convolvulus* spp.; $\chi^2 = 28.4$, df = 1, $P < 0.001$), all plants typical of dry soils and/or edges.

Habitat variables found to differ significantly in univariate comparisons between nest and unused plots were included in a logistic regression model. When pairs of variables were significantly correlated (at $r > 0.5$, $P < 0.05$), we included the one variable we felt was more biologically meaningful. The logistic regression model (Table 3) with greatest predictive power identified foliage density in the subcanopy, number of box elder stems, and canopy cover as the best predictors of Willow Flycatcher use within occupied patches. The model correctly classified 88% of the nest plots, 81% of the unused plots, and 85% of all plots.

Table 3. Habitat variables found to be significant ($p < 0.05$) predictors of Willow Flycatcher use in a logistic regression analysis.

Variable	β	df	S.E.	Wald χ^2	*P*
Foliage density 3-10 m	1	0.08	0.018	17.42	< 0.001
No. box elder tree stems	1	0.33	0.070	22.06	< 0.001
Ave. canopy cover	1	0.08	0.025	10.71	0.001
Constant	1	-12.39	2.45	25.59	< 0.001

FUTURE PROJECT GOALS

In 2000, we intend to focus increasingly on characterizing Willow Flycatcher habitat at larger spatial scales. That is, we will determine which attributes of habitat patches and landscapes influence flycatcher presence and nesting success. We will also continue to band birds and begin to analyze patterns of within-site movement, site fidelity, and survival. Preliminary reports from small, mostly ephemeral populations in Arizona suggest relatively low levels of site and even mate fidelity (Paxton et al. 1997). Our limited observations of banded individuals on the U Bar suggest this may not be true in prime habitat.

CONCLUSIONS

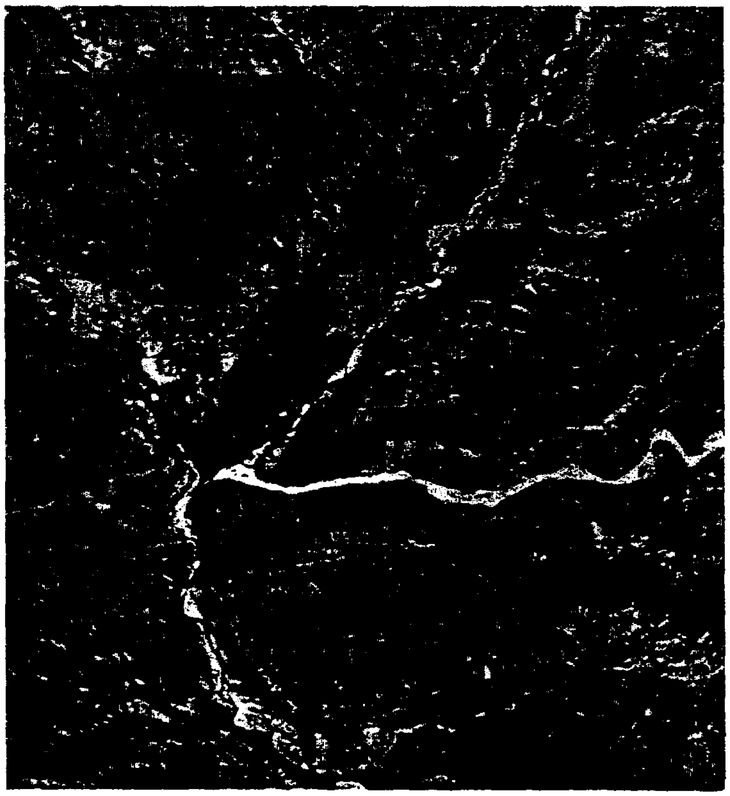
Willow Flycatchers in the Cliff-Gila Valley exhibited relatively poor nest success in 1999, perhaps due at least in part to the severe weather extremes experienced during the breeding season. Estimated rates of cowbird parasitism were the lowest we have found in three years (15.6%). Nest site selection was similar to that in 1997-98, with flycatchers demonstrating a significant preference for box elders and avoiding willows. Again, flycatchers tended to nest very high. When data from other nesting sites in the Southwest are compared with data from

ATTACHMENT "C"

SOUTHWESTERN WILLOW FLYCATCHERS IN THE CLIFF-GILA VALLEY, NEW MEXICO:

LANDSCAPE-LEVEL EFFECTS ON DENSITY, REPRODUCTION, AND COWBIRD PARASITISM

Draft Summary Report for the 2000 Field Season



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Executive Summary

The year 2000 was an odd one for Willow Flycatchers in the Cliff-Gila Valley. The population dropped substantially in size, yet reproductive output was at an all-time high. Surveys indicated the population declined over 40%, to 131 territories in the Valley. Similar levels of declines were noted elsewhere in the Southwest, suggesting a range-wide decline. Such a decline may have been due, at least in part, to a continuation of the severe drought begun in 1999. The total amount of precipitation that fell at Cliff, NM, between September of 1999 and May of 2000 was 2.88 inches, or only 34% of the norm for that period. The drought impacted the river levels, ditch flows, soil moisture, and vegetation. The drought was not confined to the Southwestern United States, but extended south through most of the flycatchers' winter range as well.

Despite the decline in population, flycatchers in the Cliff-Gila Valley had a tremendous year for reproduction. They achieved their highest rates of nesting success in 2000 in the four years of monitoring – overall, 67% of nests fledged one or more young. Cowbird parasitism reached its lowest level as well (11.5%). In addition, clutch sizes, in those nests where it could be determined, were larger than normal, with most first clutches having four eggs. Many pairs had second broods. We suggest that because of the low population numbers, most flycatchers were able to occupy the highest quality territories, which contributed to the high overall breeding success. Perhaps related to this explanation is the fact that a higher than normal percentage of nests was placed in box elder, the preferred nesting substrate in this population.

In 2000, we began in-depth analyses of patch and landscape-level effects (including land use) on flycatcher occurrence, nesting success, and cowbird parasitism. Results emphasized the importance of box elder to this population. The proportion of trees within a patch that were box elder had significant positive effects on the occurrence and density of flycatchers within patches. Further, the higher the proportion of box elder in a patch, the lower the average parasitism rate with the patch. Patch size, which has been demonstrated to have very profound effects on eastern forest birds, was positively correlated with patch occupancy – the larger the patch, the more likely that flycatchers bred in the patch – but also positively correlated with brood parasitism. Average rates of nest success within a patch were related to the maturity and density of its riparian woodlands. Although grazing has been labeled as a major causal factor for the decline and endangerment of the southwestern Willow Flycatcher, we found no significant negative impact of grazing on flycatcher nest success or brood parasitism in this system. In fact, patches that were grazed had a higher likelihood of patch occupancy and higher densities of flycatchers than ungrazed patches.

INTRODUCTION

In the past decade, avian ecologists increasingly have focused on ecosystem processes and patterns at spatial scales larger than the nest site or territory, such as the patch or landscape scale (Freemark et al. 1995). In particular, declines in Neotropical bird species have been linked to changes in landscape characteristics (Robinson et al. 1995, Askins 1995). Almost all of this work has been conducted in the eastern half of North America, where a majority of the avifauna is adapted to forest interior conditions. There, forest fragmentation has caused these forest interior bird species to increasingly overlap with predators and brood parasites typical of open areas and edges, often with disastrous consequences (Paton 1994, Danielson et al. 1997). This is the so-called edge effect. Moreover, these effects decrease with distance from edge, such that larger patches provide better habitat than smaller ones.

In contrast, in the western parts of North America, contiguous closed-canopy forest is uncommon, being found primarily in high-elevation montane areas. Much of the region supports non-forested habitats such as grasslands, shrublands, and desert. Within these non-forested habitats, riparian systems occur as narrow, linear corridors of close-canopied woodland, which support a rich and distinct avian community (Knopf et al. 1988). In the Southwest, riparian ecosystems have been severely degraded and fragmented by as much as 90% (Knopf et al. 1988). However, these riparian systems are highly dynamic in nature, resulting in a natural pattern of fragmentation (Szaro 1989). It remains unknown if the negative impacts of forest fragmentation and edge effects so well documented in the East are equally prevalent in these lower-elevation western habitats. One study in Montana suggests not (Tewksbury et al. 1998).

The Southwestern race of the Willow Flycatcher (*Empidonax traillii extimus*) is a critically endangered Neotropical migrant bird that breeds exclusively in densely vegetated riparian areas in the region. Approximately 600 pairs were known to exist in 1999, with more than a third of those in the upper Gila River Valley in New Mexico (Marshall 2000). It is currently considered the top priority species for US Fish and Wildlife Service Region 2. Within its range, many apparently suitable habitat patches (based on vegetation composition and structure) remain unoccupied. Among occupied patches, rates of nesting success and cowbird parasitism vary greatly. While several studies have now examined nesting success, parasitism, and microhabitat preferences within a single site (e.g., Sogge et al. 1997a, Stoleson and Finch 1999a, Paradzick et al. 2000), none has addressed landscape-level effects on habitat occupation and nesting success. Such landscape-level effects on the flycatcher have been identified as a top research priority (Stoleson et al. 2000).

The Cliff-Gila Valley population. — By far the largest known breeding concentration of Southwestern Willow Flycatchers is located in the Cliff-Gila Valley, Grant County, New Mexico. This population was estimated at 243 pairs in 1999 (P. Boucher, personal communication), and had increased every year since surveys began in 1994. These birds are located primarily on private property owned by the Pacific Western Land Company, a subsidiary of Phelps Dodge Corporation, and managed by the U Bar Ranch. Additional pairs occur on the adjacent Gila National Forest and other private holdings. Habitat preferences of flycatchers in this population differ, at least superficially, from those reported elsewhere (Hull and Parker 1995, Skaggs 1996, Stoleson and Finch 1999b), and from populations of other subspecies.

Objectives

Our goals for this study in 2000 were:

1. survey for flycatchers following standardized protocols to estimate population sizes in the Cliff-Gila Valley.
2. locate and monitor nests of Willow Flycatchers to assess levels of nesting success, cowbird parasitism and predation.
3. characterize and quantify vegetation at nests sites, territories, and unused sites within occupied habitat patches.
4. band adult and nestling Willow Flycatchers to allow individual identification.

This report presents the results of the fourth year of the study.

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 toward the Burro Mountains. The study was primarily conducted from just below the US Route 180 bridge upstream to the north end of the U-Bar Ranch (approximately 5 km). In addition, flycatchers were studied in two disjunct sections of the valley: (1) the Fort West Ditch site of the Gila National Forest and adjacent holdings of The Nature Conservancy's Gila Riparian Preserve, located about 9 km upstream of the Route 180 bridge, and (2) the Gila Bird Area, a riparian restoration project comprising lands of the Gila National Forest and Pacific-Western Land Company, located some 8 km downstream of the Route 180 bridge. Most of the Cliff-Gila Valley consists of irrigated and non-irrigated pastures used for livestock production and hay farming. Elevations range from 1350 to 1420 m.

The Gila River and nearby earthen irrigation ditches are lined with riparian woodland patches of various ages and composition. Most patches support a mature woodland (>25 m canopy) of Fremont cottonwood (*Populus fremontii*), with a subcanopy of mixed deciduous trees including box elder (*Acer negundo*), Goodding's willow (*Salix gooddingii*), velvet ash (*Fraxinus velutinus*), Arizona walnut (*Juglans major*), Arizona sycamore (*Platanus wrightii*), Arizona alder (*Alnus oblongifolia*) and Russian olive (*Elaeagnus angustifolia*). The understory is composed of shrubs including three-leaf sumac (*Rhus trilobata*), false indigo (*Amorpha fruticosa*), New Mexico olive (*Forestieria neomexicana*), forbs, and grasses. Fewer patches support a shrubby, early successional growth of seepwillow (*Baccharis glutinosa*), coyote and bluestem willows (*Salix exigua* and *S. irrorata*), and saplings of the species mentioned above. Most habitat patches are less than 5 ha in area. The FS Fort West Ditch site and the Gila Bird Area are 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.

Surveys. – All riparian habitats within each site were surveyed systematically for Willow Flycatchers using standardized survey techniques developed by the USFWS (Sogge et al. 1997a). Three surveys were conducted at each site during the periods of 15-30 May, 1-21 June, 22 June-15 July. Survey procedures entailed two observers walking through or adjacent to riparian habitat on clear, calm days between dawn and noon. Recordings of Willow Flycatcher vocalizations were played periodically to elicit responses from territorial birds. We recorded data on numbers of flycatchers, evidence of breeding by flycatchers, and presence of brown-headed cowbirds. All personnel of the Rocky Mountain Research Station held valid state and federal permits required for surveying and monitoring Southwestern Willow Flycatchers, and attended a mandatory survey protocol training session before initiating fieldwork.

Nest monitoring. – We searched for nests of Willow Flycatchers and other species on a daily basis. Nests were monitored every 3-7 days, following a modified (less-intrusive) version of protocols proposed by the Arizona Game and Fish Department (Rourke et al. 1999). Nest contents were observed using pole-mounted mirrors or videocameras, or 15X spotting scopes. Nests that were abandoned or destroyed were examined for evidence (e.g., cowbird eggs, mammal hairs) to ascertain causes of nest failure. We considered a nest successful if: (1) parent birds were observed feeding one or more fledged young; (2) parent birds behaved as if dependent young were nearby when the nest was empty (defensive or agitated behavior near nest); or (3) nestlings were in the nest within one or two days of the estimated fledge date. We considered a nest failed if: (1) nest contents disappeared before fledging of young was possible, assuming 10-12 d required for fledging (depredation), (2) the nest contained no Willow Flycatcher young but contained cowbird eggs or chicks (parasitized), (3) the nest was deserted after eggs had been laid (desertion), or (4) the nest was abandoned prior to egg laying (abandonment).

Vegetation and landscape measurements. – We identified and included in our analyses 39 discrete woodland patches in the Cliff-Gila Valley. We limited our focus to those patches that might be considered potential flycatcher habitat according to published descriptions (Stoleson and Finch 1999a, b; Sogge and Marshall 2000). Patches included were (1) well within the floodplain and so mesic enough to qualify as habitat, (2) wide enough (>10 m average width), and (3) of sufficient age and stature to provide adequate structure. We did not include any of the numerous very small (< 0.3 ha) patches or young regeneration of coyote willow and seepwillow, as flycatchers in this area do not appear to use them regardless of landscape features (Stoleson and Finch, unpublished data).

Within each patch, vegetation was sampled systematically starting from a randomly chosen point, using a modified BBIRD methodology (Martin et al. 1997). Sampling points were established spaced 50 to 100 m apart and at least 10 m from habitat edges. The number of sample points per patch varied with patch size and shape. Vegetation characteristics measured at each point included stem counts for trees (within 8 m of point) and shrubs (within 4 m of point) by size class and species; basal area by species; average canopy height, and canopy cover. Canopy cover was measured using hemispherical densiometers; sample point values were the average measurements at the sample point and at 4 and 8 m in reach of the cardinal directions from the sample point. Canopy heights were measured using hand-held clinometers. For each vegetation variable, we calculated patch averages and standard deviations (as a measure of homogeneity within patches).

Locations and dimensions of riparian patches were calculated using a combination of GPS (Global Positioning System) measurements and photointerpretation of digitized aerial photos provided by the Gila National Forest. This area turned out to be one of the very few remaining in the country without registered digital orthoquads yet available; therefore, we were obliged to acquire basic spatial data in the field. For each riparian patch, we determined patch area (ha), average and minimum patch width (m), patch length (m; parallel to river course), proximity to water (m), proximity to river (m), proximity to nearest patch (m), proximity to nearest occupied patch (m), proximity to nearest roads (m), width of floodplain (m, perpendicular to river course), and proximity to nearest upland. From these values, we calculated ratios of length to width, and perimeter to area, as measures of proportion of edge (Freemark et al. 1995). Because of the controversy and lack of objective information on the impacts of grazing on Willow Flycatchers, we attempted to assess such impacts, if any, at the landscape and patch level in the Gila Valley. We determined the grazing status of each patch, which was entered into analyses as a categorical variable (grazed vs. ungrazed). Numerical variables used in subsequent analyses are listed in Table 1.

Analyses

We used nesting data from 1997-2000 to calculate patch-wise averages of flycatcher nesting success and rates of cowbird parasitism. Flycatcher population levels fluctuated among years, but proportions of the total found within each patch remained approximately constant each year. For analyses, we therefore used density estimates based on 1999 data only, as data from 2000 had not yet been collated. All means are reported $\pm$ standard deviations.

Correlates of patch occupancy. – To assess landscape correlates of patch occupancy, we first compared occupied and unoccupied patches for each numerical variable using univariate t-tests. We included all numerical and categorical landscape variables that differed significantly (at $p < 0.10$) between occupied and unoccupied patches in a step-wise logistic regression using patch occupancy (occupied vs. unoccupied) as the dependent variable (Trexler and Travis 1993). We used a value of $p \leq 0.05$ to enter and 0.10 to remove individual variables from the model. We chose the most parsimonious among models with equal numbers of parameters using Akaike's Information Criterion (AIC), and we used Likelihood-ratio Chi-square to test for significant effects between nested logistic regression models (Anderson et al. 2000).

Table 1. Numerical landscape and habitat variables used in analyses

VARIABLE	DESCRIPTION
Patch size/shape	
AREA	Total area of patch, in hectares
LENGTH	Length of patch along axis parallel to river, in meters
AVEWIDTH	Average width of patch along axis perpendicular to river, in meters
LENGTH/WIDTH	Ratio of patch length to width
PERIMETER/AREA	Ratio of patch perimeter to area
Patch vegetation characteristics	
CANCVRave	Average % canopy cover in patch
CANCVRsd	Standard deviation of % canopy cover among sample points in patch
CANHTave	Average canopy height in patch, in meters
CANHTsd	Standard deviation of canopy heights among sample points in patch
SHRUBave	Average number of stems of shrubs and saplings per sample point
SHRUBsd	Standard deviation of shrub counts among sample points in patch
TREESave	Average number of stems of trees (≥10 cm dia.) per sample point
TREESsd	Standard deviation of tree counts among sample points in patch
Stems10-30	Average count of trees in 10 – 30 cm dia. size class per sample point
Stems30-50	Average count of trees in 30 – 50 cm dia. size class per sample point
Stems50-70	Average count of trees in 50 – 70 cm dia. size class per sample point
Stems70+	Average count of trees in 70+ cm dia. size class per sample point
%BOX	Percentage of woody stems in patch that are boxelder (*Acer negundo*)
%SALIX	Percentage of woody stems in patch that are willow (*Salix* spp.)
BASALAREAave	Average estimated basal area per sample point, in square meters
BASALAREAsd	Standard deviation of est. basal area among sample points in patch
Patch position in landscape	
DistH20	Minimum distance to nearest water of any type. in meters
DistRIVER	Minimum distance to surface water of Gila River, in meters
DistNEAREST	Minimum distance to next nearest patch, in meters
DistOCCUP	Minimum distance to nearest patch occupied by flycatchers, in meters
FLOODPLAIN	Distance across floodplain perpendicular to flow of river, as measured at midpoint of patch, in meters
UPLAND	Minimum distance to closest upland/floodplain interface, in meters
DistROAD	Minimum distance to nearest road, in meters

Correlates of flycatcher density, nest success, and brood parasitism. -- We determined the correlation of each numerical landscape variable to the target variable using bivariate linear regressions. All numerical landscape variables that differed significantly (at $p < 0.10$) were included in a step-wise multiple regression, using $p \leq 0.05$ to enter and 0.10 to remove. We also compared the means of target variables between grazed and ungrazed patches using t-tests to assess any impacts of grazing as practiced at this site. We tested whether nest success and brood parasitism were density dependent by regressing the target variable against population density within a patch.

RESULTS

Climate in 2000. – The drought that impacted the Cliff-Gila Valley in 1999 continued through the entire 2000 field season. The annual rainfall total for 1999 as measured in Cliff, NM, was 10.75 inches – only 74% of normal. However, the drought worsened after the 1999 field season. The total amount of precipitation that fell from the time the flycatchers left for their wintering grounds (1 Sept., 1999) until they returned to set up territories (1 June, 2000) was 2.88 inches, or only 34% of the norm for that period (ave. = 8.46 in). Thus, the Cliff-Gila Valley was extremely dry when the flycatchers returned to set up territories in late May. Water in the irrigation ditches was low, intermittent, or nonexistent. In the upper parts of the Valley (Fort West Ditch area), many of the cottonwoods and willows dropped their leaves, and some trees died.

Table 2. Precipitation at Cliff, New Mexico, for 1999, 2000, and annual averages for 1936-1999. Data from the Western Regional Climate Center (2000).

	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.	TOTAL
1999 precip.	0.11	0	0.35	0.39	0.08	0.93	5.09	1.88	1.85	0	0	0.07	10.75
2000 precip.	0.06	0.07	0.8	0.03	0	2.19	1.63	N/A	N/A	N/A	N/A	N/A	N/A
Average (1936-99).	1.00	0.94	0.86	0.33	0.35	0.53	2.77	2.84	1.65	1.28	0.71	1.16	14.52
2000: % of normal	6.0	7.4	93.0	9.1	0.0	413	58.8						
2000: cumulative (in.) deviation from norm since Jan '99	-4.6	-5.5	-5.5	-5.8	-6.2	-4.5	-5.7						

This extended drought was not confined to southwestern New Mexico, or even the southwestern United States. During the period 1999 – summer 2000, precipitation was well below normal throughout the Pacific slope of Mexico and Central America, at least as far south as Costa Rica. For example, precipitation at the northern end of the flycatchers' wintering grounds in Guerrero, Mexico, was 44% below normal for the period Jan. – Aug. of 2000 (SNM 2000; Fig. 1). For the same period, precipitation at Liberia, Costa Rica, in the center of the wintering grounds, was 35% below normal levels (INM 2000). Thus, it appears that the entire subspecies was subject to extensive drought on both the breeding and wintering grounds in 1999-2000.

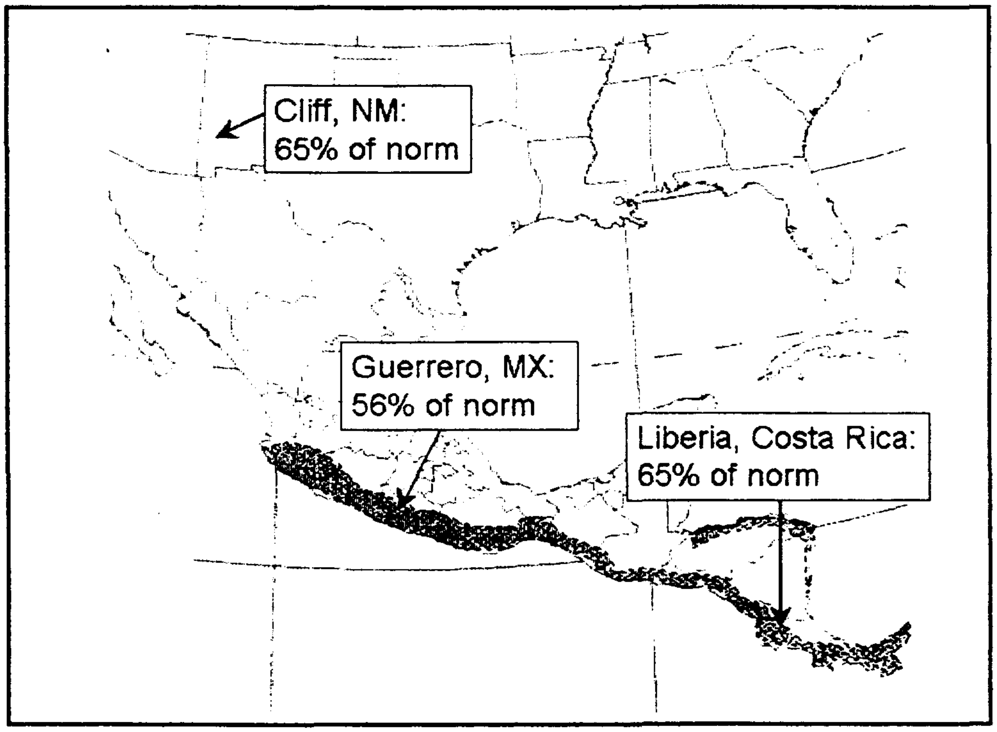

Figure 1. Proportion of normal precipitation from Jan. to Aug. 2000 at Willow Flycatcher breeding grounds (Cliff) and two sites on the wintering grounds, showing the wide area affected by drought. Shaded area indicates flycatcher wintering areas (from Howell & Webb 1997). Cliff climate data from WRCC 2000.

Willow Flycatcher population surveys. – The population of Willow Flycatchers in the Cliff-Gila Valley declined substantially in 2000, from an estimated 243 pairs in 1999 to 139 pairs (Fig. 2). This represents a drop of 43%. On the U Bar Ranch itself, the numbers declined from 209 to 121 pairs, a decrease of 42% (Appendix). The birds appeared to have left the more peripheral and marginal areas of the valley, but remained relatively common in the core areas of prime habitat.

Oddly, in 2000, we noted the first instance of flycatchers occupying a patch we refer to here as SW Crescent – a small crescent-shaped patch of young regeneration just northwest of the Rt. 180 bridge. This patch has been surveyed every year since 1997, but has not been included in reports because no flycatchers had ever been detected. This colonization suggests that birds probably shifted around within the valley in 2000. Flycatcher numbers declined greatly in some patches dependent on irrigation ditches for water. For example, on the SW Stringer, we found 3 pairs plus two apparently single males in 2000, compared to 14 pairs in 1999. In contrast, other more low-lying patches (such as SE4) had their highest numbers ever in 2000 (6 pairs vs. 3-5 in previous years). Declines upstream on the Fort West Ditch and TNC properties were even more marked than on the U Bar Ranch.

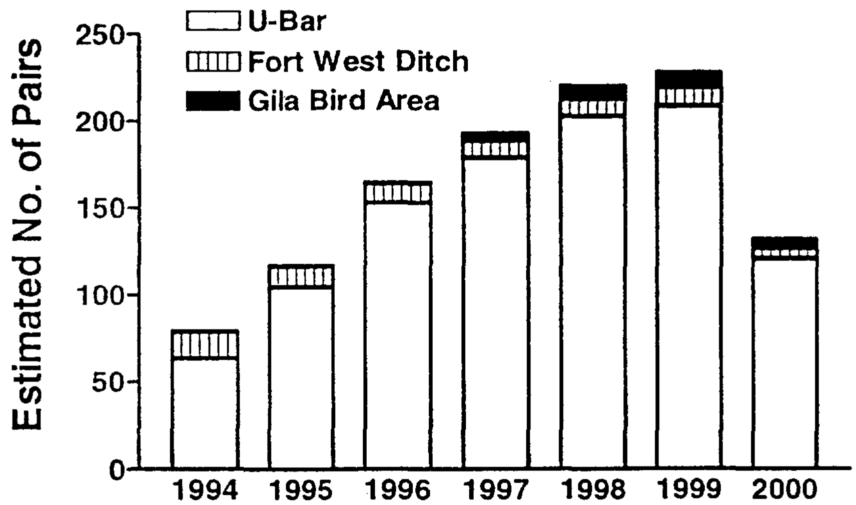

Figure 2. Population estimates of Willow Flycatchers in the Cliff-Gila Valley, 1994-2000.

