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2-21-96-F-160
SUMMARY: PROGRAMMATIC BIOLOGICAL OPINION FOR THE SAFFORD AND TUCSON FIELD OFFICES' LIVESTOCK GRAZING PROGRAM, SOUTHEASTERN ARIZONA

Date of Opinion: September 26, 1997

Action Agency: Bureau of Land Management, Safford Field Office, Safford, Arizona

Project: The Safford and Tucson Field Offices of the Bureau of Land Management propose to authorize livestock grazing on 288 allotments and leases, comprising 1,588,258 acres and averaging 145,537 annual animal unit months of use through December 31, 2006. Allotments occur in portions of Greenlee, Graham, Pinal, Cochise, and Pima counties, Arizona. The Bureau's grazing program is defined programmatically, based on applicable law, regulations, policies, objectives, standards, guidelines, and decisions as set forth in various planning documents.

Listed/Proposed Species and Critical Habitat Affected: Kearney's blue star, *Amsonia kearneyana*; Pima pineapple cactus, *Coryphantha scheeri* var. *robustispina*; Nichol's turk's head cactus, *Echinocactus horizonthalonius* var. *nicholii*; Arizona hedgehog cactus, *Echinocereus triglochidiatus* var. *arizonicus*; Huachuca water umbel, *Lilaeopsis schaffneriana* var. *recurva*; desert pupfish, *Cyprinodon macularis*; spikedace, *Meda fulgida*; Gila topminnow, *Poeciliopsis occidentalis occidentalis*; loach minnow, *Tiaroga cobitis*; razorback sucker, *Xyrauchen texanus*, (with critical habitat); southwestern willow flycatcher, *Empidonax traillii extimus*, (with critical habitat); cactus ferruginous pygmy-owl, *Glaucidium brasilianum cactorum*; lesser long-nosed bat, *Leptonycteris curasoae yerbabuenae*; jaguar, *Panthera onca*; and New Mexico ridgenose rattlesnake, *Crotalus willardi obscurus*.

Biological Opinion: The Service determined that the proposed action is not likely to jeopardize the continued existence of the listed species affected, and is not likely to result in destruction or adverse modification of designated or proposed critical habitat. The biological opinion addresses all aspects of the Safford and Tucson Field Offices' grazing program to the project level. The opinion also includes concurrences that the proposed action may affect but is not likely to adversely affect the beautiful shiner, *Cyprinella formosa*; Yaqui chub, *Gila purpurea*; Yaqui catfish, *Ictalura pricei*; Yaqui topminnow, *Poeciliopsis occidentalis sonoriensis*; American peregrine falcon, *Falco peregrinus anatum*; northern aplomoado falcon, *Falco femoralis septentrionalis*; bald eagle, *Haliaeetus leucocephalus*; and the Mexican spotted owl, *Strix occidentalis lucida*.

Incidental Take Statement:

Level of take anticipated: One or more forms of take is anticipated for each of the animal species.

Reasonable and Prudent Measures: The biological opinion presents a range of measures for reducing incidental take. In many cases, the most important measures are

adopted from options within the Bureau's proposed action. Implementation of these measures through the terms and conditions are mandatory.

Terms and Conditions: Mandatory terms and conditions are included for all animal species to implement the reasonable and prudent measures. They include a variety of measures to reduce incidental take, such as modifying actions that result in take of individual animals, education of project personnel, preconstruction surveys, and monitoring of take and habitat loss.

Conservation Recommendations: Conservation measures are recommended for all listed species. Suggested measures include recovery tasks, clarification of a species range or distribution, further studies into the effects to livestock grazing, and other related matters.

United States Department of the Interior

Fish and Wildlife Service

Arizona Ecological Services Field Office

2321 W. Royal Palm Road, Suite 103

Phoenix, Arizona 85021-4951

(602) 640-2720 Fax (602) 640-2730

In Reply Refer To:

September 26, 1997

In Reply Refer To:
AESO/ES
2-21-96-F-160

TO: Field Manager, Safford Field Office, Bureau of Land Management, Safford, Arizona

FROM: Field Supervisor

SUBJECT: Programmatic Biological Opinion for the Safford/Tucson Field Offices' Livestock Grazing Program, Southeastern Arizona

This biological opinion responds to your request for consultation with the U.S. Fish and Wildlife Service pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your original request was dated February 29, 1996, and received by us on March 4, 1996. Consultation was initiated with receipt in this office of a complete consultation package on May 21, 1997. At issue are impacts that may result from grazing of livestock, construction and maintenance of range improvements, and other features of the Safford and Tucson Field Offices' grazing program in portions of Greenlee, Graham, Pinal, Cochise, Santa Cruz, and Pima counties, Arizona. These impacts may affect the following listed species: Kearney's blue star, *Amsonia kearneyana*; Pima pineapple cactus, *Coryphantha scheeri* var. *robustispina*; Nichol's turk's head cactus, *Echinocactus horizonthalonius* var. *nicholii*; Arizona hedgehog cactus, *Echinocereus triglochidiatus* var. *arizonicus*; Huachuca water umbel, *Lilaeopsis schaffneriana* var. *recurva*; desert pupfish, *Cyprinodon macularis*; spikedace, *Meda fulgida*; Gila topminnow, *Poeciliopsis occidentalis occidentalis*; loach minnow, *Tiaroga cobitis*; razorback sucker, *Xyrauchen texanus*; southwestern willow flycatcher, *Empidonax traillii extimus*; Cactus ferruginous pygmy-owl, *Glaucidium brasilianum cactorum*; lesser long-nosed bat, *Leptonycteris curasoae yerbabuenae*; jaguar, *Panthera onca*; and New Mexico ridgenose rattlesnake, *Crotalus willardi obscurus*; and critical habitat designated for the southwestern willow flycatcher and razorback sucker.

The Bureau of Land Management (Bureau) requested concurrence from the Service that the proposed action may affect but is not likely to adversely affect the beautiful shiner, *Cyprinella formosa*; Yaqui chub, *Gila purpurea*; Yaqui catfish, *Ictalura pricei*; Yaqui topminnow, *Poeciliopsis occidentalis sonoriensis*; American peregrine falcon, *Falco peregrinus anatum*; northern aplomado falcon, *Falco femoralis septentrionalis*; bald eagle,

Haliaeetus leucocephalus; and Mexican spotted owl, *Strix occidentalis lucida*. The Service concurs with the Bureau's determinations for these species. Rationale for our concurrences is detailed in the "CONCURRENCES" section. The Bureau also requested concurrence from the Service that the proposed action may affect but is not likely to adversely affect the New Mexico ridgenose rattlesnake. The Service does not concur with this determination because of likely adverse effects to the species, including take. In accordance with 50 CFR 402.14(a) and (b), the New Mexico ridgenose rattlesnake is addressed in formal consultation herein.

This biological opinion was prepared using information from the following sources: your February 29, 1996, request for consultation; your April 19, 1996, correspondence to this office itemizing listed species occurrence by allotment; the May 1996 biological evaluation for the project (Bureau 1996a); your June 3, 1996, updated request for consultation; your September 6, 1996, response to our July 11, 1996, request for additional information about the grazing program (Bureau 1996b); your May 20, 1997, response (Bureau 1977a) to our March 21, 1997, request for additional information; your August 19, 1997, comments on the draft biological opinion; coordination meetings and discussions among our staffs and the applicants (Table 1); letters from Jeff Menges, an applicant, to this office dated July 10, 1996, August 24, 1996, September 2, 1996, April 24, 1997, June 11, 1997, and August 7, 1997; a letter with supporting reports and information from Mr Menges' attorneys dated August 18, 1997; letters from other applicants dated August 17, 1997 (Stephen Hooper); August 7, 1997 (Gary and Berta McEuen); August 4, 1997 (Gary Bryce); August 7, 1997 (Fred Decker); August 4, 1997 (Philip DeNormandie); undated (Mike Hayhurst); August 12, 1997 (The Nature Conservancy); August 2, 1997 (Mac Donaldson, John Donaldson, and John McDonald); August 14, 1997 (Joe Goff); August 4, 1997 (Pete Brawley); and our files. Literature cited in this biological opinion is not a complete bibliography of all literature available on the affected species, nor is it a complete review of the effects of livestock grazing programs on these species. A complete administrative record of this consultation is on file in our office.

The Service finds that the Safford/Tucson Field Offices' livestock grazing program is not likely to jeopardize the continued existence of Kearney's blue star, Pima pineapple cactus, Nichol's turk's head cactus, Arizona hedgehog cactus, Huachuca water umbel, desert pupfish, spikedace, Gila topminnow, loach minnow, razorback sucker, southwestern willow flycatcher, cactus ferruginous pygmy-owl, lesser long-nosed bat, jaguar, and New Mexico ridgenose rattlesnake. Nor is the livestock program likely to result in destruction or adverse modification of critical habitat designated for the southwestern willow flycatcher and razorback sucker. Incidental take statements are provided for all animal species.

Because of the length and complexity of this opinion, a Table of Contents is included following Table 1.

Table 1. Applicants to the consultation

Applicant	Allotment(s)
Jeff Menges	Zorilla (4011), Smuggler Peak (4010)
Pete Brawley	111 Ranch (5103), Tanque (5108)
Marland Norton	Ashurst (4675)
Philip DeNormandie	Painted Cave (4518)
Nimon Hopkins	Hopkins (5221)
Marie Wien	Mushog (5180), Cedar Springs (5127)
Rulon Larsen	Yuma Wash (4032)
Gary McEuen	Day Mine (4604)
Fred Decker	Dry Camp (4520)
Tex Salazar	Hell Hole (4528)
Stephen Hooper	Horse Mountain (4524)
Gary Bryce	Bryce (4608)
Dan Subia	Gila (4014)
Carlos Amada	Bonita Creek (4616)
The Nature Conservancy	South Rim (4529)
William and Donald Carpenter	Newman Peak (6022)
BHP Copper Company	Hotwell (4539)
Jerry Hooper	Balcom (6006)
Stan Jolly	Deep Well (6211)
Don Martin	Rail X (6121)
Ron Shervin	Guild Wash (6151)
Bob Walker	Newman Peak (6004)
Jim Chilton	San Luis Mountain (6085)
Joe Goff	Cross Triangle (6144)
Hooker Associates	Cerro Colorado (6023), Arroyo Seco (6186)
William Lindsey	Brunchow Hill (5251)
Parsons Company, Inc.	Empirita (6210)
Billy Tuttle	Owl Head (6083)
John Woodin	Claflin (6029)
John and Mac Donaldson	Empire Cienega (6090)
Mike Hayhurst	Babocomari (5208)

TABLE OF CONTENTS

Page
Consultation History 5
Biological Opinion 10
Description of the Proposed Action 10
Proposed Mitigation Measures 44
Scope of the Consultation 64
Analyses by Species 65
Kearney's blue star 66
Pima pineapple cactus 71
Nichol's Turk's head cactus 82
Arizona Hedgehog cactus 89
Huachuca water umbel 96
Desert pupfish 106
Spikedace 116
Gila topminnow 133
Loach minnow 147
Razorback sucker 160
Southwestern willow flycatcher 176
Cactus ferruginous pygmy-owl 213
Lesser long-nosed bat 234
Jaguar 245
New Mexico ridgenose rattlesnake 254
Disposition of Dead or Injured Listed Animals 266
Concurrences 267
Closing Statement 294
References Cited 296

CONSULTATION HISTORY

Previous Consultations and Relationship to this Biological Opinion:

Much of the proposed action has been the subject of previous formal or informal consultation. All previous consultations on the Safford and Tucson Field Offices' grazing program are listed in Table 2, which includes the date of the Service's letter concluding consultation, allotments addressed, species and critical habitat addressed, and the outcome of the consultation.

The Safford Field Office's grazing program was evaluated by the Service as part of the then Safford District's Resource Management Plan (RMP) in a biological opinion dated April 5, 1990 (2-21-88-F-114). Eight of the 15 species addressed herein in formal consultation were considered in that consultation. However, since that consultation was completed, responsibility for considerable lands west of the San Pedro River were transferred from the Bureau's Phoenix District to the Safford District. As a result of another recent reorganization, these allotments are now considered under the jurisdiction of the Tucson Field Office (Safford "District" is now considered a separate Field Office from the Tucson Field Office). The former Phoenix District allotments (now Tucson Field Office allotments) were not addressed in the 1990 RMP consultation. The Phoenix District RMP was the subject of a 1988 consultation with the Service (2-21-88-F-167); however, only elements in the RMP that differed from earlier Management Framework Plans were addressed; grazing was not addressed in that consultation. The Phoenix District RMP, including grazing, is the subject of an ongoing Plan-level consultation with the Service. The developing guidance provided in that consultation is reflected here. However, that consultation is not including project-level analyses. The current consultation is programmatic in nature and includes analyses and measures that extend to the project level.

Grazing in the Upper Gila - San Simon area was also the subject of formal consultation in 1978. Since 1978, many species/critical habitat have been listed, the status of species and grazing management has changed, and the Act was amended in 1982 to authorize incidental take and development of reasonable and prudent measures. Thus, the 1978 consultation and the Service's findings warrant reevaluation.

The recent consultation on the Empire Cienega allotment interim grazing plan (2-21-95-F-177) addressed all activities on that allotment proposed by the Bureau in the current consultation with the exception of prescribed fire, mechanical or chemical vegetation management, and range improvement projects beyond that proposed in the interim grazing program. Actions proposed in the current consultation that were not part of the interim plan are evaluated herein. The biological opinion addressed impacts to the Gila topminnow, southwestern willow flycatcher, and the lesser long-nosed bat. Since the opinion was written, the Huachuca water umbel has been listed as endangered and was found in Empire Gulch on the Empire Cienega allotment. Effects to the umbel are addressed herein. The

Table 2: Previous consultations on the Safford and Tucson Field Offices' Grazing Program

Consultation #	Date	Allotments Addressed	Species Addressed and Conclusions Concluded
No number	30 May 1978	All allotments in Upper Gila-San Simon Area	Woundfin (NJ), Gila topminnow (NJ), Mexican duck (NJ), bald eagle eagle (NJ), peregrine falcon (NJ)
2-21-87-I-038	—[1]		Mexican spotted owl, peregrine falcon
2-21-87-I-66	15 Jun 1988	San Pedro RNCA[2]	Peregrine falcon (NLAA[3]), Aplomado falcon (NLAA), Mexican wolf (NLAA), lesser long-nosed bat (NLAA)
2-21-88-F-114	5 Apr 1990	All	Bald eagle (NJ)[4], peregrine falcon (NJ), desert pupfish (NJ), loach minnow (NJ/NA[5]), spikedace (NJ/NA), lesser long-nosed bat (NJ), Gila topminnow (NLAA), aplomado falcon (NLAA), Cochise pincushion cactus (NJ)
2-21-90-F-018	1 Dec 1989	Day Mine, Bryce	Gila topminnow (NJ), desert pupfish (NJ)
2-21-90-I-150	1 May 1990	Empire Cienega	Lesser long-nosed bat (NE[6]), Gila topminnow (NLAA)
2-21-91-I-095	—[1]	Bonita Creek	Bald eagle, peregrine falcon, razorback sucker
2-21-92-F-070	3 May 1994	Johnny Creek, Bonita Creek, Bull Gap, Turtle Mountain, Twin C, County Line, Zorilla, Gila, Smuggler, Morenci	Bald eagle (NJ), peregrine falcon (NJ), loach minnow (NE), razorback sucker (NJ/NA), spikedace (NE)
2-21-92-I-219	—[1]	Braidfoot	Lesser long-nosed bat, peregrine falcon, New Mexico ridgenose rattlesnake
2-21-92-I-733	29 Sep 1992	Fan	Desert pupfish (NLAA)
2-21-94-I-053	—[1]	Safford District allotments	Bald eagle, cactus ferruginous pygmy-owl, Mexican spotted owl, peregrine falcon, lesser long-nosed bat, Arizona hedgehog cactus
2-21-95-F-177	8 Jan 1996	Empire Cienega	Lesser long-nosed bat (NJ), Gila topminnow (NJ), southwestern willow flycatcher (NJ)
2-21-95-I-049	—[7]	Rough Mountain, Happy Camp, Sheep Canyon, Nine Mile	Bald eagle, cactus ferruginous pygmy-owl, Mexican spotted owl, peregrine falcon, lesser long-nosed bat, Arizona hedgehog
2-21-97-F-	(ongoing)	Tucson Field Office allotments	Kearney's blue star, Pima pineapple cactus, lesser long-nosed bat, cactus ferruginous pygmy-owl, southwestern willow flycatcher

[1]Species list requested by the Bureau and provided by the Service, but no further consultation occurred
[2]Grazing is excluded from the San Pedro River Riparian National Conservation Area until at least 2003, at which time grazing policy would be reevaluated (Bureau 1988)
[3]NLAA = the Service found that the proposed action was not likely to adversely affect the species
[4]NJ = no jeopardy opinion issued by the Service
[5]NJ/NA = no jeopardy, no destruction or adverse modification of critical habitat opinion issued by the Service
[6]The Bureau found that the proposed action would no effect the species
[7]The Service commented on the draft Dos Cabezas Wilderness Management Plan and environmental assessment

environmental baseline for the southwestern willow flycatcher has changed since the opinion was issued; thus effects to this species are reevaluated herein. However, the Bureau has not proposed any changes to the interim grazing plan and no new information is available that warrants a reanalysis of the conclusions of the Service in regard to the effects of the interim grazing program, reasonable and prudent measures, or conservation recommendations for the Gila topminnow and the lesser long-nosed bat as presented in the Service's biological opinion.

The Service's May 3, 1994, biological opinion on the Gila Box RNCA interdisciplinary activity plan (2-21-92-F-070) addressed grazing on nine allotments along the Gila River (Table 2). The opinion noted that the southwestern willow flycatcher was proposed for listing and that suitable habitat existed in the project area. The species has since been listed as an endangered species. Fences, changes in grazing systems, development of new waters, and other actions were proposed by the Bureau to reduce the effects of livestock grazing along the Gila River. Some of these actions have yet to be implemented. For example, although reaches of the Gila River in the Twin C, Johnny Creek, and Bullgap allotments have been fenced, fencing is incomplete in the Morenci allotment, and proposed upland water developments in the Gila allotment have not been completed, allowing year-long grazing in a 5.5 mile reach of the river (Bureau 1996a). Although the effects of the action as described in the biological opinion are likely unchanged in some cases, because of the listing of the southwestern willow flycatcher and delayed implementation of measures described in the 1994 biological opinion, potential adverse effects to listed and proposed species and their critical habitat in the nine Gila Box RNCA allotments will be reevaluated in the current biological opinion.

The informal consultation on the San Pedro River RNCA Management Plan (2-21-87-I-66) found that the proposed action would not likely adversely affect listed species, including the peregrine falcon, northern aplomado falcon, Mexican gray wolf, and lesser long-nosed bat. Since that consultation was completed, the southwestern willow flycatcher and the Huachuca water umbel have been listed as endangered, and lands within the RNCA have been designated as critical habitat for the former species. The flycatcher nested near the RNCA's northern boundary in 1996 and in 1997 several birds were detected in the RNCA, including a nest at Kingfisher Pond. The Huachuca water umbel occurs at several localities within the RNCA. Although the RNCA Management Plan included disallowing livestock grazing until at least 2003, an unknown number of trespass cattle are present along the San Pedro River and are adversely affecting riparian vegetation and stream banks in localized reaches (Sally Stefferud, Fish and Wildlife Service, Phoenix, AZ, pers. comm. 1997). Due to the listing of the southwestern willow flycatcher and the Huachuca water umbel, designation of critical habitat for the former species, and apparent impacts of trespass cattle, the Service's conclusion that the proposed action would not likely adversely affect listed species will be reevaluated in the current biological opinion.

The informal consultation on the Fan allotment (2-21-92-I-733) only addressed augmentation of the water supply to a pond occupied by desert pupfish at Howard Well and associated modifications to Martin Well and connecting pipelines. Because of the narrow scope of this consultation, the effects of proposed livestock grazing on listed and proposed species in the Fan allotment will be addressed comprehensively in the current consultation.

Consultation in the Day Mine and Bryce allotments (2-21-90-F-018) focused on proposed introductions of desert pupfish to Big Spring and Cold Spring, but included an analysis of grazing impacts at these sites. Pupfish have not been observed at Big Spring since 1991, but were observed at Cold Spring in 1996 and are presumed extant at this site (Service files). This analysis still has value, but only applies to the these two sites. Analyses from this consultation are included herein.

Sequence of Events:

The Bureau's Safford Field Office began an analysis of compliance needs in regard to consultation and grazing actions in June 1995. Compliance needs were addressed in their Annual Work Plan process which began in August 1995. Informal meetings occurred between the Service and the Bureau in regard to this process in August and November 1995. In a memorandum dated January 31, 1996, the Bureau requested from this office a list of threatened and endangered species and designated critical habitat that occur on Bureau lands within the Safford District. In that memo, the Bureau informed the Service that the Southwest Center for Biological Diversity had filed suit against the Bureau for failure to consult with the Service on the effects of the grazing program to newly-listed species and their habitats. The Service responded with a list of listed and proposed species that occur in the project area in a memorandum dated February 2, 1996. Another coordination meeting was held February 22, 1996 to discuss the consultation process. In a memorandum dated February 29, 1996, the Bureau's Safford District requested initiation of formal consultation with the Service and stated that a biological evaluation was forthcoming within 90 days. The Service responded back with a memorandum dated April 4, 1996, that stated formal consultation would not be initiated until all information needed to complete a biological opinion, including a biological evaluation, was provided to the Service. In a memorandum dated April 19, 1996, the Bureau supplied the Service with a list of listed and proposed species and critical habitat that occur within allotments in the Safford District.

In a memorandum dated June 3, 1996, the Bureau again requested initiation of formal consultation with the Service. The request included a biological evaluation (Bureau 1996a). In a July 10, 1996, memorandum, the Bureau informed the Service that Mr. Jeff Menges, a permittee on the Smuggler Peak and Zorilla allotments, had requested and been granted applicant status in the consultation. In a July 11, 1996, memorandum, the Service responded to the Bureau's request for initiation of consultation and asked for more information on the scope of the proposed action and effects to listed and proposed species and critical habitat. Mr. Menges was forwarded in a August 28, 1996, letter from this office the July 11, 1996,

memorandum. In a letter dated September 2, 1996, Mr. Menges commented on the Service's July 11, 1996, memorandum.

In a September 6, 1996, memorandum, the Bureau responded to the Service's July 11, 1996, request for more information. The Service informed the Bureau and Mr. Menges in a September 24, 1996, memorandum that further work on the consultation would be delayed until early 1997 due to higher-priority work items, but that information provided by the Bureau "should be adequate to initiate formal consultation." In a December 13, 1996, memorandum, the Service informed the Bureau and Mr. Menges that work would begin on the consultation on or about February 17, 1997, and that due to the complexity of the consultation, a 45-day extension to the consultation period would be needed. Thus, a biological opinion could be provided to the Bureau about July 1, 1997. In an undated memorandum from the Bureau and received in this office January 9, 1997, the Bureau requested clarification about the date consultation was initiated and asked that a draft of the biological opinion be supplied to them for comment prior to issuance of a final document. In a March 21, 1997, memorandum, the Service again requested more information about the scope of the proposed action and effects to listed and proposed species and critical habitat.

A coordination meeting was held April 10, 1997, among the Service, the Bureau, and Mr. Menges in Safford to further discuss information needs, the consultation process, and time frames. Questions presented in the Service's March 21, 1997, memorandum were mostly answered at that meeting and what few questions remained, the Bureau committed to promptly finding answers to them. In a April 24, 1997, letter to the Service, Mr. Menges wrote that he generally supported the approach to completing the consultation and restated some of the conclusions of the meeting. In a April 29, 1997, memorandum, the Bureau's Arizona State Director restated the need for completing consultation by July 1, 1997, and that the Bureau would work with the Service to ensure prompt completion. In a May 13, 1997, memorandum from the Bureau's Arizona State Office, the Bureau informed the Service that Arizona Rangeland Health Standards and Guidelines, approved on April 28, 1997, were now a part of the proposed action in this and other grazing consultations. In a memorandum dated May 20, 1997, the Bureau supplied to the Service the information requested in the Service's March 21, 1997, memorandum. The Service responded back in a May 27, 1997, memorandum that the information was adequate and formal consultation was initiated. The memorandum also restated the Service's commitment to deliver a draft biological/conference opinion to the Bureau by July 1, 1997.

On June 25, 1997, the Service met with the Bureau to discuss effects of the action and to further clarify aspects of the proposed action and other topics needed to complete an early draft biological/conference opinion. At the meeting, the Service informed the Bureau that based on new information on the distribution of the New Mexico ridgenose rattlesnake, that we could not concur with a not likely to adversely effect determination for this species, and that we would address effects in formal consultation herein. The Service also informed the Bureau that we could concur with not likely to adversely affect determinations for eight other species.

An "early" draft biological/conference opinion was submitted to the Bureau on July 1. The Service met with the Bureau on July 10, 11, and 12, 1997, to discuss the early draft. Based on these discussions, the document was revised and submitted to the Bureau as a draft biological/conference opinion on July 14, 1997. In a memorandum dated August 19, 1997, the Bureau forwarded their comments on the draft biological/conference opinion to this office. In that memorandum, the Bureau also informed the Service that 32 permittees had been accepted as applicants to the consultation process. A list of applicants was enclosed (Table 1) as well as letters from the applicants to the Bureau commenting on the biological/conference opinion or other aspects of the consultation process. The Service received additional comment letters from the applicants, as noted on page 2.

Between issuance of the draft and final opinions, two proposed listing actions relevant to this opinion were finalized. The jaguar was listed as an endangered species in a Federal Register notice published July 22, 1997 [62 FR 39147-39157]. Also on July 22, 1997, critical habitat was finalized for the southwestern willow flycatcher [62 FR 39129-39147, and see correction at 62 FR 44228]. Thus, the draft "biological/conference" opinion was converted to a biological opinion in this final version.

The Service met with the Bureau and several of the applicants on September 4 in Safford to discuss comments and finalization of the biological opinion. The Bureau informed the Service at the meeting that, in regard to litigation brought by Southwest Center for Biological Diversity, Department of Justice would be reporting to the court on the progress of the consultation on September 30. The Bureau requested that the biological opinion be finalized prior to September 30. The draft opinion was revised into this final version based on information and comments received from the Bureau, applicants, and Mr. Menges' attorneys in comment letters and at meetings; as well as other new information obtained after issuance of the draft. This final version was also revised to reflect listing actions that occurred after release of the draft.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The Bureau's Safford and Tucson Field Offices propose grazing of livestock in 288 allotments, encompassing 1,588,258 acres in southeastern Arizona through December 31, 2006. An annual average use of 145,537 animal unit months (AUMs) occurs on the allotments. The project area, which includes lands within the jurisdiction of the two field offices is shown in Figure 1. Allotment boundaries and property ownership within allotments are illustrated in Appendix 1, available for inspection at the Service's office in Phoenix. All allotments are listed in Table 3, which includes for each allotment the management category, acreage, percentage Federal acreage, AUMs permitted by the Bureau, grazing system, and whether riparian areas are present. Allotment numbers in Table 3 are keyed to numbers in Appendix 1.