Flycatcher nests. – We located 85 Willow Flycatcher nests in 2000. Of these, 71 (84%) were placed in box elder – a somewhat higher percentage than the 70% to 75% found in box elder in all previous years. A much lower percentage was found in willows (n = 3, or 3.5%) compared to previous years (average of 11.9%, n = 48). Relatively few were found in other tree species (Table 3). This concentration in box elder, the favorite nesting substrate, again suggests the flycatchers retreated to preferred areas in this very dry year.

As in previous years, Willow Flycatchers nested high in the Cliff-Gila Valley. Nest heights ranged from 1.8 to 24.1 m in height, with a mean height of 7.8 ± 3.5 m (Table 3). Trees and shrubs in which flycatchers built nests averaged 13.7 ± 4.9 m, and ranged from 2.7 to 30.1 m high. As with height, nest trees varied greatly in diameter, from 1.2 cm in alder to a huge 142.5 cm cottonwood (mean = 24.5 ± 19.8 cm). The nest located in that large cottonwood represents a new record for nest height for the species (24.1 m = 78.3 ft).

Table 3. Nest substrates, nest heights, and comparative nest success by substrate (based on nests of known outcome) for Willow Flycatcher nests in the Cliff-Gila Valley, 2000.

Nest Substrate	N	Mean nest ht. (m)	Range nest ht. (m)	% successful (N)
Box elder	71	8.2 ± 3.1	1.8 – 16.0	69% (52)
Fremont cottonwood	5	9.8 ± 7.7	4.0 – 24.1	100% (3)
Goodding's willow	3	4.0 ± 1.0	3.3 – 5.5	0% (3)
Russian olive	2	4.9	3.8 – 6.0	50% (2)
Arizona alder	2	2.7	2.3 – 3.0	0% (2)
Saltcedar	2	3.0	2.8 – 3.1	100% (2)

Willow Flycatcher nest success. – Despite the decline in population, flycatchers in the Cliff-Gila Valley enjoyed very high rates of nesting success in 2000. Overall, 67% of nests fledged one or more young – this is one of the highest rates of nest success recorded for this species; other sites with >60% nest success have had extensive cowbird trapping and other forms of intensive management (e.g., San Luis Rey, CA). Simple nest success gives only a partial picture of the breeding effort, though. Many pairs raised a second brood after successfully fledging their first. Clutch sizes appeared to be larger than in prior years, with most first nests containing four eggs (vs. a mean of 3.2 in prior years). One pair also had a second clutch of four eggs, and successfully raised a total of eight young from their two nests (in saltcedar). In addition to the 85 nests that were found, we found fledglings being fed in four territories where no nest was found. A minimum of 65 fledglings was produced from flycatcher nests on the U Bar, although the actual number was probably two or more times that amount.

As in previous years, the likelihood of a nest being successful appeared to vary among nest tree species, although small sample sizes for most species preclude statistical analysis. Nests in box elder were slightly more likely to be successful than average (Table 3). All nests in cottonwood and saltcedar fledged young, while no nest in willow or alder fledged any young in 2000.

Causes of nest failure. – Of the 21 nests known to have failed, eight failed due to unknown causes (although these were probably depredated). One failed due to weather (blown out of tree during a storm). The remainder failed due to predators (n = 4), abandonment (n = 4), or cowbird parasitism (n = 4). One nest in alder was parasitized by cowbirds, but was lost to a predator before the cowbird egg had hatched.

Cowbird parasitism. – Of 52 nests for which parasitism status was known. we found six flycatcher nests that had been parasitized by Brown-headed Cowbirds (11.5%). In at least one of those, the cowbird egg failed to hatch and flycatcher young were successfully produced. Unlike previous years, we found no cowbird fledgling being fed for which no nest was ever found. This is by far the lowest level of parasitism we have recorded in four years of study, and may be related to the suggestion that flycatchers nested primarily in optimal areas this year.

Landscape-Level Analyses

Patch descriptions. – We included 39 woodland patches in landscape analyses, which ranged from 0.38 to 11.8 ha in size. Most of the patches were located on the U Bar Ranch; many of these patches had cattle excluded by fences. Overall, 18 of 39 patches were grazed, primarily in fall and winter only. Of the 39 study patches, 27 supported breeding Willow Flycatchers in 1999. Flycatcher densities varied greatly among occupied patches, and ranged from 0.25 to 10.3 pairs/ha. Average nest success within patches (from nests monitored 1997- 2000) also varied greatly, from 0% to 100% successful (mean = 0.51 $\pm$ 0.24, n = 392 nests of known outcome). Brood parasitism within occupied patches varied from 0% to 100%, with a mean of 19.9 $\pm$ 29.9% (n = 222 nests of known parasitism status). Patches with very high or very low rates for either parameter had very small sample sizes (< 5) of flycatcher nests.

Landscape Correlates of Flycatcher Occupancy

Land use. – We found no evidence that grazing within a patch discouraged flycatchers from occupying that patch. In fact, flycatchers were found in a significantly greater portion of the grazed patches than the ungrazed patches (87.5 vs. 52.4%, respectively; $\chi^2 = 6.5$, df = 1, $p = 0.011$).

Univariate regressions. – We compared each landscape variable between patches that were occupied and those that were unoccupied by Willow Flycatchers. Six variables differed significantly ($p \leq 0.05$) between occupied and unoccupied patches (Table 4). Patches with flycatchers averaged larger in area, greater in length, had lower variation in the numbers of shrubs, a higher percentage of box elder, were closer to water, and closer to the next nearest

Table 4. Comparisons of landscape variables between patches occupied ($n = 27$) and not occupied ($n = 12$) by Willow Flycatchers. Significant p values (≤ 0.05) are indicated in bold.

	Mean ± SD				
Variable	occupied	unoccupied	*t*	df	*p*
AREA (ha)	4.30 ± 2.77	2.07 ± 1.36	-3.38	36.5	**0.002**
LENGTH (m)	507.71 ± 300.17	346.52 ± 134.49	-2.32	36.97	**0.026**
AVEWIDTH (m)	75.08 ± 43.34	70.39 ± 35.90	-0.33	37	0.75
LENGTH/WIDTH	8.16 ± 6.27	5.62 ± 2.43	-1.82	36.64	0.077
PERIMETER/AREA	355.41 ± 224.32	501.91 ± 220.91	1.77	35	0.085
CANCVRave (%)	83.59 ± 8.99	77.13 ± 19.20	-0.97	9.25	0.36
CANCVRsd	8.56 ± 3.89	14.32 ± 12.43	1.37	8.57	0.21
CANHTave (m)	14.98 ± 4.71	15.22 ± 7.58	0.12	36	0.91
CANHTsd	6.13 ± 3.06	5.05 ± 2.66	-0.94	32	0.35
SHRUBave (count)	28.30 ± 12.93	29.53 ± 17.60	0.24	36	0.81
SHRUBsd	14.57 ± 5.92	20.34 ± 5.47	2.56	32	**0.016**
TREESave (count)	10.02 ± 4.72	12.22 ± 7.85	1.01	33	0.32
TREESsd	5.22 ± 2.85	5.83 ± 3.78	0.50	32	0.62
Stems10-30 (count)	8.25 ± 4.80	10.19 ± 7.69	0.89	33	0.41
Stems30-50 (count)	0.97 ± 0.55	1.21 ± 1.14	0.60	9.31	0.56
Stems50-70 (count)	0.30 ± 0.30	0.39 ± 0.60	0.44	9.41	0.67
Stems70+ (count)	0.49 ± 0.58	0.43 ± 0.69	-0.27	33	0.79
%BOX	41.47 ± 28.67	8.87 ± 17.06	-4.41	33.57	**>0.001**
%SALIX	24.75 ± 21.83	40.31 ± 25.19	1.96	37	0.058
BASALAREAave (m^2)	418.37 ± 169.41	494.04 ± 275.98	0.77	10.17	0.46
BASALAREAsd	224.13 ± 119.13	237.76 ± 97.91	0.31	32	0.76
DistH20 (m)	3.74 ± 8.57	26.11 ± 33.58	2.28	11.64	**0.043**
DistRIVER (m)	64.24 ± 103.12	41.62 ± 42.82	-0.97	36.94	0.34
DistNEAREST (m)	174.57 ± 223.50	332.09 ± 221.62	2.04	37	**0.049**
DistOCCUP (m)	323.76 ± 660.96	792.73 ± 1121.34	1.64	37	0.110
FLOODPLAIN (m)	4256.43 ± 1764.87	3003.07 ± 1873.63	-2.01	37	0.052
UPLAND (m)	1160.12 ± 797.67	896.28 ± 805.90	-0.95	37	0.348
DistROAD (m)	1212.50 ± 740.26	1149.81 ± 876.80	-0.23	37	0.819

patch, than were patches without flycatchers. An additional four variables showed trends towards differences between the two patch types ($0.05 < p \leq 0.10$). Occupied patches tended to have a greater length-to-width ratio and a lower perimeter-to-area ratio, a *lower* percentage of woody stems that were willow, and a broader floodplain than unoccupied patches.

Logistic regression model. – We used six of the variables found to have significant or near-significant differences above in a logistic regression analysis. Since all of the variables describing patch size or shape were highly correlated with each other (all $r > 0.5, p < 0.05$), we used only AREA, with the greatest p-value, in our analysis to avoid problems associated with collinearity of variables.

The best logistic regression model, as determined by AIC, identified three variables as significant predictors of patch occupancy by Willow Flycatchers. These variables were percent of stems that were box elder (%BOX), the distance to the nearest patch (DistNEAREST), and the standard deviation of shrub counts (SHRUBsd). This model successfully classified 96.0% of occupied patches, 77.8% of unoccupied patches, and 91.2% of patches overall. The beta coefficients indicate that patches were increasingly more likely to be occupied with (1) increasing proportion of box elder, (2) decreasing distance to nearest patch, and (3) decreasing variation in the number of shrubs among points within the patch (Table 5).

Table 5. Landscape variables found to be significant ($p < 0.10$) predictors of patch occupancy by Southwestern Willow Flycatchers, based on a stepwise logistic regression.

Variable	β coefficient	S.E.	Wald χ^2	df	p
%BOX	0.211	0.123	2.951	1	0.086
DistNEAREST	-0.016	0.010	2.635	1	0.105
SHRUBSsd	-0.496	0.259	3.674	1	0.055
CONSTANT	9.190	4.558	4.066	1	0.044

Landscape Correlates of Flycatcher Density

Land use. – Grazing appeared to have a significant effect on flycatcher densities. Grazed patches supported significantly higher densities (2.51 ± 2.70 pairs/ ha) than did ungrazed patches (0.98 ± 1.94 pairs/ha: $t = 2.05$, df = 37, $p = 0.047$).

Bivariate correlations. – We found only one landscape variable, percent of box elder, was significantly correlated with flycatcher density. The density of flycatchers increased with increasing percentage of box elder within patches. A second variable, width of floodplain, showed a nearly significant positive correlation with density, suggesting that the broader the floodplain, the higher the density of flycatchers.

Mutiple regression analysis. – The stepwise multiple regression analysis also revealed only box elder to be a significant predictor of flycatcher density; density increased with increasing percentage of box elder ($r^2 = 0.14$, $F_{1,29} = 4.85$, $p = 0.036$). As indicated by the r^2 value, this

variable explained less than 15% of the variation in density among patches. There seemed to be no significant interaction effects in this data set.

Landscape Correlates of Flycatcher Nest Success

Population density. – Average rates of nest success within patches were not correlated with the density of flycatchers within those patches ($r^2 = 0.002$, $p = 0.84$). Thus, nest success does not appear to be density-dependent in this population.

Land use. – We found no detectable impact of grazing on flycatcher nest success. Occupied patches that were grazed ($n = 15$) had a similar overall rate of nest success (0.56) as patches that were excluded from grazing (0.45; $n = 12$; $t = -1.1$, df = 25, $p = 0.28$).

Bivariate correlations. -- Six variables were significantly correlated with average patch-wise nest success. Average rates of nest success increased with decreasing variation in canopy cover, and with increasing average canopy cover, average canopy height, numbers of woody stems in the 30-50 cm DBH and 70+ cm DBH size classes, and with increasing distance from nearest occupied patch (Table 7). Two additional variables showed not-quite-significant trends: nest success increased with decreasing variation in tree counts, and with increasing percent of stems that were box elder.

Table 6. Bivariate correlations of landscape variables on average patch-wise density of Willow Flycatchers.

VARIABLE	Pearson *r*	*P*
AREA (ha)	0.023	0.89
LENGTH (m)	0.057	0.73
AVEWIDTH (m)	0.074	0.66
LENGTH/WIDTH	0.023	0.89
PERIMETER/AREA	0.010	0.95
CANCVRave (%)	0.069	0.69
CANCVRsd	0.093	0.60
CANHTave (m)	0.054	0.75
CANHTsd	0.098	0.58
SHRUBave (count)	0.11	0.52
SHRUBsd	0.089	0.62
TREESave (count)	0.16	0.37
TREESsd	0.092	0.61
Stems10-30 (count)	0.14	0.41
Stems30-50 (count)	0.042	0.81
Stems50-70 (count)	0.086	0.62
Stems70+ (count)	0.025	0.89
%BOX	0.44	**0.006**
%SALIX	0.19	0.24
BASALAREAave (m^2)	0.16	0.35
BASALAREAsd	0.13	0.48
DistH20 (m)	0.15	0.37
DistRIVER (m)	0.068	0.68
DistNEAREST (m)	0.25	0.12
DistOCCUP (m)	0.23	0.17
FLOODPLAIN (m)	0.28	0.080
UPLAND (m)	0.30	0.067
DistROAD (m)	0.071	0.67

Multiple regression analysis. – Five variables were found to be significant predictors of flycatcher nest success (Table 8). Oddly, only one variable identified as a significant predictor by the multiple regression analysis (CANCVRsd) showed a significant correlation with nest success in the univariate regression analyses. Nest success increased with increasing average basal area, and with decreasing width of floodplain, patch area, total number of stems in the 10-30 cm DBH size class, and variation in canopy cover. According to the multiple regression equation, these six variables explained 84% of the variation in nest success among patches ($r^2 = 0.84$, $F_{5,19} = 19.98$, $p < 0.001$).

Landscape Correlates of Brood Parasitism on Willow Flycatchers

Population density. – Average rates of brood parasitism within occupied patches were not correlated with the density of flycatchers within those patches ($r^2 = 0.002, p = 0.82$). Thus, brood parasitism does not appear to be density-dependent in this population.

Land use. – Brood parasitism within a patch was not significantly affected by grazing status of the patch. Average patch-wise parasitism rates did not differ between grazed (20.7 ± 29.3%) and ungrazed patches (18.8 + 31.9%; t = 0.16, df = 25, p = 0.88).

Bivariate correlations. – Two landscape variables related to patch dimensions were significantly and positively correlated with brood parasitism rates: patch area and average width (Table 9). The positive correlation coefficients indicate that with increasing patch size and width, brood parasitism rates increased. This result is opposite what would be expected if these riparian woodland patches showed an edge effect. An additional three variables showed not-quite-significant trends as well. Parasitism rates increased with the number of small stems (10-30cm DBH), but decreased with increasing stems in the 30-50 cm DBH size class and with the percentage of box elder.

Multiple regression analysis. – The average patch-wise rate of cowbird parasitism was best predicted by a single variable in a stepwise multiple regression analysis. The average parasitism rate decreased with increasing percentage of box elder ($r^2 = 0.21$, $F_{1,23} = 6.04$, $p = 0.022$). This model explained only about 20% of the variation in parasitism rates among patches.

Table 7. Bivariate correlations of landscape variables with average patch-wise nest success in Willow Flycatchers

VARIABLE	Pearson r	P
AREA (ha)	0.26	0.19
LENGTH (m)	0.18	0.36
AVEWIDTH (m)	0.17	0.41
LENGTH/WIDTH	0.10	0.61
PERIMETER/AREA	0.043	0.83
CANCVRave (%)	0.50	**0.010**
CANCVRsd	-0.56	**0.004**
CANHTave (m)	0.56	**0.003**
CANHTsd	0.33	0.10
SHRUBave (count)	0.27	0.19
SHRUBsd	0.28	0.18
TREESave (count)	0.059	0.78
TREESsd	-0.35	0.085
Stems10-30 (count)	-0.070	0.73
Stems30-50 (count)	0.46	**0.019**
Stems50-70 (count)	0.31	0.12
Stems70+ (count)	0.45	**0.023**
%BOX	0.37	0.057
%SALIX	-0.001	0.99
BASALAREAave (m^2)	0.28	0.17
BASALAREAsd	-0.031	0.89
DistH20 (m)	0.12	0.55
DistRIVER (m)	-0.22	0.27
DistNEAREST (m)	0.027	0.89
DistOCCUP (m)	0.39	**0.042**
FLOODPLAIN (m)	-0.062	0.76
UPLAND (m)	-0.062	0.76
DistROAD (m)	0.084	0.68

Table 8. Variables included in a linear stepwise multiple regression of landscape variables on Willow Flycatcher nest success.

Variable	Coefficient (β)	t	p
CANCOVRsd	-0.56	-5.46	<0.001
FLOODPLAIN	-0.50	-4.92	<0.001
AREA	-0.27	-2.83	0.011
TOT10-30	-0.15	-7.02	<0.001
ESTBAave	1.08	6.44	<0.001
CONSTANT	0.93	8.68	<0.001

Table 9. Bivariate correlations of landscape variables with average patch-wise rates of brood parasitism in Willow Flycatchers

VARIABLE	Pearson *r*	P
AREA (ha)	0.43	**0.027**
LENGTH (m)	0.14	0.49
AVEWIDTH (m)	0.41	**0.032**
LENGTH/WIDTH	-0.010	0.62
PERIMETER/AREA	0.021	0.92
CANCVRave (%)	-0.26	0.21
CANCVRsd	-0.11	0.61
CANHTave (m)	-0.30	0.14
CANHTsd	-0.24	0.24
SHRUBave (count)	0.14	0.50
SHRUBsd	-0.16	0.46
TREESave (count)	0.30	0.14
TREESsd	0.046	0.83
Stems10-30 (count)	0.38	0.053
Stems30-50 (count)	-0.36	0.069
Stems50-70 (count)	-0.31	0.12
Stems70+ (count)	-0.16	0.44
%BOX	-0.38	0.054
%SALIX	-0.13	0.54
BASALAREAave (m^2)	0.13	0.52
BASALAREAsd	-0.015	0.94
DistH20 (m)	0.12	0.54
DistRIVER (m)	0.11	0.60
DistNEAREST (m)	0.014	0.94
DistOCCUP (m)	-0.15	0.45
FLOODPLAIN (m)	0.11	0.59
UPLAND (m)	0.13	0.53
DistROAD (m)	0.037	0.85

DISCUSSION

The year 2000 was an odd one for Willow Flycatchers in the Cliff-Gila Valley. The population appeared to have dropped substantially in size, yet reproductive output was at an all-time high. The decline in population was likely due to the continued severe drought, not just in southwestern New Mexico, but extending south to the birds' wintering grounds in western Central America. It is noteworthy that population declines of approximately 40% were also reported from both the Kern River Preserve and Camp Pendleton in California (M. Whitfield, personal communication). This suggests a possible range-wide decline in numbers. It appears that populations of the entire subspecies may have been reduced because of extensive and prolonged drought on both the breeding and wintering grounds. Alternatively, populations may not have changed in size, but rather some birds might have never returned to their breeding grounds in 2000 because of drought-induced food shortages. No data exist to support this idea directly, although a study in Costa Rica during the winter and spring of 1999/2000 found most birds still present on territory in early May of 2000 (Koronkiewicz and Sogge 2000), at the same time that some birds had already arrived on the breeding grounds on the U-Bar (pers. observ).

In general, populations tend to expand into new areas when they are increasing, and often contract spatially when declining (Caughley 1977). In the Cliff-Gila Valley in 2000, we witnessed local contraction away from the peripheries of the population. Relatively fewer birds than in previous years nested in edge areas with willow, younger habitats, or along narrow stringers of vegetation. Most birds were concentrated in dense box elder stands, as reflected by the proportion of nests placed in that species.

The higher nest success we observed in 2000 may be an artifact of this apparent contraction. The birds nesting in these highest-quality areas may experience high nest success every year. In prior years, additional birds inhabiting marginal areas may have experienced poor nest success, thus diminishing the overall average success rate. Nest success has shown a strong and significant negative correlation with population size in the Cliff-Gila Valley from 1997 to 2000 (Fig. 3), which would lend credence to this hypothesis. Alternatively, some other density dependent factor may have influenced nest success, though what that factor may have been is unclear.

Factors affecting patch occupancy and flycatcher density. – Within the Cliff-Gila valley, habitat patches exhibited a range in density of Willow Flycatchers, including numerous patches with no birds at all. At a basic level, the birds occupied only the more mature, taller, and more structurally complex patches. We ignored the younger, simpler patches in our analyses. Among those older, more complex patches, flycatchers showed distinct preferences for larger, longer patches with a higher proportion of box elder, relatively lower variation in the density of shrubs, and those closer to water and to the next nearest patch. Most of these variables are partially correlated with each other. For example, box elder tends to be more frequent in patches closer to water. In part because of these correlations, a logistic regression model identified only three variables as significant predictors of patch occupancy: box elder, distance to the next nearest patch, and variation in shrubs. The model successfully categorized a higher percentage of occupied (96%) than unoccupied patches (78%). This may reflect the fact that occupied patches varied less in the various measurements than did unoccupied patches. It may also mean that some unoccupied patches (those incorrectly categorized as occupied) are in fact suitable for

flycatchers, but have not yet been colonized. Thus, the area may not be fully saturated with flycatchers yet.

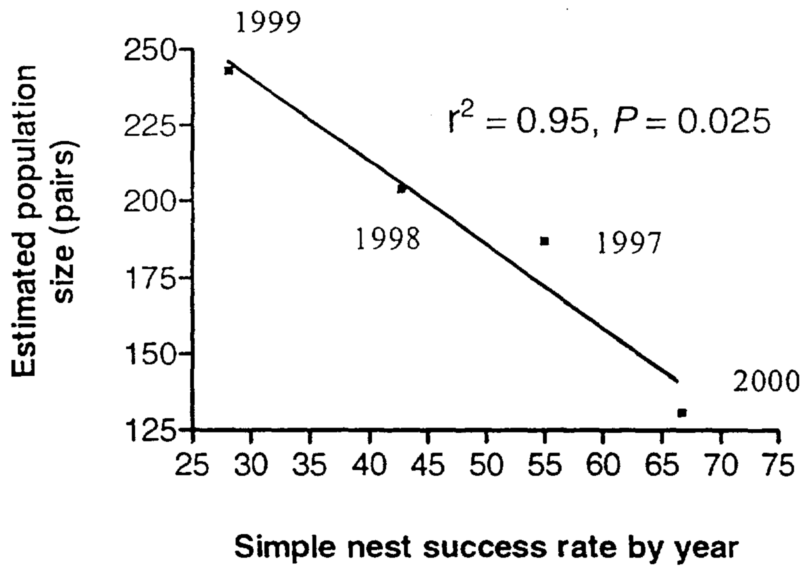

Figure 3. Flycatcher nest success has been strongly and negatively correlated with population size.

Previous studies of this population of flycatchers have shown that box elder is strongly preferred for nesting (Stoleson and Finch 1999a, b). Therefore, it seems logical that patches with an abundance of the preferred nesting tree would be more likely to have flycatchers than those without. The second variable, distance to nearest patch, suggests that flycatchers are more likely to colonize and occupy habitat patches that are near other habitat patches rather than isolated. Perhaps the likelihood of flycatchers dispersing among patches decreases with distance between patches, as has been shown with other birds (Greenwood and Harvey 1982). Finally, although occupied and unoccupied patches did not differ significantly in the average number of shrubs per sample point (Table 4), occupied patches had considerably less variation within the patch. This suggests that Willow Flycatchers tended to avoid the extremes of very dense undergrowth and very open understory. Although often thought of as a shrub-inhabiting bird, the flycatcher's weak feet and short legs make it unsuitable for hopping through dense thickets. At the other extreme, very open understories may provide inadequate cover from predators or substrates for insect prey.

Not only was the proportion of box elder a significant predictor of patch occupancy, but also it was the sole variable found to be significantly correlated with flycatcher density. This too can be attributed to the strong preference birds in this population show for nesting in box elder.

Factors affecting Willow Flycatcher nest success and brood parasitism. – Assessing correlates of nest success based on a per-patch average is necessarily a coarse-level analysis for a variety of reasons. Habitat within patches may vary, as may the ability for observers to locate and monitor flycatcher nests. Most nest failures in this population result from predation (Stoleson and Finch 1999a). Therefore, any factors we identify as significant correlates of nest success may in fact be irrelevant to the flycatcher itself, but instead may represent correlates of density of the particular suite of predators found at the site. However, even if that were the case, our findings remain relevant for at least this site.

We identified a variety of variables that were significantly associated with nest success in both bivariate and multiple regression analyses, although the two analyses found different sets of correlates (Tables 7 & 8). Generally, nest success tended to be higher in more mature patches: those with taller and more closed canopies, more trees in the larger size classes (and so higher basal area), and fewer trees in the smallest size class. Bivariate regressions suggested that nest success tended to increase with distance from the nearest occupied patch, though any biological explanation for such a relationship is unclear. As nearest occupied patch was not found to be a significant predictor of patch-wise nest success in the logistic regression analysis, its inclusion in the bivariate may be an artifact of this particular data set or completely spurious. Equally inexplicable was the inclusion in the logistic regression of both patch area and floodplain width, both negatively correlated with nest success. Perhaps larger patches, or patches in wider floodplains, were more likely to be used as hunting grounds for the major avian predators at the site (Cooper's Hawk *Accipiter cooperii*, and Common Raven *Corvus corax*). Further work is needed to verify and understand these relationships.

As with nest success, the patch-wise rates of brood parasitism were associated with different variables in the bivariate and multiple regression analyses. The bivariate analyses suggested that as patch width, and so area, increased, so did average parasitism rates. Why this might be so is unclear, as it seems contrary to patterns reported from fragmented forests in the Midwest and Eastern states (Robinson et al. 1995). One possible explanation is that like other flycatchers, Willow Flycatchers demonstrate conspecific attraction – that is, birds tend to be clumped in distribution across a landscape. Anecdotal information suggests that dispersing birds, especially young birds, are most likely to settle close to other flycatchers whenever possible, rather than cuing in to any particular aspect of the habitat itself (Muller et al. 1997). By doing so, larger clusters of flycatchers in larger patches are more likely to include many young, inexperienced birds occupying less suitable or marginal microhabitats within the patch. These inexperienced birds are most likely to be the ones parasitized or depredated. Such a pattern was documented in Hooded Warblers (*Wilsonia citrina*; Stutchbury 1997).

Based on the logistic regression analysis, box elder was the only significant predictor of patch-wise parasitism rates. With an increasing proportion of box elder, patch parasitism rates tend to decline. This result may help to explain why these flycatchers prefer box elder as a nesting tree. In previous analyses at the scale of nest site, we found that nests in box elder were much less likely to be parasitized than were nests in either willows or Russian olive, the next most frequent nesting substrates in this population (Stoleson and Finch in review).

Landscape-level processes in a linear riparian ecosystem. – Edge effects are best recognized at the scale of individual nests, rather than whole patch. However, as narrower patches have a greater portion of their area close to edges than do wider patches, any correlate of patch width could be considered an indication of an edge effect. Patch width was significantly correlated only with brood parasitism, and that was a positive correlation: the wider the patch, the higher the average parasitism rate. This contrasts with the predicted pattern if edge effects pertained to this system. In previous analyses at the nest site scale, we found no significant differences in distance to edge between successful and failed nests, or between parasitized and nonparasitized nests, supporting our finding reported here of no evidence for edge effects (Stoleson and Finch 1999a).

Evidence for patch size effects. – Although larger patches were more likely to be occupied by flycatchers, we found no data to indicate that patch size affected Willow Flycatchers in the same way it affects forest interior species in the East. Our analyses suggest that average rates of nest success actually decreased with increasing patch size, and brood parasitism rates increased with increasing patch size – both opposite to the usual conception of patch size effect. Willow Flycatchers in the Southwest occur in habitat that is naturally patchy, so it was expected that we found no negative impact of small patch size. However, the opposite effect, of apparent benefit from smaller patches, is unexpected. As mentioned above, this apparent inverse effect may result from conspecific attraction. It should be noted that in eastern forests, benefits from breeding in larger patches accrue only with patches >1000 m wide – much larger than any habitat patches found on the Gila River (Robinson et al. 1995).

Management implications. – Although grazing has been identified as a major causal factor for the decline and endangerment of the southwestern Willow Flycatcher (USFWS 1995), we found no significant negative impact of grazing on flycatcher nest success or brood parasitism in this system. In fact, grazing was associated with a higher likelihood of patch occupancy and higher densities of flycatchers. This association does not necessarily reflect a causal relationship, however.

We feel the reason for this apparent paradox is the type of grazing management practiced at our study site, compared to that practiced in other areas of the Southwest. Almost all of our grazed patches are part of the U Bar Ranch, which practices a very progressive management style based on rapid rotations and adaptive management. They employ no fixed rotation schedules, and most patches that are grazed support cattle only in fall and/or winter, and then for brief periods. How our assessment of grazing impacts might apply to other grazing management practices is unknown. The type of management practiced by the U Bar is becoming increasingly common throughout the West, however (Ehrhart and Hansen 1997, Leonard et al. 1997).

Importance of box elder. – It should be apparent that the one factor most significantly and strongly associated with Willow Flycatcher occurrence and success in the Cliff-Gila Valley is the prevalence of box elder. This tree species seems to define prime flycatcher habitat both at the nest site and patch levels. Our study site is unusual among Southwestern Willow Flycatcher sites in the use of box elder, primarily because most of this tree's range lies well above the elevations where the flycatcher is most frequently found. Furthermore, box elder is most common along

steep-sided, high-gradient montane streams (Carter 1997), which are unsuitable for Willow Flycatchers. Thus, our findings concerning box elder may be mostly irrelevant to most other active Willow Flycatcher sites in the Southwest. However, these results may be very important within this valley, and in other floodplain riparian areas at similar or higher elevations. In these mid-elevation areas, flycatchers may benefit from management that actively promotes box elder. Box elder is a secondary successional, shade-tolerant species that may become established only slowly, if ever, in disturbance-prone sites.

Future Project Goals

In 2001, we hope to expand our characterization of Willow Flycatcher habitat at larger spatial scales to allow a more robust analysis. Specifically, we hope to measure more habitat patches in the Cliff-Gila Valley, including more patches of younger growth. Most of the analyses presented here pertain to patches rather than landscapes. Therefore, we will work to obtain more and better measures of landscape-level features, such as stream gradients, canyon depths, and channel widths. We will also continue to band birds and begin to analyze patterns of within-site movement, site fidelity, and survival. And, as in previous years, we will conduct official flycatcher surveys in collaboration with Paul Boucher of the Gila National Forest, and find and monitor flycatcher nests.

ACKNOWLEDGMENTS

We thank Giancarlo Sadoti, Rebecca Hunt, Bill Trussell, Cynthia Wolf, Hope Woodward for field assistance, Michael Means for banding and his GPS and GIS expertise; Paul Boucher, Jerry Monzingo, and Ralph Pope of the Gila National Forest and Dawn Meidinger, Ty Bays, and Charles Rose of Phelps Dodge Corp. for logistical and financial support; and Tamara and David Ogilvie for housing, their hospitality, and for allowing us to use their livelihood as a laboratory. This work was funded by Phelps Dodge Corporation, the Rocky Mountain Research Station, and grant #99-254 from the National Fish and Wildlife Foundation.

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APPENDIX. Population estimates of Willow Flycatchers by patch in the Cliff-Gila Valley, New Mexico, based on protocol surveys. Numbers are: pairs (+ probable single territorial males).

PATCH	Survey 1 (5/25 - 5/26)	Survey 2 (6/14 - 6/19)	Survey 3 (7/5 – 7/7)
NW1	1 (+5)	4 (+1)	4
NW2	0	0	0
NW3	0	1	3
NW4	12 (+5)	15 (+4)	16 (+1)
Bennett project	0	0	0
NW5	0 (+1)	0 (+1)	1
NW Stringer	0 (+4)	3 (+3)	3 (+2)
NE1	0	0 (+1)	0
NE2	0	0	1
NE3	1 (+ 2)	4 (+2)	1
NE4	3 (+5)	8 (+2)	5 (+1)
NE5	3 (+4)	3	3 (+1)
SW1	1 (+1)	2 (+1)	3
SW2	2 (+1)	5	5 (+1)
SW3	1 (+2)	3	5
SW4	0 (+1)	1 (+2)	2
SW5	0	0	0
SW Crescent	0	1 (+1)	0
SW Stringer	2 (+1)	1 (+2)	3 (+2)
SE1	7 (+11)	19 (+2)	35
SE2	3 (+1)	14	8 (+1)
SE3	5 (+1)	7 (+1)	6
SE4	6 (+1)	6 (+1)	5
SUBTOTAL U Bar	47 (+46) = 93 terr.	97 (+24) = 121 terr.	109 (+9) = 118 terr.
Fort West Ditch	0 (+5)	4 (+1)	4
Gila Bird Area	0	4 (+1)	2
TOTAL	47 (+51) = 98 terr.	105 (+26) = 131 terr.	115 (+9) = 124 terr.

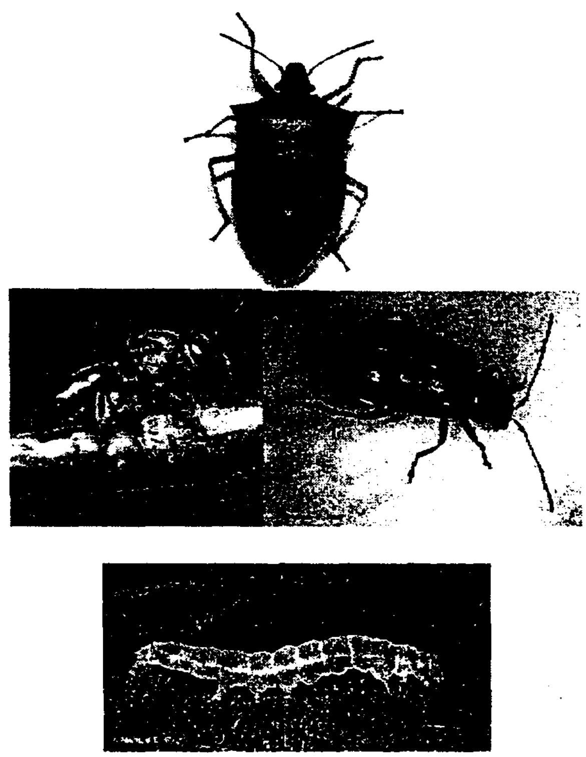
ATTACHMENT "C"

ATTACHMENT "C"

SOUTHWESTERN WILLOW FLYCATCHERS IN THE CLIFF-GILA VALLEY, NEW MEXICO

SURVEY RESULTS, NEST MONITORING, AND A PRELIMINARY ANALYSIS OF WILLOW FLYCATCHER DIET

Draft Summary Report for the 2001 Field Season
March 2002



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Executive Summary

The year 2001 was similar to 2000 for Southwestern Willow Flycatchers in the Cliff-Gila Valley. Population size increased only slightly, although the birds' distribution within the Valley changed somewhat. Notably, the number of breeding pairs in the Bennett Restoration project increased to 6 pairs, making that project's flycatcher population larger than that of 75% of the approximately 200 known sites rangewide.

We located 132 Willow Flycatcher nests. As in 2000, the average nest success was high – 67% overall. Nest success was particularly high in box elder (*Acer negundo*), and poor in willows (*Salix* spp.). Many birds had second broods. Unlike 2000, cowbirds were rather common this past year, and the flycatchers were subject to relatively high levels (16.5%) of parasitism. We noted the first reported instance of nest predation by American Kestrels *(Falco sparverius)*. As per usual for this site, most nests (81%) were in box elder, and most were place high (average = 8.5 m). In 2001, we found the first two documented Willow Flycatcher nests in net-leafed hackberry (*Celtis reticulata*).

We report here the results of a collaborative study of flycatcher diet initiated in 1999. Based on fecal samples from 23 banded birds and insect sampling conducted in 1999, we demonstrate that Gila birds ate a variety of prey taxa, predominately bees and wasps, but also substantial amounts of true bugs, true flies, and beetles. Proportions of arthropod taxa in the Gila diet differed from those at sites in Arizona and California. We used sticky traps to sample the arthropod community in three riparian patches on the Gila that varied in density of flycatchers and amount of water. Little difference was found among the three sites; what variation there was in arthropod abundance did not correspond to flycatcher densities. Because the flycatcher diet on the Gila was more similar to diets elsewhere in the Southwest than it was to the general arthropod community on the Gila, we suggest that the Southwestern Willow Flycatcher may be a diet specialist rather than a generalist. As such, there is the potential for the subspecies to be subject to food limitation.

INTRODUCTION

The Southwestern race of the Willow Flycatcher (*Empidonax traillii extimus*) is a critically endangered Neotropical migrant bird that breeds exclusively in densely vegetated riparian areas in the region. Approximately 900 pairs were known to exist in 2000, with the largest population in the upper Gila River Valley in New Mexico (USFWS 2001). It is currently considered the top priority species for US Fish and Wildlife Service Region 2.

Although recent research has shed light on various aspects of Willow Flycatcher biology and habitat associations (see Finch and Stoleson 2000, U.S. Fish and Wildlife Service 2001), its food habits remain only poorly known. Previous information on diet has been only cursory (Beal 1912, Bent 1942, and McCabe 1991). To date, two descriptive diet studies have been conducted on the southwestern subspecies at several sites in California, Arizona and Colorado (Drost et al. 1998, 2001). Based strictly on analysis of fecal samples, those studies documented a wide variety of arthropod prey including both aquatic and terrestrial taxa. This variety of prey items suggests the Willow Flycatcher may be considered a generalist insectivore, but that characterization cannot be made without an understanding of prey availability. Whether or not the Willow Flycatcher is indeed a generalist or whether it specializes in particular prey has important implications for management, especially since observed diets varied among habitat types (Drost et al. 1998) and among sites (Drost 2001).

OBJECTIVES

Our goals for this study in 2001 were:

1. Survey for flycatchers following standardized protocols to estimate population sizes in the Cliff-Gila Valley.
2. Locate and monitor nests of Willow Flycatchers to assess levels of nesting success, cowbird parasitism and predation.
3. Characterize and quantify vegetation at nests sites.
4. With collaborators from the New Mexico Natural Heritage Program and Colorado State University, describe quantitatively the diet of the Willow Flycatcher.

Due to insufficient funding, no banding was conducted in 2001.

This report presents the results of the fifth year of the study.

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 toward the Burro Mountains. The study was primarily conducted from just below the US Route 180 bridge upstream to the north end of the U-Bar Ranch (approximately 5 km). In addition,

flycatchers were studied in two disjunct sections of the valley: (1) the Fort West Ditch site of the Gila National Forest and adjacent holdings of The Nature Conservancy's Gila Riparian Preserve, located about 9 km upstream of the Route 180 bridge, and (2) the Gila Bird Area, a riparian restoration project comprising lands of the Gila National Forest and Pacific-Western Land Company, located some 8 km downstream of the Route 180 bridge. Most of the Cliff-Gila Valley consists of irrigated and non-irrigated pastures used for livestock production and hay farming. Elevations range from 1350 to 1420 m.

The Gila River and nearby earthen irrigation ditches are lined with riparian woodland patches of various ages and composition. Most patches support a mature woodland (>25 m canopy) of Fremont cottonwood (*Populus fremontii*), with a subcanopy of mixed deciduous trees including box elder (*Acer negundo*), Goodding's willow (*Salix gooddingii*), velvet ash (*Fraxinus velutinus*), Arizona walnut (*Juglans major*), Arizona sycamore (*Platanus wrightii*), Arizona alder (*Alnus oblongifolia*) and Russian olive (*Elaeagnus angustifolia*). The understory is composed of shrubs including three-leaf sumac (*Rhus trilobata*), false indigo (*Amorpha fruticosa*), New Mexico olive (*Forestieria neomexicana*), forbs, and grasses. Fewer patches support a shrubby, early successional growth of seepwillow (*Baccharis glutinosa*), coyote and bluestem willows (*Salix exigua* and *S. irrorata*), and saplings of the species mentioned above. Most habitat patches are less than 5 ha in area. The FS Fort West Ditch site and the Gila Bird Area are 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.

Surveys. – All riparian habitats within each site were surveyed systematically for Willow Flycatchers using standardized techniques developed by the USFWS (Sogge et al. 1997). Three surveys were conducted at each site during the periods of 15-30 May, 1-21 June, 22 June-15 July. Survey procedures entailed two observers walking through or adjacent to riparian habitat on clear, calm days between dawn and noon. Recordings of Willow Flycatcher vocalizations were played periodically to elicit responses from territorial birds. We recorded data on numbers of flycatchers, evidence of breeding by flycatchers, and presence of Brown-headed Cowbirds. All personnel of the Rocky Mountain Research Station held valid state and federal permits required for surveying and monitoring Southwestern Willow Flycatchers, and attended a mandatory survey protocol training session before initiating fieldwork.

Nest monitoring. – We searched for nests of Willow Flycatchers and other species on a daily basis. Nests were monitored every 3-7 days, following a modified (less-intrusive) version of protocols proposed by the Arizona Game and Fish Department (Rourke et al. 1999). Nest contents were observed using pole-mounted mirrors or videocameras, or 15X spotting scopes. Nests that were abandoned or destroyed were examined for evidence (e.g., cowbird eggs, mammal hairs) to ascertain causes of nest failure. We considered a nest successful if: (1) parent birds were observed feeding one or more fledged young; (2) parent birds behaved as if dependent young were nearby when the nest was empty (defensive or agitated behavior near nest); or (3) nestlings were in the nest within one or two days of the estimated fledge date. We considered a nest failed if: (1) nest contents disappeared before fledging of young was possible, assuming 10-12 d required for fledging (depredation), (2) the nest contained no Willow Flycatcher young but

contained cowbird eggs or chicks (parasitized), (3) the nest was deserted after eggs had been laid (desertion), or (4) the nest was abandoned prior to egg laying (abandonment).

Collection of diet samples. – In 1999,we collected fecal samples from adult Willow Flycatchers captured in mist-nets by their voluntary evacuation during net retrieval, processing (banding, measuring, etc.), and holding. After processing each bird, we held it in an opaque, well-ventilated cotton bag in an undisturbed location for at least 20 minutes before release. We collected additional fecal deposits opportunistically. Droppings were immediately placed in glass vials containing 70% Ethanol. Location, date, and sample number were written on each vial. Additional information on bird and habitat could be referenced from the sample number. A total of 23 fecal samples were collected during late May, late June and late July 1999.

Identification of diet samples. – Individual samples were transferred to microscope dishes and examined under a 10-45x stereo-zoom microscope. Fragments of bodies, wings, legs, head capsules, mouthparts, or antennae were sorted, grouped, and identified to the finest taxon based on comparisons to reference arthropods and taxonomic literature. Our reference of distinguishable arthropod parts came from sweep-net samples of the foliage during the same dates. For each taxon, we estimated the minimum number of individuals represented based on recognizable parts (e.g. pairs of wings, or head capsules).

Statistical description of diet samples. – We summarized diet samples in several ways: number of prey items per sample, number of different identified taxa per sample, number of each prey taxon across all samples, and percent occurrence (frequency) of each prey taxon in samples (proportion of samples in which a specific prey taxon was found). Small sample sizes precluded any statistical analysis of temporal trends within groups. For analyses we used and present information on the 6 most frequent arthropod orders, and pool all others as *other.*

Collection of arthropod community samples. – To sample the arthropod prey available within Willow Flycatcher habitat, we used sticky traps (Cooper and Whitmore 1990) placed in 3 different riparian patches in the Gila Valley. One patch (SE1) was adjacent to the Gila River, received irrigation runoff, contained a swampy wetland, and supported a very high density of flycatchers (7.7 pairs/ha). Another patch (NW1) was adjacent to the river and supported a low density of flycatchers (1.5 pairs/ha). The third patch (NW2) was distant (>200 m) from the river and other water sources and had no flycatchers. Otherwise, the woodlots were similar in size (4.2 – 5.1 ha) and vegetation composition and structure.

We randomly selected trees used for nesting by flycatchers in 1998 as arthropod sampling sites in SE1 (10 sites) and NW1 (8 sites). As the NW2 patch did not support breeding flycatchers, we selected 8 pseudo-nest trees based on a qualitative assessment of the available vegetation that was most similar to nest sites in occupied patches. All pseudo-nest trees selected in NW2 were box elders comparable in height (8-16 m) and structural complexity to those used in the other two patches.

For six weeks beginning 6/10/99, we placed 3 fresh sticky traps around nest trees each week based on the following protocol. A random azimuth and distance (between 0-15 m) from the nest tree were chosen to locate the first sticky trap. Second and third traps were placed at

random distances (0-15 m) from the nest tree, at 120° and 240° from the first trap for maximum radial spacing between traps. Sticky traps were hung 1-2 m off the ground in the vegetation at each selected point using tiepins. For points lacking vegetation, we fastened traps approximately 1 m off the ground to wooden survey stakes inserted in the ground. Each trap was exposed for a period of 4 days, as test samples indicated at least some sticky traps approached saturation with arthropods after 4 days exposure.

ANALYSES

Overlap index. – We used two indices to quantify dietary overlap: Horn's index and Pianka's index (Litvaitis et al. 1996). Drost's studies (1998, 2001) report only summary data, so we were unable to use the somewhat more precise Morisita's Index (Litvaitis et al. 1996). The formula for Horn's index is

$$R_o = \frac{\sum (P_{ij} + P_{ik})\log(P_{ij} + P_{ik}) - \sum P_{ij}\log P_{ij} - \sum P_{ik}\log P_{ik}}{2\log 2}$$

and that of Pianka's index is

$$O_{jk} = \frac{\sum P_{ij}P_{ik}}{\sqrt{\sum P^2_{ij} \sum P^2_{ik}}}$$

where P_{ij} = proportion order i is of total prey taken at location j, and P_{ik} = proportion order i is of total prey taken at location k. The formulae yield R_o and O_{jk}, estimates of the percent of diet overlap, at the taxonomic level of order, between flycatchers at locations j and k. We compared the proportions of arthropod orders detected in fecal samples to their proportions in sticky trap samples to assess whether prey items were taken in proportion to their abundance. We compared Southwestern Willow Flycatcher diet in the Gila Valley to that reported from three other sites: the Kern River Preserve (n = 16 samples), the Salt River inflow to Roosevelt Lake (n = 11), and the Tonto Creek inflow to Roosevelt Lake (n = 9). All comparisons are based on fecal samples obtained from breeding adult flycatchers at each site. Data from the Kern Preserve and Roosevelt Lake sites come from Drost et al. 1998 and Drost et al. 2001.

RESULTS

Climate in 2001. – The drought that impacted the Cliff-Gila Valley in 1999 and 2000 continued intermittently into July of 2001. Substantial rains fell in the Cliff area in October and November of 2000, but failed to make up for the net deficit in precipitation. That net deficit continued throughout 2001 (Table 1). The monsoon rains began relatively early in June of 2001 but were light until August, when most flycatcher breeding was already complete. Thus, the overall pattern of precipitation pattern for the 2001 breeding season was generally dry.

Table 1. Precipitation at Cliff, New Mexico, for 2000 and 2001, and annual averages for 1936-1999. Data from the Western Regional Climate Center (2001).

	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sep.	Oct.	Nov.	Dec.	TOTAL
2000 precip.	0.06	0.07	0.80	0.03	0.00	2.19	1.63	2.54	0.04	3.20	2.14	0.18	12.88
2001 precip.	0.74	0.84	0.08	0.68	0.34	0.74	1.70	5.13	0.84	0.00	0.28	0.00	11.37
Average (1936-99).	1.00	0.94	0.86	0.33	0.35	0.53	2.77	2.84	1.65	1.28	0.71	1.16	14.52
2001: % of normal	74	89	9	206	97	140	61	181	51	0	39	0	78
2001: cumulative (in.) deviation from norm since Jan '01	-0.3	-0.4	-1.1	-0.8	-0.8	-0.6	-1.7	0.6	-0.2	-1.5	-1.9	-3.1	
2001: cumulative (in.) deviation from norm since Jan '00	-1.8	-1.9	-2.7	-2.3	-2.3	-2.1	-3.2	-0.9	-1.7	-3.0	-3.4	-4.6	

Willow Flycatcher population surveys. – In 2001, the number of Willow Flycatchers in the Cliff-Gila Valley remained about the same as in 2000 (Fig. 1). A total of 132 territories were detected, of which 126 were found on the U Bar Ranch. The number of birds on the U Bar actually increased slightly (4%) compared to last year, while the number elsewhere in the valley dropped by another 40% (Appendix). The birds remained relatively common in the core areas of prime habitat, but showed some subtle changes in distribution within the Valley. The number of birds in the large SE1 patch declined considerably, from over 50 pairs in 1998-99 to only 20 pairs in 2001. Part of this apparent change may have been a lower detection rate due to both fewer observers in the field, and attenuation on the part of the flycatchers to the tape used for surveying. On several surveys we failed to detect all the pairs whose nests we were then monitoring, which indicates that the survey protocol regularly underestimates the number of birds. Perhaps the most notable change was in the Bennett Restoration project, which this year supported at least six breeding pairs. Also, a single pair recolonized NW2, which has not had flycatchers since at least 1995.

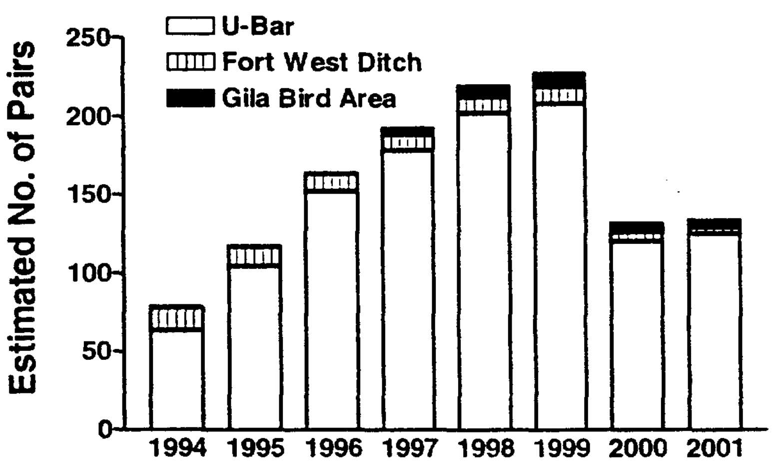

Figure 1. Population estimates of Willow Flycatchers in the Cliff-Gila Valley, 1994-2001.

Flycatcher nests. – Willow Flycatchers in the Cliff-Gila Valley bred prolifically in 2001. W located 132 nests, and found evidence (fledglings) of another 4 that were never located. Of these, 107 (81%) were placed in box elder, a proportion similar to the 84% in 2000. Willows were the next most frequent nest tree (11 = 8%). A few nests were found in several other tree species (Table 2). Of note were two nests (consecutive attempts by a single pair) in a single large net-leaf hackberry (*Celtis reticulatus*). We believe this report constitutes the first known use of this species by Southwestern Willow Flycatchers (Sedgwick 2000, USFWS 2001). Willow Flycatchers appeared to nest especially high in 2001. Nest heights ranged from 2.0 to 22.9 m in height, with a mean height of 8.5 ± 4.0 m and a median of 8.4 m (Table 3). As usual, the highest nests were in box elder.

Table 2. Nest substrates, nest heights, and comparative nest success by substrate (based on nests of known outcome) for Willow Flycatcher nests in the Cliff-Gila Valley, 2001.

Nest Substrate	N	Mean nest ht. (m)	Range nest ht. (m)	% successful (N)
Box elder	107	9.5 ± 3.5	2.0 – 22.9	74% (81)
Goodding's willow	10	3.2 ± 1.4	2.0 – 6.0	0% (7)
Fremont cottonwood	6	5.3 ± 2.5	3.0 – 10.0	33% (3)
Seepwillow	2	3.1	2.2 – 4.0	50% (2)
Net-leaf hackberry	2	4.2	3.9 – 4.5	50% (2)
Saltcedar	2	3.1	2.9 – 3.3	50% (2)
Russian olive	1	8.0	–	100% (1)
Arizona alder	1	12.0	–	100% (1)
Coyote willow	1	2.0	–	– (0)
TOTAL	132	8.5 ± 4.0	2.0 – 22.9	67% (99)

Willow Flycatcher nest success. – As in 2000, flycatchers in the Cliff-Gila Valley enjoyed very high rates of nesting success in 2001, despite (or perhaps because of) relatively low population numbers. Again this past year, 67% of nests fledged one or more young. As in 2000, many pairs raised a second brood after successfully fledging their first: an estimated 19 were second broods after successful first broods. In addition to the 132 nests that were found, we found fledglings being fed in four territories where no nest was found. A minimum of 80 fledglings was produced from flycatcher nests on the U Bar, although the actual number was probably two or more times that amount. As in previous years, the likelihood of a nest being successful appeared to vary among nest tree species, although small sample sizes for most species preclude statistical analysis. Almost three quarters of nests in box elder fledged young, compared to no success in Goodding's willow (Table 2).