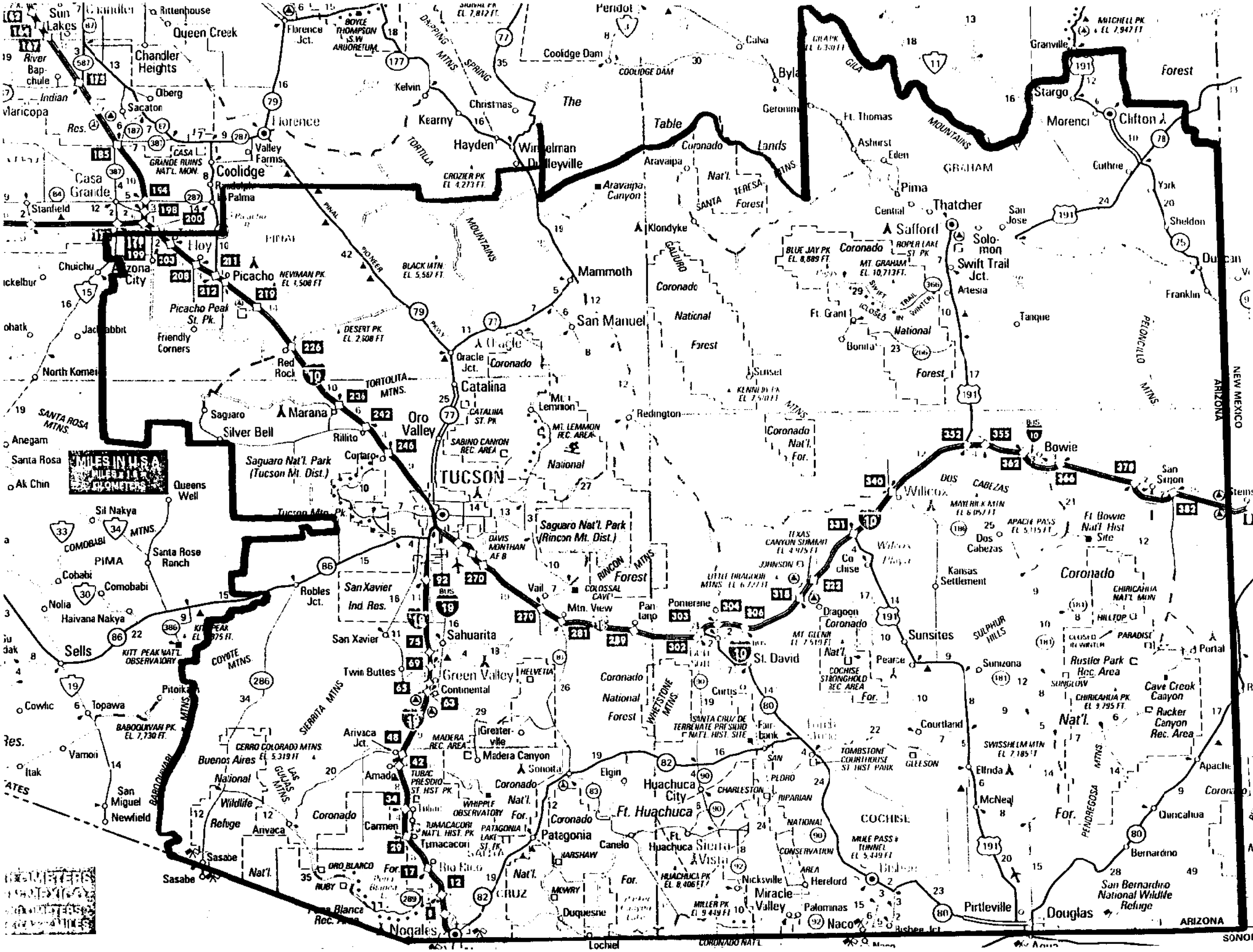

Figure 1: Project area: portion of southeastern Arizona in which the 288 allotments under consultation are located

Table 3

GRAZING ALLOTMENT INFORMATION

ALLOTMENT NUMBER	ALLOTMENT NAME	MANAGEMENT CATEGORY	CURRENT PUBLIC LAND ACRES	OTHER ACRES	TOTAL ACRES	% FEDERAL LAND	CURRENT PERMITTED USE: FED. AUMS	CURRENT GRAZING SYSTEM	RIPARIAN AREAS PRESENT
	GILA R.A.								
4001	METCALF	C	4404	12018	16422	27	348	YL	X
4002	SAN FRANCISCO	I	3925	1480	5405	73	562	YL	X
4003	MORENCI	C	6600	19083	25683	26	900	YL	X
4005	RED HICKEY HILLS	I	2460	3063	5523	45	240	YL	
4010	SMUGGLER PEAK	M	14022	223	14245	98	1260	YL	X
4011	ZORILLA	I	14771	170	14941	99	2352	DR	
4014	GILA	I	2702	120	2822	96	192	DR	X
4021	TWIN C	I	10987	0	10987	100	1920	DR	X
4022	COUNTY LINE	M	9030	0	9030	100	1680	DR	X
4023	BUCK CANYON	I	5979	1216	7195	83	543	DR	
4031	SAN JOSE COMM.	C	3360	0	3360	100	EPHEMERAL	E	
4032	YUMA WASH	M	14480	340	14820	98	282	YL	
4033	TOLLGATE	I	20021	160	20181	99	1330	DR	
4034	GUTHRIE PEAK	M	5903	0	5903	100	948	DR	
4518	PAINTED CAVE	I	12711	7199	19910	64	1824	DR	X
4519	QUINTANA	C	40	72	112	36	24	S	
4520	DRY CAMP	I	12759	80	12839	99	2796	DR	X
4521	ARAVAIPA SOUTH	C	1157	7365	8522	14	168	YL	
4522	ARAVAIPA	I	8272	860	9132	91	1811	YL	X
4524	HORSE MOUNTAIN	I	2328	0	2328	100	312	DR	X
4525	LAUREL CANYON	C	289	4895	5184	6	36	YL	X
4528	HELL HOLE	I	2074	80	2154	96	156	YL	X
4529	SOUTH RIM	I	34634	6268	40902	85	2904	DR	X
4530	BRANDENBURG MTN.	C	520	7478	7998	7	24	YL	
4542	ESKIMINZIN	C	2281	160	2441	93	EPHEMERAL	E	
4601	DIAMOND BAR	I	29462	158	29620	99	4200	YL	X
4602	TOM SPRINGS	I	16950	0	16950	100	1169	DR	
4603	FT. THOMAS	C	570	0	570	100	EPHEMERAL	E	
4604	DAY MINE	I	55256	2235	57491	96	3562	DR	X
4605	N. EDEN COMM.	C	3000	0	3000	100	EPHEMERAL	E	
4606	S. EDEN COMM.	C	5440	0	5440	100	EPHEMERAL	E	
4607	BILLINGSLEY CREEK	C	350	80	430	81	EPHEMERAL	E	
4644	BILLINGSLEY CREEK	C	80	0	80	100	EPHEMERAL	E	
4608	BRYCE	I	20874	32397	53271	39	1407	SR	
4609	KIMBALL COMM.	C	1520	0	1520	100	EPHEMERAL	E	
4610	TALLEY WASH	C	6928	2860	9788	71	127	YL	
4611	SKINNER COMM.	C	1330	50	1380	96	EPHEMERAL	E	
4612	REST HAVEN	C	1868	449	2317	81	EPHEMERAL	E	
4613	LONE STAR	I	17964	14893	32857	55	1052	DR	
4615	JOHNNY CREEK	I	20069	3233	23302	86	1804	DR	X
4616	BONITA CREEK	I	24361	810	25171	97	3341	DR	X
4617	BULLGAP	I	9016	20	9036	100	1248	YL	X
4618	TURTLE MOUNTAIN	I	16535	4460	20995	79	2872	YL	X
4619	GERONIMO	C	1040	354	1394	75	36	YL	
4620	EMERY	C	1540	200	1740	89	EPHEMERAL	E	
4621	ALKALI	M	3507	228	3735	94	100	YL	
4622	FINE WASH	C	2580	150	2730	95	EPHEMERAL	E	
4623	BENCHMARK	C	280	40	320	88	EPHEMERAL	E	
4624	N. FT. THOMAS COM.	C	1685	0	1685	100	EPHEMERAL	E	
4625	S. FT. THOMAS COM.	C	525	525	1050	50	EPHEMERAL	E	
4626	RED KNOLLS	C	1004	353	1357	74	EPHEMERAL	E	
4627	GOODWIN WASH	C	120	70	190	63	18	YL	
4628	WHITE SPRING	C	1520	245	1765	86	188	YL	X
4629	COBRE GRANDE	C	600	130	730	82	84	YL	X
4630	BLACK ROCK	I	2861	633	3494	82	262	DR	X
4631	SPENAZUMA	I	5677	470	6147	92	756	DR	X
4633	JACKSON MOUNTAIN	I	4796	617	5413	89	513	DR	

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4634	WHITE HOUSE	I	22263	731	22994	97	1362	DR	
4635	OSO LARGO	C	2050	430	2480	83	EPHEMERAL	E	
4636	BEAR SPRING	C	3740	480	4220	89	EPHEMERAL	E	
4637	PIMA	C	1360	480	1840	74	EPHEMERAL	E	
4638	MESA	C	646	0	646	100	EPHEMERAL	E	
4639	MUD HOLLOW	C	216	80	296	73	EPHEMERAL	E	
4640	WEST SPEAR RANCH	I	8471	8952	17423	49	441	DR	
4641	EAST SPEAR RANCH	C	4084	16469	20553	20	120	YL	
4647	MIXED UP	C	120	0	120	100	24	YL	
4675	ASHURST	I	10335	900	11235	92	552	DR	
4676	AMPHITHEATRE	C	240	0	240	100	EPHEMERAL	E	
4677	CANAL	C	637	0	637	100	EPHEMERAL	E	
	SAN SIMON R.A.								
5016	WILLIS	I	4233	5090	9323	45	789	DR	X
5018	TWIN PEAKS	I	1801	1740	3541	51	268	DR	
5024	HARPER	M	6550	1120	7670	85	769	YL	X
5035	SHELDON MTN.	I	14620	1320	15940	92	2313	YL	X
5037	WILLOW MTN.	C	1070	8060	9130	12	96	DR	
5041	RHYOLITE PEAK	I	4770	9380	14150	34	472	DR	
5043	CHINA CAMP	C	1160	6580	7740	15	144	YL	
5044	SADDLEBACK MTN.	I	6990	21860	28850	24	1008	DR	
5046	SAND WASH	C	110	1840	1950	6	EPHEMERAL	E	
5049	WOODS CANYON	I	5099	14191	19290	26	540	DR	
5058	LAZY B	I	51181	37033	88214	58	13488	YL	
5061	LITTLE DOUBTFUL	I	2489	600	3089	81	0		
5062	BRAIDFOOT	I	6950	2764	9714	72	588	DR	
5066	WILKY	I	4382	638	5020	87	1092	YL	X
5067	HIGH LONESOME	I	13908	9763	23671	59	3456	HO	
5101	CREOSOTE	M	15210	2920	18130	84	936	YL	X
5102	MUNSON CIENEGA	M	3080	2544	5624	55	150	S	
5103	111 RANCH	M	79774	378	80152	100	4380	DR	
5104	CHIMNEY	I	6100	640	6740	91	470	SR	
5105	ASH PEAK	I	12145	640	12785	95	962	RR	
5106	ARTESIA	C	6310	0	6310	100	EPHEMERAL	E	
5107	STOCKTON PASS	M	7649	12343	19992	38	538	S	
5108	TANQUE	M	66769	640	67409	99	2079	DR	
5109	VAN GAUSIG	I	10060	640	10700	94	612	S	
5110	BADGER DEN	I	47147	1080	48227	98	0	CA	X
5113	SLICKROCK	I	26117	0	26117	100	1356	DR	
5114	FAN	M	8510	0	8510	100	1200	DR	
5115	JOY VALLEY	M	61690	2140	63830	97	3458	RR	
5116	MIDWAY CANYON	I	4910	1380	6290	78	387	DR	
5118	MURCHISON	M	49947	5694	55641	90	3120	RR	
5119	FLYING W	I	3840	1640	5480	70	432	YL	X
5123	SALTBUSH	C	40	300	340	12	12	YL	
5124	SAN SIMON	C	530	10	540	98	36	YL	
5125	ROOSTERCOMB	I	33319	320	33639	99	2160	YL	
5126	CAMELS BACK	C	620	760	1380	45	96	YL	
5127	CEDAR SPRING	M	1788	90	1878	95	456	YL	
5128	SIMMONS PEAK	I	3700	930	4630	80	0	CA	X
5129	EAST CANYON	I	1650	100	1750	94	204	YL	
5130	CEMENT CANYON	I	4309	1018	5327	81	306	YL	X
5131	ROUGH MOUNTAIN	I	12063	5560	17623	68	1116	S	X
5132	HAPPY CAMP	M	1980	320	2300	86	186	S	X
5133	SHEEP CANYON	M	4340	3830	8170	53	562	DR	
5134	EMIGRANT CANYON	C	240	21041	21281	1	12	DR	X
5135	SHOP	C	320	0	320	100	24	S	

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5136	OIL WELL	C	2240	3590	5830	38	104	S	
5138	VANAR	M	17866	500	18366	97	432	YL	
5140	IVANHOE	C	1710	3870	5580	31	432	S	X
5141	SIPHON CANYON	C	692	3610	4302	16	60	YL	
5142	NINE MILE	C	930	630	1560	60	36	YL	
5143	SILVERSTRIKE	M	3730	6695	10425	36	559	DR	X
5144	APACHE SPRINGS	M	4365	680	5045	87	924	S	X
5149	REALTY	C	475	640	1115	43	12	YL	
5150	WHITETAIL	I	7360	2705	10065	73	336	DR	
5151	CLAYTON	M	3198	640	3838	83	190	YL	
5152	BRUSHY CANYON	I	4200	2610	6810	62	150	S	
5154	HAYSTACK	C	710	4790	5500	13	36	S	
5155	NIPPERS (BLUE MT.)	I	2300	2800	5100	45	144	S	
5156	OAK CREEK	I	2240	580	2820	79	75	S	
5157	MIDWAY	M	2510	3120	5630	45	84	YL	
5158	PARADISE	C	823	11919	12742	6	168	YL	
5160	CAVE CREEK	I	720	7061	7781	9	36	YL	
5161	RODEO RIVER	I	640	0	640	100	36	DR	
5163	RED MOUNTAIN	C	290	4274	4564	6	24	S	
5164	RED WING RANCH	C	1900	3020	4920	39	432	S	
5165	SMALL	C	80	0	80	100	EPHEMERAL	E	
5167	FOOTE WASH	C	200	360	560	36	EPHEMERAL	E	
5169	GRIPE	C	770	30	800	96	EPHEMERAL	E	
5173	DANKWORTH	C	120	40	160	75	12	YL	
5176	ROYCE	C	120	0	120	100	EPHEMERAL	E	
5179	WILLOW	C	6290	0	6290	100	EPHEMERAL	E	
5180	MUSKHOG	I	974	320	1294	75	84	S	
5181	HACKBERRY	C	4434	73042	77476	6	420	DR	
5201	TURNER	C	720	*	*	*	80	DR	
5203	ALLAIRE	C	160	*	*	*	9	S	
5206	WICK	C	760	*	*	*	96	S	
5207	BOSS	C	400	*	*	*	53	DR	
5209	SILVERCREEK	C	280	*	*	*	58	DR	
5210	ADAMS PEAK	C	254	*	*	*	24	DR	
5216	PAT HILLS	C	80	*	*	*	15	HO	
5218	BIDIGIN	C	1202	2544	3746	32	108	S	
5220	MONZINGO	C	20	*	*	*	3	S	
5221	HOPKINS	C	480	*	*	*	48	YL	
5222	D'AMICO	C	380	*	*	*	22	S	
5225	MUD SPRINGS	C	1044	11360	12404	8	60	DR	
5228	TWIST	C	937	*	*	*	126	DR	
5230	T OWENS	C	384	*	*	*	72	DR	
5234	FLANDERS	C	160	*	*	*	9	YL	
5237	GLEN	C	103	*	*	*	14	DR	
5238	BUCKHORN RANCH	C	480	*	*	*	39	DR	
5243	HUSBAND	C	800	*	*	*	75	DR	
5244	GUADALUPE W., AZ	I	7085	1148	8233	86	1560	HO	X
5249	SWISSHELM	C	884	*	*	*	70	S	X
5254	SYCAMORE	C	1147	*	*	*	257	S	X
5262	MOORE	C	327	*	*	*	31	YL	
5272	WALDEN	C	80	6400	6480	1	12	S	
5273	ROGER RIGGS	C	424	*	*	*	80	DR	
5275	GEORGE ROGERS	C	516	*	*	*	49	DR	
5276	MYRL ROLL	C	480	*	*	*	54	DR	
5279	RONALD SEARLE	C	373	*	*	*	56	YL	
5281	BEN SNURE	C	560	*	*	*	108	DR	
5285	MOORE	C	40	*	*	*	7	YL	
5286	WIEGAND	C	360	*	*	*	19	YL	

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5291	JACKSON	C	453	*	*	*	48	YL	
5292	THREE TRIANGLE	C	40	*	*	*	12	DR	
5293	T. OWENS	C	718	*	*	*	24	DR	
5294	RED BIRD HILLS	I	1190	*	*	*	216	HO	
5404	STARLIGHT	C	1855	4749	6604	28	300	DR	
5410	ADAMS PEAK	C	793	380	1173	68	96	DR	
5412	MCGOFFIN		366	1105	1471	25	60	DR	
5416	SHEEP WASH	C	320	19363	19683	2	48	YL	
	TUCSON R.A.								
6001	TWIN BUTTES	C	2380	*	*	*	264	YL	
6003	ARIVACA	C	1564	*	*	*	324	DR	
6004	NEWMAN PEAK	C	6674	*	*	*	95	YL	
6006	BALCOM	C	2902	*	*	*	432	YL	
6010	BLANCO WASH	C	2278	7742	10020	23	195	YL	
6015	ASH MOUNTAIN	C	586	*	*	*	72	YL	
6018	MARTINEZ WASH	C	200	*	*	*	48	YL	
6020	COCORAQUE	I	9181	4602	13783	67	527	S	
6022	FRESNAL CANYON	C	600	*	*	*	72	YL	
6023	CERRO COLORADO	C	1780	*	*	*	336	DR	
6025	HELVETIA	C	1114	*	*	*	156	YL	
6029	CLAFLIN	I	6036	2611	8647	70	437	YL	
6031	THOMAS CANYON	C	331	*	*	*	36	YL	
6039	COYOTE	C	11227	*	*	*	1164	DR	
6040	LA TORTUGA	C	7704	*	*	*	432	S	
6043	ROSE TREE	I	3950	4919	8869	45	1104	DR	
6054	PICTURE ROCK ROAD	C	35	*	*	*	2	YL	
6055	AVRA VALLEY	C	329	*	*	*	12	YL	
6060	MORNING STAR	I	16430	1426	17856	92	EPHEMERAL	E	
6062	OLSEN WASH	C	40	13120	13160	0	12	YL	
6068	SAWTOOTH MTN.	M	32127	50917	83044	39	2256	DR	
6075	EL TIRO	I	3550	741	4291	83	199	DR	
6077	TEJON PASS	I	11591	9420	21011	55	EPHEMERAL	E	
6078	HAYDON	C	520	*	*	*	60	YL	
6083	OWL HEAD	C	12388	35259	47647	26	1020	DR	
6085	SAN LUIS MOUNTAIN	C	408	*	*	*	84	YL	
6089	BABOQUIVARI	M	839	*	*	*	240	NU	
6090	EMPIRE CIENEGA	I	36538	37461	73999	49	9000	RR	X
6093	HAY HOOK	M	4762	*	*	*	384	NU	
6100	ANVIL	M	2577	*	*	*	144	DR	
6101	HILL TOP	C	693	*	*	*	84	DR	
6102	OLD SASCO	C	4471	*	*	*	384	S	
6115	DEMETRIE WASH	C	215	*	*	*	24	YL	
6119	BLACK HILLS	C	2762	*	*	*	408	DR	
6121	RAIL X	C	440	*	*	*	36	DR	
6123	WILLOW SPRINGS	C	480	*	*	*	96	DR	
6124	ANTELOPE	C	320	*	*	*	36	YL	
6126	AGUA DULCE	I	16144	*	*	*	814	S	
6129	UNIVERSITY	M	1440	*	*	*	324	DR	
6130	BRAWLEY WASH	C	40	3153	3193	1	2	YL	
6133	GUNNERY	C	1185	*	*	*	108	YL	
6137	THREE PEAKS	C	592	*	*	*	84	YL	
6144	CROSS TRIANGLE	C	23796	28160	51956	46	2277	S	
6151	GUILD WASH	C	4364	5790	10154	43	EPHEMERAL	E	
6153	KING	C	12737	14065	26802	48	1452	S	
6167	AGUIRRE VALLEY	C	958	*	*	*	72	S	
6175	ELKHORN	M	863	*	*	*	132	DR	
6183	AGUA BLANCA	I	14419	2365	16784	86	1356	DR	

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6186	ARROYO SECO	C	3766	*	*	*	780	DR	
6191	GUNSIGHT MTN.	C	693	*	*	*	120	DR	
6198	SIERRITA	C	2154	*	*	*	348	YL	
6200	THREE POINTS	C	199	*	*	*	33	YL	
6203	SILVER BELL	M	4835	6199	11034	44	350	DR	
6204	DIAMOND BELL	C	798	*	*	*	72	YL	
6208	TWIN BUTTES #2	C	549	*	*	*	84	YL	
6210	EMPIRITA	I	1520	23788	25308	6	121	DR	X
6211	DEEP WELL	C	320	32282	32602	1	24	S	
4401	MULESHOE	I	26360	5840	32200	82	3204	NU	X
4402	SOZA MESA	I	5300	320	5620	94	502	DR	
4407	GETZ WILLER	C	80	6120	6200	1	8	YL	
4409	SOZA WASH	M	440	*	*	*	60	DR	X
4414	RILEY WEST	C	240	*	*	*	24	DR	X
4516	DUDLEYVILLE	C	2119	3735	5854	36	106	NU	
4517	MALPAIS HILL	C	80	9065	9145	1	0	E	
4532	MASSACRE	C	606	4608	5214	12	24	YL	
4533	ZAPATA	C	596	6841	7437	8	24	YL	
4534	DRY CAMP	C	598	1002	1600	37	12	YL	
4535	TIGER	C	439	21895	22334	2	48	DR	X
4536	RELIABLE	C	610	780	1390	44	48	NU	X
4537	COPPER CREEK	M	2295	24902	27197	8	204	DR	X
4539	HOTWELL	I	3686	15408	19094	19	192	NU	X
5204	BACH	C	381	127	508	75	72	YL	
5205	POWERS	C	4431	*	*	*	516	YL	
5208	BABOCAMARI	I	1816	9696	11512	16	180	DR	X
5211	GUSENBARK	C	1293	28707	30000	4	204	YL	
5213	CARTER	C	1221	4884	6105	20	96	YL	
5214	LACY	C	960	*	*	*	24	NU	
5217	KRENTZ	C	1910	7456	9366	20	216	YL	
5219	CLEVELAND	C	282	*	*	*	24	YL	
5223	COWAN	C	80	*	*	*	12	YL	
5224	H.C. RANCH	C	330	4826	5156	6	24	YL	
5226	MONZINGO	C	1858	*	*	*	108	DR	
5227	POWERS	C	4840	7269	12109	40	636	YL	
5231	DUGIE	C	91	*	*	*	12	NU	
5232	JOSEPH J ESCAPULE	I	2731	5165	7896	35	192	YL	
5233	47 RANCH	C	1486	30131	31617	5	48	DR	
5235	HARRIS	C	1159	*	*	*	132	YL	
5239	GRIZZLE	C	139	5207	5346	3	24	YL	
5240	SUSNOW	C	118	*	*	*	24	YL	
5241	HOWARD	C	120	660	780	15	12	YL	
5242	HOPP	C	1877	10636	12513	15	180	YL	
5246	BROSNAN	C	80	*	*	*	12	YL	
5247	N JONES	C	80	5600	5680	1	12	YL	
5251	BRUNCHOW HILL	I	1038	958	1996	52	84	DR	
5252	LUCKY HILLS	I	9448	10750	20198	47	1080	DR	
5255	MARCO	C	400	100	500	80	24	YL	
5258	WILDCAT CANYON	C	1345	*	*	*	228	YL	X
5260	C MILLER	C	2225	20000	22225	10	96	YL	X
5261	Q MILLER	C	556	*	*	*	84	DR	
5265	WES POLLEY	C	2173	*	*	*	384	YL	
5268	RAMIREZ	I	992	1046	2038	49	36	YL	
5274	COX	C	1548	3612	5160	30	96	DR	
5277	SANDS INVESTMENT	C	1700	59014	60714	3	60	DR	
5278	RAINBOW'S END	C	378	16217	16595	2	36	DR	
5284	ALBERT THOMAS	I	4173	1440	5613	74	338	YL	
5287	WILBOURN	C	222	4155	4377	5	12	YL	

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GRAZING ALLOTMENT INFORMATION

ALLOTMENT NUMBER	ALLOTMENT NAME	MANAGEMENT CATEGORY	CURRENT PUBLIC LAND ACRES	OTHER ACRES	TOTAL ACRES	% FEDERAL LAND	CURRENT PERMITTED USE; FED. AUMS	CURRENT GRAZING SYSTEM	RIPARIAN AREAS PRESENT
5288	YUNCEVICH	C	80	2121	2201	4	12	YL	
5295	J.E. WARREN JR.	C	2503	2285	4788	52	84	DR	
5297	RAIN VALLEY RANCH	C	160	*	*	*	12	YL	

MANAGEMENT CATEGORY
M - Maintain
I - Improve
C - Custodial

GRAZING SYSTEM
YL - Yearlong
DR - Deferred Rotation
RR - Rest Rotation
S - Seasonal
SR - Santa Rita

GRAZING SYS
HO - Hol
E - Epheme
NU - Nonu
CA - Cancell
* - Unkno

LAWS, REGULATIONS, BUREAU POLICY AND LAND USE PLAN DECISIONS AFFECTING THE SAFFORD DISTRICT GRAZING PROGRAM

Guidance and constraints for the Safford/Tucson grazing program is provided in Federal laws and regulations. Bureau policies and land use planning provide agency direction and make decisions that implement these laws and regulations.

Federal Laws that Guide Management of Grazing

The Federal Land Policy Management Act of 1976 (FLPMA) provides basic direction to the Bureau relating to management of resources and uses on Bureau-managed public lands. One of the prime directives is to manage public lands and resources under the concept of multiple use and sustained yield. The Taylor Grazing Act (1934) and the Public Rangelands Improvement Act (1978) provide direction for the management of grazing on public lands. Other federal laws such as the Clean Water Act, Clean Air Act, Endangered Species Act, Wilderness Act, and Wild and Scenic Rivers Act may have direct and/or indirect effects on public land management including the grazing program.

b. Endangered Species Act Policy

The purpose of the Endangered Species Act is to provide a means whereby threatened and endangered species, and ecosystems the species depend upon, will be protected. The Bureau Manual 6840 sets forth the policies by which the Act is implemented by the Bureau.

Implementation of this biological opinion under the Act:

Implementation of the biological opinion will be through the implementation of the Arizona S&G's. This will be accomplished through a process which will tier the S&G's down to ecological sites, at an allotment level. This process will determine the desired resource condition necessary to meet the habitat requirements for a species To do this, we will look at existing conditions, and the range condition (ecological condition) information for a site to understand what vegetation communities can exist on a given site. Using this information a decision will be made as to what plant communities best meet the needs of the resource and support the desired uses; one of which is habitat for endangered or threatened species. The emphasis is on obtaining the desired conditions and not on the uses being made of the resources. If uses are promoting or allowing the desired conditions to meet the standards, they can continue unchanged. If they do not, changes will be made.

This process will include the following basic steps:

a. Prioritize allotments for evaluations. The goal is complete evaluation on all allotments in eight years, with the high priority allotments done first. The prioritization will be based on a number of factors; such as allotments with known vegetation condition problems, conflicts

with riparian or threatened/endangered species habitat, or ones with significant public concern. The Bureau will be setting the priorities for allotment evaluations and initiating evaluations on allotments in the Safford and Tucson Field Offices in 1998.

b. The desired ecological conditions and plant communities necessary to meet the standards will be defined. During this phase, habitat requirements and desired conditions for listed, proposed, and candidate species will be incorporated into objectives for habitat areas. This will be an interdisciplinary process which will provide for cooperation, coordination, and consultation with affected individuals, agencies, and interested publics. The Service will be invited to be a part of this process.

c. A review of monitoring data, permitted livestock use, management practices and allotment management plans or other activity plans which identify terms and conditions for management of livestock will be evaluated to determine if they meet, or are making significant progress toward meeting, the standards and are in conformance with the guidelines. The interdisciplinary/interagency group will define what constitutes significant progress toward meeting the standards.

d. If the evaluation determines the existing grazing management practices or level of use are significant factors contributing to failure to achieve the standards and conformance with the guidelines, the Bureau will work with cooperators to determine what management strategies will be implemented to achieve compliance in a satisfactory time frame.

e. Existing regulations require that the authorized officer shall take appropriate action as soon as practicable but no later than the start of the next grazing year. Results of allotment evaluation would be required to be implemented at the start of the next grazing year, after the completion of the evaluation. Appropriate action means implementing actions that will result in significant progress toward fulfillment of the standards and significant progress toward conformance with guidelines.

c. National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA), establishes a national policy for the protection and enhancement of the environment. On any proposed action affecting public lands or resources under the jurisdiction of the Bureau Safford District, NEPA requires the Bureau to analyze the impacts on all resources that could be affected by the proposal. The impacts of a proposed action on threatened and endangered species is always considered.

d. Grazing Regulation Standards and Guidelines, 43 CFR Part 4100

Changes contained in new grazing regulations that became effective August 22, 1995, required that Standards and Guidelines (S&Gs) be developed as they relate to livestock grazing, and be approved by the Secretary of the Interior. They can be developed for an entire state or for an ecosystem area encompassing more than one state. Standards relate to

the health and productivity of rangelands. Guidelines relate to livestock grazing. When in place, S&Gs are the basis for meeting the Fundamentals of Rangeland Health, and are applied on the ground through locally developed plans or through terms and conditions of grazing permits/leases. Where monitoring determines that there is not significant progress being made toward achieving standards, grazing management practices are changed by the next grazing season.

Standards are goals for the desired condition of the biological and physical components and characteristics of rangelands. Standards are: 1) measurable and attainable; and 2) comply with various Federal and State statutes, policies, and directives applicable to Bureau rangelands. Guidelines are management approaches, methods, and practices that are intended to achieve a standard. Guidelines: 1) typically identify and prescribe methods of influencing or controlling specific public land uses; 2) are developed and applied consistent with desired condition and within site capability; and 3) may be adjusted over time.

Changes in permitted use will occur when monitoring or field observations show grazing use or patterns of use are not consistent with the provisions of Subpart 4180 Standards and Guidelines, or grazing use is otherwise causing an unacceptable level or pattern of utilization, or when use exceeds the livestock carrying capacity as determined through monitoring, ecological site inventory, or other acceptable methods, the authorized officer shall reduce permitted grazing use or otherwise modify management practices (43 CFR 4110.3). The Department recognizes that it will sometimes be a long-term process to restore some rangelands to properly functioning condition (60 FR 9956).

2. Range condition statement

The range condition and trend data provided to the Service in the biological evaluation is the most current data available for the status of vegetation and apparent trend. It is on an individual allotment basis. Condition and trend data, when evaluated for a site, provides useful management information. It represents effects of the most recent management on an allotment. However, the Bureau proposes to the Service that a clear statement be presented in the biological opinion describing the management implications of range condition evaluations.

The Bureau, working through the Arizona Resource Advisory Council, has adopted the following Arizona S&Gs that meet the Minimum National S&G. Additional information on standards and guidelines can be found in Bureau (1997b).

Standard 1: Upland Sites

Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform (ecological site).

Guidelines for Standard 1

1-1. Management activities will maintain or promote ground cover that will provide for infiltration, permeability, soil moisture storage, and soil stability appropriate for the ecological sites within management units. The ground cover should maintain soil organisms and plants and animals to support the hydrologic and nutrient cycles, and energy flow. Ground cover and signs of erosion are surrogate measures for hydrologic and nutrient cycles and energy flow.

1-2. When grazing practices alone are not likely to restore areas of low infiltration or permeability, land management treatments may be designed and implemented to attain improvement.

Standard 2: Riparian-Wetland Sites

Riparian-wetland areas are in properly functioning condition.

Guidelines for Standard 2

2-1. Management practices maintain or promote sufficient vegetation to maintain, improve, or restore riparian-wetland functions of energy dissipation, sediment capture, groundwater recharge, and stream bank stability, thus promoting stream channel morphology (e.g. gradient, width/depth ratio, channel roughness and sinuosity) and functions appropriate to climate and landform.

2-2. New facilities are located away from riparian-wetland areas if they conflict with achieving or maintaining riparian-wetland function. Existing facilities are used in a way that does not conflict with riparian-wetland functions or are relocated or modified when incompatible with riparian-wetland functions.

2-3. The development of springs and seeps or other projects affecting water and associated resources shall be designed to protect ecological functions and processes.

Standard 3: Desired Plant Communities

Productive and diverse upland and riparian-wetland plant communities of native species exist and are maintained.

Guidelines for Standard 3

3-1. The use and perpetuation of native species will be emphasized. However, when restoring or rehabilitating disturbed or degraded rangelands, non-intrusive, nonnative plant species are appropriate for use where native species (a) are not available, (b) are

not economically feasible, (c) cannot achieve ecological objectives as well as nonnative species, and/or (d) cannot compete with already established nonnative species.

3-2. Conservation of Federal threatened or endangered, proposed, candidate, and other special status species is promoted by the maintenance or restoration of their habitats.

3-3. Management practices maintain, restore, or enhance water quality in conformance with State or Federal standards.

3-4. Intensity, season, and frequency of use, and distribution of grazing use should provide for growth and reproduction of those plant species needed to reach desired plant community objectives.

3-5. Grazing on designated ephemeral (annual and perennial) rangeland may be authorized if the following conditions are met:

- ephemeral vegetation is present in draws, washes, and under shrubs and has grown to useable levels at the time grazing begins;
- sufficient surface and subsurface soil moisture exists for continued plant growth;
- serviceable waters are capable of providing for proper grazing distribution;
- sufficient annual vegetation will remain on site to satisfy other resource concerns, (i.e. watershed, wildlife, wild horses and burros); and
- monitoring is conducted during grazing to determine if objectives are being met.

3-6. Management practices will target those populations of noxious weeds which can be controlled or eliminated by approved methods.

3-7. Management practices to achieve desired plant communities will consider protection and conservation of known cultural resources, including historical sites, and prehistoric sites, and plants of significance to Native American peoples.

e. Arizona Ephemeral Grazing Policy

This policy was developed for all grazing allotments designated as annual range or ephemeral in the State of Arizona. Therefore, it provides guidance for the authorization of livestock grazing on ephemeral grazing allotments in the jurisdiction of the Safford and Tucson Field Offices.

Upon receiving an application from a permittee for ephemeral grazing, the following policy is used. Prior to authorizing ephemeral use an allotment inspection is made.

The authorized officer ensures the following criteria have been met:

(1) Presence of ephemeral vegetation in draws, washes, and under shrubs.

(2) Sufficient surface and subsurface soil moisture for continued plant growth exists.

(3) Ephemeral forage has grown to useable levels by the time grazing will be authorized.

(4) Enough serviceable waters to provide good grazing distribution on the allotment for the number of livestock to be authorized.

(5) All range improvements and livestock facilities needed for proper administration of authorized grazing use are properly maintained.

(6) The level of grazing use will allow for sufficient annual vegetation to remain on site to satisfy other resource concerns, i.e. watershed, wildlife.

(7) Salt and minerals may be provided. However, maintenance feeding of livestock on ephemeral rangeland is prohibited. The authorization of ephemeral grazing use must be based on professional judgement tempered by historical data, including past authorizations, ecological site descriptions, clipping studies and experience. Other things to consider are climate (amount of precipitation received and forecast for additional precipitation) and other specific resource concerns such as desert tortoise habitat.

(8) On grazing allotments where no resource conflicts have been identified, livestock grazing authorizations can be given for a maximum period of 60 days per authorization. If there are known resource conflicts with livestock grazing (such as habitat for special status species), ephemeral authorizations will be limited to a maximum of 30 days per authorization. Because the Sonoran desert tortoise generally remains in burrows until the end of March, authorizations can be given for 60 days or until March 31. After April 1, authorizations will be limited to a maximum of 30 days in desert tortoise habitat. Initial grazing applications will not be authorized for less than 15 days.

f. Safford/Tucson Field Offices' Drought Policy

At the first sign of drought, as determined by the Bureau, normally below normal rainfall for more than two years, allottees are notified about the consequences of drought on forage

production, range condition, and utilization limits and are encouraged to reduce livestock numbers on their allotments voluntarily. This is handled by the range conservationist assigned to the allotment.

The Upper Gila-San Simon Grazing Environmental Impact Statement (EIS) decision document states utilization limits clearly. Maximum use of key species by livestock and other uses will average 40 percent and will not exceed 60 percent of the current year's growth. The upper limit of 60 percent use level can either be based on individual key areas in pastures or in use zones mapped out during intensive utilization studies. Use should not be allowed to exceed 60 percent in a key area just because areas further away from water or in rougher country have less use. If utilization exceeds 60 percent on a key area of the allotment, then policy, established in the EIS, calls for the removal of livestock from the area (pasture or allotment) until plant growth and vigor has recovered.

If the drought continues, letters will be sent to operators of allotments where excessive utilization is becoming a problem. They will be encouraged to reduce livestock numbers and informed of possible adverse actions by the Bureau if utilization exceeds 60 percent.

If a reduction is needed, calculations should be made using utilization and actual use studies for the previous grazing year. If intensive utilization results show that the use made, in AUMs, exceeded the allowable use calculated for the allotment, a reduction in livestock use will be made by at least the number of AUMs calculated.

The degree of reduction needed can be achieved several ways. First, the allottee will be notified of the results of Bureau studies and alternatives will be discussed. If the problem is distribution rather than total numbers, cattle can be moved to a different pasture or to other areas of the allotment where utilization is less. If the problem is total numbers, the allottee will be encouraged to sign an agreement taking the required non-use for a period of two years, minimum. The agreement will be signed by the livestock operator and Bureau Area Manager and will state that the non-use taken will not affect permitted use. It will also specify reasons why two years are necessary and outline conditions that will result in activation of the non-use (i.e. "normal" or above average rainfall, new waters needed to service unused portions of the range).

If no agreement can reached, a decision will be issued and if necessary, the decision will be placed in full force and effect, which means the reduction in livestock numbers becomes effective immediately. If necessary, the Safford District Manager is authorized (43 CFR 4110.3-3(b)) to close allotments or portions of allotments to livestock grazing, if vegetation on public lands requires immediate protection because of drought conditions. Here again, a grazing decision would be issued and place in full force and effect.

g. Special Management Areas Designated By Congress or the Safford District RMP

These are areas that have been designated by Congress or through RMPs. These areas are identified as needing special protection or emphasis in addition to standard Bureau management. They generally are designated in response to resource needs and livestock management is constrained to some degree. These areas also are priority for management sometimes at the expense of other areas of the Tucson and Safford Field Offices' jurisdictions due to reduced funding (see Special Management Area overlay and Appendix 5 of Bureau 1996a).

Riparian Conservation Areas (2)

Congress has designated two Riparian National Conservation Areas in the Safford and Tucson Field Offices' jurisdiction. Management direction provided in the enacting legislation instructs the Bureau to manage these areas to protect, conserve, and enhance the riparian area and associated resources. The associated resources include aquatic, wildlife, archaeological, paleontological, scientific, cultural, educational, and recreational resources. Together these areas contain about 65,000 acres of public lands including extremely important riparian and wildlife habitat. Planning for these areas has been initiated or completed. These areas include the Gila Box RNCA and the San Pedro RNCA.

Wilderness Areas (8)

Tucson and Safford Field Offices manage eight wilderness areas established by Congress in the Arizona Wilderness Act of 1984 and the Arizona Desert Wilderness Act of 1990. These areas contain about 86,000 acres of public land. Management plans have been completed for three of these eight areas. Congress instructs the Bureau to manage these areas in the following manner: "these shall be administered for the use and enjoyment of the American People in such a manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as provide for the protection of these areas and the preservation of their wilderness character, and for gathering and dissemination of information regarding their use and enjoyment as wilderness."

These wilderness areas include:

Dos Cabezas Mountains
Peloncillo Mountains
Aravaipa Canyon
Fishhooks
North Santa Teresa
Redfield Canyon
Baboquivari Peak
Coyote Mountains

Wild and Scenic Rivers (5)

Segments of five rivers and streams in the project area have been included in the Recommended Alternative of the Arizona Statewide Wild and Scenic Rivers Final Legislative EIS. They include:

Aravaipa Creek
Lower San Francisco River
Gila River within the Gila Box RNCA
Bonita Creek
San Pedro River
Cienega Creek

These areas contain about 23,000 acres of public land and are under protective management to protect their outstandingly remarkable values until Congress either includes them in the National Wild and Scenic Rivers System or releases them to management under the appropriate RMP.

Areas of Critical Environmental Concern (ACEC) (15)

The Safford District RMP designated eleven ACECs that contain about 29,000 acres of public lands. ACECs are areas with important natural resource attributes that require special management attention for their protection. Some ACECs are designated as Research Natural Areas (RNAs) while others are Outstanding Natural Areas (ONAs) or National Natural Landmarks (NNLs). The Safford District RMP established guidelines of the management of these areas. Safford District ACECs include:

Turkey Creek Riparian ACEC
Table Mountain RNA ACEC
Desert Grasslands RNA ACEC
Hot Springs Watershed ACEC
Bear Springs Badlands ACEC
Guadalupe Canyon ONA ACEC
Bowie Mountain Scenic ACEC
Dos Cabezas Peaks ACEC
Eagle Creek Bat Cave ACEC
Willcox Playa NNL ACEC
111 Ranch RNA ACEC
St. David Cienega ACEC
San Pedro River ACEC
San Rafael ACEC
Waterman Mountain ACEC

h. Riparian Area Policy and Management in the Project Area

The overall goal for riparian area management in the project area is to maintain, restore, or improve riparian values to achieve a healthy functioning condition, thus achieving a healthy and productive ecological status for maximum long-term, multiple-use benefits and values.

Riparian areas are classified into four categories: 1) Proper Functioning Condition - Riparian areas are functioning properly, 2) Functional-At-Risk - Riparian areas are in functional condition but susceptible to degradation, 3) Nonfunctional - Riparian areas that clearly are not functioning properly, and 4) Unknown - Riparian areas that lack sufficient information to make a determination (See Appendix 4 - Riparian Inventory - of Bureau 1996a).

Managers ensure that ongoing and proposed uses of the public lands are managed to protect and/or improve riparian areas. Activities occurring within riparian areas will be adequately managed or mitigated to prevent degradation of the unique ecological characteristics of these areas. A holistic view of riparian area management requires that long-term protection of riparian areas must include proper management of the entire watershed.

Riparian areas are managed with an interdisciplinary team approach to ensure all available expertise is used in developing best management practices and plans. When appropriate, an affected land user may be a member of the team. All activity or management plans containing riparian areas should include specific riparian resource management goals and objectives, management prescriptions and actions, proposed improvements, and reasonable inventory and monitoring procedures based on the interdisciplinary recommendations. Existing plans without riparian objectives will be revised to include necessary riparian management objectives. An interdisciplinary concept will also be used in evaluation of existing or past management actions or plans. Management plans will emphasize the significant resource features identified during the inventory, including ethno-ecological values, special status species, areas of critical environmental concern, wilderness, wild and scenic rivers, and other special values. Plans should identify a time sequence for review to identify whether existing management is meeting the objectives of protecting or improving a riparian area. During the review, the interdisciplinary team will conduct a formal evaluation, using the approved District Allotment Management Plan (AMP) evaluation format. If necessary the team will formulate a revised management plan to correct management deficiencies.

i. Animal Damage Control Program in the Jurisdiction of the Tucson and Safford Field Offices

The Bureau and the Arizona Office of the Animal and Plant Health Inspection Service-Animal Damage Control (APHIS-ADC) implemented a plan that permits the APHIS-ADC to carry out animal damage control activities on Bureau-administered public land in the project area. The primary focus of the program is on predator damage to

livestock. The plan does not allow ADC to do preventative control work on local coyote populations.

Public lands in the project area are placed in one of three categories for procedures governing ADC control activities: planned control areas, special management areas, and undesignated areas. Planned control areas are areas of the project area that have experienced recurring livestock predation problems in the past. In the last decade, all ADC predator control actions on Bureau-administered lands in Safford District have taken place in Graham and Greenlee counties. In planned control areas, livestock operators provide information on losses and request control directly from the APHIS-ADC. The APHIS-ADC evaluates requests for control and makes a field examination to determine the cause and the magnitude of the problem. If APHIS-ADC personnel determine that livestock losses have been or are occurring and are likely to continue, predator control actions may commence. Arizona state law (ARS 17-239 and 17-302) authorizes the livestock operator to conduct predator control on Federal, state, or private lands on their own or by contract if they wish. The law requires them to report losses and take of mountain lions and bears to the Arizona Game and Fish Department.

Arizona also has recently enacted an anti-trapping law, ARS 17-301 (D), that makes it illegal to use leg-hold traps, any instant kill body-gripping design trap, poison, or snare on public lands. These lands include state-owned or state-leased lands, lands administered by the Forest Service, the Bureau, National Park Service, Department of Defense, or lands administered by the State Parks Board, and any county or municipality.

Special management areas include wilderness and wilderness study areas, ACECs, national conservation areas, and wild and scenic rivers. ADC actions in wilderness study areas, areas of critical environmental concern, national conservation areas, and wild and scenic rivers require the Resource Area Manager's approval prior to commencing control activities. ADC activities in wilderness areas must have the State Director's approval and the actions must be consistent with wilderness management policy guidelines. Undesignated areas include scattered tracts of Federal lands not included in a grazing allotment and those allotments where grazing use has been cancelled.

The Bureau is responsible for cooperating with APHIS-ADC in the development and annual review of wildlife damage management plans affecting Bureau lands and resources and to ensure that those plans are consistent with existing RMPs or Management Framework Plans, including the identification of areas where mitigation or other restrictions may be needed to ensure land use plan conformance.

Bureau Land Use Planning Decisions that Guide the Grazing Program

Implementation of the above laws, regulations, and policies is achieved through land management plans, activity plans, and project plans. The objectives and decisions found in the Safford (1991) and Phoenix (1991) District RMPs, Upper Gila-San Simon Grazing EIS

(1979), and the Eastern Arizona Grazing EIS (1986) provide a framework for grazing management decisions.

Activity plans are prepared to provide integrated management for important resources and/or in response to problems or conflicts identified in a specific areas. Activity plans typically address specific programs in specific areas and decide how activities authorized by the RMP will be managed to avoid or mitigate conflicts between different uses and achieve the desired resource conditions established in the RMP. Activity-level plans include allotment management plans (AMPs), habitat management plans (HMPs), interdisciplinary activity plans (IAPs), and wilderness management plans. These plans are prepared by Bureau personnel in coordination with allottees, Arizona Game and Fish Department, Arizona State Land Department, other Federal agencies, and interested public.

Project plans are prepared for specific projects such as a range improvements and are usually construction related. These plans include site-specific planning and design of projects to be constructed, as called for in an activity plan. An environmental assessment is prepared for most project plans to address site specific environmental effects caused by the project. If the project is large, has great public interest, and has potential serious detrimental effects, an environmental impact statement may be prepared. The following sections summarize guidance on grazing management resulting from Bureau land use planning.

1. Special Management Areas

Aravaipa Creek Watershed (70,000 acres). Total preference was reduced from 5,796 to 2,904 AUMs on the South Rim allotment (4529). The Bureau also plans to reevaluate existing allotment management plans, and develop a monitoring plan to measure progress toward resource management objectives for the planning area.

Hot Springs Watershed ACEC (16,763 acres). Hot Springs Watershed will be designated as an ACEC. An existing suspension of grazing on the ACEC would be continued through the life of the project (12/31/06). Authorize livestock use on the new Soza Mesa allotment at an initial stocking rate of 44 cattle year long. Utilization levels will not be permitted to exceed those prescribed in the Eastern Arizona Grazing EIS (40 percent average over the full grazing cycle). Allottee will be expected to participate in construction and maintenance of range improvements necessary to facilitate livestock use of allotment.

Desert Grasslands ACEC (840 acres). Exclude livestock from lands of the Desert Grasslands ACEC not currently accessible to livestock or that are not presently being used for grazing.

Bear Springs Badlands ACEC (3,247 acres). The following management actions have been adopted in this ACEC: 1) Allow livestock use in the Bear Springs Badlands area, consistent with a livestock management plan to mitigate the adverse impacts on fossils of the area, and 2) Livestock forage use will not be permitted to exceed an average of 40 percent

over a full grazing cycle (averaging three to five years duration). Specific livestock management actions will be developed at the activity plan level.

Guadalupe Canyon ONA/ACEC (2,937 acres). Management goals for the area, including management of livestock, are to manage riparian habitat, listed species, and scenic and recreation values of the area.

San Pedro RNCA - The plan was completed in 1993 and is being implemented. No livestock grazing is permitted on the 47,668 acres of private lands originally acquired by Bureau through a land exchange. Legislation that created the RNCA in 1988 designated an additional 6,521 acres that were acquired by Bureau from the State of Arizona. Although the legislation excluded livestock grazing on the original acquisition for the next 15 years, livestock grazing is permitted on the lands acquired from the state within the RNCA. Livestock management plans will be prepared for the four allotments within the RNCA to provide for continued livestock grazing and protection of the riparian values. At the end of 15 year moratorium on livestock grazing, a decision will be made to either continue the exclusion of livestock or to permit grazing under certain terms and conditions.

2. Upland Livestock Utilization Standard

Proper stocking is an essential principle of range management, which should precede or coincide with the initiation of any grazing management system. With stocking rates in balance with the grazing capacities, utilization of key forage species in the key areas would average about 40 percent over a period of years. Studies conducted at the Santa Rita Experimental Range, south of Tucson, Arizona, indicated that use levels should be at about 40 percent to minimize vegetation damage during times of drought. At a given stocking rate during years of high forage production (above normal rainfall) utilization in the use pasture might be as low as 20 percent. During years of low forage production utilization could be as high as 60 percent. Total use of the key species is measured and any wildlife use is included in the measurement. It does not matter whether wildlife or livestock are using the plant, total use is what is important. During abnormal years, whether dry or wet, stocking rates are adjusted. Policy and regulation allow for temporary nonrenewable licensing for increases in use or reductions in use.

3. Grazing Permits/Leases. Grazing permits/leases are used to authorize livestock grazing on public lands. They can be issued for any length of time but cannot exceed 10 years. These permits/leases contain terms and conditions that describe how livestock grazing will be conducted and must be in conformance with management objectives and constraints for livestock grazing identified in land-use and activity plans. Minimum terms and conditions of a permits/leases include number of livestock and period of use which equate to AUMs. The total AUMs cannot exceed the permitted use for the allotment.

Changes in livestock use from year to year is allowed through grazing applications and billings. Each year, prior to the issuance of grazing bills, livestock operators are allowed the

opportunity to apply to change the grazing use from that currently on their permit/lease. The authorized officer can accept or deny these changes. If the total AUMs exceed the permitted use, the application would be denied and a decision would be issued giving the applicant the right to appeal to an Administrative Law Judge for an evidentiary hearing.

4. Selective Management Category

Grazing allotments in the project area are managed under three selective management categories: 1) Maintain (M), 2) Improve (I), or 3) Custodial (C). The categorization process groups allotments on the basis of existing resource conditions, potential to improve, or other resource conflicts; and ranks them according to the economic return on monies invested in range improvements. Table 2 gives the management category for each allotment. It is not necessary for allotments in any of the categories to meet all criteria set forth.

(1) Maintain Category Criteria

(a) Present range condition is satisfactory. (b) Allotments have moderate or high resource production potential, and are producing near their potential (or trend is moving in that direction). (c) No serious resource-use conflicts/controversy exists. (d) Opportunities may exist for positive economic return from public investments. Present management appears satisfactory.

(2) Improve Category Criteria

(a) Present range condition is unsatisfactory. (b) Allotments have moderate to high resource production potential and are producing at low to moderate levels. (c) Serious resource-use conflicts/controversy exists. (d) Opportunities exist for positive economic return from public investments. (e) Present management appears unsatisfactory. Allotments in this category have first priority for range improvements, monitoring and AMPs.

(3) Custodial Category Criteria

(a) Present range condition is not a factor. (b) Allotments have low resource production potential, or are producing near their potential. (c) Limited resource-use conflicts/controversy may exist. (d) Opportunities for positive economic return on public investments do not exist or are constrained by technological or economic factors. (e) Present management appears satisfactory or is the only logical practice under existing resource conditions.

5. Grazing systems

Terms and conditions of grazing permits/leases are also developed in AMPs. An AMP defines goals and objectives and establishes the seasons of use, the number of livestock permitted on the range, grazing system to be followed, monitoring requirements for the

allotment, and the range improvements needed to implement the plan. AMPs have been developed on all except 35 grazing allotments in the improve and maintain management categories. Yearlong grazing occurs on 106 allotments (Table 3). These include the allotments where an AMP has not yet been developed and custodial allotments where Federal land is a small (usually less than 20 percent) part of the total acreage in the allotment.

There are different systems of grazing management. The system developed for an allotment is based on multiple-use resource management objectives for the allotment and the preference of the livestock operator. Proposed grazing systems by allotment is found in Table 3, and is summarized over the project area in Table 4. The various grazing systems are described as follows:

Yearlong Grazing. Yearlong grazing is continuous grazing for the full calendar year. The primary criterion for selecting yearlong grazing is the restriction of management and system options that provide periodic rest or rotation by either grazing unit size or physiography. Yearlong grazing is a common system on semi-desert ranges. Proper grazing use under this system is dependent upon stocking rates consistent with the grazing capacity of the range and upon proper distribution of livestock use. Yearlong grazing is the system used on 106 grazing allotments, covering 365,468 acres of public lands. Many of these are classified as custodial due to the small percent of Federal land within the total ranch unit. Some of these allotments may have grazing systems of which the Bureau has no knowledge.

Ephemeral Grazing. Ephemeral ranges are areas of low rainfall and low perennial forage production. These areas are grazed infrequently for short periods when favorable precipitation allows the growth of relatively large amounts of short-lived annual forage. Rangelands under ephemeral management generally receive less than eight inches of average annual precipitation and are located in the lower elevations (below 3,500 feet). Ephemeral range plant communities have a minor percentage of perennial forage plants, usually not more than 10 percent of the total plant composition. These ranges annually produce an average of no more than 25 pounds of perennial forage per acre.

To comply with resource constraints of ephemeral range areas, livestock use is authorized only during favorable periods when relatively large amounts of annual vegetation are produced. Such authorized grazing use is based on range inspections following favorable rainfall and growth conditions. Ephemeral grazing management is practiced on 35 grazing allotments consisting of 82,767 acres of public lands.

Rest-rotation Grazing. The rest-rotation grazing management system is designed to provide for the growth requirements of vegetation valuable for the production of livestock and other resource values. Under this system, each range area is rested from 20 to 50 percent of the time. Under rest-rotation grazing management, the range is divided into pastures. Each pasture is systematically grazed and rested to provide for the production of

Table 4. Summary of grazing systems in Safford/Tucson Field Office areas

GRAZING SYSTEM	NUMBER OF ALLOTMENTS	FEDERAL ACRES	PERCENT OF SAFFORD DISTRICT (ACRES)
YEARLONG	106	365,468	23
EPHEMERAL	35	82,767	5
REST-ROTATION	4	160,320	10
SANTA RITA THREE-PASTURE	2	26,974	2
DEFERRED ROTATION	93	701,638	44
SEASONAL	33	136,065	9
HOLISTIC	4	22,263	1
*DEFERMENT	(9)	(14,050)	*
NONUSE	8	39,427	3
CANCELLED	3	53,336	3
TOTAL	288	1,588,258	100

* DEFERMENT is on portions of grazing allotments. The Federal acres and number of allotments are included in other categories of grazing systems.

livestock forage and other resource values and at the same time maintain and improve soil fertility and vegetation.

Resting a unit of range after a period of grazing allows the opportunity for (1) plants to make and store food to recover vigor, (2) seeds to ripen, (3) seedlings to become established, and (4) litter to accumulate between plants.

Rest-rotation grazing includes the following basic treatments: (1) grazing for livestock production, (2) rest after grazing to allow seeds to ripen, followed by grazing for seed trampling, and (3) rest to recover plant vigor, to allow for litter production, and to allow seedling establishment. Rest-rotation grazing is being applied to four allotments on 160,320 acres of Federal lands.

Santa Rita Three-Pasture Rotation. The Santa Rita three-pasture rotation system was developed in southeastern Arizona on semi-desert grass-shrub vegetation similar to much of the vegetation in the project area. It is similar to the rest-rotation system; the basic difference is in the timing of rest periods and the ability of this system to meet the physiological requirements of preferred forage species.

The Santa Rita system provides three grazing treatments, with rest for 24 months of the 36 month grazing cycle. Each pasture in the three-pasture set is rested March through October, two years out of three. Winter grazing is scheduled between the two successive March-October rest periods. This schedule provides 12 months of rest immediately before each period of spring-summer grazing. The Santa Rita Rotation system is being used on two allotments for a total of 26,974 Federal acres.

Deferred Rotation. The deferred rotation system provides for periodic rest from livestock grazing for various parts of the range in succeeding years during the growing season, usually from July through October. Each allotment using deferred rotation may be unique in the timing and amounts of livestock use or rest provided, depending upon the situation. This system can be used in two, three, four, or five- pasture allotments. It provides for rest from 25 to 50 percent of the time. The Best Pasture system is listed in the tables as deferred rotation since it is a variation of the deferred rotation system. In the best pasture system, one or more pastures are rested, and when 40 percent utilization in the grazed pasture is reached, cattle are moved to the "Best Pasture." This allows operators the flexibility of taking advantage of rainfall variations occurring on an allotment. The deferred rotation system is used on 93 allotments for a total of 701,638 Federal acres.

Seasonal Grazing. Under seasonal grazing, the grazing allotment is used only a portion of the year during a specified period, and livestock are removed for the rest of the year. Seasonal grazing is practiced on 33 allotments over 136,065 acres of public lands. The three basic types of seasonal grazing management used are: summer, winter, and winter rotation.

Summer Seasonal Grazing. Summer seasonal grazing occurs on allotments where the predominant forage production and livestock use occurs on privately owned irrigated land. The public lands are grazed lightly during the summer and livestock are returned to private lands. Generally, the public lands are grazed June through August and remain the same each year.

Winter Seasonal Grazing. The allotment is grazed each fall, winter, and early spring and would be rested from livestock grazing for the rest of the year. Typically, the allotments are grazed from November 1 through April each year.

Winter Seasonal Rotation. This system allows livestock grazing in alternating winter seasons. Winter grazing during one or two years is followed by a complete year's rest.

Holistic Resource Management (HRM). HRM begins with development of a holistic goal which includes values of the group managing the resources, forms of production that will sustain them, and a description of the resource base that will have to be produced and maintained to sustain that production indefinitely. All decisions pass through seven tests to ensure the goal is reached in the most ecologically, economically, and socially sound way. Critical to the process is the final step: before and while decisions are enacted, and despite

all the testing, you assume you could be wrong and identify what signs to look for to provide the earliest warning. When your monitoring shows the decision was wrong, you correct it immediately. This process uses non-traditional management actions with which people are often uncomfortable. Allotments where it is being employed are viewed as tests for the process. HRM is authorized on four allotments on 22,263 acres of Federal lands.

Deferment of Grazing. The Safford RMP incorporated the Upper Gila-San Simon Grazing EIS deferment decisions by reference. Approximately 14,050 acres of public land on portions of nine grazing allotments will be deferred from livestock grazing. Areas proposed for this deferment of livestock grazing are critical watershed areas along the San Simon River, and critical riparian and aquatic habitat along Aravaipa Creek, Mescal Creek, Bonita Creek, and the Gila River. Decisions to remove grazing will be issued as soon as fences are constructed. Allotments proposed for deferment are located in the Gila River, Bonita Creek, Aravaipa Creek and Mescal Creek, and San Simon Watershed. They are summarized as follows:

San Simon Watershed

The San Simon River channel would be deferred until vegetation and litter production are increased sufficiently to maintain adequate watershed protection while sustaining livestock. Livestock grazing would be authorized on deferred areas whenever significant conflicts with other resource needs are not anticipated or range condition is not expected to deteriorate with grazing.