Causes of nest failure. – Of the 34 nests known to have failed, ten failed due to unknown causes (although these were probably depredated). Six failed due to weather (blown out of tree during a storm). The remainder failed due to predators ($n = 8$), abandonment ($n = 6$), or cowbird parasitism ($n = 4$). This year we witnessed one nest with older fledglings (ca. d. 9-10) being

depredated by an American Kestrel (*Falco sparverius*), the first recorded instance of this small raptor as a predator on flycatchers.

Cowbird parasitism. – Brown-headed Cowbirds (*Molothrus ater*) appeared to be particularly abundant in the Cliff-Gila Valley in 2001 compared to prior years. We witnessed at least 5 Lucy's Warblers (*Vermivora luciae*) feeding cowbird fledglings; this cavity-nesting species tends to be parasitized only very rarely (Stoleson et al. 2000). Among other species we monitored opportunistically, 35% of Blue Grosbeak (*Guiraca caerulea*) nests and 45% of Yellow-breasted Chat (*Icteria virens*) nests were parasitized. Among the 85 Willow Flycatcher nests for which we could positively ascertain parasitism status, 14 (16.5%) were parasitized; 4 of these still fledged flycatcher young successfully. Most of the nests of unknown parasitism status were high nests that were successful, and so probably were not parasitized.

Willow Flycatcher diet on the Gila. – Flying Hymenoptera (bees and wasps) constituted 42% of the identifiable insect remains in the fecal samples from the Gila Valley (Table 3). Another 42% consisted of Hemiptera (true bugs), Coleoptera (beetles), and Diptera (true flies). The remainder of the fecal samples included ants (Hymenoptera), Homoptera (plant/leafhoppers), Thysanoptera (thrips), Odonata (damselflies, dragonflies), Neuroptera (lacewings, snakeflies), and miscellaneous material such as sand grains and willow flower parts (Table 1). Fifty-three percent of the Hymenoptera in our samples were a small bee (subfamily Apoidea, 1-2 mm in size). The remainder consisted of parasitic wasps such as cuckoo wasps (family Chrysididae), chalcid wasps (superfamily Chalcidoidea) and a medium sized sphecoid wasp, superfamily Sphecoidea.

The Hemiptera parts in the samples resembled those of seed bugs (family Lygaeidae) and leaf bugs (family Miridae). Coleoptera fragments found were less than 3 mm. Diptera identified were primarily of the suborder Nematocera that includes midges and gnats. A dance fly (family Empididae) was identified. Only two aquatic invertebrates were found, a damselfly and a lacewing (Table 1). The frequency of diet items (proportion of samples in which a taxon was identified) followed a pattern similar to the abundance of taxa among all samples. Hymenoptera was the most widespread order, being found in over half of all samples. The other most frequent taxa were true bugs (Hemiptera), beetles (Coleoptera), and true flies (Diptera) (Table 3).

Arthropod Community Structure on the Gila. -- Sticky trap samples at all three Gila sites were overwhelmingly dominated by thrips (Thysanoptera). Other predominant orders were Diptera, Hymenoptera, Coleoptera, Homoptera, and Araneae (Table 4).

The proportion of arthropod orders among Cliff-Gila sample sites was very similar: each pair of sites had >88% overlap (Table 4). The proportion of arthropod orders at the site with the high WIFL density (SE1) was most similar to that at the dry no-WIFL site (NW2), with an overlap index of 90%. The SE1 site showed slightly lower overlap with the intermediate site (NW1), but overall there was no statistically significant difference among sites in the proportion of arthropods among orders ($\chi^2 = 9.7$, df = 12, $P = 0.64$).

Table 3. Numbers and percent frequency of prey taxa in the diet of mist-netted Southwestern Willow Flycatchers from the Gila National Forest, New Mexico based on fecal samples collected during May to July, 1999 ($n = 23$ samples). Taxa are listed in descending order based on numbers of individuals identified in the samples. Category Other was excluded from percentage of prey. Frequency in samples (%) is the number and percentage of samples in which that taxon was identified.

Order	Common prey/ items	Number of prey (%)	Frequency in samples (%)
Hymenoptera	bees, wasps	25 (42)	12 (52)
Other	sand grains, willow flowers and pollen	16	3 (13)
Hemiptera	true bugs	10 (17)	8 (35)
Coleoptera	beetles	9 (15)	7 (30)
Diptera	true flies	6 (10)	5 (22)
Hymenoptera/ant	ant (wingless)	3 (5)	3 (13)
Homoptera/cicadellid	plant/leafhoppers	3 (5)	2 (9)
Thysanoptera	thrips	1 (2)	1 (4)
Odonata	damselflies, dragonflies	1 (2)	1 (4)
Neuroptera	lacewings, snakeflies	1 (2)	1 (4)
None	digested material	1	

Table 4. Numbers (and percentages) of arthropods collected in sticky traps at three sites in the Cliff-Gila Valley, N.M. The three sites supported high density (SE1), low density (NW1), and no Southwestern Willow Flycatchers. Taxa are listed in the same order as in Table 3.

		Site					
Order	Prey Type	SE1		NW1		NW2	
Hymenoptera	bees, wasps, ants	1,084	(4.8)	1,485	(9.1)	1,516	(8.1)
Hemiptera	true bugs	228	(1.0)	138	(0.8)	69	(0.4)
Coleoptera	beetles	830	(3.6)	1,332	(8.2)	1,026	(5.5)
Diptera	true flies	3,208	(14.1)	3,369	(20.7)	2,927	(15.7)
Homoptera/cicadellid	plant/leafhoppers	1,013	(4.4)	941	(5.8)	619	(3.3)
Thysanoptera	thrips	15,990	70.3	8,423	(51.8)	12,011	(64.4)
Odonata	damselflies, dragonflies	0	(0)	0	(0)	0	(0)
Neuroptera	lacewings, snakeflies	0	(0)	7	(<0.1)	2	(<0.1)
Aranaea	spiders	223	(1.0)	308	(1.9)	226	(1.2)
Other	all other	182	(0.8)	276	(1.7)	261	1.4

The numbers of arthropods sampled by sticky traps did vary significantly among the three Gila sites and over time (ANOVA with site and week as classifying factors: $F_{16, 21761}$, $P < 0.01$). Post hoc tests (Bonferroni) indicated arthropod numbers were significantly greater in SE1 than in NW2, and significantly greater in NW2 than in NW1 (see Table 4). These results were similar whether thrips were included in analyses or not. Numbers of Hymenoptera, the most common prey taxon, were inversely correlated with flycatcher density: SE1 had the fewest and NW2 had the highest numbers. Because there were no significant differences in the proportions of prey taxa among the Cliff-Gila sample sites, we compared our diet samples to a composite arthropod community from all 3 sites.

Comparison of flycatcher diet with the Gila arthropod community. -- The proportions of arthropod orders represented in the diet samples differed significantly from the proportions determined from our sticky traps ($\chi^2 = 113.2$, df = 7, $P < 0.001$). The degree of overlap between diet and sticky traps was only 45% based on Horn's index, and only 21% based on Pianka's index.

Thrips made up an overwhelming proportion of the arthropods in our sticky traps, yet appeared to be taken only rarely by the flycatchers (Tables 3 & 4). It may be inappropriate to consider thrips as available prey since the birds rarely took them, and to do so is likely to skew comparisons of diet and available arthropods. We therefore compared the proportion of arthropod orders in flycatcher diets and sticky traps excluding thrips from both samples. Again, the diet differed significantly from the traps ($\chi^2 = 51.0$, df = 6, $P < 0.001$). The degree of overlap was 67% by Horn's index, and 60% by Pianka's. Both Hymenoptera and Hemiptera were over-represented in the diet samples compared to the sticky traps (Figure 2). Homoptera and Diptera were disproportionately scarce in the diet samples. Coleopterans were taken in proportion to their abundance.

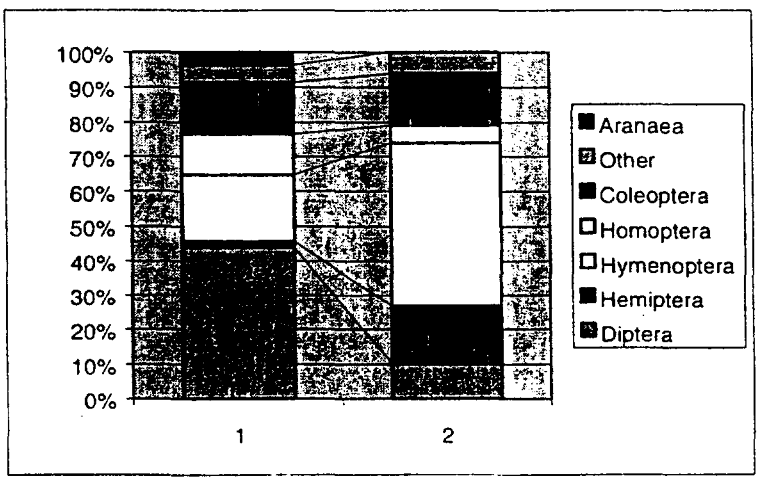

Figure 2. Proportions of major arthropod orders in Southwestern Willow Flycatcher diet (2) and the arthropod community as sampled by sticky traps (1). These graphs exclude thrips (Thysanoptera); differences are exaggerated when thrips are included.

Willow Flycatcher diet among breeding sites. -- The composition of Willow Flycatcher diets was only moderately similar among breeding sites: levels of overlap ranged from 71% to 83% based on Horn's index, and 52% to 84% based on Pianka's index (Table 5, Figure 3). The Gila differed significantly from the other three sites (all $\chi^2 \leq 29.0$, df = 6, $P < 0.001$). Diet on the Gila was most similar to that on the Tonto, and most different from the Kern Preserve (Figure 3). The two sites on Roosevelt Lake (Tonto and Salt) were the most similar to each other (Table 5).

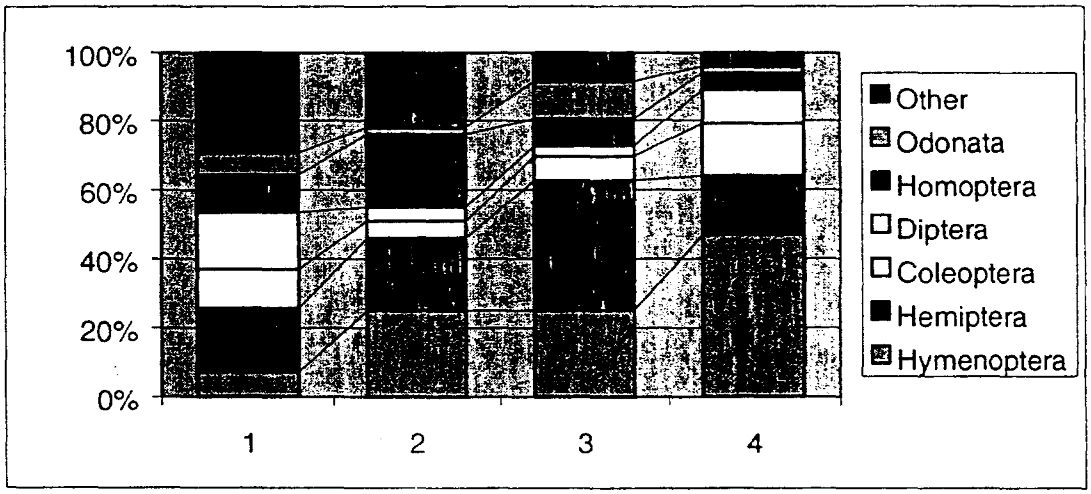

Figure 3. Proportions of major arthropod orders in the diet of Southwestern Willow Flycatchers at (1) the Kern River, CA, (2) Salt River, AZ, (3) Tonto Creek inflow to Roosevelt Lake, AZ, and (4) Cliff-Gila Valley, NM.

Compared to other sites, Gila birds preyed to a much greater extent on bees and wasps. Remains of these Hymenoptera groups were found in 52% of Gila samples, versus 36% of Kern samples. Data on frequency of prey items in samples are not available for the Arizona sites, but flying Hymenoptera were the most abundant taxa among all prey items recorded from the Salt, and the second most abundant on the Tonto (Drost et al. 2001). Beetles (Coleoptera) also made up a proportionally larger share of the diet on the Gila than elsewhere. In contrast, the proportion of leafhoppers and other Homopterans in the flycatcher diet was lowest among the Gila birds. Still, the distribution of arthropod orders in the diet of Willow Flycatchers on the Gila was more similar to that in diets in Arizona than it was to the general arthropod community from which it was taken on the Gila.

Table 5. Estimates of diet overlap among four Willow Flycatcher sites based on Horn's index (upper right), and Pianka's index (lower left).

	KERN	SALT	TONTO	GILA
KERN	-	0.82	0.77	0.71
SALT	0.82	-	0.83	0.78
TONTO	0.62	0.84	-	0.81
GILA	0.52	0.76	0.79	-

The Kern samples contained a variety of arthropod taxa not found in the Gila samples, despite our larger sample sizes. We found no recognizable termites (Isoptera), spiders (Araneae), moths and butterflies (Lepidoptera), isopods (Isopoda), or mites (Acari) in the Gila diet samples, although Lepidoptera, mites, and spiders were found in sticky trap samples.

DISCUSSION

Flycatcher numbers. – Despite a very high rate of nest success in 2000, the Cliff-Gila population of Willow Flycatchers did not grow appreciably in 2001. Possible reasons for this include: (1) low post-fledging survival either on migration or on the wintering grounds; and (2) high rates of dispersal of young birds to other sites. We have no data to explore these possibilities. However, post-natal dispersal is the norm in songbirds, and improvements in riparian habitats in numerous nearby drainages suggest that the amount of suitable habitat into which young birds could disperse is increasing rapidly. Apparently the small population downstream near Redrock, NM, has grown considerably in recent years. This growth may be due to emigration from the Cliff-Gila Valley, which is likely to function as a source population. The increase in the number of flycatchers nesting in the Bennett Restoration Project is notable, especially in light of the resistance from the USFWS and some locals to plans to carry out similar projects on the U Bar. Six breeding pairs in the Bennett give that project area alone a larger flycatcher population than over 75% of known Willow Flycatcher *sites* (USFWS 2001).

As in 2000, the flycatchers enjoyed high rates of nest success, and many pairs double-brooded. High success was achieved despite the relatively high abundance of cowbirds and high rates of parasitism in other species. These patterns reflect those recorded in 2000. We hypothesized that the lower populations of flycatchers in 2000 compared to previous years meant that birds were especially concentrated in the highest-quality sites – those dominated by box elder (Stoleson and Finch 2001). Again this year, the proportion of nests in box elder was exceptionally high, even though all of the Bennett birds were in young stands of cottonwood/willow.

Willow Flycatcher diet in the Cliff-Gila Valley. – We found that in the Cliff-Gila Valley, NM, flying Hymenoptera (non-ants) were the most abundant and widespread taxon throughout our samples, making up almost half of the identifiable prey items. True bugs (Hemiptera), beetles (Coleoptera), and true flies (Diptera) also ranked high in total numbers and in frequency of occurrence in flycatcher diet. Aquatic arthropods were not well represented in our fecal samples: only 2% Odonata (damselflies, dragonflies) compared to the 7% found in mixed riparian of samples of Arizona and Colorado (Drost et al. 1998). Cliff-Gila samples also lacked lepidopteran larvae, Trichoptera, Ephemeroptera, and non-insects such as spiders (Araneae) and pill bugs (Isopoda).

Comparison of Willow Flycatcher diet among breeding sites. – The diet of Willow Flycatchers varied among the four breeding sites. Several taxa predominated in the diet at all sites (Hymenoptera, Hemiptera, Diptera, Coleoptera). The Hymenoptera constituted a much larger proportion of the diet in Gila birds than elsewhere. Although such a result might occur if

the Gila was less diverse than the other sites, this seems unlikely. The riparian vegetation on the Gila is relatively speciose compared to the other sites (Sogge and Marshall 2000), and thus likely to support a more diverse assemblage of prey taxa. In particular, the Roosevelt Lake sites are dominated by exotic salt cedar, which may support lower arthropod diversity and density (DeLay et al. 1999). One notable exception is the leafhoppers (Homoptera:Cicadellidae), which are relatively abundant and diverse in saltcedar, and were significantly more prominent in the diet at Roosevelt Lake (Drost et al. 1998, 2001). Overall the Gila diet resembled that on the Kern in the relatively higher use of Dipterans and Coleopterans, but was more like the Salt River in low use of Odonates. Gila birds apparently did not prey on Isopterans (termites) or Araneaens (spiders); this may reflect the fact that flycatchers on the Gila tend to be high up in the subcanopy as opposed to in the understory as in other sites.

Are Southwestern Willow Flycatchers generalist foragers? – Every arthropod sampling method has inherent biases as to which types of prey it samples well (Cooper and Whitmore 1990, Poulin and Lefebvre 1997). Sticky traps primarily sample flying insects, and tend to sample only poorly such non-volant groups as lepidopteran larvae and mites (Cooper and Whitmore 1990). However, as Willow Flycatchers are primarily aerial foragers (Sedgwick 2000), we feel it is reasonable to assume that the arthropods sampled by sticky traps were representative of those taxa most available to flycatchers foraging within the study site.

We found significant differences between the relative abundance of arthropods within the Cliff-Gila Valley sampling sites and their relative abundance in the fecal samples, whether we included thrips in analyses or not. The Hymenoptera made up over 47% of the prey items, but constituted less than 10% of the arthropods caught on sticky traps (19% without thrips). Similarly, Hemipterans made up 17% of the diet, but constituted less than 1% of the available prey (2% without thrips). In contrast, 14-20% of sticky trap arthropods were Dipterans (45% excluding thrips), yet accounted for only 10% of the diet.

Thus, it appears that Willow Flycatchers on the Gila do not take arthropod prey in proportion to their availability. This suggests that the flycatcher should not be considered a generalist insectivore. Rather, it appears that flycatchers may be preying selectively on Hymenoptera and Hemiptera at this site. For example, the high use of Hymenoptera we found is not simply because bees and wasps are particularly abundant and visible – no butterflies or moths were represented in fecal samples, although they are a much more conspicuous component of the diurnal aerial arthropod fauna (pers. obs.). It is noteworthy that aquatic arthropods made up only a very small fraction of the flycatcher diet, suggesting that the flycatcher's strict association with water is *not* food-based.

The suggestion that flycatchers are not generalists is supported by the observation that the diet on the Gila was more similar to that recorded at other sites in the Southwest, including the very different Roosevelt Lake sites that are dominated by non-native saltcedar, than to the general arthropod community on the Gila. It seems likely that saltcedar habitats support a very different, and probably less diverse, arthropod community than does the mixed native riparian habitat on the Gila, as has been reported from saltcedar habitats on the Rio Grande in New Mexico (DeLay et al. 1999). Similarities in diet among sites are unlikely to be due to similarities in arthropod communities, but more likely due to similar prey selectivity among flycatchers at those sites.

It should be noted that our assessment of availability may better reflect what arthropods are present at the site rather than what is actually available to foraging flycatchers (Wolda 1990). It is unclear whether those taxa under-represented in the diet (e.g., thrips) might be less available to flycatchers than suggested by trap data because of behavioral or life history traits. For example, nocturnally active insects would be well sampled by sticky traps but may be only rarely found by diurnal flycatchers. Alternatively, certain prey types may be unpalatable and therefore taken only infrequently. Further research needs to be conducted on potential factors such as these that might skew our comparisons.

Does prey availability determine Willow Flycatcher density? – We found no significant differences in the proportions of arthropod orders among the three Gila sampling sites (Table 4). Further, although the absolute numbers of arthropods collected varied among sites, that pattern of variation did not correspond to flycatcher numbers. The site with the fewest arthropods (NW1) supported moderate numbers of flycatchers, while the site with intermediate levels of arthropods (NW2) had none. Also, the abundance of Hymenoptera, the most frequent prey taxon in the Cliff-Gila Valley, was inversely related to flycatcher density – the site with high numbers of flycatchers (SE1) had the lowest counts of Hymenoptera. These results argue that food availability *per se* is not responsible for the observed variation in flycatcher numbers among sites in the Cliff-Gila Valley.

Conservation and management implications. – Southwestern Willow Flycatchers take a wide variety of arthropod prey. Although dominated by flying insects, they also take terrestrial forms (wingless ants in this study; termites, mites, and spiders in the Arizona and Kern studies). Although flycatchers are strongly associated with water, invertebrates with aquatic stages make up only a minor component of their diet.

Despite the apparent diversity of prey items taken by the Cliff-Gila population, our results suggest the birds may not be true generalists, but rather seem to be selective in their prey choice. Their high use of relatively mobile bees and wasps suggests they may be vulnerable to accumulation of pesticides from prey that range into agricultural areas adjacent to riparian zones (Paxton et al. 1997).

Prior descriptive studies of flycatcher diet suggested flycatchers might not be limited by food, based on the diversity of prey items identified (Drost et al. 1999, 2001). We found no evidence that flycatchers in the Cliff-Gila Valley were limited by food in 1999. However, we believe that if flycatchers are indeed specializing on certain prey taxa, they could be vulnerable to stochastic or deterministic declines in the abundance of those taxa, especially in less healthy riparian ecosystems. We strongly encourage additional research on flycatcher diet to assess both prey use and availability. This research should be conducted at multiple sites, including both native and exotic dominated areas.

Future Project Goals

In 2002, we hope to expand our characterization of Willow Flycatcher habitat at large spatial scales (landscape, watershed) in collaboration with Katherine Brodhead, now of Montana State

University, to enable a greater understanding of the distribution of flycatchers in the region. And, as in previous years, we will conduct official flycatcher surveys in collaboration with Dennis Parker, and find and monitor flycatcher nests.

Acknowledgments

We thank Giancarlo Sadoti, Rebecca Hunt, and Hope Woodward for field assistance, D. Hawksworth and M. Means for helping collect fecal samples; Linda Delay and Matt Farnsworth for doing the bulk of the diet sampling and analysis; Paul Boucher, Jerry Monzingo, and Ralph Pope of the Gila National Forest and Dawn Meidinger, Ty Bays, and Charles Rose of Phelps Dodge Corp. for logistical and financial support; and Tamara and David Ogilvie for housing, their hospitality, and for allowing us to use their livelihood as a laboratory. This work was funded by the Gila National Forest, Phelps Dodge Corp., the Rocky Mountain Research Station, Colorado State University; funding for the analysis of diet samples was provided by T&E, Inc.

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APPENDIX. Population estimates of Willow Flycatchers by patch in the Cliff-Gila Valley, New Mexico, based on protocol surveys. Numbers are: pairs (+ probable single territorial males).

PATCH	Survey 1 (5/22 - 5/24)	Survey 2 (6/12 - 6/16)	Survey 3 (7/8 – 7/11)
NW1	2 (+4)	3 (+4)	4 (+1)
NW2	0	1	1
NW3	0 (+2)	3	1
NW4	6 (+4)	10 (+1)	11
Bennett project	3	6	5
NW5	0	1 (+1)	0
NW Stringer	0 (+1)	1	2
NE1	0	1 (+1)	1
NE2	0	0	0
NE3	1	1	0
NE4	4	3 (+2)	3
NE5	3 (+1)	6 (+1)	5
SW1	2 (+2)	4	3
SW2	3 (+3)	4 (+4)	7
SW3	4	4 (+1)	4
SW4	1 (+2)	4	3
SW5	0	0	0
SW Crescent	0 (+1)	0	0
SW Stringer	3 (+3)	16 (+1)	10
SE1	6 (+11)	16 (+4)	12 (+1)
SE2	10 (+4)	11 (+1)	8
SE3	2	3 (+1)	1
SE4	3	6	5
SUBTOTAL U Bar	53 (+48) = 101 terr.	104 (+22) = 126 terr.	86 (+2) = 88 terr.
Fort West Ditch	0	2 (+1)	3 (+1)
Gila Bird Area	1	2 (+1)	3 (+1)
TOTAL	54 (+48) = 102 terr.	108 (+24) = 132 terr.	92 (+4) = 96 terr.

ATTACHMENT "D"

Appendix G.
Management of Livestock Grazing in the Recovery of the Southwestern Willow Flycatcher

A. Introduction

Breeding habitat for the southwestern willow flycatcher is restricted to riparian ecosystems. As a result of multiple factors, southwestern riparian ecosystems are among the most endangered in North America. In arid western North America, livestock overgrazing has detrimental effects on riparian ecosystems (Ames 1977, Knopf and Cannon 1982, Kaufman and Krueger 1984, Skovlin 1984, Fleischer 1996, Ohmart 1996, Belsky et al. 1999), including many of the attributes of southwestern willow flycatcher nesting habitat (USFWS 1995). However, the effects of livestock grazing vary over the range of the flycatcher, due to variations in grazing practices, climate, hydrology, ecological setting, habitat quality, and other factors. Also, other stressors affect the flycatcher's habitat to varying degrees, including water management practices, stream channel control, recreational use, and agricultural activities. In some situations, these and other factors may aggravate livestock impacts, and are sometimes difficult to separate from grazing effects. Livestock grazing has been a prevalent industry in the region for 200 years or more, but there exists a limited body of rigorous industry records or scientific research that documents livestock grazing affects on the environment (Larsen et al. 1998). Most of the available research has shown negative impacts to a host of biological resources. Addressing the issue of livestock management in the context of recovery of the southwestern willow flycatcher is therefore complicated.

Ideally, this issue would be approached by examining information that specifically compares the effects of various grazing practices on the southwestern willow flycatcher and its habitat. Because this information remains to be researched, the Technical Subgroup was compelled to approach the question indirectly by reviewing literature pertaining to grazing within riparian areas. Questions we tried to address included: What direct effects does grazing have on southwestern willow flycatchers? What are the effects of grazing on southwestern riparian ecosystems? On riparian vegetation specifically? On the plants and other habitat attributes that are key components of flycatcher habitat? On riparian birds that are ecologically similar to the flycatcher?

A large body of literature related to livestock grazing and impacts to riparian habitats, the willow flycatcher, and other riparian birds was reviewed. Much of this literature came from more mesic areas of the West where ecological conditions and riparian recovery potential differ from the arid Southwest. Convincing evidence from within and outside of the flycatcher's range comes from exclosure studies such as the San Pedro River (Krueper 1992), where after major stressors – principally livestock grazing – were removed, the riparian habitat, channel morphology, and riparian bird fauna improved substantially within five years (Figures 1- 4). Although these studies lack experimental rigor, they provide evidence that in riparian habitats where livestock grazing is the major stressor, exclosure may be the quickest method of accomplishing recovery. A critical question for the Technical Subgroup is – after full recovery of flycatcher habitat and

occupancy by flycatchers, what level of grazing (other than exclosure) may be compatible with the maintenance of the riparian habitat preferred by flycatchers?

Figure 1. Photopoint 22-B, Highway 90 and San Pedro River, San Pedro Riparian National Conservation Area, July 4, 1987. Photo courtesy of David J. Krueper, BLM.

Figure 2. Photopoint 22-B, San Pedro Riparian National Conservation Area, July 6, 1992, after five years of no grazing. Photo courtesy of David J. Krueper, BLM.

Figure 3. Photopoint 31, Greenbrush Draw and San Pedro River, San Pedro Riparian National Conservation Area, July 5, 1987. Photo courtesy of David J. Krueper, BLM.

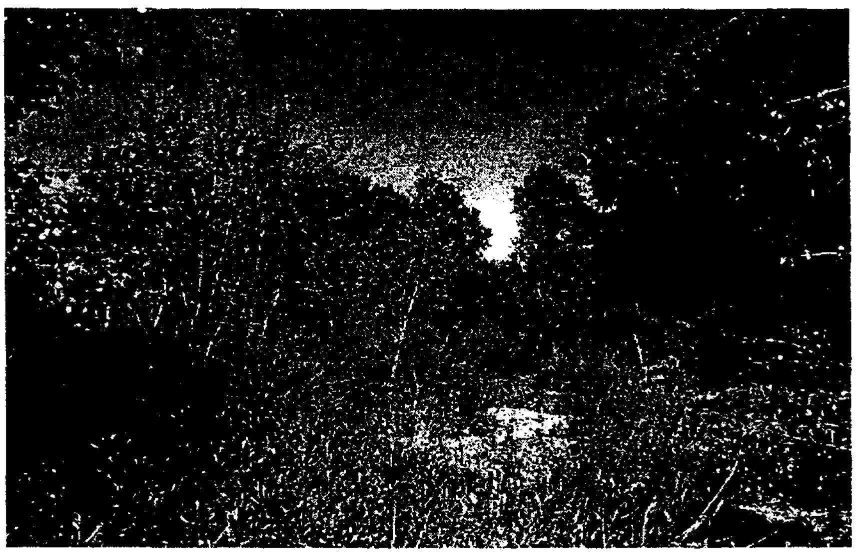

Figure 4. Photopoint 31, San Pedro Riparian National Conservation Area, July 17, 1992, after five years of no grazing. Photo courtesy of David J. Krueper, BLM.

While reading this document, it is important to remember that livestock grazing is not a single-faceted activity. Grazing has parameters of extensiveness (wide-spread), intensiveness (number of animals, season of use, various grazing systems), and species-specific (cattle, horses, elk, burros, sheep, goats, llamas, etc.). This discussion is intended to provide general concepts of potential impacts and management measures. The effects of each would vary among these parameters of livestock grazing. Concepts and recommendations expressed herein are derived principally from interpreting research on the effects of livestock on biological resources. The Technical Subgroup acknowledges that, as with domestic livestock, excessive utilization of herbaceous and woody vegetation can occur by ungulates such as elk (*Cervus elaphus*) (Kay and Chadde 1992, Singer et al. 1994, Wagner et al. 1995). Even in the absence of domestic livestock grazing, elk can over-utilize riparian areas if not properly managed (Treadaway et al. 1999), requiring some corrective measures to balance this pressure with maintenance of other ecological functions. Management of ungulates as game animals is the responsibility of State game agencies, and is largely beyond the scope of a livestock grazing review. This issue paper addresses grazing by domestic livestock; grazing and browsing by native ungulates will be discussed in the Southwestern Willow Flycatcher Recovery Plan.

B. How Livestock Grazing Can Impact Southwestern Willow Flycatchers

Impacts of livestock grazing on southwestern willow flycatchers and their habitat fall into several general categories. The primary impacts are on habitat availability and suitability. Of lesser severity are the impacts of destroying nests with eggs or young, and facilitating brood parasitism by brown-headed cowbirds. These impacts are discussed below.

1. Impacts on Habitat Availability and Suitability

Because livestock use riparian vegetation for forage, and because riparian plant structure largely defines southwestern willow flycatcher habitat, grazing can have a variety of effects on flycatcher habitat. Information on this impact exists in a variety of forms, and comes from a variety of sources and perspectives. This information fell into four general categories:

1. Overall effects of livestock grazing on southwestern riparian ecosystems.
2. The effects and/or sustainability of livestock grazing on selected plants.
3. Impacts of livestock grazing on willow flycatchers, other riparian birds, and their habitat.
4. Examples of southwestern willow flycatchers being present where livestock grazing also occurs.

Brief reviews of these information categories follow:

Effects Of Livestock Grazing On Southwestern Riparian Ecosystems

Improper livestock grazing has been a significant factor in the degradation of riparian habitats in arid western North America. Excessive grazing can change watershed hydrology, water quality, aquatic and riparian ecology, and structure and composition of riparian plant communities. In general, excessive grazing results in general drying of riparian areas, reduction in vegetation structure and volume, changes in vegetation composition, soil compaction, increases in sedimentation and water temperature, and other effects (see Bryant et al. 1972, Ames 1977, Carothers 1977, Evans and Drebs 1977, USDA Forest Service 1979, Platts 1982, Knopf and Cannon 1982, Rickard and Cushing 1982, Cannon and Knopf 1984, Kaufman and Krueger 1984, Klebenow and Oakleaf 1984, Skovlin 1984, General Accounting Office 1988, Clary and Webster 1989, Schultz and Leininger 1990, Elmore 1992, Fleisher 1996, Ohmart 1996, Belsky et al. 1999, and others). Excessive livestock grazing activities in uplands contribute to changes in surface runoff quantity and intensity, sediment transport, soil chemistry, and infiltration and water holding capabilities of the watershed; flood flows may increase in volume while decreasing in duration, and low flows may decrease in volume and increase in duration (Brown et al. 1974, Gifford and Hawkins 1978, Johnson 1992). However, Larsen et al. (1998) and Rinne (1999) point out that although a significant body of literature on the effects of grazing on riparian ecosystem components exists, very little of that literature is based on credible experimental research. Common problems include inadequate description of grazing practices under study, weak study design (e.g., lack of replicates, lack of random allocation of treatments, controls either absent or not independent from treatments), and lack of pre-treatment data. The last is an especially pernicious problem, because grazing has been a pervasive land use and recovery may take decades or longer. True controls are difficult to find.

The Technical Subgroup concluded that the preponderance of evidence indicates that excessive grazing is harmful to riparian habitats. Key attributes of southwestern willow flycatcher habitat (dense deciduous vegetation, high water tables) are among the riparian characteristics most affected by livestock grazing. Thus the evidence indicates that excessive livestock grazing is deleterious to flycatcher habitat. However, there are examples of breeding flycatchers existing with livestock grazing (see below). This presents the challenge, addressed by this document, of determining what types of grazing (including grazing intensity, season, and grazing systems) are compatible with conservation and recovery of the flycatcher.

Effects And Sustainability Of Livestock Grazing On Plants

On this topic, development of guidelines for grazing in flycatcher habitat is somewhat limited by lack of directly applicable data. Range science literature tends to examine livestock grazing from the perspective of economic and ecologic sustainability of livestock production, economic sustainability of key forage plants, physiological sustainability of certain forage plants or plant associations, and maintaining or enhancing overall range condition. It is difficult to translate these measurements of grazing into effects on the primary attributes of southwestern willow flycatcher habitat. For example, grazing effects on willows that are physiologically "sustainable" by individual plants may not sustain the type of willow foliage volume and structure that constitutes flycatcher habitat. To characterize a grazing system as "sustainable" by the survival of individual willows says nothing regarding the effects on other key factors such as regeneration, ground cover of

herbaceous plants, soil compaction, etc. Further, most literature on grazing effects and sustainability of riparian vegetation originates in regions other than the southwest, where differences in conditions of climate, hydrology, and regional flora limit their application in the southwest. For example, most southwestern willow flycatchers are not found in shrubby willows, but in higher-stature habitats dominated by tamarisk, tree willow, boxelder, or Russian olive. As true for ecosystem levels of assessment, studies on the effects of grazing (heavy versus light or no grazing) on riparian vegetation tend to be compromised by lack of true controls, weak methodologies, and inaccurate or overly broad quantification of grazing intensity and ecological effects (Larsen et al. 1998).

Willows can become a principal source of cattle browse as other more palatable forage resources are depleted or as the palatability of the alternate forage decreases (Kovalchik and Elmore 1992). While in Oregon most browsing damage to willows occurs in late summer (Kauffman et al. 1983, Smith 1982), in the arid southwest such damage may occur at other times, and at greater intensities, because of the more limited alternate forage (Skovlin 1984, Belsky et al. 1999). Willow seedlings may be a preferred forage. As long as palatable herbaceous forage is available in the riparian zone, willow utilization generally remains minor in Oregon (Kauffman et al. 1983). In Oregon, mid- to late-season grazing indicates that cattle begin utilizing the current annual growth on willows when riparian forage use reaches about 45% (4- to 6-inch stubble height), and cattle eat all the willows they can when herbaceous utilization is 85% or more (< 2 inches) (Kovalchik and Elmore 1992). Along the Verde River in Arizona, livestock use of woody shrubs and trees increased during dry winters when herbaceous forage was limited or upland range conditions were poor (Tonto National Forest, unpubl. data). During dry winters use of woody shrubs and trees increased greatly after bud break, which typically occurred in late February to early March (Tonto National Forest, unpubl. data). Cattle display a strong preference for remaining in riparian zones because of the availability of shade, water, and forage. This preference can lead to further habitat degradation that, typically, would not be captured in standard vegetation utilization monitoring. For example, stream bank alteration monitoring by the Tonto National Forest on the Verde River showed that the proportion of alterable stream banks showing degradation (e.g., bank sloughing, compaction, removal of vegetation) reached 100% well before use of woody vegetation by livestock reached the established threshold of 40% (Tonto National Forest, unpubl. data).

The available literature indicates that in some areas and depending on the type of herbaceous forage available, negative impacts on woody riparian vegetation (e.g., willows) can be avoided by not allowing stubble height of herbaceous vegetation to be reduced below 3 to 6 inches (Cook et al. 1967, Cook and Harris 1968, Clary and Webster 1989). Also, cattle generally prefer grasses and forbs to woody vegetation, at least when the herbaceous vegetation is green (Gillen et al. 1985, Holechek and Vavra 1983, Kovalchik and Elmore 1992, Vavra et al. 1980). Therefore, some use of palatable grasses and sedges can occur without undesirable browsing of riparian shrubs and streambank damage (Clary and Webster 1989, Kauffman and Krueger 1984, Kauffman et al. 1983, Kovalchik and Elmore 1992, Platts and Nelson 1989). Damage to stream banks can further be avoided by implementing guidelines established by Fleming et al. (2001). They recommend that the extent of alterable stream banks remaining un-vegetated should not exceed 10%. Alterable stream banks are those portions of banks containing exposed soil or vegetation and that are not composed of bedrock, boulders, or large cobbles.

The applicability of these observations to riparian habitat in the arid Southwest is limited by three factors: 1) The

majority of these studies originate outside the Southwest, in more cool and moist climates where upland forage is more abundant; 2) Herbaceous vegetation (understory) was not treated as a significant component of habitat but is sometimes a significant component of flycatcher habitat, so utilization by livestock equates to some reduction in this habitat attribute; 3) These studies concern themselves with avoiding excessive impacts or unsustainable use of woody vegetation. The criteria for defining these concepts (e.g., "excessive" or "unsustainable") are not always provided, and are not likely to be the same as the criteria for avoiding negative impacts to the woody vegetation component of flycatcher habitat.

Mosley et al. (1997) suggested the following guidelines for stubble heights in riparian systems in Idaho: 1) stubble height of 3 to 4 inches for sedges, tufted hairgrass, and similar species following the growing season; 2) two inches for Kentucky bluegrass; 3) four to 6 inches for large bunchgrasses; and 4) utilization of riparian shrubs should not exceed 50 to 60% during the growing season. However, some researchers caution against recommendations that call for a uniform level of utilization or stubble height to maintain riparian attributes because these recommendations ignore the inherent complexity of riparian systems (Green and Kauffman 1995).

Many riparian shrub species appear to be more tolerant of leaf and twig removal than shrubs inhabiting drier sites. For example, Lammon (1994) reported that planeleaf willow could sustain 58 to 70% utilization. Riparian shrubs are generally more tolerant of browsing because they benefit from greater water availability to support plant growth. However, as noted above, willows that can physiologically sustain these use levels may not ecologically sustain southwestern willow flycatchers. Also, the effect of grazing and browsing on willow reproduction is a concern because willow seeds are short-lived and are not stored in soil seed banks (Brinkman 1974, Densmore and Zasada 1983). First-year willow seedlings can be especially sensitive to browsing. Shoots and roots at this age are generally less than 12 and 8 inches in length, respectively. Browsing of first-year shoots often kills the entire plant, because the plants are easily pulled from the ground or are killed by trampling (Kovalchik and Elmore 1992). However, mature willows have been shown to reproduce well as long as herbaceous utilization in riparian systems does not exceed 70%; at greater utilization willow reproduction is compromised (Mosley et al. 1997).

Excessive livestock grazing can have a considerable effect on vegetation, resulting in depressed vigor, biomass, and altered species composition and diversity (Bryant et al. 1972, Evans and Drebs 1977, Knopf and Cannon 1982). Excessive grazing pressures in riparian zones can significantly reduce herbaceous vegetation (Kauffman et al. 1983, Marcuson 1977) and browse (Kauffman et al. 1983, Knopf and Cannon 1982). Within the riparian zone, livestock use of browse is related to availability and palatability of herbaceous vegetation, and the palatability of the available browse (e.g., tamarisk is generally considered to be relatively unpalatable to livestock). In addition, excessive grazing pressure can prevent the establishment of seedlings (Carothers 1977, Glinski 1977). By high-lining (consumption of forage up to the maximum height of the animal) riparian deciduous shrubs or trees, or removing low-level vegetation altogether, browsing reduces the vegetation's suitability for supporting nests, may increase nest detectability to predators, and reduces foraging options. This may be a greater problem in monotypic, shrubby type habitats than in higher-stature habitats. Changes are somewhat insidious as habitat at a gross scale may persist, and condition or trend may require several years to determine under continued livestock management.

Throughout their evolutionary history, willow flycatchers probably inhabited vegetation that was grazed and browsed by large herbivores (Burkhardt 1996, see also Appendix F). More than 20 now extinct large herbivorous mammals (>45 kg) inhabited the Western United States and Mexico during the Late Quaternary (Martin and Szuter 1999). These were in addition to the nine extant large herbivores. Thus, over evolutionary time, large herbivores used riparian zones to an unknown level but probably not to an intensity that significantly reduced habitat suitability. Platts (1991) asserted that prior to European contact, "wild ungulates usually grazed within the carrying capacity of the range. If forage produced by a given range suddenly became scarce or nonexistent, wild grazing animals either moved to more favorable ranges or perished, bringing populations into balance with range capacity." Additionally, migratory herbivores – by their behavior of migration – inherently yield rest periods for their forage (Frank 1998). Perhaps more importantly than forage/consumer feedback mechanisms, predators (including humans [Martin and Szuter 1999]) played an important role in the condition of vegetation. Kay (1998) asserts that during the Pleistocene, herbivores were predator limited, and not food limited. Over much of the West, large predators have been extirpated enabling large herbivores, including livestock, to over-use the range. Predator prey dynamics of large herbivores and carnivores can have marked effects on riparian bird populations mediated through changes in the habitats (Berger and Stacey, In prep.).

The ecological equivalency of native large herbivores during the Pleistocene to domestic livestock is open to debate. Livestock management is characterized by constraints on movement (fencing) and predator control. Cattle are not frequently herded (Platts and Nelson 1989), and thus will concentrate activity in streamside zones during the spring and summer growing periods.

The Technical Subgroup concluded that the scientific literature on browsing of riparian shrubs and trees, in particular, was inadequate to determine levels of browse that are detrimental or acceptable for flycatcher habitat. Shrub and tree survival do not directly equate with suitable willow flycatcher habitat, particularly with consideration of the flycatcher's preference for dense foliage from the ground up. No studies evaluated or tested grazing levels with habitat metrics such as foliage volume or foliage height diversity.

Effects Of Livestock Grazing On Willow Flycatchers, Other Riparian Birds, And Their Habitats

At this time, specific effects of livestock grazing on southwestern willow flycatcher habitat have not been defined through experimental research. The effects are inferred from more general investigations. Southwestern willow flycatcher habitat is generally typified by high plant density and moist conditions; grazing in riparian habitats can result in reduction of plant density and a drying of riparian habitats. Not all riparian areas in the southwest are southwestern willow flycatcher habitats. However, because grazing can negatively impact riparian ecosystems in general, it follows that southwestern willow flycatcher habitat can be affected. Therefore, the Technical Subgroup concludes a negative correlation between prolonged or heavy grazing and presence of quality flycatcher habitat is probable.

Another strategy to help define the impacts of livestock grazing on the flycatcher is to examine the documented effects of grazing on other willow flycatcher subspecies, other riparian birds that are often associated with and/or ecologically similar to the flycatcher, and their habitats. We reviewed published information on the effects of livestock grazing on riparian birds, and evaluated those findings for their relevance to managing for recovery of the southwestern willow flycatcher (Table 1). As noted above regarding the general literature on environmental effects of grazing, the studies summarized are somewhat compromised by inadequate description of grazing practices, including level of grazing, intensity, lack of replication, and lack of pre-treatment data. With that qualification, the studies show that improper grazing is deleterious to many riparian birds. That southwestern willow flycatchers probably fall into the group that are harmed is supported by the fact that the Great Basin willow flycatcher (*Empidonax traillii adastus*) was harmed. Within the range of grazing practices examined, winter grazing and lighter grazing intensities had lesser negative effects than heavier grazing, summer grazing, or year-round grazing. Similarly, riparian habitats were rehabilitated most quickly and/or completely with no grazing (Ohmart 1996), and more quickly with light and/or winter grazing than with heavy, summer, and/or year-long grazing. Certainly, more research is needed to evaluate differences in rates of riparian recovery under total exclusion versus fall-winter, winter, and early spring grazing regimes. As with the literature on overall ecological effects of grazing, much of the literature on effects of grazing on riparian birds originates from outside the Southwest - generally from the Great Basin and Sierra Nevada. However, this literature is considered relevant because riparian habitats in the arid range of the southwestern willow flycatcher are more vulnerable to livestock impacts than these more mesic regions. As shady, cool, wet areas providing abundant forage, they are disproportionately preferred by livestock over the surrounding warm, xeric uplands (Ames 1977, Johnson 1989, Kauffman and Krueger 1984, Belsky et al. 1999). The negative effects of livestock grazing are typically more severe in warmer, drier environments.

Southwestern Willow Flycatchers Coexisting With Livestock Grazing

In some locations, southwestern willow flycatchers breed at sites which experience some degree of livestock grazing. The sites described below are located in exceptionally large floodplain riparian areas, where riparian conditions are of distinctive quality and extent. These examples indicate that under certain circumstances, flycatchers can exist with livestock grazing. Although both livestock and flycatchers occur together, specific data on grazing practices are not yet available, effects on riparian vegetation are not documented, and long-term trends (>10 years) of the resident flycatchers are either fluctuating or unknown. The lack of experimental data on the impacts of grazing to habitat and consequent responses by flycatchers leaves questions of coexistence, suitability, and compatibility unanswered. Translating these examples into refined management prescriptions that allow both grazing and flycatcher recovery will require improved documentation and monitoring of grazing practices, research into effects on riparian habitats, and continued monitoring of flycatcher populations.

The South Fork of the Kern River, California

A relatively large population of southwestern willow flycatchers occurs on the Kern River in south-central California. This population has fluctuated from 44 pairs in 1989 to 27 pairs in 1992, 38 in 1997, 26 in 1998, and 12 in 2000 (Whitfield et al. 1998 and pers. comm.). The variation in these numbers, and that they have been supported in part by cowbird trapping since 1993 (Whitfield et al. 1998), suggest that while the population persists, it may not be stable. The South Fork of the Kern River presents a nearly ideal setting for extensive, high-quality flycatcher habitat. It is a low-gradient broad floodplain with perennial stream flow and a high water table. Riparian habitat is present as a kilometer-wide cottonwood-willow forest with extensive marshy conditions. The Kern River Preserve was established in 1981, and grazing was significantly reduced in that year. Harris et al. (1987) believed that terminating grazing along parts of the South Fork of the Kern River resulted in increases in riparian vegetation and, consequently, nesting southwestern willow flycatchers (Figures 5 and 6).

Livestock presence now varies from year to year with roughly 70% of the flycatcher population occurring in areas grazed at least occasionally. All flycatcher areas that have grazing have light to moderate winter grazing. Except for removing spring/summer grazing, researchers do not believe that flycatcher numbers were significantly affected by the different grazing regimes (M. Whitfield pers. obs.). Data from grazed and ungrazed areas on the Kern River are not comparable because the areas are intrinsically different. Three components of this situation merit mention. First, grazing at the Kern River Preserve is not part of an annual grazing scheme but is conducted at the preference of the Preserve Manager, who determines ecological conditions, as well as on and off dates for livestock. Second, the Preserve comprises 1,127 acres which allows close monitoring of ecological conditions and efficient removal of livestock when conditions warrant removal. Third, forage production of perennial grasses on property adjacent to the Preserve has been measured at a level of biomass that is rarely found in other riparian systems within the range of the southwestern willow flycatcher. During a recent "wet" year, production estimates from a wet meadow on this property were approximately 4,000 and 11,000 pounds/acre in April and June, respectively (M. Whitfield pers. comm.). In the same year, production estimates from an alkaline meadow on the

property during April and June were about 2,700 and 2,400 pounds/acre, respectively.

Figure 5. Kern River Preserve driveway in 1988 following about 6 years of no grazing. Photo courtesy of M. Whitfield, Kern River Preserve.

Figure 6. Kern River Preserve driveway in 1998 following about 16 years of no grazing. Photo courtesy of M. Whitfield, Kern River Preserve.

Table 1. Summary of literature examining effects of livestock grazing on riparian birds.

Citation	Location	Site information	Study objectives	Methods & parameters measured	Conclusions	Relevance to southwestern willow flycatcher habitat	Other
1,2	Arapaho NWR, Colorado	Elevation: 2,500 m (8200 ft) Sage-brush outside of flood plain. 8 spp of *Salix*.	Avian community response to differences in seasonal (winter vs. summer) grazing patterns. Both seasons experienced heavy grazing.	2-year study, avian community surveys; multiple vegetation measurements at bird-centered and random points	Bird community segregated into groups that were sensitive, insensitive, and benefited by summer grazing. Sensitive species (e.g.,WIFL[a]) used locations based on bush spacing. Grazing impacts primarily through the horizontal patterning of the vegetation community.	WIFL[a] density 0.2/ha in winter grazed, absent in summer grazed. Significant correlations include height of bush (+,2/2), mean height of nearest bushes (+,½), standing biomass of herbaceous layer (-,½), distance to nearest bush (-,2/2), # of dead stems (+,2/2).	Suggests willows in winter-grazed are healthy, summer grazed are decadent; due in part to drier soils and vegetation. BHCOs[b] more common in summer-grazed. Downplays height relationship as biased by territorial behavior, not necessarily important in patch selection.
3	Lower Truckee River, Nevada	Elevation and adjacent vegetation not reported; pictures suggest sagebrush,	Compare breeding bird abundance between 1868 (Ridgway) and 1972-76.	Ridgway's undefined "rare, common, abundant" categories compared with more-clearly defined categories from multiple transect (2x2 km) surveys and 25 km survey.	Both + and – changes in the avifauna, WIFL[a] common in 1868, not detected in the 1970-80 samples.	Identifies multiple assaults on riparian system since 1868. Protection of 1 site from grazing, troubled by persistent trespass, shows some habitat recovery.	Some interpretation problems, lack of any information on livestock grazing intensity, uncontrolled for other practices.
4	Mountain Meadows	generic	literature review and recommendations			Relative to grazing, recommends eliminating grazing or delaying it until mid-August.	

Table 1. Summary of literature examining effects of livestock grazing on riparian birds.

Citation	Location	Site information	Study objectives	Methods & parameters measured	Conclusions	Relevance to southwestern willow flycatcher habitat	Other
5 & 6	Malheur National Wildl. Refuge, Oregon	Southeastern Oregon, fenced and irrigated pastures.	Response of yellow warbler and willow flycatcher' abundance to changes in grazing intensity.	Bird density and grazing intensity. Two bird data sets: BBS routes over 10-years and 9 strip surveys for 2 years within pastures under different livestock management.	On Breeding Bird Survey (BBS) routes, abundance of WIFLs' increased from nearly 0 during 1st 5 years to 18-30 during last 4 years of a 10-year period when AUM's decreased by about 75% (120k to 30k AUM) over the same period. When the transects are ordered by frequency of cattle grazing on an annual basis, clear negative correlation.	Reduced grazing increases willow production and enhances bird productivity. WIFL' #s not substantial until shrub volume > ≈900 m³ / 100m transect.	Removal of willows by grazing appeared to be the mechanism. WIFL's' habit of nesting within 2 m of the ground made them especially vulnerable.
7	Central Sierra Nevada, California	Elevation: 1525-2285m (5000-7500 ft) Montane meadows.	Document livestock grazing impacts and protection measures.	Bird territory and nest monitoring over multiple years in three meadows. Two study sites fenced to restrict livestock except during early spring and late-fall drop-off and round-up.	Livestock directly caused 20% WIFL' nest loss, and damaged another 20% post-fledging. Reduced stocking (40%) and delayed on-date (after July 15) for 75% of remaining livestock eliminated nest losses.	Areas grazed intensively for drop-off and round-up provided nesting habitat. Controlling stock numbers and retarding on-dates reduce conflicts apparently because forage remains more abundant away from nesting areas, thus diminishing the attractiveness of the wet meadow area later in the season.	Prior to the grazing management change, WIFL' nests were destroyed by livestock from early July through mid-August. Nests were not destroyed earlier in the season, presumably due to the abundance of succulent forage, drinking water and cool climate earlier in the season and the wetness of the meadows earlier in the summer.

Table 1. Summary of literature examining effects of livestock grazing on riparian birds.