Severely eroded areas proposed for deferment would be grazed after rehabilitation and revegetation, probably after 15 to 25 years. During the deferment period, habitat and vegetation studies would be implemented. Subsequent management would depend upon the response and improvement of these areas. Where natural revegetation does not occur, desirable species would be planted.

The revegetation would primarily consist of naturally occurring species found within the San Simon channel: 1) mesquite, 2) salt cedar, 3) vine mesquite, 4) Johnson grass, 5) blue panic, 6) alkali sacaton, and 7) four-wing saltbush. Introduced species, such as blue panic, would be used to rehabilitate areas disturbed during construction of the detention dams.

Following an initial deferment period, grazing might be allowed under the following conditions: 1) that desirable riparian plants be established and maintained, 2) that grazing not occur more often than one year out of three during the critical March through October growing period, 3) that grazing not occur for longer than an eight month period at a time, and 4) that utilization of desirable species not exceed 40 percent of the current years growth. A given water course would be divided with fences, where feasible, to prevent livestock from grazing the entire length at any given time.

Non-use (NU) (eight allotments over 39,427 acres)

Allotments where permitted use is still allocated to the allotment but for management reasons livestock use is not currently being licensed. These allotments may be licensed under the new regulations for conservation use.

Cancelled Allotments (three allotments over 53,336 acres)

On some allotments, permitted use has been cancelled for administrative reasons. At this time, the allotment is unavailable for licensing but may be in the future.

6. Range Improvements Projects

Anticipated range improvements for the life of the project include fences, pipelines, storage tanks, earthen reservoirs, rainfall catchments, masonry dams, drilled wells, and developed springs. Range improvement projects will continue to be maintained and constructed but at a much lower rate than in the past. Construction will be primarily to protect high value resources or projects needed to implement revisions in AMPs, as the result of evaluations, and/or as a result of other activity plans. Much of the effort will be directed at special management areas, such as the Gila Box RNCA.

Construction of range improvements are often necessary to implement the grazing management program designed to meet objectives of an AMP. When planning range improvement projects an interdisciplinary team of resource specialists will review the proposal to ensure the greatest multiple use benefits. For instance, a livestock water can be designed to benefit wildlife also. All proposals will be evaluated in an environmental assessment of appropriate scope to determine site-specific impacts. As a minimum, the EA will address cultural resources, listed species, visual resources and wilderness values. Mitigating measures will be developed to reduce or eliminate site-specific impacts, if needed. A project checklist is used by the Safford and Tucson Field Offices during planning and design of a project to ensure all disciplines are considered, documentation is completed, and resources are protected to the extent possible.

The most common range improvement projects needed to implement AMPs on public lands are construction of fences, pipelines, water storage tanks, earthen reservoirs, and rainfall catchments; drilling of wells; and developing existing springs.

It is Bureau policy to assign maintenance responsibility for projects which benefit livestock grazing, to the extent possible, to the livestock operator. The Bureau will normally assume maintenance responsibility for improvements not designed for the benefit of livestock grazing, and all nonstructural improvements. Nonstructural improvements are vegetation manipulation projects such as seedings.

7. Inventory and Monitoring

Ecological Site Inventory (ESI) is the inventory method that the Bureau uses to determine the condition of rangelands. The procedure recognizes all resource values associated with a particular range site, soils, precipitation, temperature, and elevation. It is a study to determine what is growing on a particular site compared to what could grow there over a long period with no outside disturbances such as livestock grazing. The terms "potential natural community" (excellent), "late seral" (good), "mid seral" (fair), and "early seral" (poor), are used to describe the relationship of the existing plant community to the potential plant community for the site.

Range (ecological) condition describes the current vegetation composition relative to a potential vegetation community, for a site. The potential plant community (excellent condition) does not necessarily equate to excellent habitat for an individual animal/plant species nor to excellent watershed condition. These assessments must be made, on specific sites, with methodology designed to measure habitat condition or watershed condition, coupled with an understanding of the habitat requirements.

The cause for the current range condition may be historical uses and vegetation changes that have resulted in a relatively stable plant community that will show little or no change in condition with or without livestock. A change in condition in this state my require some form of vegetation manipulation to move it to another condition class. Range condition, therefore, must be evaluated on a site by site basis, with a knowledge of current cause and effect relationships, stability of the current vegetation, and desirability of the current condition as habitat for a specific wildlife/plant species and watershed condition.

An upward trend in range condition for a site within a grazing allotment is a realistic interim management goal to show movement toward a desire future condition. A change in range condition would be set as a goal when the current condition is caused by current livestock grazing, and there is a reasonable probability that a change in grazing management can result in a change in range condition that is beneficial to specific wildlife/plants species and/or watershed condition.

ESI is a time-consuming process, therefore, until ESI can be completed on an allotment, professional judgement is used to describe range condition. The range conservationist, with knowledge of range sites, soils, and vegetation, estimates the range condition for the allotment using his/her best judgement.

Trend is the change in vegetation and soil characteristics directly resulting from environmental factors, primarily precipitation and grazing. Permanent three-foot or five-foot square photo plots are established in key areas of each allotment. Overhead photos of the plot are taken periodically to document changes in ground cover, plant vigor, and species composition. On some allotments trend studies also consist of 200-point pace frequency plots

and/or 100-foot line transects. Table 5 gives the range condition and trend for individual allotments.

Utilization is monitored on grazing allotments to determine the level of actual vegetation utilization. The frequency and intensity of utilization monitoring is determined by the selective management category of the allotment. The method used is the Key Forage Plant method described in the Bureau Technical Reference 4400-3. Data collected is used to map utilization zones on the allotment to create a use pattern map. This data is used to determine livestock carrying capacities for an allotment according to Bureau Technical Reference 4400 - 7. The standards for livestock utilization for allotment use were determined through the Upper Gila-San Simon and Eastern Arizona Grazing EISs.

Precipitation data is collected at 54 permanent rainfall collection stations throughout the project area. Rainfall data is used during the evaluation of allotments. Monitoring is used to determine the effectiveness of grazing treatments and new rangeland developments to see if AMP objectives are being met. Monitoring provides information critical to managing and refining the grazing program and provides the basis for making needed adjustments.

When monitoring reveals that multiple use objectives are not being met, grazing systems will be modified, livestock numbers increased or decreased, kind of livestock changed, or additional rangeland developments built to reach the objectives. In some instances, rangeland management objectives may need to be reevaluated.

If monitoring studies show that trend is static or upward and utilization by livestock and other uses is less than 40 percent on the key species, the stocking rate would be increased. If studies show that trend is static or downward and utilization is more than 40 percent on the key species, the stocking rate would be decreased. Both increases and decreases in livestock numbers will be conducted in accordance with procedures in new grazing regulations that became effective August 21, 1995.

Evaluations. Allotment evaluations are formal interdisciplinary analyses of the progress towards accomplishing the objectives of an AMP. The evaluation is a detailed analysis of study data. Evaluations determine whether satisfactory progress is being made toward meeting management objectives and, if not, what actions are necessary to correct the situation. AMPs are revised as the result of an evaluation if it indicates that progress toward an objective is not being made or objectives are not being accomplished.

f. Prescribed fire, and mechanical or chemical vegetation management
Prescribed fire and vegetation management, such as imprinting, rootplowing, chaining, and herbicide use may be employed to improve range condition.

Table 5

RANGE CONDITION AND TREND

ALLOTMENT NUMBER	ALLOTMENT NAME	CURRENT PUBLIC LAND ACRES	ACRES PNC * (EXCELLENT)	ACRES LATE SERAL (GOOD)	ACRES MID SERAL (FAIR)	ACRES EARLY SERAL (POOR)	APPARENT TREND
	GILA R.A.						
4001	METCALF	4404	0	0	4404	0	STATIC
4002	SAN FRANCISCO	3925	0	3000	925	0	STATIC
4003	MORENCI	6600	0	0	6600	0	STATIC
4005	RED HICKEY HILLS	2460	0	2000	460	0	UPWARD
4010	SMUGGLER PEAK	14022	0	4000	9000	1022	UPWARD
4011	ZORILLA	14771	0	8000	6771	0	UPWARD
4014	GILA	2702	0	2000	400	302	STATIC
4021	TWIN C	10987	0	5500	5487	0	UPWARD
4022	COUNTY LINE	9030	0	6000	3030	0	UPWARD
4023	BUCK CANYON	5979	0	2490	2489	1000	UPWARD
4031	SAN JOSE COMM.	3360	0	3360	0	0	UPWARD
4032	YUMA WASH	14480	0	0	14480	0	STATIC
4033	TOLLGATE	20021	0	6650	13371	0	STATIC
4034	GUTHRIE PEAK	5903	0	5903	0	0	UPWARD
4518	PAINTED CAVE	12711	0	7000	5711	0	UPWARD
4519	QUINTANA	40	0	30	5	5	STATIC
4520	DRY CAMP	12759	**3759**	**9000**	**0**	**0**	UPWARD
4521	ARAVAIPA SOUTH	1157	0	0	800	357	STATIC
4522	ARAVAIPA	8272	0	1500	6000	772	STATIC
4524	HORSE MOUNTAIN	2328	0	2328	0	0	UPWARD
4525	LAUREL CANYON	289	0		289	0	STATIC
4528	HELL HOLE	2074	0	1074	1000	0	UPWARD
4529	SOUTH RIM	34634	**7785**	**18467**	**8382**	**0**	UPWARD
4530	BRANDENBURG MTN.	520	200	320	0	0	STATIC
4542	ESKIMINZIN	2281	0	2281	0	0	UPWARD
4601	DIAMOND BAR	29462	**1714**	**17713**	**9701**	**334**	UPWARD
4602	TOM SPRINGS	16950	**0**	**15158**	**1792**	**0**	UPWARD
4603	FT. THOMAS	570	0	570	0	0	STATIC
4604	DAY MINE	55256	**900**	**44098**	**6402**	**3856**	UPWARD
4605	N. EDEN COMM.	3000	0	3000	0	0	STATIC
4606	S. EDEN COMM.	5440	0	5440	0	0	STATIC
4607	BILLINGSLEY CREEK	350	0	350	0	0	STATIC
4644	BILLINGSLEY CREEK	80	0	80	0	0	STATIC
4608	BRYCE	20874	**60**	**11325**	**3830**	**5639**	STATIC
4609	KIMBALL COMM.	1520	0	1520	0	0	STATIC
4610	TALLEY WASH	6928	0	3500	3428	0	STATIC
4611	SKINNER COMM.	1330	0	1330	0	0	STATIC
4612	REST HAVEN	1868	0	1868	0	0	STATIC
4613	LONE STAR	17964	**680**	**12340**	**4527**	**417**	UPWARD
4615	JOHNNY CREEK	20069	**998**	**16276**	**1727**	**1068**	UPWARD
4616	BONITA CREEK	24361	0	**22124**	**2039**	**198**	UPWARD
4617	BULLGAP	9016	**2001**	**6791**	**0**	**224**	STATIC
4618	TURTLE MOUNTAIN	16535	0	10350	5185	1000	UPWARD
4619	GERONIMO	1040	0	0	1040	0	STATIC
4620	EMERY	1540	0	800	740	0	STATIC
4621	ALKALI	3507	0	3000	507	0	UPWARD
4622	FINE WASH	2580	0	1000	1580	0	STATIC
4623	BENCHMARK	280	0	280	0	0	STATIC
4624	N. FT. THOMAS COM.	1685	0	1685	0	0	STATIC
4625	S. FT. THOMAS COM.	525	0	525	0	0	STATIC
4626	RED KNOLLS	1004	0	1004	0	0	STATIC
4627	GOODWIN WASH	120	0	120	0	0	STATIC
4628	WHITE SPRING	1520	0	520	1000	0	UPWARD
4629	COBRE GRANDE	600	0	0	600	0	STATIC
4630	BLACK ROCK	2861	0	2000	861	0	UPWARD
4631	SPENAZUMA	5677	0	2000	3627	50	UPWARD
4633	JACKSON MOUNTAIN	4796	0	3296	1000	500	UPWARD
4634	WHITE HOUSE	22263	0	15263	6000	1000	UPWARD

*PNC - Potential Natural Community

Bold Numbers = Ecological Site Inventory (ESI)
Regular Numbers = Professional Judgement

Table 5

RANGE CONDITION AND TREND

ALLOTMENT NUMBER	ALLOTMENT NAME	CURRENT PUBLIC LAND ACRES	ACRES PNC * (EXCELLENT)	ACRES LATE SERAL (GOOD)	ACRES MID SERAL (FAIR)	ACRES EARLY SERAL (POOR)	APPARENT TREND
4635	OSO LARGO	2050	0	1050	500	500	STATIC
4636	BEAR SPRING	3740	0	3740	0	0	STATIC
4637	PIMA	1360	0	1360	0	0	STATIC
4638	MESA	646	0	646	0	0	STATIC
4639	MUD HOLLOW	216	0	216	0	0	STATIC
4640	WEST SPEAR RANCH	8471	0	4471	4000	0	UPWARD
4641	EAST SPEAR RANCH	4084	0	500	3584	0	UPWARD
4647	MIXED UP	120	0	0	120	0	STATIC
4675	ASHURST	10335	0	7000	2000	1335	UPWARD
4676	AMPHITHEATRE	240	0	240	0	0	STATIC
4677	CANAL	637	0	0	637	0	STATIC
	TOTAL	509179	18117	315452	156031	19579	
	SAN SIMON R.A.						
5016	WILLIS	4233	0	2497	1000	736	STATIC
5018	TWIN PEAKS	1801	155	900	500	246	STATIC
5024	HARPER	6550	**0**	**6070**	**480**	**0**	STATIC
5035	SHELDON MTN.	14620	**4350**	**6490**	**2422**	**1358**	UPWARD
5037	WILLOW MTN.	1070	65	700	305	0	STATIC
5041	RHYOLITE PEAK	4770	150	2600	1610	410	UPWARD
5043	CHINA CAMP	1160	0	0	750	410	STATIC
5044	SADDLEBACK MTN.	6990	**0**	**6672**	**318**	**0**	DOWNWARD
5046	SAND WASH	110	0	0	60	50	UPWARD
5049	WOODS CANYON	5099	**1291**	**3390**	**393**	**25**	UPWARD
5058	LAZY B	51181	**13430**	**28104**	**8748**	**899**	DOWNWARD
5061	LITTLE DOUBTFUL	2489	0	2059	320	110	DOWNWARD
5062	BRAIDFOOT	6950	**0**	**6783**	**167**	**0**	UPWARD
5066	WILKY	4382	1670	402	1000	1310	UPWARD
5067	HIGH LONESOME	13908	3160	7600	2423	725	UPWARD
5101	CREOSOTE	15210	0	**5859**	0	**9351**	STATIC
5102	MUNSON CIENEGA	3080	0	2000	1080	0	STATIC
5103	111 RANCH	79774	5584	18300	37494	18396	STATIC
5104	CHIMNEY	6100	1369	4600	131	0	UPWARD
5105	ASH PEAK	12145	200	8000	2500	1445	STATIC
5106	ARTESIA	6310	0	0	6010	300	STATIC
5107	STOCKTON PASS	7649	0	800	3200	3649	STATIC
5108	TANQUE	66769	**200**	**14879**	**3278**	**48412**	STATIC
5109	VAN GAUSIG	10060	1200	2000	3860	3000	UPWARD
5110	BADGER DEN	47147	**880**	**19182**	**6510**	**20575**	UPWARD
5113	SLICKROCK	26117	0	**20633**	0	**5484**	UPWARD
5114	FAN	8510	600	2000	3000	2910	DOWNWARD
5115	JOY VALLEY	61690	5000	54690	1000	1000	UPWARD
5116	MIDWAY CANYON	4910	1500	2100	1000	310	UPWARD
5118	MURCHISON	49947	0	21947	20000	8000	UPWARD
5119	FLYING W	3840	940	1600	500	800	UPWARD
5123	SALTBUSH	40	0	0	0	40	STATIC
5124	SAN SIMON	530	0	0	250	280	STATIC
5125	ROOSTERCOMB	33319	319	20000	8000	5000	STATIC
5126	CAMELS BACK	620	0	620	0	0	STATIC
5127	CEDAR SPRING	1788	1088	500	0	200	UPWARD
5128	SIMMONS PEAK	3700	200	3000	500	0	DOWNWARD
5129	EAST CANYON	1650	0	1250	400	0	UPWARD
5130	CEMENT CANYON	4309	909	2000	1000	400	UPWARD
5131	ROUGH MOUNTAIN	12063	2663	5800	3000	600	UPWARD
5132	HAPPY CAMP	1980	280	1000	700	0	UPWARD
5133	SHEEP CANYON	4340	**786**	**1986**	**290**	**1278**	UPWARD
5134	EMIGRANT CANYON	240	0	240	0	0	STATIC
5135	SHOP	320	0	0	0	320	STATIC
5136	OIL WELL	2240	0	0	0	2240	STATIC
5138	VANAR	17866	0	15000	2000	866	STATIC

*PNC - Potential Natural Community

Bold Numbers = Ecological Site Inventory (ES
Regular Numbers = Professional Judgeme

Table 5

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5140	IVANHOE	1710	450	1000	260	0	STATIC
5141	SIPHON CANYON	692	200	400	92	0	DOWNWARD
5142	NINE MILE	930	160	250	0	520	STATIC
5143	SILVERSTRIKE	3730	**155**	**2356**	**1047**	**172**	UPWARD
5144	APACHE SPRING	4365	255	3910	200	0	STATIC
5149	REALTY	475	0	0	275	200	STATIC
5150	WHITETAIL	7360	360	3000	2000	2000	UPWARD
5151	CLAYTON	3198	**0**	**0**	**945**	**2253**	STATIC
5152	BRUSHY CANYON	4200	1200	1200	1000	800	UPWARD
5154	HAYSTACK	710	0	510	200	0	STATIC
5155	NIPPERS (BLUE MT.)	2300	100	1100	500	600	STATIC
5156	OAK CREEK	2240	**220**	**462**	**630**	**928**	STATIC
5157	MIDWAY	2510	**0**	**0**	**1825**	**685**	STATIC
5158	PARADISE	823	**0**	**764**	**59**	**0**	STATIC
5160	CAVE CREEK	720	**0**	**0**	**720**	**0**	STATIC
5161	RODEO RIVER	640	**0**	**45**	**595**	**0**	UPWARD
5163	RED MOUNTAIN	290	**0**	**246**	**11**	**33**	UPWARD
5164	RED WING RANCH	1900	300	1000	600	0	UPWARD
5165	SMALL	80	0	0	0	80	STATIC
5167	FOOTE WASH	200	0	160	0	40	STATIC
5169	GRIPE	770	0	570	100	100	STATIC
5173	DANKWORTH	120	0	0	80	40	STATIC
5176	ROYCE	120	0	0	80	40	STATIC
5179	WILLOW	6290	400	3000	2890	0	STATIC
5180	MUSKHOG	974	0	500	474	0	UPWARD
5181	HACKBERRY	4434	0	4434	0	0	UPWARD
5201	TURNER	720	0	200	500	20	STATIC
5203	ALLAIRE	160	0	100	60	0	STATIC
5206	WICK	760	0	400	200	160	STATIC
5207	BOSS	400	0	0	300	100	STATIC
5209	SILVERCREEK	280	0	80	200	0	STATIC
5210	ADAMS PEAK	254	0	180	74	0	STATIC
5216	PAT HILLS	80	0	80	0	0	UPWARD
5218	BIDIGIN	1202	0	100	1000	102	STATIC
5220	MONZINGO	20	0	0	20	0	STATIC
5221	HOPKINS	480	40	100	340	0	STATIC
5222	D'AMICO	380	80	300	0	0	STATIC
5225	MUD SPRINGS	1044	0	44	400	600	STATIC
5228	TWIST	937	0	637	300	0	STATIC
5230	T OWENS	384	0	300	84	0	STATIC
5234	FLANDERS	160	0	0	160	0	STATIC
5237	GLEN	103	0	103	0	0	STATIC
5238	BUCKHORN RANCH	480	0	300	180	0	STATIC
5243	HUSBAND	800	0	600	100	100	STATIC
5244	GUADALUPE W., AZ	7085	500	4000	2500	85	UPWARD
5249	SWISSHELM	884	200	684	0	0	STATIC
5254	SYCAMORE	1147	0	647	300	200	UPWARD
5262	MOORE	327	0	0	327	0	STATIC
5272	WALDEN	80	0	80	0	0	STATIC
5273	ROGER RIGGS	424	0	300	124	0	STATIC
5275	GEORGE ROGERS	516	0	300	100	116	STATIC
5276	MYRL ROLL	480	0	200	200	80	STATIC
5279	RONALD SEARLE	373	0	0	300	73	STATIC
5281	BEN SNURE	560	0	400	160	0	STATIC
5285	MOORE	40	0	0	0	40	STATIC
5286	WIEGAND	360	0	0	200	160	STATIC
5291	JACKSON	453	0	200	253	0	STATIC
5292	THREE TRIANGLE	40	0	0	40	0	DOWNWARD
5293	T. OWENS	718	0	400	200	118	STATIC

*PNC - Potential Natural Community

Bold Numbers = Ecological Site Inventory (ESI)
Regular Numbers = Professional Judgement

Table 5

RANGE CONDITION AND TREND

ALLOTMENT NUMBER	ALLOTMENT NAME	CURRENT PUBLIC LAND ACRES	ACRES PNC * (EXCELLENT)	ACRES LATE SERAL (GOOD)	ACRES MID SERAL (FAIR)	ACRES EARLY SERAL (POOR)	APPARENT TREND
5294	RED BIRD HILLS	1190	0	700	300	190	DOWNWARD
5404	STARLIGHT	1855	100	1000	600	155	STATIC
5410	ADAMS PEAK	793	0	693	100	0	DOWNWARD
5412	MCGOFFIN	366	0	200	166	0	STATIC
5416	SHEEP WASH	320	0	200	120	0	STATIC
	TOTAL	698012	52709	342688	150690	151925	
	TUCSON R.A.						
6001	TWIN BUTTES	2360	95	357	1333	595	STATIC
6003	ARIVACA	1564	0	1486	78	0	STATIC
6004	NEWMAN PEAK	6674	3000	0	3674	0	STATIC
6006	BALCOM	2902	0	34	2709	159	STATIC
6010	BLANCO WASH	2278	0	180	2098	0	STATIC
6015	ASH MOUNTAIN	586	0	0	586	0	STATIC
6018	MARTINEZ WASH	200	0	0	200	0	STATIC
6020	COCORAQUE	9181	0	2942	3296	2943	UPWARD
6022	FRESNAL CANYON	600	0	352	248	0	STATIC
6023	CERRO COLORADO	1780	0	848	79	853	STATIC
6025	HELVETIA	1114	150	864	0	100	STATIC
6029	CLAFLIN	6036	236	2555	3245	0	STATIC
6031	THOMAS CANYON	331	299	0	32	0	STATIC
6039	COYOTE	11227	0	594	8190	2443	STATIC
6040	LA TORTUGA	7704	0	1754	5950	0	STATIC
6043	ROSE TREE	3950	1950	2000	0	0	STATIC
6054	PICTURE ROCK ROAD	35	0	0	35	0	STATIC
6055	AVRA VALLEY	329	0	0	329	0	STATIC
6060	MORNING STAR	16430	438	4272	10241	1479	STATIC
6062	OLSEN WASH	40	0	0	40	0	STATIC
6068	SAWTOOTH MTN.	32127	3436	9440	15556	3695	STATIC
6075	EL TIRO	3550	39	1641	1436	434	STATIC
6077	TEJON PASS	11591	202	3014	7332	1043	STATIC
6078	HAYDON	520	0	0	0	520	STATIC
6083	OWL HEAD	12388	0	656	11732	0	STATIC
6085	SAN LUIS MOUNTAIN	408	0	112	237	59	STATIC
6089	BABOQUIVARI	839	599	0	240	0	STATIC
6090	EMPIRE CIENEGA	36538	**7308**	**22654**	**6576**	**0**	UPWARD
6093	HAY HOOK	4762	1879	2121	762	0	UPWARD
6100	ANVIL	2577	0	2377	200	0	STATIC
6101	HILL TOP	693	0	0	200	493	STATIC
6102	OLD SASCO	4471	0	0	4471	0	STATIC
6115	DEMETRIE WASH	215	0	0	215	0	STATIC
6119	BLACK HILLS	2762	505	1116	1018	123	STATIC
6121	RAIL X	440	39	0	401	0	STATIC
6123	WILLOW SPRINGS	480	0	0	200	280	STATIC
6124	ANTELOPE	320	0	0	200	120	STATIC
6126	AGUA DULCE	16144	50	1915	13206	973	UPWARD
6129	UNIVERSITY	1440	0	1000	440	0	UPWARD
6130	BRAWLEY WASH	40	0	0	40	0	STATIC
6133	GUNNERY	1185	0	0	0	1185	DOWNWARD
6137	THREE PEAKS	592	592	0	0	0	UPWARD
6144	CROSS TRIANGLE	23796	0	0	23796	0	STATIC
6151	GUILD WASH	4364	0	0	4364	0	STATIC
6153	KING	12737	0	0	12737	0	STATIC
6167	AGUIRRE VALLEY	958	0	458	0	500	STATIC
6175	ELKHORN	863	152	278	433	0	STATIC
6183	AGUA BLANCA	14419	0	683	8758	4978	STATIC
6186	ARROYO SECO	3766	0	3151	185	430	STATIC
6191	GUNSIGHT MTN.	693	0	38	655	0	STATIC
6198	SIERRITA	2154	0	2078	76	0	STATIC
6200	THREE POINTS	199	0	0	32	167	DOWNWARD

*PNC - Potential Natural Community

Bold Numbers = Ecological Site Inventory (ES
Regular Numbers = Professional Judgeme

Table 5

RANGE CONDITION AND TREND

ALLOTMENT NUMBER	ALLOTMENT NAME	CURRENT PUBLIC LAND ACRES	ACRES PNC * (EXCELLENT)	ACRES LATE SERAL (GOOD)	ACRES MID SERAL (FAIR)	ACRES EARLY SERAL (POOR)	APPARENT TREND
6203	SILVER BELL	4835	0	0	4368	467	STATIC
6204	DIAMOND BELL	798	0	0	798	0	STATIC
6208	TWIN BUTTES #2	549	0	549	0	0	STATIC
6210	EMPIRITA	1520	**200**	**1000**	**320**	**0**	UPWARD
6211	DEEP WELL	320	0	0	320	0	STATIC
4401	MULESHOE	26360	**240**	**15079**	**11041**	**0**	UPWARD
4402	SOZA MESA	5300	**1800**	**3150**	**350**	**0**	UPWARD
4407	GETZ WILLER	80	0	0	0	80	UPWARD
4409	SOZA WASH	440	0	440	0	0	STATIC
4414	RILEY WEST	240	0	0	0	240	STATIC
4516	DUDLEYVILLE	2119	0	0	1119	1000	STATIC
4517	MALPAIS HILL	80	0	0	80	0	STATIC
4532	MASSACRE	606	0	0	300	306	STATIC
4533	ZAPATA	596	0	0	296	300	STATIC
4534	DRY CAMP	598	0	0	298	300	STATIC
4535	TIGER	439	0	0	200	239	STATIC
4536	RELIABLE	610	210	400	0	0	STATIC
4537	COPPER CREEK	2295	800	1200	295	0	UPWARD
4539	HOTWELL	3686	**0**	**1991**	**1548**	**147**	STATIC
5204	BACH	381	0	100	200	81	STATIC
5205	POWERS	4431	100	500	3405	426	STATIC
5208	BABOCAMARI	1816	0	0	816	1000	STATIC
5211	BUSENBARK	1293	243	400	400	250	UPWARD
5213	CARTER	1221	0	400	700	121	STATIC
5214	LACY	960	0	0	0	960	STATIC
5217	KRENTZ	1910	0	200	1410	300	STATIC
5219	CLEVELAND	282	0	0	182	100	STATIC
5223	COWAN	80	20	60	0	0	STATIC
5224	H.C. RANCH	330	0	0	160	170	STATIC
5226	MONZINGO	1858	0	0	1260	598	STATIC
5227	POWERS	4840	250	3760	540	290	STATIC
5231	DUGIE	91	0	31	60	0	STATIC
5232	JOSEPH J ESCAPULE	2731	0	0	730	2001	STATIC
5233	47 RANCH	1486	0	0	300	1186	STATIC
5235	HARRIS	1159	0	0	1000	159	DOWNWARD
5239	GRIZZLE	139	0	0	0	139	STATIC
5240	SUSNOW	118	0	40	78	0	STATIC
5241	HOWARD	120	20	90	10	0	UPWARD
5242	HOPP	1877	0	0	1300	577	STATIC
5246	BROSNAN	80	20	60	0	0	STATIC
5247	N JONES	80	0	80	0	0	STATIC
5251	BRUNCHOW HILL	1038	0	0	608	430	UPWARD
5252	LUCKY HILLS	9448	0	100	4160	5188	UPWARD
5255	MARCO	400	0	0	135	265	UPWARD
5258	WILDCAT CANYON	1345	0	400	300	645	STATIC
5260	C MILLER	2225	0	300	1600	325	STATIC
5261	Q MILLER	556	0	0	200	356	STATIC
5265	WES POLLEY	2173	0	400	800	973	STATIC
5268	RAMIREZ	992	0	0	312	680	UPWARD
5274	COX	1548	0	0	920	628	STATIC
5277	SANDS INVESTMENT	1700	100	400	900	300	STATIC
5278	RAINBOW'S END	378	0	228	150	0	UPWARD
5284	ALBERT THOMAS	4173	0	0	1033	3140	DOWNWARD
5287	WILBOURN	222	0	0	0	222	STATIC
5288	YUNCEVICH	80	0	0	80	0	UPWARD
5295	J.E. WARREN JR.	2503	0	0	1000	1503	UPWARD
5297	RAIN VALLEY RANCH	160	0	160	0	0	UPWARD
	TOTAL	381067	24972	102488	203943	49664	

*PNC - Potential Natural Community

Bold Numbers = Ecological Site Inventory (ESI)
Regular Numbers = Professional Judgement

Proposed Mitigation Measures

The Bureau proposes a variety of measures to minimize adverse effects, including take, to listed species; minimize adverse effects to critical habitat; and minimize the destruction and degradation of the habitat of listed species as a result of the proposed action. Many crucial mitigation measures are integral components of the project description (Bureau 1996a&b), including all or parts of the Arizona Standards and Guidelines, the upland livestock utilization standard, and policies in regard to ephemeral grazing, drought, riparian resources, and special management areas summarized above. Additional measures are summarized here, including measures described in Bureau (1996a&b), and species-specific measures agreed to by the Bureau during a April 10, 1997, meeting with the Service and Jeff Menges, and in subsequent discussions between the Service and the Bureau.