Citation	Location	Site information	Study objectives	Methods & parameters measured	Conclusions	Relevance to southwestern willow flycatcher habitat	Other
8	Southeast Wyoming	Elevation: 2225-2380 m (7300-7800 ft)	Compare birds and habitat at two willow riparian sites with different grazing history: 1) AUMs from >5,000 in 1920s to 900 after 1967, July 1- 30 Sept. season of use; 2) currently (and recent) 1,750 AUMs from 6 June to 30 Sept (prior grazing "overuse").	3-year study, random shrubs and bird species-defined shrubs as point centers to compare shrub density and tunneling effects.	Where grazing intense, *Empidonax* spp used shrubs in density the same as available (ca. 950/ha), whereas where grazing lighter, *Empidonax* spp. used shrubs in less dense (mean about 950/ha) areas than available (ca 2000/ha). Tunnel heights lower on lighter-grazed area, but no relationship with grazing discussed.	Suggests that flycatchers select for a patchy distribution of willows, a condition for which livestock can be used to achieve. However, distribution needs to be controlled to prevent detrimental effects.	SPECIES OF EMPIDONAX NOT DISCLOSED. However, other species discussed are WIFL associates. Tunnel floors were covered by grasses and sedges, suggesting the grazing intensity was relatively low.
9	Nevada & Idaho	Elevation: 1875-1966 m (6150-6450 ft) sagebrush surroundings.	Compare birds in 2 paired grazed (grazing intensity not reported) and un-grazed (excluded for 11 years, light trespass grazing) of high elevation riparian zones.	Measured vegetation cover by growth form. Willow clumps recorded average stem diameter and average stem height, biomass estimated by equation. Birds were spot-mapped from > 10 visits both in 1988 and 1989.	Herbaceous plants differed significantly between grazed and un-grazed. Aspen differed significantly. A large difference between willow standing crop biomass was masked by extreme variation. Non-willow, large shrub biomass was significantly greater in grazed than un-grazed. No meaningful differences in bird species richness, total bird density, and bird biomass between grazed and un-grazed. *Empidonax* spp, presumed to be dusky flycatchers had slightly higher (45.3) on grazed vs. (33.8 pairs/40 ha) un-grazed sites.	Mid-to-late summer grazing (intensity unknown) caused significant changes in herbaceous vegetation and aspen regeneration, and perhaps modified willow standing crop. Differences in riparian bird community were slight.	Only one location had willows. By written description and bird species identified, the other area unlikely to have been WIFL habitat. The discussions here refer only to the more potentially suitable pair of study plots. Small mammal communities differed between the grazed and un-grazed areas.

Table 1. Summary of literature examining effects of livestock grazing on riparian birds.

Citation	Location	Site information	Study objectives	Methods & parameters measured	Conclusions	Relevance to southwestern willow flycatcher habitat	Other
10	Carson Range, Nevada	Elevation: 1920 m (6298 ft) Montane meadow, surrounded by lodgepole and Jeffrey pine and white fir.	Compare vegetation structural differences between a 30-year rested and summer-grazed (cattle and sheep, typically 24 cow-calf units) area; both between 25-30 ha. Compare differences in predation rates on active and artificial nests. No grazing during year of study; thus, differences suggested to be the result of grazing-induced habitat change on predators, and not on the presence of the livestock per se.	Cover within quadrants classified by growth form and the height of the top vegetation layer. Nest searches and monitoring at 4-5 day intervals. Artificial nests experiments in three designs; 1) simulating natural placements of habitat generalists [n = 30 ground and 30 above-ground each]; 2) in willows within 15m of channel [15 ground and above-ground each]; and 3) willows distant (>100m) to stream [15 ground and 15 above-ground nests, each]	Willows more abundant within 15 m of stream on un-grazed. Artificial nests were more successful on un-grazed than grazed plot in all above-ground, but not in the on-ground nests in experiment 1 & 2. Real nests were significantly more successful when grouped, but not for on-ground or above-ground categories.	Long-term grazing may alter productivity via changes in predation pressure; i.e., changes in abundance and make-up of predator community; changes in predator behavior or nest detectability; or decreasing the nesting opportunities of nesters.	No replications in study.
11	Multiple	Various	Literature review and meta-analysis of 9 published empirical grazing/breeding bird studies. Grazing intensity not specified.	Species assessed in >1 study; differences between treatments > 25%, and majority in same direction (harm, benefit)	Eight species benefit from grazing, 17 impacted, and 18 unresponsive or inconsistent responses. Species impacted were nesters and/or foragers in heavy shrub or herbaceous ground-cover, and/or vulnerable to nest parasitism.	Grazing (unspecified intensity, system, etc.) has detrimental effects on some riparian species – especially those occupying the vegetation utilized by WIFLs.	Literature review.

Table 1. Summary of literature examining effects of livestock grazing on riparian birds.

Citation	Location	Site information	Study objectives	Methods & parameters measured	Conclusions	Relevance to southwestern willow flycatcher habitat	Other
12	San Pedro River, Arizona	Elevation: 1097-1280m (3600-4200 ft) Ecotone between Sonoran and Chihuahuan Deserts	Case study of riparian community recovery and changes in bird density.	4 years after livestock exclusion, under-story vegetation increased (documented with before/after picture). Spot mapping of bird populations.	No grazing, more under-story vegetation, marked increase (consistent and > 2x) in most (7) of the neotropical migrants studied (10).	Species positively responding in density are likely associates of WIFLs'. Remove grazing, habitat improvement measurable within 4 years.	Uncontrolled case study.
13	See 5 & 6	See 5 & 6	Response of avian community to changes in grazing intensity.	See 5 & 6.	Willow volume significant negative correlation with frequency of grazing, positive correlation with the time since last grazing. Passerine abundance correlated with shrub volume and shrub heights between 2-6 m, but not for shrubs 1 m high. Same for bird species richness.	WIFLs' only present on 4 areas: most WIFLs' (average 14.3-18.0 males) where livestock excluded for 40 years & maximum shrub volume. Second average 10.3-12.3 males) was 6-yeas of exclusion (1 winter graze) and 2nd greatest shrub volume. Other 2 (averages; 3.7-4.0 males and 0.7-1.3 males, respectively) sites were 7th & 4th in terms of shrub volume. No WIFL' use in most recently grazed or impacted units.	One site had reduced passerine abundance than expected based on shrub volume. Accounted for by the heavy camping pressure on the site.

Table 1. Summary of literature examining effects of livestock grazing on riparian birds.

Citation	Location	Site information	Study objectives	Methods & parameters measured	Conclusions	Relevance to southwestern willow flycatcher habitat	Other
14	Western US	Various	Summarize impacts of livestock grazing on fish & wildlife resources of riparian habitats.	Literature review & pertinent personal observations.	Demonstrable effects of grazing on all forms of wildlife. Suggests impacts to migrants as well as residents (unsupported).	[page 270] "The best way to manage riparian habitats is not to graze them. [Page 272] "With total rest, most systems...show tremendous change within 8-10 years. & "with managed grazing riparian healing time is twice and maybe 4 times longer than exclusion."	Brief discussion of livestock as management tool – but notes that examples of [well] managed riparian grazing are so few and [poor] unmanaged grazing so common that this tool is meaningless. Identifies a couple of cases of good riparian habitat under some grazing regimes.
15	Northeast California, Northwest Nevada	Great Basin	Compare bird and small mammal densities in "heavily" grazed and un-grazed examples of 6 habitat types; one of which (Aspen) appears (based on plant and animal species encountered) to be possibly relevent to WIFLs'. The un-grazed Aspen site had livestock exclusion for 87 years.	Vegetation sampled in twenty 1m² plots every 5 m along line transects. Height and species composition of the canopy, mid-story and under-story, % cover and count of rooted species. Birds inventoried on 1-mile strip census on 3 consecutive mornings.	Relative to grazed site, un-grazed had lush 1-m deep under-story of forbs. Young aspen and willow in the mid-story. Mid-story almost absent on grazed. Litter 2x as deep on un-grazed site compared with grazed. *Empidonax* sp. density was 21/100 acres on un-grazed, and 8/100 acres on grazed. Total avian density was 792 and 385 birds / 100 acres on the un-grazed and grazed site, respectively. Both treatment and control had a group of unique species.	"Heavy" grazing eliminated the mid-story (shrubby vegetation. Bird species community reflected these changes.	Sites were paired based on its equivalent site potential (as per Daubenmire), not proximity. No replicates. Besides "heavy," grazing not quantified.

[a] Great basin willow flycatcher, *Empidonax traillii adastus*

[b] Brown-headed cowbird, *Molothrus ater*

[c] Southwestern willow flycatcher, *E. t. extimus*

1. Knopf et al. 1988.
2. Knopf, F. 1999. Pers. comm
3. Klebenow and Oakleaf 1984
4. Sanders and Flett 1989.
5. Taylor and Littlefield 1984.
6. Taylor and Littlefield 1986.
7. Valentine et al. 1988.
8. Krueger and Anderson 1985.
9. Clary and Medin 1992.
10. Ammon and Stacey 1997.
11. Bock. et al. 1993.
12. Krueper 1993.
13. Taylor 1986.
14. Ohmart 1996.
15. Page et al. 1978.

The Cliff-Gila Valley, New Mexico

In the Cliff-Gila Valley of the Gila River in southwestern New Mexico, the largest known population of southwestern willow flycatchers exists. With roughly 200 nesting pairs, this area constitutes a substantial portion of the subspecies' total numbers. This reach of the Gila River presents a unique combination of natural and manmade factors affecting flycatcher habitat. The area has highly favorable hydrological conditions for flycatcher habitat - a broad floodplain with perennial low-gradient streamflow. Some streamflow is diverted onto the floodplain to irrigate pastures, and ranch operators have allowed extensive riparian vegetation to develop along field edges, irrigation ditches, and return flow courses (Figure 7). Although water is diverted from the Gila in this area and upstream, the river is not regulated by dams upstream. Significant floods occur periodically, as in the El Niño events of 1979, 1983, and 1993, and a 1997 flood caused by Pacific typhoon Nora (Stoleson pers. obs.). Thus, natural hydrological functions like floodplain wetting, scouring, flushing of salts, and sediment deposition still occur. During the 1997 event for example, streambanks were damaged in a few areas but in general much sediment was deposited, which has resulted in substantial regeneration of riparian vegetation. Some sediment beds from earlier floods support more advanced regeneration, some of which has become occupied by flycatchers recently (S. Stoleson pers. comm.).

The majority of the Cliff-Gila population is contained in 20 riparian patches on a private ranch. Of these, two are grazed nearly year-round, seven are in a pasture grazed in late fall and winter, and the remaining 11 have had grazing excluded since approximately 1993 but are adjacent to pastures that are grazed periodically throughout the year (S. Stoleson pers. comm.). It is difficult to characterize the grazing in this area. It is closely managed; there are no fixed rotations or stocking rates, rather cattle are rotated among pastures based on visual assessments of range quality. Half of the floodplain pastures are used for off-season grazing only, and the other half are used year round. Pastures are a variety of irrigated permanent pastures, dry pastures, and fields planted in forage crops. The relative proportions of these pasture types varies from year to year. It is possible that the irrigated pastures, which are used extensively in the dry months of May and June, provide the cattle with better quality forage than they might extract from riparian vegetation. Cattle often seem to enter the riparian patches only to drink and seek shade, but not to forage (S. Stoleson pers. comm.).

A significant change in management that provided a potential short-term benefit to flycatcher habitat was the increase in water diversions to irrigate pasture and forage cropland. In approximately 1993, ranch operators experienced an increase in water available for diversion. The additional water was used to rehydrate old irrigation ditches to irrigate several pastures and fields. Stoleson (pers. comm.) suspects that any increases in flycatchers in recent years are directly related to the increase in hydration of the floodplain and corresponding changes in vegetation. The two habitat patches with the most flycatchers (49 and 41 pairs in 1999) are adjacent to irrigated fields where water runs off and produces a densely vegetated, swampy area.

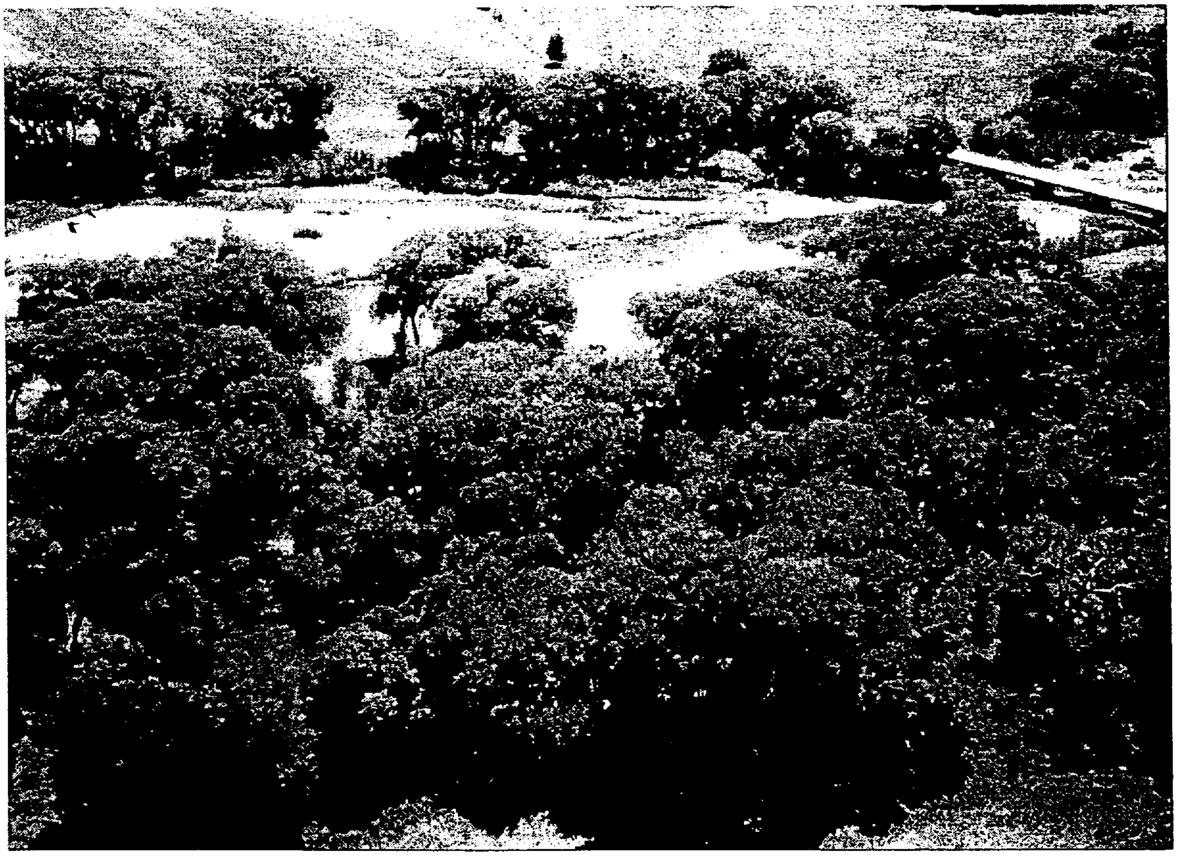

Figure 7. Cliff-Gila Valley, New Mexico, October 1998. Photo taken by S. Sferra, USBR.

The Technical Subgroup is unable to conclude that the livestock management activities at the Kern River and Gila Valley are, on the whole, either detrimental or beneficial to the flycatcher. Similarly, it is unclear whether current management will sustain suitable habitat in the long-term. It is difficult to draw conclusions in the absence of better quantitative and/or experimental data. In both situations, livestock operators have access to alternative pastures in addition to the riparian areas discussed, so their ability to relieve pressure on the riparian areas is increased. Water is relatively abundant in both areas. This factor illustrates that with sufficient water, options for managing flycatchers and other resource uses are substantially increased, and conflicts are likely to be reduced. With sufficient water, riparian and aquatic ecosystems are more resilient and more capable of supporting multiple demands. Despite the above uncertainties, the Technical Subgroup commends these landowners and livestock managers for considering the flycatcher in decisions regarding grazing. The current grazing programs appear to be compatible with the current flycatcher population levels. The Technical Subgroup also commends these managers for enabling researchers to study these important populations. These areas present opportunities for continuing and refining very important research.

2. Destroying Nests with Eggs or Young

In some habitats, livestock may contact flycatcher nests or supporting limbs while watering, foraging, shading, or resting in riparian areas. This may result in destruction of the nest, or loss of eggs or nestlings. This impact is probably most common in high-elevation (1800 m or 6000 ft), low-stature monotypic willow stands. In the Sierra Nevada (the little willow flycatcher, *Empidonax traillii brewsteri*) Valentine et al. (1988) observed four of 20 studied nests destroyed by livestock prior to the young fledging. Additionally, four other nests were destroyed by livestock within days after they fledged young - demonstrating that more nests were susceptible. Strikingly, some of the losses occurred in cattle exclosures that were not adequately maintained. Susceptibility of the nests to livestock was attributed to their low height within the shrubs (approx. 1.5 m or 5 ft), small diameter of their supporting limbs, proximity to water, low branch density near the nests, and proximity to shrub edges. However, the height to which livestock can affect willow flycatcher nests is unknown (Valentine et al. 1988). Loft et al. (1987) illustrated that heavy grazing can reduce the cover attributed by willow up to at least 1.5 m (5 ft). Because southwestern willow flycatcher nest heights vary considerably, so does the magnitude of this threat. For example, southwestern willow flycatcher nests have been reported at heights from 0.6 to 18 m (1.9 to 59 ft) (Sogge et al. 1997). Herbivores have probably always grazed riparian zones over the willow flycatcher's evolutionary history, suggesting that the source of loss is not unique to domestic livestock; however, its frequency may now be out of the species range of variation, especially in low stature habitats. The grazing intensity over that pre-European contact period may well have been sufficiently different from that experienced under current livestock management. Clearly, the biological significance of livestock toppling of nests is large when the entire flycatcher population is low and the number of habitats occupied is few.

3. Facilitating Brood Parasitism by Brown-headed Cowbirds

Livestock grazing can facilitate brood parasitism by brown-headed cowbirds (*Molothrus ater*). Livestock grazing in and adjacent to riparian habitat may provide cowbirds with greater access to southwestern willow flycatcher nests, improve foraging opportunities, and establish foraging areas closer to flycatcher nesting areas. Cowbirds can impact southwestern willow flycatcher productivity even when the grazing is remote (> 8 km or 5 mi) from the flycatcher's nesting habitats (Curson et al. 2000, Rothstein et al. 1984). However, these impacts are variable and site specific. Because cowbird parasitism varies geographically and temporally, data on cowbird abundance, distribution, and levels of nest parasitism must be gathered locally. These data are essential to determine the extent to which cowbird control or cowbird habitat management via livestock management efforts are justified (see Appendix F; cowbird parasitism and management).

C. Measures That Can Be Taken To Alleviate Livestock Impacts

The fundamental approach to recovering an endangered species is to remove the threats to its existence, whether they are contamination, persecution, loss of habitat, or others. In the case of livestock grazing and the southwestern willow flycatcher, our approach was to examine the available information to determine as specifically as possible the degree and the conditions under which livestock grazing is compatible or incompatible with flycatcher recovery. This effort was undertaken because of a desire to avoid recommending undue or unnecessary restrictions on a widespread, traditional land use industry.

With the southwestern willow flycatcher, the effort to fine-tune recovery recommendations with respect to livestock grazing is worthwhile, as livestock operators, biologists, and management agencies increasingly learn that much can be accomplished by working together. However, the primary responsibility of the Technical Subgroup is to chart the recovery of the southwestern willow flycatcher. The goal of a recovery plan is to recommend actions that will bring about recovery of a species. The evidence and field examples indicate that with respect to livestock grazing, southwestern willow flycatcher recovery would be most assured, and in the shortest time, with total exclusion of livestock grazing from those riparian areas that are deemed necessary to recover the flycatcher and where grazing has been identified as a principal stressor. There is also evidence that under the right circumstances, certain types of grazing are likely to be compatible with recovery. While the data are insufficient to identify specifically what grazing systems are compatible in which specific circumstances, exploring the levels of grazing that may be compatible with maintenance of suitable flycatcher habitat is warranted.

During five separate meetings with Implementation Subgroups associated with the Recovery Team, individuals representing the ranching industry repeatedly underscored the importance of maintaining flexibility within livestock management operations. Evaluation of the current system of public lands grazing leads to the conclusion that there is little or no flexibility because allotments are either all committed to permittees or have been withdrawn from grazing for various conservation or other purposes. When permittees find themselves in a situation where the allotment needs rest, their choices

may be limited to selling their livestock, finding alternative pastures or private land to graze, and/or continuing to graze the allotment. There is no grass bank for public lands grazing. Also, contemporary public land managers are frequently compelled to manage livestock grazing and a variety of other resource uses and values without adequate staff and funding. In some cases, livestock grazing is conducted in the context of management unit boundaries that may be constraining to flycatcher recovery and inappropriate for the complexities of modern ecosystem-based resource management. Modifications to these management unit boundaries may be necessary to achieve recovery goals. Therefore, in addition to specific recommendations (Table 2), the following general recommendations are made, encouraging Federal land managers to undertake a major conservation planning initiative to:

1. Identify the most important riparian areas for the recovery of the southwestern willow flycatcher and riparian and aquatic organisms in general.
2. Identify the most appropriate areas for permitting livestock grazing given the biodiversity concerns for the particular land management unit.
3. Reconfigure grazing pasture boundaries to reflect the true productivity of rangelands associated with important flycatcher recovery areas, and allow differential management of units of varying ecological sensitivity.
4. Exclude livestock from sites where exclusion would result in the greatest ecological improvement and least economic loss.
5. If monitoring is less than annual, establish livestock use numbers based on drought years, not the average or wettest years, to provide for livestock operations that are viable given this region's propensity to experience prolonged drought. With annual monitoring, adjust livestock levels in response to reduced forage availability, poor vigor and physiological stress on forage plants, and/or decreased cover brought on by drought conditions.
6. Establish an adequate number of ungrazed areas at different elevation and geomorphic settings. These will provide land management agencies and researchers with a much-needed series of sites against which to compare the condition of grazed watersheds (Brinson and Rheinhardt 1996) (see #8 below).
7. Institute and/or improve record-keeping and documentation of grazing practices, retroactively where possible, so that the ecological effectiveness of various grazing practices can be more scientifically evaluated (see #8 below).
8. Work with state universities, private colleges, and research institutions to fund and facilitate research that better defines the ecological and hydrological effects and sustainability of livestock grazing in southwestern ecosystems, particularly southwestern riparian ecosystems.

These recommendations strive to promote flexibility within the confines of conserving willow flycatchers. With flexibility and proper grazing management, grazing may be compatible with recovery and conservation of the southwestern willow flycatcher and other riparian species. This conservation planning effort and adjustment of managing public lands grazing should be completed within the next five years. In the interim, the Technical Subgroup is challenged with providing

specific recommendations that will begin the process of recovery. After thoughtful and thorough review of the scientific literature, and much deliberation, the Technical Subgroup is confident there is common ground between the needs of the livestock manager and the southwestern willow flycatcher. Both prosper from efforts that sustain the quality of the landscape. The preponderance of evidence indicates that conservative stocking rates and light-to-moderate utilization levels are generally effective in maintaining range condition while increasing individual animal (livestock) performance (Johnson 1953, Klipple and Costello 1960, Paulsen and Ares 1962, Martin 1975, Houston and Woodward 1966, Holechek 1992, Winder et al. 2000). In all cases, the uniqueness of each area needs to be recognized and considered in developing a management strategy.

Accepting that conservative management is a logical beginning point, the Technical Subgroup recognizes that the spatial and temporal flexibility remaining within the context of conservative management will, by necessity, be further reduced for purposes of recovering the critically endangered southwestern willow flycatcher and the riparian habitats upon which it depends. Recommendations the Technical Subgroup believes will begin the process of recovery while promoting ecologically sustainable grazing practices are presented below (Table 2). A precept of these recommendations is that grazing has been identified as the major stressor, or one of the major stressors. Recommendations are based on the best information available on the effects of livestock on southwestern riparian ecosystems, on selected plant types, and on willow flycatchers and other riparian birds. Because of the impacts discussed in this document, this information in general points toward cessation of grazing to accomplish recovery. However, the information reviewed here also suggests some degree of compatibility between grazing and flycatcher recovery, under certain circumstances. This table explores the variability in southwestern willow flycatcher habitats, grazing systems, and ecological considerations of plant phenology. Southwestern willow flycatcher habitats are allocated to two broad categories. These are the lower stature willow habitats often found at higher elevations (>1,830 m or 6,000 ft), and taller stature habitats found at lower elevation typically comprised of willow, cottonwood, boxelder, tamarisk, and associated trees and shrubs. Grazing is separated into growing season and non-growing season of woody riparian vegetation (non-growing season is from leaf drop to bud break of common woody riparian species).

The recommendations do not address the myriad other grazing variations. This issue paper does not address specific locations where these recommendations should be implemented, but rather identifies management for general categories of sites. Therefore, the recommendations for domestic livestock grazing presented in Table 2 should be interpreted as general guidelines that should be applied according to site-specific conditions (see summary on page G-31). Specific watersheds or portions of watersheds for implementation of recovery actions are identified in the main body of this plan, in the form of recovery goals (e.g., total number of flycatchers, acres of habitat, and distribution of these across the range).

The intent of these general grazing guidelines is to promote recovery of the southwestern willow flycatcher while allowing conservative livestock grazing where appropriate and to provide flexibility for adaptive management in order to maintain or enhance southwestern willow flycatcher habitat. We recognize that private lands will play an important role in the recovery of the flycatcher, and that coordination and cooperation with private landowners and public grazing permittees

is critical to the success of this recovery effort. In order to provide incentives for private landowners and public grazing permittees to improve and manage for southwestern willow flycatcher habitat, flexibility through adaptive management must be an integral part of the recommended grazing guidelines. Therefore, if a particular grazing system is improving southwestern willow flycatcher habitat (e.g., grazing system is not preventing regeneration of woody and herbaceous riparian vegetation), then that particular grazing system should be allowed to continue provided it is appropriately monitored and documented.

Table 2. General guidelines for domestic livestock grazing in southwestern willow flycatcher habitat.

Site Conditions			Site-Specific Guidelines	
Habitat Status	**Flycatcher Status**	**Season**	**Low-Stature Habitat: 3-4m shrubby willow**	**All other habitat types ≤1830 m or 6000 ft elevation**
1. Restorable or Regenerating Habitat[1]	1A. Unoccupied	Growing Season[2]	No grazing.	No grazing.
	1B. Unoccupied	Non-Growing Season	No grazing.	Provisional grazing[3] (assumes grazing is not a major stressor).
2. Suitable Habitat	2A. Unoccupied	Growing Season	No grazing.	No grazing, but at discretion of USFWS, provision for a limited number of small-scale, well-designed experiments to determine levels of pre-breeding season grazing that do not adversely affect southwestern willow flycatcher habitat attributes. Grazing not to exceed 35% utilization of palatable, perennial grass or grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use[4] not to exceed 10%.[5]
	2B. Unoccupied	Non-Growing Season	Conservative grazing with average utilization not to exceed 35% of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%. Woody utilization not to exceed 40% on average.	Conservative grazing with average utilization not to exceed 35% of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%. Woody utilization not to exceed 40% on average.
	2C. Occupied	Growing Season	No grazing.	No grazing until research in comparable unoccupied habitat demonstrates no adverse impact; if unoccupied habitat becomes occupied habitat, continue existing management (grazing should not exceed 35% of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%).

Table 2. General guidelines for domestic livestock grazing in southwestern willow flycatcher habitat.

	2D. Occupied	Non-Growing Season	No grazing.	Conservative grazing with average utilization not to exceed 35% of palatable, perennial grasses and grass-like plants in uplands and riparian habitats, and extent of alterable stream banks showing damage from livestock use not to exceed 10%. Woody utilization not to exceed 40% on average.
3. Uplands & Watershed Condition [6]	3. Occupied & Unoccupied	For any season of use	Average utilization of palatable, perennial grasses and grass-like plants not to exceed 30-40%. Use stubble height guidelines: 3" for short grass, 6" for midgrass, 12" for tall grass. Determine monitoring species prior to grazing.	Average utilization of palatable, perennial grasses and grass-like plants not to exceed 30-40%. Use stubble height guidelines: 3" for short grass, 6" for midgrass, 12" for tall grass. Determine monitoring species prior to grazing.

[1] "Restorable" means riparian systems that are degraded but have the appropriate hydrological and ecological setting to be restored to suitable flycatcher habitat, and could be restored with reasonable costs and actions. Lack of regeneration due to grazing is one factor contributing to habitat degradation; conditions in each habitat should include adequate plant regeneration to ensure habitat sustainability into the future. At these sites, flycatcher habitat is precluded largely or solely by livestock impacts. "Restorable" habitats are those that would be suitable if not for grazing, alone or in combination with other major stressors. This means cessation of grazing is a necessary, but not necessarily a sufficient action.

[2] Growing season is defined as bud break to leaf drop for cottonwood and willow species. Non-growing season is defined as leaf drop to bud break for cottonwood and willow species.

[3] Grazing should only be conducted if it is not a major stressor and does not preclude satisfactory progress toward suitability.

[4] Damage to stream banks from livestock use includes: bank chiseling, trampling, trailing, soil compaction, breakage of vegetation, bank sloughing, etc.

[5] Alterable stream banks are those portions of banks containing exposed soil or vegetation and not composed of bedrock, boulders, or large cobbles (Fleming et al. 2001).

[6] Uplands and watersheds, or portions of watersheds, associated with areas identified as restorable, regenerating, or suitable southwestern willow flycatcher habitat. General guidelines should be implemented unless site-specific data clearly indicate that deviation from the guidelines will not prevent or slow progression toward suitability and/or maintenance of suitable habitat conditions.

The guidance provided in Table 2 is based on the current endangered status of the southwestern willow flycatcher. Flexibility will increase with the eventual downlisting of the flycatcher to threatened status. Overall, the best available information suggests that flycatcher recovery is most assured with no grazing in its habitat during the growing season. In some situations, some light to moderate levels of grazing during the non-growing season may be compatible with flycatcher recovery , if carefully managed and closely monitored. Where grazing is indicated in Table 2, the following set of conditions apply:

1. All grazing is to be accompanied by monitoring. If funding is not sufficient to allow monitoring, then grazing should be discontinued. Monitoring should include exclosed areas, where possible, in riparian habitat on allotments or pastures where grazing has been discontinued, as well as allotments or pastures where grazing is allowed to continue.
2. The target for total utilization of palatable, perennial grasses and grass-like plants should not exceed 35% (±5% to accommodate sampling error) in upland and riparian habitats. Utilization of 35% not only includes direct consumption, but also includes other factors associated with herbivory (e.g., trampling, trailing, bedding). With monitoring, stocking rates may be adjusted to current forage production each year (White and McGinty 1997).
3. Stubble height baselines should have a forage/acre figure associated with them, if possible, so the baseline is not established for areas that are too poor to graze.
4. Annuals are excluded from the forage base because reliance on annuals indicates overuse of perennial grasses and grass-like plants and woody riparian vegetation.
5. The target for utilization of woody vegetation at the pasture level is 40% (±10% to accommodate sampling error), meaning the removal of 40% of the biomass of the current year's growth. This not only includes direct consumption but also includes other factors associated with herbivory (e.g., trampling, breakage of vegetation).

Consideration of uplands is essential. Elmore and Kaufman (1994) reported that "simply excluding the riparian area (from grazing) does not address the needs of the upland vegetation or the overall condition of the watershed. Unless a landscape-level approach is taken, important ecological linkages between the uplands and aquatic systems cannot be restored and riparian recovery will likely be limited." Livestock grazing may alter the vegetation composition of the watershed (Martin, 1975, Savory 1988, Valentine 1990, Popolozio et al. 1994). It may cause soil compaction and erosion, alter soil chemistry, and cause loss of cryptobiotic soil crusts (Harper and Marble 1988, Marrs et al. 1989, Orodho et al. 1990, Schlesinger et al. 1990, Bahre 1991). Cumulatively, these alterations contribute to increased erosion and sediment input into streams (Johnson 1992, Weltz and Wood 1994). They also contribute in changes to infiltration, water holding capacity of the watershed, and runoff patterns, thus increasing the volume of flood flows while decreasing their duration (Brown et al. 1974, Gifford and Hawkins 1978, Johnson 1992). As a result, groundwater levels may decline and surface flows may decrease or cease (Cheney et. al. 1990, Elmore 1992).

1. Narrative Interpretation of Table

Row 1A (Unoccupied restorable habitat in growing season):

Low Stature Habitat: 3-4 m monotypic shrubby willow at high elevation (> 1,830 m or 6,000 ft)

At sites where the goal is to restore habitat to suitable for flycatchers no grazing is recommended, because most of the nesting structure is within the zone of direct livestock impact. This habitat type is highly susceptible to direct impacts, and slow to recover due to the short growing season. With a goal of restoring habitat, the best possible conditions for hydrological recovery, regeneration, and growth of vegetation are desired. The literature indicates exclusion of grazing will facilitate this. For this habitat and the next three (through row 1B), note that the transition from "restorable" habitat to "suitable" habitat will be a regulatory decision made by USFWS with input from land managers, based on habitat attributes discussed in Appendix D.

All other habitat types < 1,830 m or 6,000 ft.

At sites where the goal is to restore habitat to suitable for flycatchers, no grazing is recommended. With a goal of restoring habitat, the best possible conditions for hydrological recovery, regeneration, and growth of vegetation are desired. The literature indicates exclusion of grazing will facilitate this.

Row 1B (Unoccupied restorable habitat in non-growing season):

Low Stature Habitat: 3-4 m monotypic shrubby willow at high elevation (> 1,830 m or 6,000 ft)

The goal is to restore habitat to suitable for flycatchers. No grazing is recommended, because this habitat type is highly susceptible to impacts. With a goal of restoring habitat, the best possible conditions for hydrological recovery, regeneration, and growth of vegetation are desired. The literature indicates exclusion of grazing will facilitate this.

All other habitat types < 1,830 m or 6,000 ft.

The goal is to restore habitat to suitable for flycatchers. No grazing is preferred, but provisional grazing is considered possible if grazing is not a major stressor. With a goal of restoring habitat, the best possible conditions for hydrological recovery, regeneration, and growth of vegetation are desired. Grazing must not preclude satisfactory progress toward suitability. In situations where other significant stressors occur, those should be removed, and the significance of grazing as an additive or synergistic stress should be considered.

Row 2A (Unoccupied suitable habitat in growing season):

Low Stature Habitat: 3-4 m monotypic shrubby willow at high elevation (> 1,830 m or 6,000 ft)

The goal is to maintain and/or enhance flycatcher habitat attributes. No grazing is recommended, because this habitat type is highly susceptible to fragmentation and impacts. With a goal of maintaining and enhancing habitat, the best possible conditions for maintaining hydrological integrity, and maintenance, regeneration, and growth of vegetation are

desired. The literature indicates exclusion of grazing will facilitate this.

All other habitat types < 1,830 m (6,000 ft)

The goal is to maintain and/or enhance flycatcher habitat attributes. No grazing is recommended, because with a goal of maintaining and enhancing habitat, the best possible conditions for maintaining hydrological integrity, maintenance, regeneration, and growth of vegetation are desired. The literature indicates exclusion of grazing will facilitate this.

Regarding grazing research, the intent is to collect information that may allow changes in these recommendations, if appropriate. This grazing research offers a reasonable complement to excluding grazing from most of the sites in this category, and is crucial to refining our understanding of grazing effects on riparian ecosystems. Here as elsewhere, documentation and monitoring of grazing systems and effects is important.

Row 2B (Unoccupied suitable habitat in non-growing season):

Low Stature Habitat: 3-4 m monotypic shrubby willow at high elevation (> 1,830 m or 6,000 ft)

The goal is to maintain and/or enhance flycatcher habitat attributes while providing an alternative to no grazing. Grazing is allowed at specified intensities because literature from the Pacific Northwest and other areas indicates these rates of utilization on herbaceous and woody plants can be sustained by the plants. Effects on flycatcher habitat characteristics are not known. Grazing utilization rates must be monitored with emphasis on collecting data that will provide an opportunity to modify this and other recommendations in the future.

All other habitat types < 1,830 m (6,000 ft)

The goal is to maintain and/or enhance flycatcher habitat attributes while providing an alternative to no grazing. Grazing is allowed at specified intensities because literature from the Pacific Northwest and other areas indicates these rates of utilization on herbaceous and woody plants can be sustained by the plants. Effects on flycatcher habitat characteristics are not known. Grazing utilization rates must be monitored with emphasis on collecting data that will provide an opportunity to modify this and other recommendations in the future.

Row 2C (Occupied suitable habitat in growing season):

Low Stature Habitat: 3-4 m monotypic shrubby willow at high elevation (> 1,830 m or 6,000 ft)

The goal is to maintain and/or enhance flycatcher habitat attributes, and protect nesting flycatchers. All current breeding flycatchers are important to recovery. No grazing is recommended, because this habitat type is highly susceptible to fragmentation and impacts, and flycatcher nests are vulnerable to direct disturbance. The literature indicates exclusion of grazing will avoid these impacts.

All other habitat types < 1,830 m (6,000 ft)

The goal is to maintain and/or enhance flycatcher habitat attributes, and protect nesting flycatchers. All current

breeding flycatchers are important to recovery. No grazing is recommended, because effects of heavy grazing are known to be deleterious. Effects of light or moderate growing-season grazing on flycatcher habitat are not specifically known. The literature indicates exclusion of grazing will avoid these impacts. Some field examples (e.g., Cliff-Gila Valley) indicate that under some circumstances, flycatchers persist with grazing during the growing season. However, the general effects are unknown. Research is needed to define the relationships and thresholds involved. If research is completed on comparable unoccupied sites, grazing may be considered, at intensities below thresholds that degrade flycatcher habitat.

Row 2D (Occupied suitable habitat in non-growing season):

Low Stature Habitat: 3-4 m monotypic shrubby willow at high elevation (> 1,830 m or 6,000 ft)

The goal is to maintain and/or enhance flycatcher habitat attributes. All current breeding sites are important to recovery. No grazing is recommended, because this habitat type is highly susceptible to fragmentation and impacts. This habitat type may be particularly vulnerable in the non-growing season when snow covers alternate forage plants. Effects of heavy grazing even in non-growing season are known to be deleterious. Effects of light or moderate grazing on flycatcher habitat are not specifically known. The literature indicates exclusion of grazing will avoid these impacts.

All other habitat types < 1,830 m (6,000 ft)

The goal is to maintain and/or enhance flycatcher habitat attributes. All current breeding sites are important to recovery. Conservative grazing is allowed at specified intensities because literature from the Pacific Northwest and other areas indicates these rates of utilization on herbaceous and woody plants can be sustained by the plants. Effects on flycatcher habitat characteristics are not known. Several field examples (e.g., Kern River) demonstrate that flycatchers persist with this grazing system in some situations.

Row 3 (Uplands and watershed condition, all seasons):

Low Stature Habitat: 3-4 m monotypic shrubby willow at high elevation (> 1,830 m or 6,000 ft)

The goal is to rehabilitate and maintain uplands and watersheds in conditions that will facilitate restoration of southwestern willow flycatcher riparian habitat. Evidence suggests this conservative grazing regime will achieve this goal (see Table 1). Monitoring species must be determined prior to grazing, and monitoring must take place.

All other habitat types < 1,830 m (6,000 ft)

The goal is to rehabilitate and maintain uplands and watersheds in conditions that will facilitate restoration of southwestern willow flycatcher riparian habitat. Evidence suggests this conservative grazing regime will achieve this goal (see Table 1). Monitoring species must be determined prior to grazing, and monitoring must take place.

2. Summary:

This issue paper does not address specific locations where recommendations contained herein should be implemented, but rather identifies management for general categories of sites. Because of the variability associated with riparian systems, these recommendations should be interpreted as guidelines that must be applied according to site-specific conditions. The uniqueness of each area needs to be recognized and considered in the development of site-specific management strategies. Specific watersheds or portions of watersheds for implementation of recovery actions are identified in the main body of this Recovery Plan (e.g., total number of flycatchers, acres of habitat, and distribution of these across the range).

The Technical Subgroup recommends against growing-season grazing in southwestern willow flycatcher habitat. Within the range of grazing practices examined, winter grazing and lighter grazing intensities had lesser negative effects than heavier grazing, summer grazing, or year-round grazing. Similarly, riparian habitats were rehabilitated most quickly and/or completely with no grazing, and more quickly with light and/or winter grazing than with heavy, summer, and/or year-long grazing. Research is needed to define the relationships and thresholds involved. A reasonable complement to excluding grazing is to provide for a limited number of small-scale, well-designed, and adequately funded experiments to determine appropriate levels of pre-breeding season grazing. This grazing research is crucial to refining our understanding of grazing effects on riparian systems.

Development of refined management prescriptions that allow both grazing and flycatcher recovery will require improved documentation of grazing practices. The need for monitoring is fundamental. The Technical Subgroup recommends that grazing be discontinued if not accompanied by monitoring. Monitoring should include exclosed reference areas in riparian habitat, where possible, on allotments or pastures where grazing has been discontinued, as well as allotments or pastures where grazing is allowed to continue.

D. Literature Cited

Please see Recovery Plan Section VI.

ATTACHMENT "E"

Applied Ecosystem Management, Inc.

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April 28, 1995

Mr. Sam Spiller
State Supervisor
Arizona Ecological Services
U.S. Fish and Wildlife Service
2321 Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951

Re: Final Rule Determining Endangered Status for the Southwestern Willow Flycatcher

Dear Mr. Spiller,

Please accept these comments from Applied Ecosystem Management, Inc. (AEM), regarding both critical habitat and the "Final Rule Determining Endangered Status for the Southwestern Willow Flycatcher" (FR 60, 10694-10715), submitted on behalf of the Arizona Mining Association.

Although we are aware that the Service has found for this rule, we find it impossible to conclude that this finding is either legally proper or scientifically warranted. To the contrary, the failure of the Fish and Wildlife Service to base its finding for this rule on the best scientific and commercial data available (by excluding all 1994 survey data from any consideration) and its failure to respond to or consider many of the comments received from interested persons, is arbitrary and capricious and in clear violation of both 50 CFR § 424.11 and 50 CFR § 424.13.

Because the Service's finding for this rule is arbitrary and capricious and not based on the best scientific and commercial data available, we find it necessary to respond to the Service's treatment, and non-treatment, of the comments it received. Because so much of the information actually relied upon by the Service in support of this finding is out of date, inaccurate, not based on substantial scientific data, or is indicative of willful omissions and misrepresentations, we find it necessary to refer in comment to specific pages and columns of this Federal Register Notice. For the sake of clarity, we have listed the Federal Register page number along with the number of the column (FRs have 3 columns/page) to which our comments pertain.

FR 10696, Column 1:

The Fish and Wildlife Service claims that "extimus" is distinguished from other Willow flycatcher subspecies by subtle differences in color and morphology, and cites Unitt (1987) as support for this claim. The Service claims that Browning (1993) also found "extimus" to be distinguishable by color.

Problem: Unitt (1987) could not separate "extimus" from other alleged Willow flycatcher subspecies based on color. Unitt (1987 at page 140) states: "I saw no consistent difference in color between **extimus** and **traillii** and cannot confirm Aldrich's (1951) statement that "**campestris**" (i.e. **traillii**) is "somewhat more greenish" than **extimus.**"

Unitt could not separate "**extimus**" from all other alleged Willow flycatcher subspecies on the basis of morphology (i.e., wing formula). Unitt's (1987) data does not confirm any difference in wing chord length between "**extimus**" and "**brewsteri.**" In fact, Unitt (1987) did not even compare wing formula difference between "**extimus**" and "**brewsteri.**" Further, Unitt (1987) found that wing chord difference between the alleged Willow flycatcher subspecies he did compare is more reliable for females than than it is for males.

Browning (1993) found measurement of wing chord not to be useful for purposes of distinguishing between alleged subspecies of **E. traillii.** According to Browning (1993 at page 247): "Analysis of measurements (i.e. g., wing chord, tail, bill) revealed no taxonomically important differences in size between populations." Although Browning (1993) claims that the five, nominate subspecies **E. traillii** are recognizable on the basis of color, his use of Munsell Color Charts as the basis for determining color values (pale vs. dark) of the crowns and backs of most specimens, compromises the scientific validity of this conclusion. Browning (1993) freely concedes (at page 246) that his use of Munsell Color charts "present many of the same problems" (of Smithe's (1975) color standard). Three criteria, any of which if met, render color comparison by the use of color charts impossible: color swatches do not match actual colors; color swatches do not match plumage colors of Willow flycatchers; and, color swatches do not have the same texture, gloss, and colorants as the plumage being compared (Browning, 1993). Since Browning acknowledges that the use of Munsell Color Charts is compromised by at least 2 of these 3 criteria (by his use of the word "many") in regard to Willow flycatchers, it is not scientifically possible to conclude, as Browning (1993) has, that 5 subspecies of **E. traillii** are validly recognizable by color differences established by the use of Munsell Color Charts.

Conclusion: Unitt (1987) could not separate "**extimus**" based on either color or wing chord difference. The Fish and Wildlife

Service misrepresents the findings of Unitt's work in the final rule. Browning (1993) could not separate "**extimus**" based on wing chord difference and his claim that nominate "subspecies" are distinguishable on the basis of color is not possible by the use of the methodology he employed. Neither Unitt (1987) nor Browning (1993) establish "**extimus**" as a separate and distinct subspecies of **E. traillii**. Browning provides evidence to the contrary. According to Browning (1993, at page 244): "Traylor (1979) stated that the subspecific taxonomy of **E. traillii** cannot be worked out without long series of fresh specimens of known song type. Although perhaps it was not his intent, Traylor implied that because the original descriptions of subspecies of **E. traillii** did not include information on song, and thus specific identity, each of the subspecific names could be construed as being **nomen dubium** (i.e., name of unknown or doubtful application)."

FR, 10697, Column 3:

The Fish and Wildlife Service claims that **E. t.** "**extimus**" is a valid taxon on the basis of "a majority opinion" to that effect found by the Service to exist among authorities who have critically examined the taxonomy of **E. traillii**, and cites 5 authorities as support for this claim.

Problem: Two of the five authorities cited by the Service (Unitt, 1987, and Browning, 1993) do not establish "**extimus**" as a valid (subspecific) taxon. A third authority (Hubbard, 1987) offers only a qualified endorsement of the validity of **E. t.** "**extimus**," and recommends that there be further examination of the taxonomy. Although two authorities (Phillips, 1948 and Aldrich, 1951) recognize "**extimus**" as a valid taxon, substantial disagreement exists between the two over the range inhabited by this race.

While Aldrich (1951) considers "**extimus**" to include all pale-colored southwestern populations, including those found in the southern Great Basin and the southern Great Plains, Phillips (1948) assigns both the southern Great Basin and the southern Great Plains areas primarily to "**brewsteri**." Although Aldrich (1951) viewed populations of **E. traillii** from west of the Sierra Nevada in southern California as intergrades between "**extimus**" and "**brewsteri**," Phillips (1948) attributes this geographic region to inhabitance by "**brewsteri**" alone.

Conclusion: The Service's "majority opinion" consists of two authorities whose work recognizes "**extimus**" as a valid and distinct taxon, but is in substantial disagreement over the area of geographic range the taxon inhabits.

FR, 10697, Column 3:

"The AOU (1983) did not list subspecies of any bird, including the willow flycatcher, in its 1983 Checklist of North American Birds. However, this does not indicate a lack of recognition of **E. t. extimus**".....

Problem: Neither "**adastus**" nor "**extimus**" was accepted in the 1957 AOU Check-list (1957: 343-344). In the thirty-second supplement to the AOU Check-list (1973: 415-416) the flycatchers formerly grouped in the species **E. traillii** are divided into two species based on a difference in vocalization. The species and subspecies in the West are listed as **E. traillii brewsteri** under the common name of Willow flycatcher. While the 1983 AOU Check-list does not include any subspecies, it does state (1983: 541-452) that the species **alnorum** (Alder flycatcher) and **traillii** (Willow flycatcher) are "virtually indistinguishable morphologically, differing primarily in vocalizations and ecology; formerly recognized as a single species." Additionally the 1983 Check-list goes on to state that "the two are now considered as constituting a superspecies (= "**trailli complex**")."

Conclusion: The Fish and Wildlife Service misrepresents the American Ornithologists' Union and is guilty of willful ommission. The American Ornithologists' Union Check-list is regarded as <u>the</u> authority on recognizing and identifying bird species throughout North America. Neither "**adastus**" nor "**extimus**" were accepted for inclusion by the AOU in its 1957 Check-list. No AOU supplement or Check-list since that time has included either "**adastus**" or "**extimus.**" The 1983 AOU Check-list advances the concept of "superspecies" in application to the Willow/Alder flycatcher group. The "superspecies" concept is the direct antithesis of the subspecific approach taken by the Fish and Wildlife Service in regard to the Willow flycatcher group. The AOU and Traylor are in general agreement, and neither recognizes **E. t. "extimus"** as a valid taxon.

FR 10698, Column 1:

While acknowledging that McCabe's (1991) consideration of the Willow/Alder flycatcher group as a "superspecies" is based on a thorough review of the history, taxonomy, ecology, morphology, and song type distinction of this group, the Service then rejects McCabe's argument because it "contrasts with the majority opinion regarding taxonomy of the willow and alder flycatchers."

Problem: "Majority opinion" is not "scientific or commercial data." The two authorities cited by the Service in support of its "majority opinion" cannot be used to support this claim. Unitt (1987) does not confirm any wing chord difference between "**extimus**" and "**brewsteri,**" and could not distinguish "**extimus**"

from "**traillii**" on the basis of color. Browning's (1993) claim that "**extimus**" is distinguishable by color must be dismissed because the methodology he employed to reach this conclusion (i.e., the use of Munsell Color Charts) is not scientifically credible.

Conclusion: The listing of **E. t.** "**extimus**" as a distinct subspecies is not supported by the authorities cited by the Service. Neither the AOU, Traylor or McCabe recognize subspecies of Willow flycatchers. Both the AOU and McCabe advance the concept of "superspecies" in regard to taxonomic treatment of the Willow/Alder flycatcher group. "**extimus**" is not a valid subspecies and has been listed in error, in violation of 50 CFR § 424.02(k). The Fish and Wildlife Service violates 50 CFR § 424.11(c) by basing its finding on opinion rather than on the best scientific and commercial data available only, as is required of it by law.

FR 10698, Column 3 - 10699, Column 1

"..the Service believes it is not a misrepresentation to state that up to 90 percent of southwestern riparian ecosystems have been lost or modified" ..."No data, or elaboration, were presented to support statements that riparian regeneration is approaching 1000 percent in southeasteastern Arizona."

Problem: The Service presents no supporting documentation for its "90%" loss and modification of riparian habitat claim. The Fish and Wildlife Service was cognizant of a study by Friedman (1989) which established a 233% increase of cottonwood/willow on the upper San Pedro River over a period of 50 years. Elaboration of cottonwood/willow regeneration on the upper Santa Cruz River far in excess of 1000% was directly provided to the Service through its active participation in the Santa Cruz River Corridor Planning Process sponsored by Arizona State Parks. The Service learned that the upper Santa Cruz has extended its flow by about 2.5 miles over that known in presettlement times.

Conclusion: The Service has misrepresented the trend of riparian condition and has engaged in willful omission by failing to acknowledge its awareness of Friedman's (1989) study of the San Pedro or the elaboration it was provided on the upward trend of upper Santa Cruz River riparian condition. The Service presents no support for its claim that southwestern riparian trend is downward.

FR 10699, Columns 1 & 2:

"As this final rule discusses, **E. t. extimus** sometimes nests in tamarisk, but does so at lower densities ..... than in native

vegetation." "The southwestern willow flycatcher was described as a common nester in Glen Canyon prior to inundation."

Problem: The largest known population of Willow flycatchers in Arizona is that which inhabits groves of tamarisks at Roosevelt Lake (Bureau of Reclamation, 1994). 42 of 60 Willow flycatcher nests found in Arizona during 1994 were located in Tamarisks. The literature reveals that the Willow flycatcher was always rare in southern Utah. Behle (1969, 1975) identifies only one locale for the Willow flycatcher ("**extimus**") in southeastern Utah along the Colorado River.

Conclusion: The Service's claims regarding tamarisk and Willow flycatcher status in Utah are false. The Service failed to rely on the best and most recent scientific and commercial data available (1994 survey results) and misrepresents the literature in arriving at its determinations. The Service has clearly violated 50 CFR § 424.

FR 10699, Columns 2 & 3:

"Comprehensive, long-term population data are not necessarily required for making listing determinations. Rather, these decisions often rest upon data on loss and modification of habitat and other threats, which are reasonably assumed to result in population declines. In many cases, population declines are inferred from decline in habitat availability.....The reports published by government agencies, academic institutions, and professional journals on which this determination is based are accepted as credible."

Problem: The Service is required by 50 CFR § 424 to base its determinations **soley** on the basis of the best scientific and commercial data available; not on "assumption." Most of the reports, et al., that the Service obscurely refers to have been discredited by scientific peer review (Arizona Chamber of Commerce, 1992). The 1990 State of Arizona report that the Service relies upon in large part for support is among those thoroughly refuted by peer review. The Service misrepresents current population trend data by excluding 1994 survey results from consideration.

Conclusion: The Service is in violation of 50 CFR § 424.

FR 10698, Column and 10699, Column 3:

"The Service recognizes that some diversions, particularly unmaintained irrigation ditches, sometimes support riparian vegetation. However, the Service believes diversion and irrigation result in a net loss of riparian habitat." .....

"The Service believes that some livestock grazing regimes are likely to be found compatible with rehabilitation and maintenance of **E. t. extimus** habitat."

Problem: The Service offers no support for its claim that the diversion of surface water for agricultural purposes results in a net loss of riparian habitat. The FWS also infers, inaccurately, that all areas where livestock and Willow flycatchers both occur are in need of "rehabilitation and maintenance." In regard to the former, water diversion for agricultural purpose in the Gila Valley, New Mexico, was found to be of benefit to Willow flycatchers (Parker and Hull, 1994). Riparian stringers along the irrigation ditches of this area were found to be inhabited by Willow flycatchers; up to 300 meters removed from the Gila River proper (Parker and Hull, 1994). Eight pairs of Willow flycatchers were found to occupy territories along these irrigation ditch stringers by Parker and Hull in 1994. On a follow-up survey (July 29, 1994), Parker and Hull, accompanied by S. Williams III of NMGF and Bill Maynard of the FWS, found that water had stopped flowing through some of these ditches, but some Willow flycatchers were still present in the riparian vegetation found along them.