General Measures

1. In the construction of range improvements on public lands the following measures will be implemented:

(a) permanent roads or trails will not normally be constructed to project sites, disturbance of soil and vegetation at all project sites will be held to an absolute minimum, and areas of soil disturbance will be finished to blend into the surrounding soil surface.

(b) listed species surveys and clearances will be required for each project site before construction.

(c) projects constructed in wilderness areas will use the minimum tools necessary.

2. Prioritize implementation of Safford District RMP decisions on allotments that contain potential habitat or occupied habitat of the species addressed herein. These decisions include the provisions among others to inventory listed species and their habitat, manage habitat of listed species to maintain and enhance populations, protect and restore riparian areas including springs, and improve the condition of upland watersheds.

3. Develop site-specific management actions for listed species in cooperation with the Service and Arizona Game and Fish Department at the activity plan level that addresses allotment-specific conflicts between the grazing program and listed species and their habitat requirements. Consult as necessary with the Service at the activity plan level.

Species-Specific Measures

4. To protect Kearney's blue star and its habitat:

(a) The Bureau will take immediate action, including working with other landowners, to remove trespass cattle in the Baboquivari allotment as soon as possible and actions will be taken (such as fencing) to ensure that trespass of cattle does not continue. The Bureau will immediately initiate trespass procedures and a 12-month closure to livestock under 43 CFR 4150 to remove all livestock from public lands in the Baboquivari allotment. If ownership of the livestock cannot be determined, the Bureau will issue a "Notice and Order to Remove livestock" and initiate impoundment of the animals within 15 days of the notice.

(b) The Bureau will continue to work with Arizona State Land Department, Buenos Aires National Wildlife Refuge, the Tohono O'odham Nation, and other adjacent land owners to minimize future unauthorized livestock use. The Bureau will analyze the necessity of constructing an exclosure fence to ensure the protection of the Brown Canyon Kearney's blue star population from possible impacts from livestock, wildlife, and people. The Bureau will coordinate with the Service through the NEPA process on construction of any exclosure fences.

(c) The Bureau will formalize its decision to cancel livestock grazing on the Baboquivari allotment (6089) and allocate any available forage to wildlife species by December 1997. No future projects will be designed for the purposes of enhancing livestock grazing on the allotment.

(d) No cattle grazing will be authorized by the Bureau on Bureau-administered lands in the watershed of Brown Canyon in the Baboquivari allotment through the life of the project (December 31, 2006).

(e) No range improvements (except facilities needed to exclude cattle), and no mechanical or chemical vegetation manipulation will be authorized by the Bureau, and no planting or seeding of nonnative plants will occur in the Brown Canyon watershed within the Baboquivari allotment.

(f) Planning for prescribed fire in the watershed of Brown Canyon will be coordinated with the Service. The Bureau, with input from the Service, will develop a mitigation plan for each project. The mitigation plan will be approved by the Bureau and the Service.

(g) The Bureau will monitor the status of the Brown Canyon Kearney's blue star population on Bureau lands at least annually. Monitoring will include looking for evidence of trespass cattle grazing in the vicinity of the population. The Bureau will briefly report to the Service the results of that monitoring in an annual report to be delivered by March 15

following the calendar year in which the monitoring occurred. The first report will be due March 15, 1998.

(h) The Bureau will conduct botanical inventories in the canyons in the Baboquivari Mountains to determine presence of any additional populations of Kearney's blue star.

(i) The Bureau will develop an interdisciplinary activity plan for the Bureau lands that would address wilderness, recreation, vegetation, watershed, wildlife, and livestock management. The Bureau will implement the proposed actions and conduct monitoring at the level necessary to evaluate impacts of the action.

5. To protect Pima pineapple cactus and its habitat:

(a) The Bureau will not authorize seeding or planting of nonnative plants in the 20 allotments listed in Table 6.

(b) The Bureau will inventory with methods approved by the Service suitable Pima pineapple cactus habitat on the 20 allotments in Table 6. Measures (c) through (k) will only apply to suitable habitat within the allotments. Until such inventories are complete, the measures will apply to those areas within the allotments that are also within habitat of the Pima pineapple cactus as shown in Figure 2.

(c) Construction of range improvement projects will be preceded by surveys for Pima pineapple cactus in all areas directly or indirectly affected by the action. Areas indirectly affected may include areas within 0.5 mile of new water sources, or areas in which cattle numbers are increased due to fences or pasturing. Surveys will be in accordance with Service protocol (Appendix 2). Range developments will be planned to avoid direct impacts (death or injury) to Pima pineapple cactus as a result of construction or maintenance activities. Mitigation of indirect impacts, if any, will be coordinated with and approved by the Service on the project level.

(d) Planning for prescribed fire and chemical or mechanical vegetation management in suitable Pima pineapple cactus habitat will be coordinated with the Service. The Bureau, with input from the Service, will develop and implement a mitigation plan for each project. The mitigation plan will be approved by the Bureau and the Service

(e) The Bureau will develop an interdisciplinary activity plan for the Baboquivari and Coyote Wilderness Areas that addresses wilderness, recreation, vegetation, watershed, wildlife, and livestock management on public lands, and any possible impacts to Pima pineapple cactus. This plan will incorporate the livestock grazing management on public lands in the allotments in the maintain category in Table 6 (Hay Hook, Anvil, and Elkhorn allotments). The grazing management actions will be implemented no later that two years after completion of the interdisciplinary plan.

(f) Existing AMPs for any allotments in Table 6 will be implemented no later than October 1998.

(g) Actions will be taken to maintain range condition[1] in good or excellent condition in the maintain category allotments in Table 6.

(h) For allotments in the custodial category in Table 5, the Bureau will work with other landowners in the allotment to establish a long-term upward trend in range condition in those areas where condition is fair or poor[1]. Actions the Bureau could take with others may include developing grazing strategies, planning and developing range improvement projects and vegetation management, and providing technical assistance.

(i) Inventory, monitoring, and evaluations as described in the Bureau's proposed action (Bureau 1996a) and applicable sections of the Bureau Manual will be conducted in the allotments in Table 6. If Pima pineapple cactus is found in a custodial allotment, that allotment will be reclassified as maintain or improve and the above measures that apply to maintain allotments will be applied to such reclassified allotments. Inventory, monitoring, and evaluation activities and results; surveys for Pima pineapple cactus; and construction and mitigation in Pima pineapple cactus authorized as part of the grazing program will be summarized in an annual report to the Service, due March 15 of the year following the calendar year in which such activities occurred. The first report will be due March 15, 1998.

(j) The Bureau will continue to develop Coordinated Resource Management Plans with other Federal and State agencies to improve livestock grazing management on those allotments listed in Table 6. The Plans should identify and mitigate conflicts between grazing and Pima pineapple cactus.

6. To protect Nichol's Turk's head cactus:

(a) Planning of prescribed fire, and chemical or mechanical vegetation management in the Agua Dulce allotment (6126) will be coordinated with the Service. A mitigation plan, approved by the Service, will be developed and implemented by the Bureau for each project.

(b) The Bureau will authorize no seeding or planting of nonnative plants in the Agua Dulce allotment.

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[1] Note: the Bureau is developing a qualitative procedure to assess rangeland heath (Upland Rangeland Health Assessment) that may replace range condition assessment. The Bureau is encouraged to request amendment or reinitiation of this biological opinion to amend this and other measures that refer to range condition, when the procedure is finalized. The Service anticipates that the Health Assessment will provide a better measure of watershed condition and species habitat condition than range condition.

Table 6: Occurrence of Pima pineapple cactus on allotments

Allotment	Management Category	Potential Habitat	Recorded on Allotment
Twin Buttes (6001)	C	Yes*	No
Arivaca (6003)	C	Yes*	No
Ash Mtn (6015)	C	Yes*	No
Cerro Colorado (6023)	C	Yes*	No
Helvetia (6025)	C	Yes*	No
La Tortuga (6040)	C	Yes	No
San Luis Mtn (6085)	C	Yes	No
Hay Hook (6093)	M	Yes*	Yes
Anvil (6100)	M	Yes	Yes
Hill Top (6101)	C	Yes*	Yes
Black Hills (6119)	C	Yes*	Yes
Gunnery (6133)	C	Yes*	No
Three Peaks (6137)	C	Yes	No
Elkhorn (6175)	M	Yes	No
Arroyo Seco (6186)	C	Yes*	No
Gunsight Mtn (6191)	C	Yes*	No
Sierrita (6198)	C	Yes	No
Three Points (6200)	C	Yes*	Yes
Diamond Bell (6204)	C	Yes*	No
Twin Buttes 2 (6208)	C	Yes*	No

*Potential habitat occurs on Bureau lands within the allotment

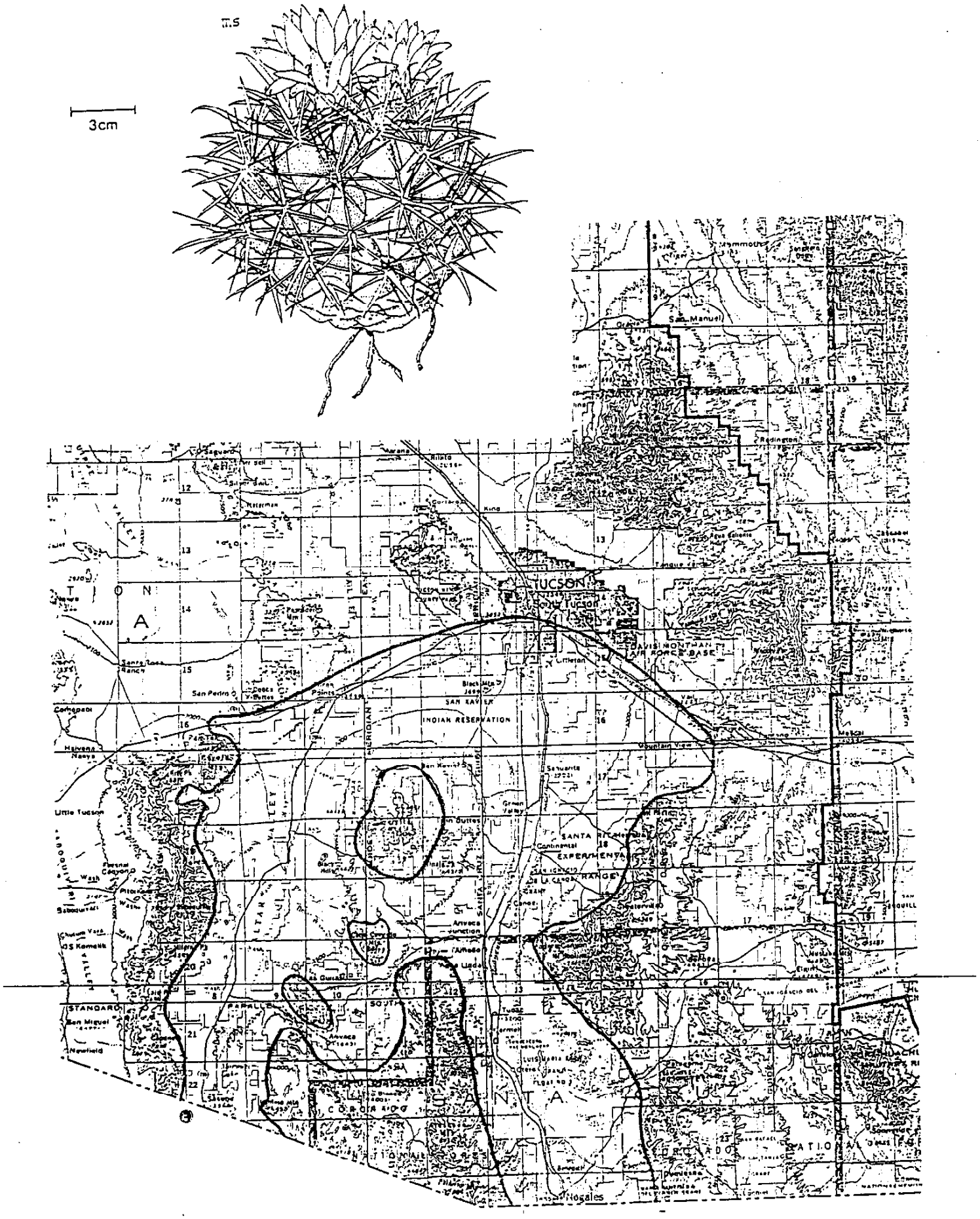

Figure 2: Range of the Pima pineapple cactus.

(c) Construction of range improvement projects in the Agua Dulce allotment will be preceded by surveys for the cactus in all areas to be disturbed. Measures will be taken to avoid impacting any cactus and to mitigate impacts to cactus habitat.

7. To protect Arizona hedgehog cactus:

(a) Construction of fences or pipelines in potential Arizona hedgehog cactus habitat will be preceded by 100-percent surveys of areas to be disturbed, and modification(s) of the project as needed will be implemented to avoid impacts to individual cacti.

(b) No planting/seeding of nonnative plants will be authorized by the Bureau in the 86 allotments where the Arizona hedgehog cactus occurs or potentially occurs (see Bureau 1996a for identification of 86 allotments).

(c) In suitable Arizona hedgehog cactus habitat in the 86 allotments, the Bureau will develop and implement mitigation plans, approved by the Service for the following actions. No mitigation plan is necessary if surveys are conducted pursuant to part 7(a) and no hedgehog cacti are found in areas affected by the actions (including the 0.5 mile radius around projects indicated herein):

(1) development of new water sources within 0.5 mile of Arizona hedgehog cactus.

(2) changes in cattle distribution resulting from water developments, modifying grazing systems, or other changes that result in increased numbers of cattle in any portion of an allotment where Arizona hedgehog cactus occurs.

(3) construction or improvement of roads or trails within 0.5 mile of Arizona hedgehog cactus.

(4) prescribed fire within 0.5 mile of Arizona hedgehog cactus.

(5) chemical or mechanical vegetation management in habitat or potential habitat of the cactus.

8. To protect the Huachuca water umbel:

(a) The Bureau will take immediate action to remove trespass cattle from the San Pedro River RNCA as soon as possible, and measures will be implemented, including continuing to construct, inspect, and maintain fences to ensure that trespass does not continue. The Bureau will immediately initiate trespass procedures and a 12-month closure to livestock under 43 CFR 4150 to remove all unauthorized livestock from the public lands in the San Pedro RNCA. If ownership of the livestock cannot be determined, the Bureau will issue a "Notice and Order to Remove the Livestock" and initiate impoundment of the animals within 30 days.

(b) The Bureau will continue to work diligently with the Arizona State Land Department, and other adjacent landowners to minimize future unauthorized livestock use. The Bureau will proceed with construction of new fencing and fence maintenance as necessary to ensure protection of the resources in the San Pedro RNCA. The Bureau will coordinate with the Service through the NEPA process on these actions.

(c) The Bureau will work with private landowners in the Brunchow Hill allotment to exclude livestock from Bureau-administered lands in that allotment within the riparian zone of the RNCA.

(d) AMPs will be completed in accordance with the following schedule for those allotments in the improve category listed in Table 7 that currently do not have them:

Babocomari (5208) - 1998
Brunchow Hill (5251) - 1999
Joseph J. Escapule (5132) - 2000
Ramirez (5268) - 2002
Albert Thomas (5284) - 2002

(e) Existing AMPs for any allotments in Table 7 will be implemented no later than October 1998.

(f) AMPs developed pursuant to item d. will be implemented no later than two years after completion.

(g) The Bureau will take action by October 1998 that will result in a long-term upward trend in range condition (see footnote on page 43) in areas of "improve" allotments listed in Table 7 that are in fair or poor condition.

(h) For allotments in the "custodial" category in Table 7, the Bureau will work with other landowners in the allotment to improve range condition (see footnote on page 43) in areas of fair or poor range condition. Actions the Bureau could take with others may include developing grazing strategies, planning and developing range improvement projects and vegetation management, and providing technical assistance.

(i) The Bureau will work with Natural Resource Conservation Service and landowners in the allotments to develop and implement watershed improvement projects that will increase infiltration.

(j) The Bureau will not develop or maintain range improvement projects in the riparian corridor of the San Pedro River, except for fences, cattle guards, and gates to exclude and better manage cattle. Also, the Bureau will not conduct chemical or mechanical vegetation management or prescribed fire in the riparian zone of the San Pedro or Babocomari rivers for the purpose of managing livestock.

Table 7: Range condition and trend, and management category of allotments in the watershed of the San Pedro RNCA.

Allotment	Condition (acres)				Trend	Management Category
	Excellent	Good	Fair	Poor		
Powers (5205)	100	500	3405	426	Static	Custodial
Babocomari[1] (5208)	0	0	816	1000	Upward	Improve
Cleveland (5219)	0	0	182	100	Static	Custodial
Monzingo (5226)	0	0	1260	598	Static	Custodial
Powers (5227)	250	3760	540	290	Static	Custodial
Joseph J. Escapule (5232)	0	0	730	2001	Static	Improve
47 Ranch (5233)	0	0	300	1186	Static	Custodial
Susnow (5240)	0	40	78	0	Static	Custodial
Hopp (5242)	0	0	1300	577	Static	Custodial
Brunchow Hill (5251)	0	0	608	430	Upward	Improve
Lucky Hills (5252)	0	100	4160	5188	Upward	Improve
Marco (5255)	0	0	135	265	Upward	Custodial
Wildcat Canyon (5258)	0	400	300	645	Static	Custodial
Q Miller (5261)	0	0	200	356	Static	Custodial
Ramirez (5268)	0	0	312	680	Upward	Improve
Cox (5274)	0	0	920	628	Static	Custodial

Table 7 (cont.)

Sands Investment (5277)	100	400	900	300	Static	Custodial
Albert Thomas (5284)	0	0	1033	3140	Downward	Improve
J.E. Warren Jr. (5295)	0	0	1000	1503	Upward	Custodial
Totals:	**450**	**5200**	**18180**	**19313**		

[1]The permittee reports that range condition trend is upward (undated letter from Mike Hayhurst to Grant Drennan, Bureau, Tucson, AZ), although the Bureau reports the trend as static (Bureau 1996a).

(k) The Bureau will authorize no grazing in the riparian zone of the San Pedro River in the San Pedro RNCA for the life of the project.

(l) Grazing on Bureau-administered lands in the allotments in Table 7 will adhere to the Bureau's Arizona Standards and Guidelines, Upland Livestock Utilization Standard, Safford Drought Policy, Arizona Ephemeral Policy, and Riparian Area Policy.

(m) Inventory, monitoring, and evaluations as described in the Bureau's proposed action (Bureau 1996a) and applicable sections of the Bureau Manual, will be conducted in the allotments in Table 7. Inventory, monitoring, and evaluation activities and results; removal of trespass cattle; fence construction; and AMP development will be summarized in an annual report to the Service, due March 15 of the year following the calendar year in which such activities occurred. The first report will be due March 15, 1998.

9. To protect the desert pupfish and its habitat:

(a) The exclosure around Howard Well will be maintained.

(b) A fence will be constructed at Cold Spring Seep to exclude livestock from pupfish habitat.

(c) The Bureau will cooperate with the Service and Arizona Game and Fish Department to identify site-specific measures to protect populations of pupfish from grazing program impacts as specific impacts are identified. These measures could include, among others, surveys of stock waters for nonnative fish and replacement of nonnative fish populations with native fish in perennial stock tanks.

10. To protect the spikedace and its habitat:

(a) Direct effects of livestock grazing in the riparian zone of Aravaipa Creek that may jeopardize the continued existence of spikedace will be eliminated. This may include elimination of grazing, or other range management options.

(b) The Bureau will evaluate all stock tanks on the allotments in the watershed of Aravaipa Creek for their degree of risk to introduce nonnative fish to spikedace habitat. The Bureau will then, in conjunction with the Service and Arizona Game and Fish Department, develop and implement management techniques or practices for the tanks in each risk category. Management techniques may include, but are not limited to, replacement of the existing tanks with alternative water sources, treatments to eliminate fish, or other appropriate methods. Proposed tanks will undergo the same evaluation for risk, and will include development of a mitigation plan approved by the Service.

(c) Livestock grazing will be deferred or otherwise managed to assure conditions in the Aravaipa watershed are maintained or improved. Action will be taken to ensure that range condition does not deteriorate in the South Rim, Painted Cave, and Hell Hole allotments. Action will be taken within three years on Bureau-administered lands in these allotments in fair condition that will result in a long-term upward trend in range condition (see footnote on page 43).

(d) The Bureau will cooperate with the Service and Arizona Game and Fish Department to identify site-specific measures to protect spikedace populations from grazing program impacts as specific impacts are identified. These measures could include officially deferring riparian grazing on the Quintana and Brandenberg Mountain allotments; replacement of nonnative fish populations with native fish in perennial stock ponds, and implementation of a prescribed fire plan in the semi-desert grassland areas in the Aravaipa Creek watershed to enhance watershed function.

11. To protect the Gila topminnow and its habitat:

(a) The Bureau will maintain the exclosure around Martin Well.

(b) The Bureau will cooperate with the Service and Arizona Game and Fish Department to identify site-specific measures to protect populations of topminnow from grazing program impacts as specific impacts are identified. These measures could include, among others, surveys of stock waters for nonnative fish, replacement of nonnative fish populations with native fish in perennial stock ponds, and implementation of prescribed fire in grassland vegetation types in the Cienega Creek watershed to improve the condition of the watershed.

12. To protect the loach minnow and its habitat:

(a) Direct effects from livestock grazing that may jeopardize the continued existence of the loach minnow will be eliminated in the riparian areas of Bureau-administered lands on the San Francisco River and Aravaipa Creek. This may include elimination of grazing, or other range management options.

(b) The Bureau will evaluate all stock tanks on Bureau lands in the watersheds of Aravaipa Creek or the San Francisco River above Clifton for their degree of risk to introduce nonnative fish to habitats of the loach minnow. The Bureau will then, in conjunction with the Service and Arizona Game and Fish Department, develop and implement management techniques or practices for tanks in each risk category. Management techniques may include, but are not limited to, replacement of existing tanks with alternate water sources, treatments to eliminate fish, or other appropriate methods. Proposed tanks will undergo the same evaluation for risk, and will include development of a mitigation plan to be approved by the Service.

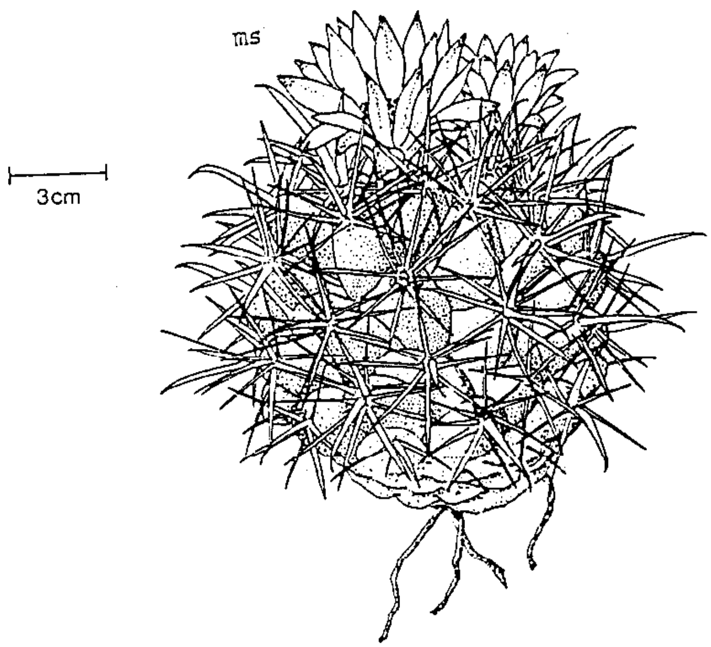

Figure 2: Range of the Pima pineapple cactus.

(c) Livestock grazing will be deferred or otherwise managed to assure conditions in the watersheds of Aravaipa Creek and the San Francisco River above Clifton are maintained or improved. Action will be taken to ensure that range condition (see footnote on page 47) does not deteriorate in the South Rim, Painted Cave, and Hell Hole allotments, and in the watershed of the San Francisco River in the San Francisco, and Red Hickey Hills, and Metcalf allotments. Action will be taken within three years on Bureau lands in portions of these allotments in fair condition that will result in a long-term upward trend in range condition (see footnote on page 47).

(d) The Bureau will cooperate with the Service and Arizona Game and Fish Department to identify other site-specific measures to protect loach minnow populations from effects of the grazing program as specific effects are identified. These measures could include officially deferring riparian grazing on the Quintana, Brandenberg Mountain, Red Hickey Hills, and San Francisco allotments, surveys of stock waters for nonnative fish, replacement of nonnative fish populations with native fish in perennial stock ponds, and implementation of a prescribed fire plan in the semi-desert grassland areas in the watersheds containing loach minnow to enhance watershed function.

13. To protect the razorback sucker and its habitat:

(a) Direct effects of livestock grazing that may jeopardize the continued existence of the razorback sucker or its critical habitat will be eliminated on Bureau lands in the riparian areas of the San Francisco and Gila rivers, and Bonita Creek. This may include elimination of grazing, or other range management options.

(b) The Bureau will evaluate all stock tanks on Bureau lands in the watersheds of the Gila and San Francisco rivers, and Eagle and Bonita creeks in the project area for their degree of risk to introduce nonnative fish to habitats of the razorback sucker. The Bureau will then, in conjunction with the Service and Arizona Game and Fish Department, develop and implement management techniques or practices for tanks in each risk category. Management techniques may include, but are not limited to, replacement of existing tanks with alternate water sources, treatments to eliminate fish, or other appropriate methods. Proposed tanks will undergo the same evaluation for risk, and will include development of a mitigation plan to be approved by the Service.

(c) Action will be taken to ensure that range condition (see footnote on page 43) does not deteriorate in the allotments in Table 8, and for Bureau lands in the allotments in the improve or maintain category that are in fair or poor condition action will be taken within three years that will result in a long-term upward trend in range condition.

(d) A mitigation plan will be developed by the Bureau in coordination with the Service for each range improvement project that may adversely affect the razorback sucker or its critical habitat, prescribed fire, and vegetation management projects in the allotments in Table 8. Mitigation plans for prescribed fire will limit to the extent practicable the

possibility that fire would spread to the Gila and San Francisco rivers, and Eagle and Bonita creeks. Mitigation plans will be approved by the Service.

(e) Grazing on Bureau-administered lands within allotments in Table 8 will strictly adhere to the Bureau's Arizona Standards and Guidelines, the Upland Livestock Utilization Standard, Safford Drought Policy, Arizona Ephemeral Grazing Policy, and Riparian Area Policy.

(f) Inventory, monitoring, and evaluations as described in the Bureau's proposed action (Bureau 1996a) and applicable sections of the Bureau Manual will be conducted in the allotments in Table 8.

(g) The Bureau will submit annual monitoring reports to the Arizona Ecological Services Field Office by March 15, of each year beginning in 1998. These reports will briefly summarize for the previous calendar year: 1) the effectiveness of these mitigation measures, and 2) any take of razorback sucker resulting from grazing activities. If such activities or monitoring occurs, the report shall also summarize: 1) grazing actions initiated or completed including range improvement projects, prescribed fires, and vegetation management in the allotments in Table 8; 2) allotment monitoring results; 3) fish monitoring data, 4) riparian, stream channel photopoint, channel geomorphology transects, and other monitoring data collected; and 5) records of downed or damaged exclosure fencing or incidents of cattle within the Bureau-administered riparian corridors of the Gila or San Francisco rivers, or Bonita Creek, and action taken to remove the cattle. The report will also make recommendations for modifying or refining these measures to enhance razorback sucker protection or reduce needless hardship on the Bureau and its permittees.

(h) The Bureau will cooperate with the Service, Arizona Game and Fish Department, National Park Service, the Forest Service, Arizona State Lands Department, the San Carlos Apache Tribe, and private land owners within the upper Gila River watershed to seek and implement solutions to problems involving recovery of the razorback sucker. If determined by this aforementioned group to be necessary, the Bureau may conduct surveys for razorback suckers and nonnative fish, eliminate nonnative fish populations in stock tanks found to be a threat to razorback suckers, and on allotments that are determined to have unacceptable effects on the razorback sucker, implement grazing strategies that will reduce the identified impacts to a mutually acceptable level. These grazing strategies may include changes in season of use, stocking levels, or grazing systems; construction, relocation, or removal of range improvements; or complete deferment of grazing on allotments or portions of allotments.

14. To protect the southwestern willow flycatcher and its habitat:

The following measures are designed to map suitable and potential habitat on Bureau-administered lands, survey habitats for the presence of flycatchers, and provide protective

Table 8: Allotments in which potential adverse effects to razorback suckers and their habitat may result from Bureau-authorized activities.

Allotment	Potential Effects to: Aquatic Razorback Sucker Habitat	Watershed[1] above Habitat
Bonita Creek (4616)	X (Bonita Ck)	X
San Francisco (4002)	X (San Franc. R.)	X
Red Hickey Hills (4005)	X (San Franc. R.)	X
Morenci (4003)	X (Gila R.)	X
Smugglers Peak (4010)	X (Gila R.)	X
Harper (5024)	X (Gila R.)	X
Zorilla (4011)	X (Gila R)	X
Gila (4014)	X (Gila R.)	X
Twin C (4021)	X (Gila R.)	X
Sheldon Mtn (5035)	X (Gila R.)	X
Johnny Creek (4615)	X (Bonita Ck)	X
Bull Gap (4617)	X (Bonita Ck, Gila)	X
Woods Cyn (5049)		X
Wilky (5066)		X
Sand Wash (5046)		X
Rhyolite Peak (5041)		X
China Camp (5043)		X
Buck Canyon (4023)		X
Metcalf (4001)		X
Turtle Mtn (4618)	X (Bonita Ck)	X
County Line (4022)		X
(4614)		X
San Jose Comm. (4031)		X
Yuma Wash (4032)		X
Lone Star (4613)		X
Gripe (5169)		X
111 Ranch (5103)		X
Rest Haven (4612)		X
Skinner Comm. (4611)		X
Talley Wash (4610)		X
Kimball Comm. (4609)		X
Bryce (4608)		X
Billingsley Ck (4607)		X
S. Eden Comm. (4606)		X
N. Eden Comm. (4605)		X
Day Mine (4604)		X
Ft. Thomas (4603)		X

Tom Springs (4602)	X
Diamond Spring (4601)	X
East Spear Ranch (4641)	X
Mud Hollow (4639)	X
Mesa (4638)	X
Pima (4637)	X
Oso Largo (4635)	X
White House (4634)	X
S. Ft. Thomas Comm. (4625)	X
N. Ft. Thomas Comm. (4624)	X
Benchmark (4623)	X
Mixed Up (4647)	X
Fine Wash (4622)	X
Alkali (4621)	X
Ashurst (4675)	X
Canal (4677)	X
Emery (4620)	X
Geronimo (4619)	X

[1]Allotments adjacent to (within approximately three miles) the Gila or San Francisco rivers, or Bonita or Eagle creeks.

measures for habitats which are currently suitable or have the potential to become suitable flycatcher habitat.

The Bureau's Safford and Tucson Field Offices will develop and implement an action plan for the southwestern willow flycatcher that provides for protection and management of flycatcher habitat while implementing Bureau authorized activities.

(a) Mapping: maps will be prepared that convey the following information about flycatcher habitat managed by the Safford and Tucson Field Offices:

1. Location, size, shape, and spacing of habitat areas;

2. Habitat stage with respect to flycatchers according to the following classification: suitable-occupied, suitable-unoccupied, suitable-unsurveyed, potential in the short term (one to three years), and potential in the long-term (greater than three years);

3. Status of flycatcher surveys for each area of suitable habitat: either the date(s) surveyed or indication that the area has not been surveyed.

(b) Flycatcher Surveys: a list will be prepared of areas to be surveyed following the most recent Service recommended protocol, along with the anticipated completion date.

(c) Habitat Management Guidelines: management guidelines (fencing, grazing system used, or flycatcher habitat improvement activities) will be prepared and implemented for areas at each of the habitat stages defined above for mapping. These guidelines must include:

1. Exclusion of livestock grazing within occupied or unsurveyed, suitable habitat during the breeding season (April 1-September 1).

2. Management of suitable flycatcher habitat so that its suitable characteristics are not eliminated or degraded.

3. Management of potential flycatcher habitat to allow natural regeneration (through natural processes) into suitable habitat as rapidly as possible.

(d) Cowbird Control: To reduce the likelihood of nest abandonment and loss of flycatcher productivity owing to cowbird parasitism associated with Bureau-authorized grazing activities in or near occupied habitats, the following will be implemented:

1. Investigate and identify livestock concentration areas on Bureau lands in the action area that are likely foraging areas for brown-headed cowbirds within a five-mile radius of occupied or unsurveyed suitable southwestern willow flycatcher habitat (not including the Gila River corridor downstream of the San Jose Diversion in the project area), and evaluate ways to reduce any concentration areas found.

2. If cowbird concentrations indicate a strong likelihood that parasitism to flycatcher nests is occurring or actual parasitism is documented through nest monitoring, possible cowbird foraging areas will be assessed, and appropriate control measures for cowbirds will be implemented. Evaluation of possible parasitism apply to active flycatcher nests on Bureau-administered lands which are within five miles of Bureau-authorized grazing activities (not including the Gila River corridor downstream of the San Jose Diversion in the project area). These efforts will be coordinated with the Service, APHIS, and Arizona Game and Fish Department. Monitoring and/or control activities will be conducted by qualified personnel with appropriate permits.

The number and acreage of suitable and potential habitat areas may change due to natural riparian restoration processes, site potential, flood events which alter riparian vegetation and site capability, refinements in habitat definitions, and additional inventory/mapping efforts. The Bureau will keep the Service apprized of these sorts of changes on a regular basis.

Direction on this issue (grazing use in occupied or suitable-unsurveyed habitats during the nesting season) will be fully implemented prior to the 1998 flycatcher nesting season. A schedule for completion of the above features will be developed by the Bureau and transmitted to the Service with 60 days of the date of this biological opinion. The Service

will respond within 30 days thereafter with comments on the adequacy of the schedule for meeting the intent of the reasonable and prudent alternative.

15. To protect the cactus ferruginous pygmy-owl and its habitat:

(a) Livestock grazing conflicts with pygmy-owls and their habitat will be eliminated from the riverine riparian areas within suitable occupied habitat, or potential habitat, as defined by the most current habitat profiles. This may include elimination of grazing, or other range management options in riparian areas in the following allotments:

Metcalf (4001)	San Francisco (4002)
Morenci (4003)	Smuggler Peak (4010)
Gila (4014)	Twin C (4021)
County Line (4022)	Johnny Creek (4615)
Bonita Creek (4616)	Bullgap (4617)
Turtle Mtn (4618)	

(b) The potential for adverse effects to pygmy-owl habitat on Bureau lands within those allotments near the largest known pygmy-owl population in Arizona (northwest Tucson and Marana) will be avoided. This may include suspension of grazing in the following allotments:

#6004 - Newman Peak	#6006 - Balcom
#6022 - Fresnal Canyon	#6029 - Claflin
#6083 - Owl Head	#6121 - Rail X
#6144 - Cross Triangle	#6151 - Guild Wash
#6211 - Deep Well	

unless or until studies (as described in c.3. below) determine that grazing would not remove key habitat elements for pygmy-owls.

(c) Assessment of Allotment Suitability: The Bureau will coordinate with Service personnel in determining which of the allotments listed below should be visited to determine if additional suitable habitat is present and what effect, if any, grazing is having on Sonoran Desert scrub in these allotments. The site visit should include those allotments determined to have potential habitat by the Bureau as follows:

#4516 - Dudleyville	#4529 - South Rim
#4532 - Massacre	#4534 - Dry Camp
#4536 - Reliable	#4537 - Copper Creek
#4539 - Hotwell	#6085 - San Luis Mountain
#6100 - Anvil	#6183 - Agua Blanca

Additionally, a strategy should be devised in coordination with the Service to arrange for visitation of the allotments listed below. It may be possible, following coordination with the

Service, to choose allotments representative of habitat conditions within a limited geographic area so that visitation to each of the individual allotments is not required:

#4518 - Painted Cave	#4520 - Dry Camp
#4524 - Horse Mountain	#4528 - Hell Hole
#5277 - Sands Investment	#5297 - Rain Valley Ranch
#6001 - Twin Buttes	#6003 - Arivaca
#6010 - Blanco Wash	#6015 - Ash Mountain
#6018 - Martinez Wash	#6020 - Cocoraque
#6023 - Cerro Colorado	#6025 - Helvetia
#6040 - La Tortuga	#6043 - Rose Tree
#6054 - Picture Rock Road	#6055 - Avra Valley
#6060 - Morning Star	#6068 - Sawtooth Mountain
#6075 - El Tiro	#6077 - Tejon Pass
#6089 - Baboquivari	#6101 - Hill Top
#6102 - Old Sasco	#6119 - Black Hills
#6126 - Agua Dulce	#6130 - Brawley Wash
#6137 - Three Peaks	#6153 - King
#6167 - Aguirre Valley	#6176 - **No Name**
#6186 - Arroyo Seco	#6191 - Gunsight Mountain
#6198 - Sierrita	#6200 - Three Points
#6203 - Silver Bell	#6204 - Diamond Bell
#6208 - Twin Buttes #2	

(1) Map any suitable habitat identified within the jurisdiction of the Tucson and Safford Field Offices during the site visit process. Suitable habitat will be defined based on the Service's most current habitat profile and distribution map and the site visit and will be completed within three years.

(2) Survey for the presence of owls on all Bureau-administered lands over all areas of suitable habitat within a time frame identified in an action plan developed in cooperation with the Service. Prioritization of survey efforts within the action plan will be as follows:

(a) Survey first any habitat subject to disturbing activities (this applies to all suitable habitat, regardless of the status of the mapping effort described in number 2 above);

(b) Survey second those areas in proximity to occupied or recently (within the last 10 years) occupied habitat;

(c) Survey third any historic localities; and

(d) Survey fourth any likely historic habitat, based on historic localities and the habitat profile.

(3) Devise and conduct, in coordination with the Service, a study plan to determine the effects of different grazing systems on Sonoran Desert scrub habitat. The study should, at a minimum, determine the effects of grazing on key components of suitable pygmy-owl habitat, including plant species diversity and density, browsing levels on mesquite, palo verde, and

ironwood, trampling and grazing effects on saguaro cactus, and differences in grazing effects at varying levels of utilization.

(4) Develop and implement, using data from the study in step (3) above, recommendations necessary to minimize the effects of grazing on suitable pygmy-owl habitat, as identified through site visits and mapped by the Bureau.

(d) Bureau riparian policy will be implemented that directs the Bureau to achieve proper functioning condition on 75 percent of its riparian areas by 1997 and establish advanced ecological status as the goal unless management objectives for an area require an earlier seral stage.

(e) The Bureau will prioritize implementation of Safford District RMP decisions on allotments that contain potential habitat or occupied habitat on the District. This would require, in part, that the Bureau inventory priority species and their habitat, manage habitat of priority species to maintain and enhance populations, protect and restore riparian areas including springs, improve the condition of upland watersheds, and include design criteria for range improvements such as water developments.

(f) The Bureau will develop site specific management actions in cooperation with the Service and Arizona Game and Fish Department at the activity plan level that address allotment specific conflicts between the grazing program and threatened and endangered species and their habitat requirements. Additionally, the Bureau notes that consultation with the Service would occur at the activity plan and project planning levels, including allotment management plans, areas of critical environmental concern plans, interdisciplinary activity plans, habitat management plans, wilderness management plans, and prescribed fire plans.

16. To protect the jaguar and its habitat:

(a) The Bureau will inform permittees by letter within 90 days of the date of this opinion that the jaguar is listed as endangered under the Act, take of jaguar is prohibited under the Act, and violators are subject to prosecution and substantial fines.

(b) The Bureau will require that all appropriate State permits are obtained prior to authorizing any control activities.

(c) Dense, low vegetation in major riparian corridors within allotments on Bureau-administered lands south of Interstate 10 and Highway 86 will be maintained.

17. To protect the New Mexico ridgenose rattlesnake and its habitat:

The Bureau will monitor grazing in New Mexico ridge-nosed rattlesnake habitat on Bureau lands in the southern Peloncillo Mountains. If grazing becomes appreciable, the Bureau will reinitiate consultation.

18. To protect the bald eagle and its habitat:

The Bureau will reinitiate consultation if bald eagles are found nesting on any of the allotments during the life of the project.

19. To protect the peregrine falcon and its habitat:

(a) The Bureau will survey known or potential nest sites during the same year as any proposed surface-disturbing activity or activity that would produce loud noises or otherwise would cause disturbance to nesting peregrine falcons.

(b) No blasting, and no chainsaw or other loud power tool operation would occur within 0.5 miles of an active nest site from March 1 through July 31.

20. To protect the Aplomado falcon and its habitat:

The Bureau will reinitiate consultation if the species is found in any of the allotments during the life of the project.

SCOPE OF THE CONSULTATION

This consultation is programmatic, in that the effects of the livestock grazing program are evaluated broadly over a large range of actions and a large number of allotments through the year 2006. However, this opinion is designed so that all aspects of the program are addressed herein to the project level. The Service offers this perspective for planning purposes only. In any case, the Bureau has the responsibility under section 7(a)(2) of the Act and 50 CFR 402.14(a) to review its actions to determine whether any action may affect a listed species or critical habitat, and if such a determination is made, to enter into formal consultation with the Service if that action has not been the subject of previous consultation. Reinitiation criteria are listed in the "CLOSING STATEMENT" of this document.

This opinion evaluates all effects of the proposed action, including interdependent and interrelated effects (50 CFR 402.02), some of which occur on non-Federal lands in the allotments. Although the effects of grazing activities on non-Federal lands are addressed herein where they are interrelated or interdependent to the proposed action, reasonable and prudent measures and terms and conditions only apply to discretionary Bureau actions, not actions conducted by private individuals, the State of Arizona, or others that do not require authorization from the Bureau. Anticipated incidental take in the "Take Statements" for animal species is based on these effects analyses, and if the reasonable and prudent measures and terms and conditions are implemented, the Bureau is exempted from incidental take prohibitions in section 9 of the Act so long as such take is in compliance with the incidental take statement. The take statement only applies to activities funded, authorized, or carried out by the Bureau and does not authorize take by private individuals, the State of Arizona, or others, unless such take is incidental to an action that is authorized by the Bureau and

described in the "Description of the Proposed Action." Permittees and others conducting grazing activities not authorized by the Bureau should apply for a section 10(a)(1)(B) incidental take permit from the Service for those activities that may result in take of a listed species.

Some aspects of the proposed action were not described in detail, or exact location, size, effects, etc. of specific projects were unclear. This is particularly true for range improvement projects, vegetation management, and prescribed fire. As a means to extend the consultation to the project level, the opinion establishes a process whereby as the details of such projects are developed, their effects can be evaluated and mitigation developed and implemented under the umbrella of this opinion. In some cases, this process was proposed by the Bureau (see **"Proposed Mitigation Measures"** above) or it is developed as a reasonable and prudent measure. The Service believes that no further consultation on these projects are required so long as none of the reinitiation criteria are triggered in the **"CLOSING STATEMENT"** <u>and</u> the Service approves mitigation plans for the projects. In considering whether or not to approve mitigation plans, the Service will determine if the type of project proposed and the nature of impacts anticipated fall within the scope of activities and impacts described herein. In making this determination, the Service will carefully evaluate the additive effects (number and impacts of all such projects authorized under this opinion) to ensure that the sum total of such projects do not exceed the extent or nature of that evaluated here, that impacts do not exceed that anticipated herein, and that any anticipated take would not be met or exceeded. If anticipated effects of proposed projects exceed that described herein, the project type is not included here in the "DESCRIPTION OF THE PROPOSED ACTION", or anticipated take would be met or exceeded, the Service will not approve the mitigation plan and, in accordance with 50 CFR 402.14(a), the project would be subject to additional section 7 consultation if the Bureau determines that the project may affect a listed species or its critical habitat.

ANALYSES BY SPECIES:

The following section includes separate analyses for each of the 15 listed species considered in this biological opinion. Analyses include a status of the species, environmental baseline, effects of the action, concluding findings, and as appropriate, incidental take statements for each animal species. Incidental take statements include reasonable and prudent measures and terms and conditions, which are mandatory actions that must be carried out by the Bureau so they become binding conditions of any grant or permit issued to a permittee. With some exceptions, a timetable is not provided for implementation of terms and conditions. This is because implementation will, in some cases, require funding or labor that cannot be obligated by the Bureau at this time. However, the Service assumes that terms and conditions will be implemented as soon as possible. Failure to carry out terms and conditions may nulify the exemption from incidental take under of section 7(o)92) of the Act and leave the Bureau and/or its permittees subject to prosecution for an unlawful take.

Terms used in the following discussion, such as range improvement projects and chemical or mechanical vegetation manipulation, and others are discussed and defined in the "DESCRIPTION OF THE PROPOSED ACTION" and Bureau (1996a&b).

Kearney's Blue Star
STATUS OF THE SPECIES

Kearney's blue star is an herbaceous perennial with alternate lance-shaped leaves and erect, pubescent stems that rarely branch. The plant generally grows to 2.3 feet (ft) tall and 3 ft across and is described as belonging to the Apocynaceae. Terminal flower clusters bloom a pale blue color in April and individual flowers range from 0.5 to 0.6 inches (in) in length. Fruits are 1.2 to 3.9 in long follicles commonly found in pairs extending beyond the leaves at the terminal ends of branches from June to July. Seeds are cork-like cylinders 0.3 to 0.4 in long and approximately 0.014 in wide with tapered ends (Phillips and Brian 1982). This taxon was listed as endangered by the Service in January of 1989 due its extreme vulnerability related to reduced population size and number (Service 1989a).

Kearney's blue star is known only from the Baboquivari Mountains in Pima County, including South Canyon and possibly one other canyon on the west slope, and Brown Canyon on the east slope. One group of plants in Brown Canyon consists of individuals planted from seed stock collected in South Canyon. In November 1993, 64 plants occurred in this introduced population (Reichenbacher et al. 1994). Another apparently natural group of approximately 300 plants occurs on a steep slope in upper Brown Canyon on Bureau lands upstream of the planted Kearney's blue stars (Thea Ulen, Buenos Aires National Wildlife Refuge, pers. comm. 1997; Jim Donovan, University of Arizona, pers. comm. 1997). The population in South Canyon consisted of 25 plants in 1982 (Phillips and Brian 1982) but was reduced to 8 individuals by 1986. Howell (1987) conducted surveys in most potential habitat in the Baboquivari Mountains without finding additional populations.

The species occupies alluvial bottoms and slopes of steep canyons comprised of granitic parent material associated with partial cover and leaf litter of Mexican blue oak, *Quercus oblongifolia*; catclaw acacia, *Acacia greggii*; desert hackberry, *Celtis palida*; narrowleaf hoptree, *Ptelia angustifolia*; Arizona walnut, *Juglans major*; velvet mesquite, *Prosopis velutina*; and lower growing desert honeysuckle, *Lonicera arizonica*; and desert cotton, *Gossypium thurberi*. The presence of Kearney's blue star in riparian canyons, phenology of fruit maturity, and seed morphology, suggest that seed dispersal and germination are associated with summer monsoon rains and flood events.

Reintroduction of Kearney's blue star in Brown Canyon was only 26 percent successful with no presence of new recruits. Low success was due in part to flooding (Reichenbacher et al. 1994). Three transplantations occurred from 1989 and 1991. Once plants were established, survivorship increased (Reichenbacher et al. 1994). Research concluded that following transplantation of old and large greenhouse stock, plant survivorship and reproduction could

be successful in the absence of catastrophic flood events and with application of supplemental water and pesticides.

Heavy insect predation and increased flood events may threaten populations due to the extremely limited number of and small size of populations. Reproduction may be limited by stink bugs, *Chlorochroa ligulata*, feeding on seed embryos. The threat of a catastrophic flood has significance because some plants are located in canyon bottoms subject to periodic flooding. Increases in water flow through these steep canyons due to loss of upstream vegetation cover may reduce these populations and threaten the continued existence of this species. Activities that may cause significant losses in side slope and upstream cover, such as overgrazing or fire may cause such a threat. Any threats to this species are very serious because of its extremely endangered status.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat to provide a platform to assess the effects of the action now under consultation.

The only known occurrence of Kearney's blue star on Bureau lands is the population in upper Brown Canyon in the Baboquivari allotment (6089). The base property was recently purchased by the Service; this property is now part of Buenos Aires National Wildlife Refuge. Although the allotment has been placed into non-use (Bureau 1996a&b), approximately 10 cattle remain in upper Brown Canyon, primarily on the Bureau-administered lands (Thea Ullen, pers. comm. 1997). The Federal permitted AUMs is 240 for the Baboquivari allotment. Assuming all animals are adult and if the cattle are located mostly on the Bureau lands, then current grazing is approximately 50 percent of permitted use. The stocking rate for the ranch prior to purchase by the Service was 60 head of cattle (Bureau 1997c); thus current stocking for the allotment as a whole is approximately 17 percent of historic use. As of July, 1997, at least two calves were with the herd; thus current use is somewhat less than 50 percent. The Refuge has maintained a corral trap on the base property for over two years. Many cattle have been trapped out of the canyon, but those remaining are difficult to trap and typically are found upstream of the corral trap on the Bureau-administered lands.

The upper Brown Canyon population, which consists of approximately 300 plants, is the largest population of Kearney's blue star. Nearly all of the plants occur on a steep, northeasterly facing slope at about 5,000 feet in an upper fork of Brown Canyon. Two plants occur in the canyon bottom (Jim Donovan, pers. comm. 1997). Dominant plants in the area include Mexican blue oak and Arizona rosewood, *Vaquelinia california*; on the hillsides, and poison ivy, *Rhus radicans*; and sycamore, *Platanus racemosa*; in the canyon

bottom. In July, 1997, some trailing by deer and possibly cattle was evident on the hillside where Kearney's blue star occurs. Substrates on the slope where the plants occur are a loamy, gravelly material that appears to be susceptible to erosion. Minor erosion is occurring downslope of some portions of the trails. Cattle sign in the form of bones and recent droppings were present in the canyon bottom below the slope (J. Rorabaugh, pers. obs., 1997).

The presence of most of the plants on a slope in the upper reaches of the canyon suggest that this population is probably much less susceptible to flooding events than plants in the canyon bottoms in the lower portion of Brown Canyon and in South Canyon. In the event of an extreme flood event, such as a late summer tropical storm, this population might remain relatively unaffected whereas plants in the bottom of Brown and South canyons could be scoured away. Because of this, and because it is the largest of the three known populations of this endangered species, this population is critical to the survival of the species.

EFFECTS OF THE PROPOSED ACTION

The Baboquivari allotment, which includes the upper portions of Brown Canyon where Kearney's blue star is found, is currently in nonuse; however, an estimated 10 cattle occur on the allotment. Cattle are unlikely to consume Kearney's blue star, because the plants are toxic and/or unpalatable (Service 1993a). Although trampling has not been observed, cattle could potentially step on plants. Trailing of cattle along the slope could also result in erosion on the slope and subsequent loss of plants and habitat, particularly during severe storm events.

Currently, the number of cattle in upper Brown Canyon is probably not great enough to cause significant damage to the watershed. However, reproduction in this herd or immigration of animals from the Elkhorn or Thomas Canyon allotments, which border the Baboquivari allotment, or from the Tohono O'odham reservation, could potentially increase the herd to a degree where watershed degradation could occur, including increased rates of erosion in the canyon and flood damage. These conditions could increase threats to Kearney's blue star populations in Brown Canyon, particularly plants in the lower portion of the canyon. A single flood event in 1990 removed 76 percent of the introduced plants in Brown Canyon. Exacerbation of flooding effects could eliminate the population.

The Bureau's proposed action does not rule out the possibility of prescribed fire. Fire can dramatically alter habitat conditions through removal of vegetation cover, increased evaporation from soils, increased surface temperatures, and alteration of soil nutrient content (McPherson 1995). The response of Kearney's blue star to altered habitats caused by fire is unknown. However, reduced vegetation cover resulting from fire can facilitate runoff and soil erosion, with adverse effects to Kearney's blue star similar to that described above for watershed damage caused by livestock grazing. Prescribed fire would only occur after development of a mitigation plan approved by the Service.

Planting or seeding of nonnative plants could introduce species that would compete with Kearney's blue star or alter habitat conditions, including fire frequencies (see "EFFECTS OF THE PROPOSED ACTION" for Pima pineapple cactus), in a way that could be adverse to the species.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline.

Lands west of the crest of the Baboquivari Mountains are within the Tohono O'odham Nation. Brown Canyon is a mix of Bureau, State, and National Wildlife Refuge lands. Most of the east slope of the Baboquivari Mountains are owned by the Arizona State Lands Department, although the Bureau manages significant acreage near the crest of the mountain range. Bureau lands in the Baboquivari allotment total 839 acres.

The status of the population in South Canyon (Tohono O'odham lands) is unknown, but the habitat there has been heavily grazed (Service 1993a). No change in this situation is expected. State lands on the east slope are also grazed; and although State lands could be sold or used for other purposes to maximize revenues, demand for use of these lands for purposes other than grazing is probably low at present. Actions that may affect populations in Brown Canyon would likely be Federal actions subject to consultation, and thus are not considered as cumulative effects.

Effectiveness of Proposed Mitigation

The Bureau proposes a range of measures that dramatically reduce potential effects of livestock grazing and associated activities to Kearney's blue star and its habitat. The Bureau proposes removing the trespass cattle and ensuring that trespass does not continue. No grazing would be authorized by the Bureau in the Baboquivari allotment through the life of the project (December 31, 2006). No range improvements, chemical or mechanical vegetation management, or planting/seeding of nonnative plants will be authorized by the Bureau in the Brown Canyon watershed. The Bureau could conduct prescribed fire in the area, but only after development of a mitigation plan approved by the Service. The Bureau also has committed to botanical inventories in canyons in the Baboquivari Mountains, development of an activity plan for the area that would address vegetation and other resources and uses, monitoring of implementation of the proposed action, and reporting the results of the monitoring to the Service in annual report. Prompt and thorough implementation of these mitigation measures is imperative to limit or remove what the Service believes are very serious threats to Kearney's blue star.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of Kearney's blue star. We present this conclusion for the following reason:

Although this species is critically endangered, the proponent's project description includes substantial features to minimize or eliminate potential adverse effects of the grazing program on Kearney's blue star and its habitat, most important of which is immediate action to remove trespass cattle as soon as possible and a commitment to not graze the Baboquivari allotment for the life of the project.

CONCLUSION

After reviewing the current status of Kearney's blue star, the environmental baseline for the action area, the anticipated effects of the proposed grazing program, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of Kearney's blue star. No critical habitat has been designated for this species, thus none will be affected.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for Kearney's blue star. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau should investigate the demographics of the Kearney's blue star population on Bureau lands in Brown Canyon. Demographic information is used to determine minimum viable populations and acceptable levels of natural variation within stable, reproducing populations. This information can be used to clarify threats. Once identified, the Bureau should implement measures to abate threats.

2. If suitable, unoccupied habitat is identified during Bureau surveys for Kearney's blue star, the Bureau should assist the Service in developing and implementing plans to introduce the species into these habitats.

In order for the Service to be kept informed of actions that minimize or avoid adverse effects or benefit listed species, the Service requests notification of implementation of any conservation actions.

(Note: any research or other activities that require collection of Kearney's blue star or parts thereof require appropriate permits from the Service and Arizona Department of Agriculture.)

Pima Pineapple Cactus
STATUS OF THE SPECIES

The final rule listing Pima pineapple cactus as endangered was published September 13, 1993 (58 FR 49875); no critical habitat has been designated. Factors contributing to this listing included habitat loss, degradation, and fragmentation; distribution characteristics and plant rarity; illegal collection; other threats; and difficulties in providing protection of an area large enough to maintain a functioning population. The biological information summarized below is from the proposed and final rules, and other sources.

Pima pineapple cactus is a low growing hemispherical cactus with adults varying in stem diameter from 2.0 to 8.3 in and height from 1.8 to 18.0 in. Individuals are considered adults when they exhibit the ability to reproduce with the presence of flowers. Plants can be either single or multi-stemmed with yellow flowers blooming with the summer rains. Clusters of Pima pineapple cactus stems are formed primarily from vegetative clones produced at the plant base (Benson 1982, Roller 1996). The diagnostic characteristic of this taxon is the presence of one stout, straw-colored, hooked central spine. Radial spines extend laterally around the central spine and average 10 to 15 spines on large cacti and six on small cacti (Benson 1982).

Pima pineapple cactus occurs south of Tucson, in Pima and Santa Cruz counties, Arizona (Figure 2) and adjacent northern Sonora, Mexico. It is distributed throughout both the Altar and Santa Cruz valleys and low lying areas connecting the two valleys. Generally, the cactus grows on gentle slopes of less than 10 percent and along the tops of alluvial bajadas between the basins and steep, rocky slopes. The plant is found between 2,362 and 4,593 ft elevation (Phillips et al. 1981, Benson 1982, Ecosphere Environmental Services, Inc. 1992) in vegetation characterized by Brown (1982) as both the Arizona upland subdivision of the Sonoran Desert scrub and semi-desert grasslands.