Conclusion: The Service fails to acknowledge that the largest populations of Willow flycatchers known in either Arizona or New Mexico are those populations which occur where livestock are present (Bureau of Reclamation, 1994; Parker and Hull, 1994), The Service also fails to acknowledge that the largest population of Willow flycatchers known in the Southwest is that found in the Gila Valley of New Mexico, where both water diversion for agricultural purpose and the grazing of livestock are the two principal land/water resource uses practiced (Parker and Hull, 1994). The Fish and Wildlife Service fails to base its determinations to the contrary on the best scientific and commercial data available, in direct violation of 50 CFR § 424.

FR 10699, Column 3 & 10700, Column 1:

"Montgomery et al. (1985) did not determine whether the willow flycatchers they detected on grazed land were resident **E. t. extimus** or migrating individuals of other subspecies. Further, neither grazing intensity nor nesting success were quantified, so that no correlations can be made."

Problem: The Service willfully misrepresents this issue and excludes from consideration the best and most recent scientific and commercial data available, in violation of 50 CFR § 424. Parker and Hull (1994) estimated 81 pairs of Willow flycatchers in residence in 1994 on the same lands surveyed by Montgomery in 1983. Parker and Hull established that these flycatchers were not migrants. Parker and Hull (1994) also quantified

grazing intensity on these lands. Willow flycatcher presence on these lands was verified by the Fish and Wildlife Service by on-site visit, July 29, 1994.

Conclusion: By excluding all 1994 survey data from any consideration, the Service has failed to base its determinations on the best scientific and commercial data available, in contravention of 50 CFR § 424. The Service's claims regarding both Willow flycatcher status and the quantification of grazing intensity in this area are false.

FR 10701, Column 1:

"The Service found no information ..... that tamarisk is primarily a successional stage vegetation type"...

Problem: Tamarisk was described to the Service as a "successionist," not as a "successional stage," in comment. Tamarisk is not shade tolerant, therefore it cannot "invade" and take over healthy cottonwood/willow communities. Tamarisk colonizes areas after cottonwood/willow communities are removed.

Conclusion: The Service misrepresents both tamarisk and the comments it received.

FR 10703, Column 2:

"In early 1993, catastrophic floods in southern California and Arizona destroyed much of the remaining occupied or potential breeding habitat."

Problem: The Service offers no support for this claim. In Arizona, 60 nests of the Willow flycatcher were found in 1994, while less than a dozen were found in 1993 (AGFD, 1994).

Conclusion: The Service willfully misrepresents flooding and its actual impact on Willow flycatcher populations by excluding the best and most recent scientific and commercial data from consideration, in violation of 50 CFR § 424.

FR 10704, Column 1:

"The Service believes it used the best available information and has determined that this information is adequate to support listing."

Problem: The Service, arbitrarily, capriciously and willfully excluded all 1994 survey results from consideration. These surveys reveal significantly more Willow flycatchers in Arizona

and New Mexico than numbers found in 1993.

Conclusion: The Service's determination is in error and in direct violation of 50 CFR § 424.

FR 10706, Column 1:

"Extensive surveys in New Mexico and Arizona in 1993 located **E. t. extimus** numbers that do not significantly change the total population estimates made in the proposed rule."

Problem: 1993 survey results are not representative of the best and most recent scientific and commercial data available. 1994 survey results, which the Service has arbitrarily and capriciously excluded from consideration, reveal significantly increased Willow flycatcher populations in both Arizona and New Mexico over 1993 survey results.

Conclusion: The Service has refused to base its determination of unchanged population estimates on the best and most current scientific and commercial data available in clear violation of 50 CFR § 424.

FR 10706, Column 3:

"Much of the livestock grazing that may be affected by this rule takes place on Federal lands."

Problem: The largest Willow flycatcher population known in the Southwest occurs on privately owned lands in New Mexico. The Service offers no support for its conclusion that this rule would primarily affect grazing on federal lands.

Conclusion: The Fish and Wildlife Service misrepresents the affect of this rule on livestock grazing on private lands.

FR 10709, Column 3:

"The southwestern willow flycatcher has declined throughout Arizona."

Problem: Survey results reveal that 60 nests of this species were found in Arizona during 1994 (AGFD, 1994), a six-fold increase over 1993. Two new colonies of Willow flycatchers, representing the largest known concentration of Willow flycatchers in Arizona, were discovered in tamarisk at Roosevelt Lake in 1994 (Bureau of Reclamation, 1994). These flycatchers apparently chose tamarisk over suitable willow habitats present at these sites (Jakle, pers. comm., 1995). Of the 60 nests

of this flycatcher found in Arizona during 1994, 42 (or 70%) were in tamarisk.

Conclusion: The Service failed to use the best scientific and commercial data available in arriving at its determination of decline, in flagrant and willful violation of 50 CFR § 424. The claims of the Service in regard to this species' decline in Arizona are false.

FR 10710, Columns 2 & 3:

In New Mexico, the Service believes, among other things, that the overall range of **E. t. "extimus"** has not been reduced but its habitat and numbers have declined .... areas with 19 and 53 singing Willow flycatchers, not distinguished as nesting or migrants were found on the upper Gila River by Montgomery in 1985 .... preliminary data from 1994 surveys indicate that this breeding group (Montgomery, 1985) is still present, but that their breeding status and population trends over time has not been determined.

Problem: The two authorities cited by the Service cannot be used to support any of these claims and Willow flycatcher breeding status and population trends are established by Parker and Hull (1994) for the largest of these upper Gila River locations, in direct contradiction of the Service's personal communication source to the contrary. Unitt (1987) did not base his conclusions on field research, therefore is in no positon to offer valid statement regarding the current status of the Willow flycatcher in New Mexico. Additionally, Unitt's 1987 work, even if it did qualify for serious consideration, was accomplished eight years ago and is out of date. Reliance on Hubbard (1987) is also fatally compromised by the passage of time. Parker and Hull (1994) estimated 81 pairs of Willow flycatchers in their study area on the upper Gila River during the breeding season accorded to **"extimus"** by the Fish and Wildlife Service, in 1994. Parker and Hull (1994) also quantified population trends over a 26 year time period, and livestock grazing levels over a period of 11 years. Parker and Hull (1994) found that between 1983 and 1994, the Gila Valley population of Willow flycatchers increased by as many as 123 birds, or by as much as 232%. During this same time period, livestock numbers in this area have increased by 250 head, or by 167%. Between 1968 and 1994, detections of singing male, Willow flycatchers in this area have increased from 13+ in 1968 (Hubbard,1987), to 49 in 1981 (Egbert, 1981), to 53 in 1983 (Montgomery, 1985), and to 81 in 1994 (Parker and Hull, 1994). The only long term population trend data available to the Fish and Wildlife Service from New Mexico establishes an increase of Willow flycatchers in New Mexico over the last quarter century.

Conclusion: The Fish and Wildlife Service misrepresents the status and trend of the Willow flycatcher in New Mexico and is in flagrant violation of 50 CFR § 424 by failing to base its determinations soley on the basis of the best scientific and commercial data available.

SUMMARY:

The determination for the rule to list the southwestern willow flycatcher as endangered is in fundamental violation of the law. As has been conclusively shown in the preceding comments, the Service willfully excluded from consideration the best scientific and commercial data available to it; the results of 1994 population surveys, from any consideration in arriving at its determination for this rule in direct violation of 50 CFR § 424.

When queried on April 12, 1995, as to the reason the Service had not considered the results of 1994 surveys in reaching its determination for this rule, Mr. Rob Marshall of the Fish and Wildlife Service stated that these surveys were not included for consideration in this final rule because the draft for the final rule was completed during the spring of 1994; or before the close of the public comment period regarding this species' proposed listing.

The obvious conclusion is that the Service acted arbitrarily and capriciously by finalizing its draft of this rule prior to the close of the public comment period and by refusing to base its determination for this rule on the best scientific and commercial data available as is required of it by 50 CFR § 424. Clearly, the listing of **"extimus"** by the Service is both legally and scientifically inappropriate.

COMMENTS ON CRITICAL HABITAT, FR 10713:

There are numerous and major problems with the FWS proposed critical habitat designation for the southwestern willow flycatcher. Some of the problems are direct violations of law and regulation, while others are more substantive in nature. Taken together, these problems make it very difficult, if not impossible for the public to comment on this Proposed Rule for Critical Habitat Designation (PRCHD).

For example, according to the Endangered Species Act (ESA) critical habitat is defined as those specific areas **on which are found** those physical and biological features essential to the conservation of the species (16 USCS § 1532 (5)(A)). These habitat features, such as nest sites, feeding sites, and vegetation type are usually described in greater detail using

quantifiable measurements of the characteristics of that habitat. These habitat characteristics include measurements of, for example, stem densities, canopy closures, and habitat structure. In other words, it is imperative and follows the intent of the law, to know what **specific** features compose critical habitat, i.e., the necessary and specific features that are actually and currently found on those designated areas. However, in this case there have been no quantifiable measurements of any of the specific features assumed to be critical habitat, and, to date, none of the species' habitat requirements, including vegetative structure, have been satisfactorily described or defined by the FWS. Hence, until such habitat is specifically defined it is impossible to designate any critical habitat for this species, as, according to law, those required features must actually be found on those areas.

In addition, because the FWS cannot describe what the critical habitat is, it is impossible for the public to comment on its designation. In short, no one can make meaningful comment on this critical habitat if the agency in charge doesn't even know what it is.

Furthermore, all areas being considered as **potential** habitat, by law, **cannot** be considered for CHD because those required features do not currently exist on those areas, i.e., they are not found there. Critical habitat can only be designated for those areas **on which are found** those essential biological and physical features. The "on which are found" phrase is not speculative to some point in the future. Rather, the intent and letter of this phrase in relation to critical habit is to designate areas which **currently possess** the essential features, thus any designation of potential or future habitat is illegal (16 USCS § 1532(5)(A)).

Another major problem with the PRCHD is **where** the critical habitat is located. On July 23, 1993, the FWS proposed designating critical habitat and found that it was determinable and supplied general maps of the areas considered for designation (58 FR, 39502). Now, however, the FWS is deferring the designation while finding that it is, in fact, not determinable because, among other things, the FWS is reconsidering the proper boundaries of the designation (60 FR, 10713). No maps were supplied to the public in the more recent notice. In other words, not only doesn't the FWS know what critical habitat is, but it also doesn't even know where it is. Obviously, this makes it impossible for the public to provide meaningful comment or input.

Furthermore, the exact location of **each** of the critical habitat areas is imperative to know if the economic analysis in regard to the exclusionary process is to be meaningful. According to the ESA, the economic impacts (and other relevant impacts)

must be viewed in relation to **"specifying any particular area"** as critical habitat and that the exclusion of CHD is meaningful only if "the benefits of such exclusion outweigh the benefits of **specifying such area** as part of the critical habitat ... (16 USCS § 1533(b)(2)) (emphasis added). Therefore, the FWS must analyze each of the areas of CHD individually in regard to economic and other relevant impacts.

Furthermore, as mentioned above and in compliance with law and regulation, the FWS must consider the economic impacts and any other relevant impacts before critical habitat is designated (16 USCS § 1533(b)(2). To date no analyses, economic or otherwise, are known to have been conducted or have been made available to the public. The FWS has, however, extended the final critical habitat rule pending an economic analysis and review of "new information." However, the public comment period closes on April 28, 1995, hence, the FWS will not disclose the findings of the economic analysis to the public nor will the general public have the opportunity to coment on this document. Furthermore, the public has not been made aware of the specific "new information" that in part led to this proposed rule being deferred.

The FWS claims that substantial disagreement exists on the CHD and that this gives good cause to extend the period relative to the final rule. However, the FWS was made aware of similar disagreements on the listing, yet no extension was granted, even though an extension was specifically requested. This was a clear violation of law (16 USCS § 1533(b)(6)(B)(ii)).

As of October, 1993, when forming new regulations and as directed by Executive Order 12866, each federal agency shall "assess both the costs and the benefits of the intended regulation" and "propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulations justify its costs" (58 FR, 51736). To date the FWS has provided nothing to show how and when it intends to comply with Executive Order 12866. This proposed rule is considered a significant regulatory action as it will in a material way effect the local economy and local communities. Hence, the FWS is obligated to follow the Executive Order.

Brown-headed cowbird, 60 FR 10700:

Because of the FWS' misrepresentation of this "threat" in the final rule, we are also compelled to revisit this issue.

The FWS maintains that cowbird populations in the United States appear to be declining only in the northeast and further states that the West has experienced a marked population increase over the last five years. However, the Service fails to point out

that neither of those two statements is true in relation to the Southwest -- which is the range of this species.

It is interesting to note that the FWS provides no actual data figures to support its statements that cowbirds have increased in the Southwest (see: 60 FR, 10712). If the FWS would have looked at the data, and this information **was** available to it, the Service would have found that cowbird populations over most of the range of this species have decreased according to Breeding Bird Survey (BBS) data.

The BBS database contains the most comprehensive bird population trend information available and has been used by the FWS as a source of information on other listings (see, for example, the proposed listing of the Mexican spotted owl, 56 FR 56351). The BBS information shows conclusively that throughout most of the southwestern Willow flycatcher's range, the population trend for the cowbird is declining -- not increasing as the FWS contends.

This information points out that for the years 1980-1994, populations of cowbirds have significantly declined by 2.4% annually in Arizona, and have declined by .3% annually in New Mexico. This data does not support the determination by the Service that cowbirds are increasing in population, nor does it show that cowbirds will be a threat to the flycatcher in the future -- again, because cowbird populations in the Southwest are declining.

The FWS further states that it is "the threat of parasitism, regardless of the cause, that in part necessitates listing." However, the criteria to list species never discusses nor even hints that **potential threats** in regard to "other natural or manmade factors affecting" the species' existence are to be given consideration (16 USCS § 1533(a)(1)(E)). Moreover, this criterion indicates that the factors must be <u>currently</u> occurring in order to be considered - not an unknown threat at some point in the future. Given that potential threats of parasitism cannot be used as a valid criteria for listing, coupled with the fact that cowbird populations are declining, clearly, this factor as support for listing this species, must be eliminated.

The FWS states that recent information continues to document high parasitism rates by cowbirds, citing both Sogge (1993) and Muzineks (1994). Both of these authors, however, monitored only a few nests. In Muzinek's citation (Table 3, p. 16), for example, only 9 nests were monitored of which 4 were parasitized (44%). This monitoring was conducted in 1993.

However, the data from 1994, a year in which many more nests were monitored, shows that of the 58 nests monitored, only 7, or **12%**, were parasitized by cowbirds (Arizona Partners In Flight,

Aug. 6, 1994). Instead of citing this data, the FWS discusses the high rates of cowbird parasitism on the Kirtland's warbler (72-83%) and falsely states that these high rates of parasitism are comparable for the Willow flycatcher in the Southwest. The 1994 Arizona figures do not support the notion that the available evidence documents a high parasitism rate by cowbirds as the FWS contends. Again, this information was available to the FWS, yet was not used. This is a direct violation of law (16 USCS § 1533 (b)).

There are other comments in regard to the listing criterion of "Other Natural or Manmade Factors Affecting Its Continued Existence" that merit attention (60 FR, 10711). As is stated very clearly in both law and regulation, the FWS **must solely use** the best scientific or commercial data available in its determinations (16 USCS § 1533(b) and 50 CFR § 424.11(c)). Conjecture, speculation and supposition do not constitute and are not part of the best scientific or commercial data available. Therefore, any statements made by the FWS which support the listing of a species that are not based on scientific or commercial data (and thusly cited) must be considered as illegal and irrelevant.

Thank you for your consideration of these comments made on behalf of the Arizona Mining Association by Applied Ecosystem Management, Inc.

cc.: Mr. David Ridinger, Arizona Mining Association

ATTACHMENT "F"

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

ATTACHMENT "G"

Dennis Parker
Attorney at Law
P.O. Box 1100
Patagonia, Arizona 85624

March 21, 2003

Mr. Delvin Lopez
Cave Creek District Ranger
40202 No. Cave Creek Rd.
Scottsdale, Arizona 85262

Re: Response to letter from District Ranger dated 27 February 2003

Dear Delvin,

Thank you for providing the Johnson Ranch with the extension of time requested to respond to your letter of February 27, 2003. In that letter, you solicit the Johnson Ranch's response to your selection of Alternative D of the E.A. and your proposal of research on the effects of grazing management in the Davenport Pasture.

At the outset, your decision to exclude non-growing season livestock use of the Lower Chalk Pasture, in reversal of your October 29, 2002, determination allowing such, is both disappointing and inappropriate for a number of reasons. First, your analysis of what the Southwestern Willow Flycatcher Recovery Plan calls for in regard to the Lower Chalk Pasture is in error. Because your exclusion of the Lower Chalk Pasture from all livestock use since 1998 was based on an agency position regarding potential flycatcher habitat that has since been rejected by the 9th Circuit Court of Appeals in Arizona Cattle Growers' Association (2001), grazing was, and in fact yet remained, a lawful, ongoing activity in the Lower Chalk Pasture when new flycatcher nests became established --- not withstanding your unilateral decision to wrongly exclude this pasture from all use. Therefore, continuing lawful use of this pasture with monitoring is both appropriate and incentive driven, as called for by the Recovery Plan for the flycatcher.

Second, the Recovery Plan does not state that grazing should not be reinitiated in the Lower Chalk Pasture. According to Appendix G of the Southwestern Willow Flycatcher Recovery Plan, … "[t]he intent of these general grazing guidelines is to promote recovery of the southwestern willow flycatcher while allowing conservative livestock grazing where appropriate and to provide flexibility for adaptive management in order to maintain or enhance southwestern willow flycatcher habitat." (Appendix G at p.24).

Third, the Recovery Plan does not exclude livestock grazing below 6,000' in elevation in occupied, suitable unoccupied, or potential flycatcher habitats. (Appendix G at pp. 26-

27). Because the Lower Chalk Pasture is below 6,000' in elevation and because the Recovery Plan states that ... "[i]n order to provide incentives for private landowners and public grazing permittees to improve and manage for southwestern willow flycatcher habitat, flexibility through adaptive management must be an integral part of the recommended grazing guidelines," (Appendix G at p. 25), non-growing season use of the Lower Chalk Pasture by livestock is thus also appropriate for these additional reasons according to the Recovery Plan.

Fourth, your reliance on the Regional Grazing Guidance Criteria of April 15, 2002, as grounds for reaching your determinations is also misplaced. This Guidance Criteria does not have the force of law because it was not promulgated as a rule as required by the Administrative Procedure Act. Instead, the Forest Service circumvented the rulemaking process by adopting this criteria as policy, without input from the regulated public that would be substantially impacted by it, in violation of the APA.

While the Recovery Plan recognizes the value of providing incentives for private landowners and public grazing permittees, such as the Johnson Ranch, to improve and manage southwestern willow flycatcher habitat through flexible and adaptive management, apparently the Forest Service does not. The Johnson Ranch bases this conclusion on your February 27 response to the concerns raised in its February 21 letter to you.

Your February 27 response to the twin concerns raised by the Johnson Ranch --- lack of incentives and the Forest Service's continuing policy of excluding all livestock from potential flycatcher habitat by policy fiat --- was essentially three-fold in nature. First, the Forest Service will not consider either of these concerns. Second, you have decided to reverse your decision of October 29, 2002, allowing non-growing season livestock use of the Lower Chalk Pasture by the Johnson Ranch without any input from the Johnson Ranch. Third, you have selected Alternative D of the E.A. without providing the Johnson Ranch any notice of your intention to do so. This is hardly an approach that provides incentives or promotes the kind of coordination and cooperation with private landowners and public grazing permittees called for by the Southwestern Willow Flycatcher Recovery Plan.

Moreover, because the restrictions on livestock grazing imposed by the Regional Grazing Guidance Criteria of April 15, 2002, for the willow flycatcher are not based on objective analysis of the best scientific and commercial information available, the exclusion of all grazing from potential habitat and within 2 to 5 miles of occupied flycatcher habitat cannot be supported. Therefore, the Johnson Ranch is filing a petition with the Forest Service under the Data Quality Act to correct these errors in the Criteria, concurrent with this letter to you.

Further, because the Forest Service has 60 days to respond to this petition, and because the Johnson Ranch then has the right to appeal that decision, should it need to, any agency selection of an E.A. alternative for the Johnson Ranch is therefore not currently possible and lawfully premature. Thus, the Forest Service must await the

outcome of the Johnson Ranch's DQA petition before it can rationally determine which of the alternatives in the E.A. for the Johnson Ranch, if any, are still in fact viable.

In closing, Delvin, the Johnson Ranch nevertheless remains ready to resume its participation in the development of a research area proposal on the stretch of the Verde River involving the ranch, should the Forest Service decide upon reconsideration to implement the incentives and appropriate levels of non-growing season livestock use of occupied, suitable unoccupied, and potential habitat for the flycatcher sought by the Johnson Ranch, and called for by the Southwestern Willow Flycatcher Recovery Plan. Again, any suggestions you may have as to how this can be accomplished are welcomed by the Johnson Ranch.

Sincerely,

Dennis Parker

Dennis Parker,
Attorney for the Johnson Ranch

Cc: S.O., Chris Udall, Josh Penry

ATTACHMENT "H"

To: Mr. Delvin Lopez, District Ranger,
Cave Creek District, Tonto National Forest

From: Dennis Parker for Johnson Ranch Partnership

Re: Proposal to Graze the Lower Chalk and Yearling pastures outside of the Southwestern Willow flycatcher's critical season on an experimental basis

Date: August 30, 2002

I. Summary of Proposal

The Johnson Ranch Partnership proposes to graze the Lower Chalk and Yearling pastures from November 1 through March on an experimental basis in order to (1) minimize the threat of loss of occupied Southwestern Willow flycatcher habitat to stochastic fire event per Section 7 of the Endangered Species Act and (2) to facilitate more efficient management of the Johnson Ranch through more effective use of the Forest Service allotments it currently holds. We suggest that allowable use could be set at 40% for woody species under six feet tall and that bank alteration would not be allowed to exceed 20%. Moreover, under this proposal, livestock will not be allowed to "camp out" in the occupied Southwestern Willow flycatcher habitat found at the upper end of Horsehoe Lake because livestock use of this area will be closely monitored and the livestock will be actively herded away from this area as necessary. All livestock will be removed from both pastures by April 1 in order to avoid livestock use during the critical season for the Southwestern Willow flycatcher (April 1 thru July 31), or earlier if allowable use levels are approached.

II. Compatibility of this Proposal with Section 7 of the Endangered Species Act

Section 7 of the Endangered Species Act requires that the Forest Service "insure that any action authorized, funded or carried out ..... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species." Once consultation with the Fish and Wildlife Service has been initiated by the Forest Service, the Forest Service and any permit or license applicant involved may not make any irreversible or irretrievable commitment of resources.

Here, the action proposed -- grazing of the Lower Chalk and Yearling pastures -- is not likely to jeopardize the continued existence of the Southwestern Willow flycatcher or result in the destruction or adverse modification of its habitat.

This is because the use proposed is outside of the critical season for this species, is within allowable forage use and bank alteration levels, and will serve as the primary tool to substantially reduce the high risk of flycatcher and flycatcher habitat loss to catastrophic wildfire which now exists in both of these pastures.

The presence of livestock during the non-critical season in both of these pastures will substantially reduce the potential for catastrophic wildfire as it relates to Southwestern Willow flycatchers and their habitat because the livestock will trample down and to an extent consume the over-abundant fuels now existent within these pastures. These fuels consist primarily of dense stands of cocklebur in the lakebed and to the edge of the riparian green line, dense buildups of dry Russian thistle plants within and at the edge of the riparian greenline, and Johnson grass to a lesser extent.

Loss of Southwestern Willow flycatchers and their habitat to catastrophic wildfire is a very real and well known threat within flycatcher-occupied areas subjected to year-round exclusion of livestock (such as is currently the case with the Lower Chalk and Yearling pastures). Substantial evidence supporting this conclusion is provided by the loss of four occupied Southwestern Willow flycatcher habitats to wildfire in the year 1996 alone.

One of these fires, which occurred June 3, 1996, on the PZ Ranch along the lower San Pedro River, burned approximately 75% of the entire patch and about two-thirds of the historical flycatcher breeding area then found at that location. Significantly, this site consisted of a mature Fremont Cottonwood gallery forest with an understory of Tamarisk on the edge -- a habitat type far more resistant to destruction by fire than the younger growth Goodding Willow edged by Tamarisk habitat type now found at the upper end of Horseshoe Lake. In 1997, no flycatchers returned to the burned area on the PZ, nor did any return to the unburned area to the north of the 96' burn the next year.

Furthermore, in response to the Forest Service's stated concern regarding cowbird parasitism and Willow flycatchers, we must point out that the elimination of livestock grazing within 2-5 miles of occupied Willow flycatcher habitat, based on the assumption that to allow such would lead to increased parasitism of Willow flycatchers by cowbirds, is unsuppported by substantial evidence. To the contrary, the best scientific and commercial data available -- that obtained by the Forest Service's own Rocky Mountain Research Station on the U Bar Ranch in New Mexico -- clearly shows that parasitism rates on flycatchers by cowbirds are extremely low and reproductive success rates of flycatchers are extremely high in an area where

livestock and flycatchers occur together or within close proximity to one another during the Willow flycatcher's critical season. See 1998-2001 Summary Reports by Drs. Scott H. Stoleson and Deborah M. Finch, USDA Forest Service, Rocky Mountain Research Station, Albuquerque, New Mexico. This information is in fundamental contradiction with the Forest Service's April 15, 2002, Guidance Criteria for grazing which eliminates livestock grazing within 2-5 miles of occupied flycatcher habitat and which cites as support for this approach no research conducted after 1996.

Here, however, because the use proposed is to occur during the non-critical season when the Willow flycatcher is not on its Horseshoe Lake breeding grounds, there is no threat of cowbird parasitism. Thus, cowbird parasitism is a non-factor in the consideration of this proposal.

III. Conclusion

Utilization by livestock of the Lower Chalk and Yearling pastures during the non-critical season for the Southwestern Willow flycatcher as here proposed will substantially reduce the currently high potential for loss of flycatchers and their habitat to catastrophic wildfire in compliance with Section 7 of the Endangered Species Act. Moreover, because the use proposed is during the time period when Willow flycatchers are not present on their breeding grounds, there is no conflict between such use and concerns regarding cowbird parasitism on Willow flycatchers. Finally, riparian condition will not be degraded because utilization of these pastures by livestock under this proposal will not exceed allowable use percentages. For all of the preceding reasons, the Johnson Ranch strongly urges the Forest Service to accept its proposal to utilize the Lower Chalk and Yearling pastures during the non-critical season for the Southwestern Willow flycatcher.