Groups of flowers begin to bloom for single day periods following five to seven days after the first monsoon rains. Flowering is triggered by as little as 0.039 in of precipitation. Generally flowers begin opening mid-morning and close at dusk. Adult plants will bloom (single flowers or groups of flowers) one to three days each year, generally finishing by the end of August. Cross-pollination produces significantly more viable seeds than self-pollination. Fruits are mature within two weeks following successful pollination and nearly all are removed from the plant by October or November. Germination has been observed in the field during the summer monsoon season (Roller 1996).

The seedling size class of Pima pineapple cactus ranges in diameter from 0.3-0.4 in after their first year's growth following the summer monsoons. Sub-adult classes are larger than

and private lands. Development projects are typically not subject to section 7 consultation because they lack a Federal nexus. As a result, little in-situ conservation or mitigation occurs in regard to these projects. The majority of the best habitats for this species is reasonably certain to be converted by urbanization or mining development in the foreseeable future.

Other threats to the species include activities associated with livestock grazing, off-highway vehicle use, proliferation of roads and trails, natural and prescribed fire, and illegal collection. Adverse effects of grazing include trampling by livestock, habitat loss and degradation associated with construction of range improvements, vegetation manipulations, such as chaining, prescribed fire, seeding with nonnative plants, and imprinting; and heavy grazing that results in erosion, changes in vegetation communities, hydrology, and microhabitats in uplands where the species occurs.

Areas surrounding and including parts of Green Valley and Sahuarita, as well as parts of the San Xavier District of the Tohono O'odham Nation, may be the most important regions for conservation and recovery of this species. Surveys conducted from 1992 to 1995 and a quantitative analysis technique established a pattern of greater population densities and higher ranks of cactus vigor and reproduction occurring within the semi-desert grasslands/Sonoran desert scrub in this area.

Potentially suitable habitat occurs within 20 allotments located south of Tucson and west of the Santa Rita Mountains (Table 6, Roller 1996, Service files). The species has been found in 5 of the 20 allotments, but the Service is unaware of any locality records for Pima pineapple cactus on Bureau lands within allotments. Potential habitat occurs on Bureau lands in 14 of the 20 allotments (Roller 1996, Service files). The largest acreage of potential habitat occurs within the Black Hills allotment (6119), located southwest of Green Valley. Large acreages of potential habitat also occur within the Twin Buttes (6001), Three Peaks (6137), Arroyo Seco (6186), and Diamond Bell (6204) allotments. Distribution and abundance of the cactus throughout much of the potentially suitable habitat in the allotments is unknown due to a lack of survey data (T. Roller, pers. comm. 1997).

EFFECTS OF THE PROPOSED ACTION

The proposed action includes grazing of 4,449 AUMs on 37,129 acres of public lands in the 20 allotments that include suitable habitat for Pima pineapple cactus. According to guidelines developed by the U.S. Natural Resource Conservation Service, this level of stocking (equivalent to an average of 6 cows per section) should result in moderate levels of grazing on rangelands in fair condition (Bureau 1997c). Total acres of suitable habitat on public lands in the allotments is unknown but is somewhat less than 37,129 because some public lands within the allotments are outside of the range of the cactus or in habitats, such as montane slopes, which are not suitable.

Grazing would occur on both Federal and non-Federal lands in the 20 allotments. Although the Bureau has no discretion over activities on non-Bureau lands in the allotments, and therefore has no control over the types, extent, or intensity of effects to listed species on those lands, grazing systems and prescriptions on Bureau lands may influence the way cattle are grazed on non-Federal lands. In these cases, grazing on the non-Bureau lands in the allotment may be interrelated or interdependent to grazing on the Bureau lands.

In accordance with 50 CFR 402.14(g), the Service is required to consider all effects of the proposed action, which refer to "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." "Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration" (50 CFR 402.02). The Service's Section 7 Handbook provides further guidance on the definition of "interrelated and interdependent actions" by establishing the following rule: Determining if an action is interrelated or interdependent depends on the "but for" test. Ask whether the Federal, State, or private activity could occur "but for" the proposed action.

The percentage of Bureau lands in an allotment is a determining factor in whether grazing on non-Bureau lands in an allotment is interrelated or interdependent to the proposed action. If the Bureau owns a large percentage of the allotment, grazing on the non-Federal portions might be conducted very differently or not at all if the Bureau lands could not be grazed. On allotments in which the Bureau owns a lesser, but still significant, acreage the way that the non-Federal lands are grazed might be affected if the Bureau lands are not grazed. For instance, if the Bureau lands comprise one pasture in a three pasture rest-rotation grazing system, then if that pasture cannot be grazed, the non-Federal lands may be grazed year-round or under some other grazing system. These other grazing systems may have significantly different effects on listed species as compared to a three pasture system.

Determining on which allotments grazing on the non-Federal portions of the allotment is interrelated or interdependent would require an allotment by allotment analysis. Because of the large number of allotments under consultation and the programmatic nature of this biological opinion, such an analysis is not warranted. Instead, the Service assumes that the effects of grazing on the non-Federal portions of the allotments are interrelated and interdependent when the Bureau lands exceed 30 percent of the total area within an allotment. Under this land ownership scenario, the way the non-Federal lands are grazed would likely be influenced by decisions to graze or not graze the Bureau lands, or in cases where the Bureau owns most of an allotment, a decision not to graze the Bureau lands might result in a non-viable operation on other lands in the allotment and a decision not to graze those lands, as well.

Bureau ownership is 30 percent or less in sixteen of the 20 allotments containing potential Pima pineapple cactus habitat. The other four allotments, including Helvetia (6025), Hay

Hook (6093), Gunnery (6133), and Twin Butte 2 (6208) contain from 36 to 99 percent Federal lands (Bureau 1997c). The Hay Hook allotment is currently in non-use, but could be grazed after preparation of an AMP. In these allotments, the Service considers any grazing in the non-Bureau portions of the allotments interrelated and interdependent to the proposed action. Non-Federal acreage within these allotments are as follows: Helvetia (939), Hay Hook (888), Gunnery (2,077), and Twin Butte 2 (10). Roughly 75 percent of these non-Federal lands are within the range of the Pima pineapple cactus. When added to Federal lands in the 20 allotments within the range of the cactus, the proposed action affects roughly 75,000 acres of Pima pineapple cactus habitat, which is approximately 6.5 percent (75,000/1,152,000) of the suitable habitat of the species.

From Table 6, two of the 20 allotments (Gunnery-6133 and Three Points-6200) exhibit a downward trend in range condition. Two allotments (Hay Hook-6093 and Three Peaks-6137) exhibit an upward trend, and the rest are static. Of the Bureau acreage in the allotments, 4,005 acres are in poor condition (early seral) (11 percent of Bureau lands), and 12,622 acres are in fair condition (mid seral) (34 percent of Bureau lands). Rangelands in fair and poor condition are from 49 to 25 percent and 0 to 24 percent, respectively, of a site's potential plant community (Bureau 1994). Information provided by the Bureau does not show the distribution of range condition classes, thus we cannot determine the acreages of fair or poor condition range in Pima pineapple cactus habitat. We also have no information on range condition in the non-Bureau portions of the allotments. In his comments on the draft biological opinion, Dr. Phil Ogden, advisor to Jeff Menges, applicant, stated that "current range condition has been caused by an interaction of many factors, with historical and/or present effects, and each of these variables among sites. Past livestock grazing has been one of these factors affecting condition on many sites." Range condition is often determined by professional judgement, and some of the data is dated (Bill Brandau, Bureau of Land Management, Safford, AZ, pers. comm. 1997). Range condition and trend was determined by professional judgement on 255 of the 288 (89 percent) allotments under consultation (Table 4). Analyses based on professional judgement or old data may not be accurate. However, this is the only information available to the Service that provides some indication of the condition of vegetation in the allotments and the impacts grazing may have on vegetation communities. In accordance with 50 CFR 402.14(g)(h), the Service is required to use the best scientific and commercial data available in formulating its biological opinion. This information indicates that vegetation communities over relatively large portions of the 20 allotments are degraded, and that past and/or current livestock grazing is a contributing factor in habitat degradation.

Very little is known regarding the effects of low to moderate levels of livestock grazing on Pima pineapple cactus distribution. A study is underway at the Coronado National Forest to quantify the effects of grazing on Pima pineapple cactus. This taxon is patchy in distribution, widely dispersed, and occupies upland, relatively xeric soils (Roller 1996) that are used less by livestock than streams or wash bottoms. Heavy grazing may threaten populations by increasing the probability of trampling, as well as altering surface hydrology and increasing erosional rates, which in turn may affect seed dispersal or seedling

establishment. Trampling of cacti is also expected to occur at reduced levels under moderate and light grazing regimes. Habitat effects of grazing could include erosion, hydrologic and micro-climatic changes, and invasion or expansion of nonnative grasses due to livestock preferences for native grass species over nonnatives.

To what extent grazing may directly or indirectly effect the cactus by impacting the structure and function of the ecosystem is not well-studied. However, heavy grazing, fire suppression, drought, and introduction of nonnative plants such as Lehman lovegrass, *Eragrostis lehmanniana*, in arid grassland ecosystems have all been hypothesized as being the cause, either individually or collectively, of changes in arid grassland community structure and function (Bahre 1985). The relatively large proportion of Bureau lands in fair or poor condition suggests one or more of these factors, possibly including current grazing practices, has had an adverse effect on vegetation communities in the allotments. Grazing can degrade habitat through damage and alteration of soils, vegetation communities, and cryptobiotic crusts.

Cryptobiotic crusts, consisting of lichens, fungi, algae, mosses, and cyanobacteria are important soil stabilizers of desert soils (Kleiner and Harper 1972, 1977; Belnap 1992). Although the relationship between Pima pineapple cactus and cryptobiotic crusts has not been investigated, cryptobiotic crusts occur in the habitat of the cactus (T. Roller, pers. comm. 1997). These crusts decrease wind erosion (Brady 1974 in Anderson et al. 1982) and have a significant effect on soil stability and rates of water infiltration (Kleiner and Harper 1972; Kleiner and Harper 1977; Belnap 1992; Belnap and Gardner 1993). Cyanobacterial soil crusts have been shown to increase soil retention through absorbency of the polysaccharide sheath material that surrounds groups of living filaments. These crusts also act to increase the availability of many nutrients in sandy soils (Belnap 1992; Belnap and Gardner 1993).

Studies at Arches and Canyonlands National Parks demonstrated a dramatic decrease in nitrogen input into the system, with virtually no nitrogenase activity detectable in cyanobacterial populations after a single footprint disrupted the soil crust (Belnap, unpubl. report). At Arches National Park, fescue, *Festuca octoflora*, had eight percent lower total nitrogen content in its tissues and *Streptanthella longirostris* had 30 percent less (Belnap, unpubl. report) after trampling occurred.

In Utah, the bulk of microbiotic tissue in sandy soils consisted of abandoned, buried cyanobacterial sheath material, which, although abandoned, may still reduce soil erodibility and enhance moisture and nutrient retention of the soil (Belnap 1993). Repeated trampling of this dry material pulverizes the abandoned sheath and results in permanent destruction of the crust if no living filaments are present to re-secrete the gelatinous material (Belnap 1993). Areas trampled by humans in Arches National Park exhibited a 90 percent lower infiltration rate than untrampled areas, resulting in overall water loss to the system (Belnap unpubl. report). Therefore, trampling may result in the reduction of soil stability, soil fertility, and soil moisture retention (Belnap 1992). Recovery of cryptobiotic crusts may take a long time, especially for the lichen and moss components of the crust (Belnap 1993). Cryptobiotic

crusts will not likely recover significantly from previous disturbances under a seasonal grazing regime. Without these crusts, the reestablishment of the potential natural community may not occur (Menke 1988).

Grazing caused considerable damage to cryptobiotic crusts resulting in less stable soil conditions at Navajo National Monument, Arizona (Brotherson et al. 1983). In Utah, Marble and Harper (1989) found that late winter grazing caused significant reductions in cryptogamic crusts. In his review of soil conditions on a large cattle exclosure within the Coso area of the Naval Weapons Center in California, Menke (1988) stated that "the enhanced cryptobiotic crust that will result from livestock exclusion... will substantially alter the (plant) species composition of the area and likely increase forage productivity and habitat favorable to the Mojave ground squirrel." Additionally, cryptobiotic crusts provide improved microsites for seedling establishment and aid in stabilizing surface soils by reducing wind erosion (Menke 1988; Harper and St. Clair 1985). Menke (1988) suggested that enhanced cryptobiotic crusts tend to change soils and plants in a way that facilitates development of potential natural communities. He added "many of the native plants and animals should increase in abundance as the community develops." In conclusion, effects of grazing on cryptobiotic crusts may cause changes in soil stability, nutrient content, and soil moisture retention that may be detrimental to survival of Pima pineapple cactus.

The effects of livestock grazing on desert soils and vegetation have been documented by numerous authors. Grazing practices can change vegetation composition and abundance, and cause soil erosion and compaction, reduced water infiltration rates, and increased runoff (Klemmedson 1956, Ellison 1960, Arndt 1966, and Gifford and Hawkins 1978), leaving less water available for plant production (Dadkah and Gifford 1980). Livestock grazing can result in decreased shrub cover (Webb and Stielstra 1979) and desirable shrubs (Orodho et al. 1990), or in semi-desert grasslands can result in replacement of grasses with shrubs (Bahre 1995). Weedy nonnative plants, such as Lehmann lovegrass; split grass, *Schismus arabicus*; checker fiddleneck, *Amsinkia intermedia*; filaree, *Erodium cicutarium*; and cheatgrass, *Bromus rubens*; have benefitted from grazing, while perennial bunchgrasses, which are highly palatable grazing forage, have become less abundant in many areas (Berry and Nicholson 1984, Kie and Loft 1990, McClaran and Anable 1992). The intensity of damage to soil caused solely by cattle is assumed to be directly proportional to the AUMs of forage used per pasture (Bureau 1980). The most severe impacts occur in areas used for loading and unloading cattle, supplemental feeding, watering sites, and salt licks. In these areas, effects to habitat, such as vegetation removal, soil compaction (Orodho et al. 1990) and resultant reduction in soil moisture (Daddy et al. 1988), and presumably crushing of cacti, are prevalent.

Pima pineapple cactus populations characterized by relatively high plant densities, good reproduction, and high levels of cactus vigor are typically found in upland associations with mid-sized mesquite shrubland that includes an assortment of other succulent species and native bunch grasses (Roller and Halvorson in press). Many of the species dominant in this vegetation type are associated with grazing (i.e. are known as "increasers" under some

grazing practices). In these areas supporting apparently healthier populations of Pima pineapple cactus, some pastures with lower levels of grazing support greater native grass coverage and species diversity. Thus, establishing standards and guidelines for grazing practices that are accompanied by monitoring, may allow for the development of further useful information regarding these relationships.

Some level of soil movement or disturbance is required for seed germination because the seed will not germinate on the surface; it generally germinates at a depth between 0.2-0.6 in (Roller 1996). Presence of seedlings or sub-adults have been documented at few locations throughout the plant's range. However, all but one of the known locations with seedlings or subadult plants had been grazed within three years of the observation. Whether light to moderate grazing practices provides the appropriate level of soil movement to cause seed germination has not been determined. The study established on the Coronado National Forest should provide some insight on seed germination relative to specific grazing intensities.

The invasion of Lehmann lovegrass combined with fire is a threat to populations. Continuous distribution of fuels and greater biomass have been hypothesized as increasing fire intensity across semi-desert grasslands, including the often bare-ground refugia in which Pima pineapple cactus occur. Under these conditions, mortality of Pima pineapple cactus following fire is elevated (Roller and Halvorson, in press). Research shows that fire increases Lehmann lovegrass distribution and suggests fire intensity and fire frequency increases with Lehmann lovegrass invasion (McPherson 1995). Grazing can result in increased abundance of Lehmann lovegrass relative to the abundance of native grasses (McClaran and Anable 1992). Lehmann lovegrass has been seeded in many areas in an attempt to improve rangelands for livestock (Bahre 1995).

The Bureau's proposed action includes possible mechanical or chemical management of vegetation communities on allotments, and prescribed fire. Such actions would likely be planned across land ownership and allotment boundaries. Thus, Bureau and non-Bureau lands within allotments could be affected by chemical and mechanical vegetation management, and prescribed fire. Pima pineapple cactus could be killed or injured during mechanical treatments such as imprinting or rootplowing, and may be adversely affected by herbicide treatments. From 27 to 100 percent of Pima pineapple cactus showed evidence of burning during fires on the King Anvil Ranch and at Buenos Aires National Wildlife Refuge. Mortality of cactus was significantly elevated where Lehmann lovegrass was dominant (Roller and Halvorson in press). Fire intensity and frequency increases in dense stands of Lehmann lovegrass (Anable 1990, McPherson 1995, Ruyle et al. 1988, Sumrall et al. 1991). Distribution and abundance of Lehmann lovegrass in the 20 allotments is unknown. The Bureau's guideline for standard 3 would allow use of nonnative plants (including Lehmann lovegrass) in range improvement, under certain conditions (Bureau 1996a); however, no seeding or planting of nonnative plants would occur in the allotments in Table 6 (see "PROPOSED MITIGATION MEASURES").

The Bureau proposes range improvements as needed in allotments. Such improvements could include fences, pipelines, water storage tanks, earthen reservoirs and catchments, wells, and developed springs. Construction activity associated with these activities could result in destruction of habitat and loss of cactus; although construction impacts would likely be relatively small within the range of the species. If roads are constructed in association with construction, such roads could provide improved public access and increase potential illegal collection by the public, and off-highway vehicle (OHV) activity. Redistribution of cattle with fences or water developments could alter the distribution of impacts on habitat and the cactus, which could be either beneficial or detrimental.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline.

The primary cumulative effects contributing to extirpation of individuals and large scale habitat loss has been residential development. Continued development of private and State lands in and near Green Valley and Sahuarita is expected. Livestock grazing and associated impacts are expected to occur on State and private lands outside of the allotments addressed herein.

Effectiveness of Proposed Mitigation

The Bureau proposes substantial measures to reduce or eliminate the potential adverse effects of the grazing program. The Bureau has committed to not seed or plant nonnative plants in Pima pineapple cactus habitat, avoiding impacts to Pima pineapple cactus during range improvement project construction, coordinating prescribed fire and vegetation management activities with the Service and obtaining Service approval on mitigation plans for these activities, and implementing AMPs and taking other actions to ensure that range condition is improved or maintained in good or excellent condition. Prompt and thorough implementation of these mitigation measures will be imperative to limit what the Service believes are very serious threats to Pima pineapple cactus. The Bureau also proposes to conduct botanical inventories to clarify distribution of the cactus.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of the Pima pineapple cactus. We present this conclusion for the following reasons:

1. The proponent's project description includes substantial features to minimize or eliminate adverse effects of the grazing program on Pima pineapple cactus.

2. Occurrence of Pima pineapple cactus appears to be compatible with well-managed livestock grazing.

CONCLUSION

After reviewing the current status of Pima pineapple cactus, the environmental baseline for the action area, and the effects of the proposed cumulative effects, it is the Service's biological opinion that the Safford/Tucson Field Offices' grazing program is not likely to jeopardize the continued existence of the Pima pineapple cactus. No critical habitat has been designated for this species, thus, none will be affected.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for Pima pineapple cactus. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau should establish cattle exclosures with controls in areas of relatively high densities of Pima pineapple cactus to investigate the effects of grazing on the cactus.

2. The Bureau should conduct extensive surveys to further clarify the distribution of Pima pineapple cactus in the allotments in Table 6.

3. The Bureau should develop techniques for and reestablish native grasses in the allotments.

4. The Bureau should fund research of the pollination biology of Pima pineapple cactus, which would contribute to our understanding of how habitat fragmentation affects this plant.

5. The Bureau should monitor allotments for illegal collection of Pima pineapple cactus and report to the Service results of such monitoring.

6. The Bureau should map the occurrence and abundance of Lehmann lovegrass within the allotments.

In order for the Service to be kept informed of actions that minimize or avoid adverse effects or benefit listed species, the Service requests notification of implementation of any conservation actions.

(Note: any research or other activities that require collection of Pima pineapple cactus or parts thereof require appropriate permits from the Service and Arizona Department of Agriculture.)

Nichol's Turk's Head Cactus
STATUS OF THE SPECIES

Nichol's Turk's head cactus, *Echinocactus horizonthalonius* var. *nicholii*, was determined by the Service to be endangered on October 26, 1979 (44 CFR 61929). Actions associated with mining, recreation, urbanization, and illegal collection of individuals and seeds are specific threats documented as impacting this taxon. The effects of grazing on the species are not well studied.

Nichol's Turk's head cactus is a blue-green, low growing succulent that is generally found as a single stem with eight ribs, spiraling around from the base to the apex. Pink to magenta flowers bloom near the apex of the stem in late April and early May and fruits appear dry with a cover of dense, wooly, white hairs when mature in late May. The largest of individuals range in height from 16 and 20 in. and from 5 to 8 in. in diameter. Each aerole along the ribs consists of a rosette of 5 radial spines and 3 central spines.

This variety *nicholii* of *Echinocactus horizonthalonius* was first named by Lyman Benson (1969). According to Benson's analysis (1982), this variety is differentiated from the *horizonthalonius* variety based on the morphological characters listed in Table 9.

Populations of Nichol's Turk's head cactus have been documented in the Waterman Mountains south of Silver Bell, Arizona; the Vekol Mountains in southwestern Pinal County, Arizona (Service 1986a); and the Sierra del Viejo of northwestern Sonora, Mexico (Yatskievych and Fisher 1984). Extent of habitat in the Waterman and Vekol mountains is estimated at 5,000 and 5,700 acres, respectively (Service 1986a). The Sonora, Mexico population is apparently very small. The combined number of individuals from all known populations was estimated in 1985 to be near 10,000 (Clayton May, Tucson, AZ, pers. comm. 1986). The cactus could also potentially occur on small outcrops of limestone deposits in Koht Kohl Hills; the Santa Rosa, Cimarron, Brownell, Sierra Blanca, and Growler mountains of Pima County; and the Slate Mountains and Vaiva Hills in Pinal County.

Available data indicate that the cactus grows on alluvial fans, inclined terraces, and saddles derived from limestone material at an elevation of 3,200 to 3,829 ft (Phillips et al. 1979a) in the Arizona uplands subdivision of the Sonoran Desert scrub vegetation type (Brown 1982a). Some variation in the limestone-derived, carbonatic soils has been observed in the Vekol

Mountains with individuals occurring on both Lozier and Tencee soil series. Carbonatic soils consist of greater than 40 percent calcium carbonate.

Data from a weather station situated nearer to the Waterman range than the Vekol range at 2,700 ft (500 ft less than the cactus site) shows that less than 13 in of precipitation per year typically occurs in this area (Sellars and Hill 1974). Rainfall occurs in both the winter and summer, with more than 50 percent of the total precipitation occurring in the summer. Typically there are no more than five nights of below freezing temperatures and average maximum temperatures in July are 99° Fahrenheit.

Table 9. Morphological character differentiation between var. horizonthalonius and var. nicholii based on Benson (1982).

CHARACTERISTIC	*horizonthalonius*	*nicholii*
Stem habit	depressed-globose to broadly ovoid	depressed-globose to broadly ovoid, becoming columnar with age
Stem size	usually 4-6 in. high and diameter	ultimately 16-20 in. high, 5-6 in. diameter
Spine color	gray, usually pale gray covering red-and-yellow	some nearly black or dark gray, with some under-layers of red
Central spines	3(5), the lower one curving downward or nearly straight, similar to but larger than others, the upper two usually short and straight	3,1 black and curving strongly downward and much shorter than the others, two red or basally pale gray and curving upward
Radial spines	usually 6(7)per areole	5 per areole
Seeds	broader than long, 0.008 in. long, 0.01 in. broad	longer than broad, 0.013 in. long, 0.008 in. broad
Hilium	appearing "lateral" to basal, 0.002 in. diameter	"sub-basal", ± 0.004 in. diameter
Altitude	3000-5500 ft	3000-3500 ft
Floristic Association	Chihuahuan Desert	Sonoran Desert

Plants are typically found in open areas with few trees or shrubs on limestone derived soil types. Regardless of whether limestone soils are present, the cactus is less abundant at the base of the alluvial fans where canopy cover of trees and shrubs increases. Individuals at the base of alluvial fans grow, flower, and survive at lower rates than plants higher up on the bajada where less cover occurs. Dominant plant species associated with Nichol's Turk's

head cactus include foothill palo verde, *Cercidium microphyllum*; triangleleaf bursage, *Ambrosia deltiodea*; white ratany, *Krameria grayi*; brittlebush, *Encelia farinosa*; prickly pear cactus, *Opuntia phaeacantha*; saguaro, *Carnegia gigantea*; ocotillo, *Fouquieria splendens*; and buckhorn cholla, *Opuntia acanthocarpa*.

In the United States, Nichol's Turk's head cactus is known to occur on lands managed by the Bureau, Bureau of Indian Affairs, State of Arizona, the Tohono O'Oodom Nation, as well as on private lands. To date, the plant's relative distribution across the land ownership pattern has not been well defined due primarily to the paucity of survey data for areas identified as potential habitat.

ENVIRONMENTAL BASELINE

Although survey information is limited, Nichol's Turk's head cactus is recognized as being an endemic taxon with a narrow range. Such a distribution increases the immediacy of our concern and possibly the effectiveness of our management and conservation of this species. Primary activities and projects resulting in habitat degradation and/or the loss of Nichol's Turk's head cacti include mining, urbanization, recreation, and illegal collection. Table 10 summarizes activities that have adversely affected this cactus since monitoring began in 1973 by Clayton May.

Quarrying of limestone is a significant threat to this cactus. A mineral withdrawal now protects the Waterman population from limestone and other potential mining impacts. The Bureau has designated 1,960 acres of Nichol's Turk's head cactus habitat in the Waterman Mountains as an ACEC. Planned actions for the ACEC include the mineral withdrawal, limiting motorized vehicles to designated roads and trails, prohibition of land use authorizations except along existing roads, acquisition of 1,140 acres, implementation of an approved habitat management plan, and prohibition of oil and gas development (Bureau 1996a, 1988). All actions have been implemented except route designation, land acquisition, and some aspects of the HMP.

The Service cannot reliably predict cause and effect scenarios for the future due to a lack of historic comparative data and compounding factors such as climatic change and urbanization. We do not know if the majority of known populations of Nichol's Turk's head cactus can be sustained given the possibility of mineral development. Thus, the need for information on what is limiting this plant's distribution under current habitat conditions is important.

EFFECTS OF THE PROPOSED ACTION

Very little is known regarding the effects of livestock grazing on Nichol's Turk's head cactus distribution or population health. A variety of grazing activities have a potential for adversely affecting the taxon and the community structure and function which supports it. These plants do not inhabit soil types or communities often preferred by livestock managed at

Table 10: Activities/actions that have resulted in loss of habitat and/or individual Nichol's Turk's head cactus

ACTIVITY	EFFECT
Mining	
Limestone Quarry	Small Population & Habitat Lost in Waterman Range
Happy Jack Mine Airstrip	Several Populations Fragmented & an Estimated Loss of 350 Individuals, Waterman Range
Happy Jack Mine Roads	Evidence of Erosion Burying and Washing out individuals, Waterman Range
Recreation & Urbanization Activities	
Off-road Vehicle Use	Numerous Extirpations & New Roads Initiated 1974-1982, Waterman Range
Trespass Camping on Tribal Lands	Annual Winter Visitors Camped on and destroyed Numerous Individuals, Vekol Range, Tohono O'odum Lands
Target Shooting	Numerous Individuals were Vandalized, Waterman Range
Illegal Collection	
Illegal Collection	Numerous Individuals taken From Bureau Monitoring Plots Waterman Range
Illegal Possession	20 People in Tucson Area Were Found to Possess Field Collected Plants, Tucson, Arizona
Illegal Possession	Numerous Individuals Observed in Landscaped Areas Silverbell, Arizona

lower stocking rates. Cattle could potentially trample Nichol's Turk's head cactus. Studies have shown that saguaros, particularly smaller individuals, can be trampled by cattle (Abouhalder 1992). Trampling rates may be related to local rangeland condition and livestock stocking rates (Steenbergh and Lowe 1977). May (pers. comm. 1984) found that in an area apparently grazed at moderate rates, cattle avoided stepping on larger Nichol's Turk's head cactus.

Effects of grazing on the soils, vegetation communities, and cryptobiotic crusts in the habitat of Nichol's Turk's head cactus are complex and many. The discussion of these effects in the "EFFECTS OF THE PROPOSED ACTION" for the Pima pineapple cactus is included by reference here. Grazing likely affects these habitat parameters in regard to both Pima pineapple cactus and Nichol's Turk's head cactus similarly, except that the limestone areas where the latter species occurs may be affected less than habitats of the Pima pineapple cactus, because cattle do not congregate at or extensively use limestone areas.

Some range management practices such as mechanical imprinting, chaining, and ripping have presumably contributed to the modification and loss of habitat and destruction of individual cactus. The Bureau has not ruled out the use of mechanical or chemical control of vegetation as part of their proposed action. Neither does the Bureau's proposal rule out use of prescribed fire. However, use of prescribed fire, and chemical or mechanical vegetation control is unlikely in the desert scrub of the Agua Dulce allotment. Also, any such proposed actions would be accompanied by a mitigation plan approved by the Service. Furthermore, the specific habitats where Nichol's Turk's head cacti are found are unlikely to carry a fire. Development of range improvements, such as construction of fences, placement or burial of pipelines, water developments, and roads and trails associated with range improvements may cause crushing or removal of cactus. Roads and trails to range projects also provide access and may facilitate illegal collection of Nichol's Turk's head cactus. Range improvement projects would be preceded by preconstruction surveys and measures would be taken to avoid impacting Nichol's Turk's head cactus.

The Agua Dulce allotment (6125) is the only allotment in which Nichol's Turk's head cactus is known to occur. This allotment includes the eastern portion of the Waterman Mountain population. Bureau lands in the vicinity of known populations have been surveyed without finding additional individuals or populations of this cactus (Bainbridge and Weins 1991). The Agua Dulce allotment is in the "improve" category and is grazed seasonally (Table 3). Acreages in excellent, good (late seral), fair (mid seral), and poor (early seral) range condition are 50, 1,915, 13,206, and 973, respectively. These figures suggest that vegetation communities are degraded due to drought, introduction of nonnative plants, livestock grazing, and/or other factors. The range condition trend is upward (Table 5).

In accordance with 50 CFR 402.14(g), the Service is required to consider all effects of the proposed action, which refers to "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." "Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration" (50 CFR 402.02). The Service's Section 7 Handbook provides further guidance on the definition of "interrelated and interdependent actions" by establishing the following rule: Determining if an action is interrelated or interdependent depends on the "but for" test. Ask whether the Federal, State, or private activity could occur "but for" the proposed action.

In this biological opinion and as discussed in the "EFFECTS OF THE PROPOSED ACTION" for the Pima pineapple cactus, grazing activities on non-Bureau lands in allotments where Bureau ownership is more than 30 percent are considered interrelated and interdependent to the proposed action. The Bureau did not provide the percentage of lands in the allotment in Bureau ownership, but based on the land ownership pattern in Appendix 1, the Bureau appears to own more than half of the lands in the allotment; thus, the effects of grazing on the non-Bureau lands in the allotment are considered interrelated and

interdependent to grazing on the Bureau lands. An estimated 43 percent of all Nichol's Turk's head cacti in the Waterman Mountain population occur on State and private lands (the remainder occurs on Bureau lands and Tribal lands) (Service files, 1997). Range condition is unknown on these non-Federal lands, but is likely similar to condition on the Federal lands (predominantly in fair condition).

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline. Future activities that may affect the Waterman Mountain population of Nichol's Turk's head cactus may be subject to section 7 consultations because a portion of that population occurs on Bureau-administered lands, and other activities on Tohono O'odham Tribal lands, State, and private lands, may be subject to section 7 if a Federal nexus exists, such as issuance of permits under section 404 of the Federal Water Pollution Control Act (33 U.S.C. 1251-1376), as amended, by the U.S. Army Corps of Engineers, or if funding is provided by the Bureau of Indian Affairs. However, the Service estimates that only about 10 percent of cacti in the Waterman Mountain population occurs on Bureau lands. Thus, many activities, such as mining, off-highway vehicle impacts, road and campground construction, and other surface-disturbing activities could occur as cumulative effects in the Waterman Mountains. A similar suite of cumulative effects threatens the Vekol Mountain population, which occurs on lands of the Tohono O'odham Nation. Potential for adverse effects resulting from mining may exist in the Vekol Range due to the presence of abundant mineral resources (i.e. silver, gold, copper, zinc, lead, silica, perlite, and fluorspar) and the proximity of an active mine site to a known population (Service 1986a). Possible cumulative effects to the population in the Sierra del Viejo of Sonora are unknown.

Effectiveness of Proposed Mitigation

Coordination with the Service on prescribed fire and vegetation management projects, and developing mitigation plans approved by the Service for such projects, preconstruction surveys for the species and avoiding impacts to the cactus during range improvement project construction, and a commitment not to seed or plant nonnative plants are significant measures proposed by the Bureau to mitigate adverse effects of the grazing program on Nichol's Turk's head cactus. These actions combined with partial implementation of planned actions for the ACEC (not part of the proposed action), particularly the recent mineral withdrawal, provide significant protection to the portion of the Waterman Mountain population that occurs on Bureau lands.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of Nichol's Turk's head cactus. We present this conclusion for the following reasons:

1. The proponent's project description includes features to mitigate the direct and indirect impacts of the proposed action on Nichol's Turk's head cactus and its habitat.

2. Partial implementation of planned actions in the Waterman Mountains ACEC have reduced threats to the cactus population there.

3. Cattle use of limestone areas where the cactus occurs is relatively light.

4. Prescribed fire, and mechanical or chemical control of vegetation is unlikely to be proposed in the xeric habitats where Nichol's Turk's head cactus occurs, and such activities in cactus habitat would only occur with a mitigation plan approved by the Service.

CONCLUSION

After reviewing the current status of Nichol's Turk's head cactus, the environmental baseline for the action area, and the anticipated effects of the Bureau's proposed Safford/Tucson Field Offices' grazing program, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of Nichol's Turk's head cactus. No critical habitat has been designated for this species, thus none will be affected.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for Nichol's Turk's head cactus. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau should conduct annual monitoring of Nichol's Turk's head cactus on lands managed by the Tucson Field Office and summarize monitoring data into an annual report to this office.

2. The Bureau should fully implement as soon as possible the management plan for the Watermans Mountain ACEC, particularly designation of routes.

3. The Bureau should fund research of the pollination biology of this cactus, which would contribute to our knowledge of how habitat fragmentation affects this plant.

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

(Note: research or other activities that require collection of Nichol's Turk's head cactus or parts thereof require permits from the Service and Arizona Department of Agriculture.)

Arizona Hedgehog Cactus
STATUS OF THE SPECIES

The Arizona hedgehog cactus was listed as an endangered species on November 26, 1979 (44 FR 61556). No critical habitat has been designated for this cactus. At the time of the listing, Arizona hedgehog cactus was only known from the general vicinity of the type locality, a limited area along the Gila/Pinal county boundary in central Arizona, roughly between the towns of Miami and Superior. Recent surveys and other studies have added information to further define the range of the species to include the Pinal, Dripping Springs, and Mescal mountains south of Globe, and the Superstition Mountains east of Apache Junction. Within this distribution, Cedar Creek Associates (in Tonto National Forest 1996), using all available distribution and ecological data, estimated that Arizona hedgehog cactus occupies approximately 18,900 acres (30 square miles) of habitat. Cacti displaying similar morphological characters as Arizona hedgehog cactus have been reported from east-central and southeastern Arizona. Work by Bellsey et al. (1996) determined that the plants from sites in southeastern Arizona (Cochise County: Gunnison Hills between Dragoon and Cochise, Chiricahua Mountains between Portal and Paradise) were of the variety *neomexicanus*, not *arizonicus*. The taxonomic status of specimens from elsewhere in southeastern Arizona and east-central Arizona is currently uncertain, but until such time that the taxonomy is resolved, or these plants can be morphologically distinguished from Arizona hedgehog cactus, they will be considered as the listed entity pursuant to requirements of the Act. However, the species status and environmental baseline included within this opinion is based primarily on plants from the general vicinity of the type locality.

Arizona hedgehog cactus is a robust, succulent perennial, with dark green cylindroid stems that occur singly, or most often, in clusters of a few to approximately ten stems (Benson 1982). Occasionally, a plant may have over 100 stems (Tonto National Forest 1996). Stems arise from the base of the plant and are large, typically nine to 16 in high and three to four in in diameter. Specimens as large as approximately 24 in in height have been recorded (Tonto National Forest 1996). Each stem has strong, tuberculate ribbing. The number of ribs per stem has been given as approximately 10 (Benson 1982, Earle 1963). However, the most common number of ribs in the vicinity of the type locality is nine, followed by eight and then 10 ribs (Tonto National Forest 1996). There are one to three gray or pinkish central spines with the largest one deflexed. The five to 11 radial spines are short, slightly

curved, and robust. However, there is considerable variability in spine characteristics. Flowers erupt along sides of the stem and are a brilliant scarlet to deep red color. The flower is broad, about two in in diameter (Arizona Game and Fish Department 1994).

Arizona hedgehog cactus habitat consists of exposed bedrock or boulders within Interior Chaparral, Madrean Evergreen Woodland, and Desert Grassland plant communities (Brown 1982a) in an elevation range of primarily 3,400 to 5,300 ft. Cacti that are apparently Arizona hedgehog cactus in east-central Arizona occur from 3,200 to 7,000 ft (Bureau 1996a). This habitat is characterized by rugged, steep-walled canyons, and boulder pile ridges and slopes. Typically, the cactus is scattered on open, rocky exposures, rooting in shallow soils and narrow crevices among the boulders (Phillips et al. 1979b, Service 1979, Service 1991a). Arizona hedgehog cactus may be found beneath the understory of shrubs, but moderate to high shrub densities and associated deeper soils tend to preclude the cactus (Tonto National Forest 1996). Substrates on which Arizona hedgehog cactus are normally found include Orthoclase-rich granite of late Cretaceous age, primarily Schultze Granite. The cactus is also found in mid-Tertiary age Dacite, and to a lesser extent in Pinal Schist (Arizona Game and Fish Department 1994, Tonto National Forest 1996).

Arizona hedgehog cactus begins to produce flower buds in early April with anthesis (flowering) from late April to mid-May. Weather conditions can hasten, prolong, or delay flowering by several weeks (Arizona Game and Fish Department 1994). The pollination ecology of the species is largely unknown, but it is an obligate outcrosser. Likely pollinators include insects, primarily bees, and perhaps hummingbirds (Ferguson 1989). Fruits are present from May through June. Approximately 100 small seeds are produced per fruit with several fruits often occurring per plant. The amount of variation in annual seed production, and seed viability and longevity are unknown (Phillips 1985). Seed dispersal is expected to be by birds and mammals (Tonto National Forest 1996). Germination can occur in mid-summer. The seeds do not appear to require after-ripening or have other special germination requirements in addition to protection from extended direct sunlight and extreme temperatures (above 110°F) (Phillips 1985). Natural insect predators include borers and leaf-foot bugs (Coreidae) that attack the stems. Also, rodents may gnaw on stems and eat the fruits (which may contribute to dispersal). Root rot may also be an important cause of mortality (Crosswhite 1976, Phillips et al. 1979b).

Threats to the Arizona hedgehog cactus include habitat destruction by mining, mineral exploration, road construction, power-line construction and utility corridors, OHV use and other recreational activities, rangeland improvements including water developments, trampling by livestock, fire, and illegal collecting. Additional potential threats to the cactus include herbicide and pesticide application, and insect and javelina predation (Service 1979, Service 1991a, Arizona Game and Fish Department 1994, Tonto National Forest 1996).

Construction of Highway U.S. 60 and its later realignment destroyed Arizona hedgehog cactus and its habitat. Cedar Creek Associates (1994) estimated that 2,348 cacti were lost from approximately 67 acres of presumed occupied habitat, and an additional 85 acres of

presumed unoccupied but potential habitat was eliminated by highway construction. These estimates were based on habitat characteristics, including vegetation type, topography, and parent geologic material of adjacent sites and the recorded densities of Arizona hedgehog cactus in similar habitats. The construction of powerlines parallel to the highway and the Silver King substation for the Salt River Project resulted in the loss of an additional 18 acres of occupied habitat (Cedar Creek Associates 1994). Six plants were removed and transplanted by Boyce Thompson Arboretum in 1978 to permit construction of the Silver King substation (Phillips et al. 1979b).

Arizona hedgehog cactus has horticultural value and is commercially available from cactus and succulent dealers. Illegal collection of Arizona hedgehog cactus plants has been identified as a primary threat to the species (Service 1979). Removal of plants may occur for landscaping or for suspected hallucinogenic purposes. The extent of possible collection pressures remains uncertain. Comparisons of isolated and roadside populations suggest there may be diminished population levels at easily accessible sites. Those plants most susceptible to collection would be those that could be easily dislodged from the soil rather than those growing within the rock matrix. However, during surveys conducted for the proposed Carlota Mine by Cedar Creek Associates (1994; and in Tonto National Forest 1996), including portions of the Highway U.S. 60 corridor, reduced densities along the highway were not discernable when compared with plant densities from more remote locations. Seed collection is also a potential threat. Any effect collecting of plants and seeds may have on the long-term reproduction and survival of Arizona hedgehog cactus is unknown (Service 1991a). However, any effects would be expected to be site-specific. If there is a major change in the market demands for Arizona hedgehog cactus, either for landscaping or hallucinogenic purposes, it could result in substantive impacts to the cactus.

The greatest threats to Arizona hedgehog cactus are mining and related activities (Service 1979). Within the Globe-Miami-Superior area, major mining operations in or adjacent to Arizona hedgehog cactus habitat are currently being conducted by Magma, Cyprus, and Carlotta Copper. Other smaller mines and mining claims occur within and at the periphery of the range of the cactus. Although the surface geology of the habitat is not well mineralized, potential subsurface mineral deposits may warrant test drilling. In certain locations within occupied habitat, mining claims have been filed. Roads to provide exploration access and exploratory drilling for underlying deposits are a threat to the species even though these roads often detour around the prime Arizona hedgehog cactus habitat of rocky outcrops. The amount of potential disturbance from mining is dependent on whether a mine is open pit or shaft, and how much surface area (of occupied or potential habitat) will eventually be covered by tailings (Service 1991a). Cedar Creek Associates (1994) estimated that the Magma and Cyprus operations eliminated approximately 2,195 acres of potential habitat. There is no evidence, based on post-project surveys, that either plants or occupied habitat were directly lost to either of these mining operations.

The taxonomic status of Arizona hedgehog cactus is currently under debate. Different investigators have assigned the entity from the type locality (vicinity of Globe, Arizona) to

different species of cacti and at different taxonomic levels (species or variety). The specimens from east-central Arizona that have tentatively been assigned to *E. triglochidiatus* var. *arizonicus* adds another challenge to the taxonomic situation. Those who have contributed to these investigations include: D. Ferguson (1989), S. Mills (SWCA, Inc., Tucson, AZ), D. Mount (University of Arizona, Tucson, AZ), B. Parfitt (Missouri Botanical Garden, St. Louis, MO), Parfitt and Christy (1991), D. Pinkava (Arizona State University, Tempe, AZ), F. Reichenbacher (Southwestern Field Biologists, Tucson, AZ), S. Viert (Cedar Creek Associate, Fort Collins, CO), A. Zimmerman, and John Anderson (Bureau, Tucson, AZ). However, until there is a general consensus within the scientific community with published literature, the Service continues to consider Arizona hedgehog cactus as a valid and unique variety of plant that merits endangered species designation and full protection of the Act.

ENVIRONMENTAL BASELINE

Arizona hedgehog cactus habitat is managed by the Tonto National Forest, Globe Ranger District, Arizona State Land Department, the Bureau, and private individuals. Direct access to a large portion of the cactus' range is very limited due to the rugged topography and remote nature of these habitats. Cedar Creek Associates (1994, and in Tonto National Forest 1996) has estimated that there are over 250,000 individual Arizona hedgehog cacti. This estimate is considered to be conservative because it does not include up to several thousand plants occurring in satellite populations disjunct from the main distribution of the species or cacti that may be Arizona hedgehog cactus in east-central and southeastern Arizona. In addition, actual sample counts tend to under-count smaller plants.

The Bureau reports finding cacti that appeared to be Arizona hedgehog cactus in 6 allotments and potential habitat in another 80 allotments (see Table 15 in Bureau 1996a). Over 300,000 acres of potential habitat occurs in Bureau allotments (Bureau 1996a). These allotments are located in east-central and southeastern Arizona. For the purpose of this consultation, cacti in these areas are assumed to be the listed variety, but further taxonomic work is needed to confirm this. Specimens tentatively identified as Arizona hedgehog cactus have been found in the Metcalf (4001), Morenci (4003), Smuggler Peak (4010), Guthrie Peak (4034), Johnny Creek (4615), and Bonita Creek (4616) allotments, all of which are in the former Gila Resource Area (Bureau 1996a).

EFFECTS OF THE PROPOSED ACTION

Livestock grazing effects Arizona hedgehog cactus through trampling of plants and/or habitat degradation. Physical damage to cacti by livestock has been documented (Tonto National Forest 1996). However, Cedar Creek Associates (1994) noted that plants damaged by livestock are observed primarily in those areas most accessible to livestock, and, in active pastures, occur at a rate of approximately one out of every 400 to 500 plants observed. Habitat degradation due to livestock grazing has not been studied; but, the discussions of effects to watersheds, vegetation communities, soils, and cryptobiotic crusts in the previous

sections on Kearney's blue star, Pima pineapple cactus, and Nichol's Turk's head cactus, also apply here. However, the microhabitat in which Arizona hedgehog cactus are typically found - boulders, rock crevices, steep-walled canyons, and rocky slopes - are much less susceptible to habitat degradation due to grazing than are habitats more accessible to cattle.

The Bureau (1996) reports that 81 percent of the acreage in the 86 allotments is in fair to excellent condition and the trend in range condition is either static or upward in 94 percent of the allotments. The Metcalf and Morenci allotments are in the custodial management category, Smuggler Peak and Guthrie Peak allotments are in the improve category, and Johnny Creek and Bonita Creek allotments are in the maintain category. As discussed in previous "EFFECTS OF THE PROPOSED ACTION", in allotments in which the Bureau administers at least 30 percent of the lands, grazing and associated activities in the non-Federal portions of allotments are considered interrelated and interdependent to the proposed action. Threats to the species in the 80 allotments, other than livestock grazing, are not well documented, but are assumed to be similar to those described above in the "STATUS OF THE SPECIES".

Range improvement projects have the potential to adversely affect this species through increased livestock use; direct impacts to individual cactus resulting from construction of fences, waters, pipelines or other facilities; and by increasing access and facilitating collection. Development of waters typically result in areas of heavy cattle use that extend up to 0.5 mile from the water source (Tracy 1991). Fences and gates across roads may also reduce access to habitats and reduce collecting pressure. Redistribution of cattle through development of waters, pastures, and fencing, also has the potential of reducing cattle use in cactus habitat. The Bureau has included mitigation measures as part of the proposed action that would reduce potential adverse effects from range improvement projects.

The Bureau (1996a) has not ruled out the possibility of prescribed fire, and mechanical or chemical vegetation manipulation in the range of Arizona hedgehog cactus. The cactus can be destroyed or injured by fire, particularly where fuel loads are high, such as in chaparral or grasslands. However, the cactus is often somewhat protected from fire because fuel loads in the rocky habitat in which it is typically found are often relatively low. Broad-spectrum herbicide application and mechanical vegetation control that does not target individual plants could result in direct injury or death of individual cacti. Vegetation management could also result, at least temporarily, in increased erosion, disturbance to soil surfaces, and changes in vegetation communities that may reduce habitat quality for Arizona hedgehog and could alter fire regimes, leading to adverse effects to the cactus. Coordination with the Service on prescribed fire and vegetation management projects, and development and implementation of mitigation plans approved by the Service should substantially reduce effects from these activities.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline.

An estimated 90 percent of all Arizona hedgehog cactus habitat is found on Federal lands. Consequently, most potential projects occurring in cactus habitat would require separate consultations under section 7 of the Act. However, certain future State, local, or private actions may affect Arizona hedgehog cactus. Cyprus Miami Mining Corporation has proposed expanding their operations which may impact approximately 620 acres of presumed Arizona hedgehog cactus habitat (Cedar Creek Associates, 1994). Improvements and expansion of highway U.S. 60 by Arizona Department of Transportation between Superior and Globe could destroy plants and habitat. Illegal collection of Arizona hedgehog cactus may be occurring at an unknown magnitude. Certain mineral explorations on Federal lands do not require separate permit and as such may be occurring unregulated with undocumented impacts to plants and habitat. Livestock grazing, road construction, development, and other activities that occur on private and State lands without a Federal nexus may also adversely affect the cactus.

Effectiveness of Proposed Mitigation

The Bureau proposed specific mitigation measures for Arizona hedgehog cactus that remove or mitigate potential adverse effects of range improvement projects, changes in distribution of cattle, roads and trails that may provide access to Arizona hedgehog cactus localities, prescribed fire, chemical and mechanical vegetation management, and nonnative plants. For most of these activities mitigation plans would be developed by the Bureau and approved by the Service. Effects of livestock grazing, including trampling, and adverse effects to soils, cryptobiotic crusts, and vegetation communities would be limited by utilization limits, drought policy, and ephemeral grazing policy, and because the cactus is typically found in areas that are not frequented by cattle.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of the Arizona hedgehog cactus. We present this conclusion for the following reasons:

1. Grazing is limited and the effects of associated activities such as range improvement projects, prescribed fire, and vegetation manipulation are reduced in the rocky and often steep terrain where the cactus occurs.

2. The Bureau has proposed mitigating measures that should reduce the effects of the action on the Arizona hedgehog cactus.

3. The project area is outside of that portion of the species' range from which most records for the cactus have been documented.

4. Known occurrence of the cactus is limited to six allotments.

CONCLUSION

After reviewing the current status of the Arizona hedgehog cactus, the environmental baseline for the action area, the effects of the proposed Safford/Tucson Field Offices' grazing program, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Arizona hedgehog cactus. No critical habitat has been designated for this species, therefore, none will be affected.

Conservation Recommendations

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for Arizona hedgehog cactus. In furtherance of the purposes of the Act, we recommend implementing the following action:

1. The Bureau should fund genetic studies to determine the taxonomy of the apparent Arizona hedgehog cactus on Bureau allotments.

2. If genetic studies demonstrate that cacti on the allotments are *Echinocereus triglochiadiatus* var. *arizonicus*, the Bureau should determine the distribution and monitor the status of the cactus on public lands in the jurisdiction of the Safford and Tucson Field Offices.

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

(Note: collection of Arizona hedgehog cactus for genetic studies or other purposes requires appropriate permits from the Service and the Arizona Department of Agriculture.)

Huachuca Water Umbel
STATUS OF THE SPECIES

The Huachuca water umbel was listed as an endangered species on January 6, 1997. No critical habitat has been proposed or designated. The umbel is an herbaceous, semiaquatic perennial plant with slender, erect leaves that grow from creeping rhizomes. The leaves are cylindrical, hollow with no pith, and have septa (thin partitions) at regular intervals. The yellow/green or bright green leaves are generally 0.04-0.12 in in diameter and often one to two in tall, but can reach up to eight in tall under favorable conditions. Three to 10 very small flowers are borne on an umbel that is always shorter than the leaves. The fruits are globose, 0.06-0.08 in in diameter, and usually slightly longer than wide (Affolter 1985). The species reproduces sexually through flowering and asexually from rhizomes, the latter probably being the primary reproductive mode. An additional dispersal opportunity occurs as a result of the dislodging of clumps of plants which then may reroot in a different site along aquatic systems.

Huachuca water umbel was first described by A.W. Hill based on the type specimen collected near Tucson in 1881 (Hill 1926). Hill applied the name *Lilaeopsis recurva* to the specimen, and the name prevailed until Affolter (1985) revised the genus. Affolter applied the name *L. schaffneriana* ssp. *recurva* to plants found east of the continental divide.

Huachuca water umbel has been documented from 23 sites in Santa Cruz, Cochise, and Pima counties, Arizona, and in adjacent Sonora, Mexico, west of the continental divide (Saucedo 1990, Warren et al. 1989, Warren et al. 1991, Warren and Reichenbacher 1991, Service files). The plant has been extirpated from six of the 23 sites. The 17 extant sites occur in four major watersheds - San Pedro River, Santa Cruz River, Rio Yaqui, and Rio Sonora. All sites are between 3,500 to 6,500 ft elevation.

Huachuca water umbel has an opportunistic strategy that ensures its survival in healthy riverine systems, cienegas, and springs. In upper watersheds that generally do not experience scouring floods, the umbel occurs in microsites where interspecific plant competition is low. At these sites, the umbel occurs on wetted soils interspersed with other plants at low density, along the periphery of the wetted channel, or in small openings in the understory. The upper Santa Cruz River and associated springs in the San Rafael Valley, where a population of Huachuca water umbel occurs, is an example of a site that meets these conditions. The types of microsites required by the umbel were generally lost from the main stems of the San Pedro and Santa Cruz rivers when channel entrenchment occurred in the late 1800's. Habitat on the upper San Pedro River is recovering, and Huachuca water umbel has recently been found along short reaches of the main channel.

In stream and river habitats, Huachuca water umbel can occur in backwaters, side channels, and nearby springs. After a flood, it can rapidly expand its population and occupy disturbed habitat until interspecific competition exceeds its tolerance. This response was recorded at Sonoita Creek in August 1988, when a scouring flood removed about 95 percent of the

Huachuca water umbel population (Gori et al. 1990). One year later, the umbel had recolonized the stream and was again codominant with watercress, *Rorippa masturtium-aquaticum* (Warren et al. 1991). The expansion and contraction of Huachuca water umbel populations appears to depend on the presence of "refugia" where the species can escape the effects of scouring floods, a watershed that has an unaltered hydrograph, and a healthy riparian community that stabilizes the channel.

Density of umbel plants and size of populations fluctuate in response to both flood cycles and site characteristics. Some sites, such as Black Draw, have a few sparsely-distributed clones, possibly due to the dense shade of the even-aged overstory of trees, dense nonnative herbaceous layer beneath the canopy, and deeply entrenched channel. The Sonoita Creek population occupies 14.5 percent of a 5,385 ft^2 patch of habitat (Gori et al. 1990). Some populations are as small as 11-22 ft^2. The Scotia Canyon population, by contrast, has dense mats of leaves. Scotia Canyon contains one of the larger Huachuca water umbel populations, occupying about 57 percent of the 1,450 m (4,756 ft) perennial reach (Gori et al. 1990; Jim Abbott, Coronado National Forest, Tucson, AZ, in litt. 1994).

While the extent of occupied habitat can be estimated, the number of individuals in each population is difficult to determine because of the intermeshing nature of the creeping rhizomes and the predominantly asexual mode of reproduction. A "population" of Huachuca water umbel may be composed of one or many genetically distinct individuals.

Overgrazing, mining, hay harvesting, timber harvest, fire suppression, and other activities in the nineteenth century led to widespread erosion and channel entrenchment in southeastern Arizona streams and cienegas when above-average precipitation and flooding occurred in the late 1800's (Bahre 1991, Bryan 1925, Dobyns 1981, Hastings and Turner 1980, Hendrickson and Minckley 1984, Martin 1975, Sheridan 1986, Webb and Betancourt 1992). These events contributed to long-term or permanent degradation and loss of cienega and riparian habitat throughout southern Arizona and northern Mexico. Much habitat of the Huachuca water umbel and other cienega-dependent species was presumably lost at that time.

Wetland degradation and loss continues today. Human activities such as groundwater overdrafts, surface water diversions, impoundments, channelization, improper livestock grazing, chaining, agriculture, mining, sand and gravel operations, road building, nonnative species introductions, urbanization, wood cutting, and recreation all contribute to riparian and cienega habitat loss and degradation in southern Arizona. The local and regional effects of these activities are expected to increase with the increasing human population.

Dredging extirpated the Huachuca water umbel from House Pond, near the extant population in Black Draw (Warren et al. 1991). The umbel population at Zinn Pond in St. David near the San Pedro River was probably lost when the pond was dredged and deepened. This population was last documented in 1953 (Warren et al. 1991).

Livestock grazing can affect the umbel through trampling and changes in stream hydrology and loss of stream bank stability. However, existence of the umbel appears to be compatible with well-managed livestock grazing (Service 1997). In overgrazed areas, stream headcutting can threaten cienegas where the umbel occurs. Such headcutting occurs at Black Draw just south of the international boundary and at Los Fresnos, in the San Rafael Valley, Sonora. Groundwater pumping has eliminated habitat in the Santa Cruz river north of Tubac, and threatens habitat in the San Pedro River. Severe recreational impacts in unmanaged areas can compact soils, destabilize stream banks, and decrease riparian plant density, including densities of the Huachuca water umbel. Populations in Bear Canyon in the Huachuca Mountains have been impacted by trampling and off-highway vehicles.

A suite of nonnative plant species has invaded wetland habitats occupied by the Huachuca water umbel. In some cases their effect on the umbel is unclear. However, in certain microsites, the nonnative Bermuda grass, *Cynodon dactylon*, may directly compete with the umbel. Bermuda grass forms a thick sod in which many native plants are unable to establish. Watercress is another nonnative plant now abundant along perennial streams in Arizona. It is successful in disturbed areas and can form dense monocultures that can outcompete Huachuca water umbel populations.

Limited numbers of populations and the small size of populations makes the Huachuca water umbel vulnerable to extinction as a result of stochastic events that are often exacerbated by habitat disturbance. For instance, the restriction of this taxon to a relatively small area in southeastern Arizona and adjacent Sonora increases the chance that a single environmental catastrophe, such as a severe tropical storm or drought, could eliminate populations or cause extinction. Populations are in most cases isolated, as well, which makes the chance of natural recolonization after extirpation less likely. Small populations are also subject to demographic and genetic stochasticity, which increases the probability of population extirpation (Shafer 1990, Wilcox and Murphy 1985).

ENVIRONMENTAL BASELINE

On allotments addressed in this consultation, the Huachuca water umbel is only known to occur on the Empire Cienega allotment (6090). The species also occurs on the Bureau's San Pedro River RNCA. Potential habitat occurs in the Empirita (6210), Babocomari (5208), and Brunchow Hill (5251) allotments (Bureau 1996a).

Nine *Lilaeopsis* populations occur in the San Pedro River watershed in Arizona and Sonora on sites owned or managed by private landowners, Fort Huachuca Military Reservation, the Coronado National Forest, and the Bureau's Tucson Field Office. Two extirpated populations in the upper San Pedro watershed occurred at Zinn Pond in St. David and the San Pedro River near St. David. Cienega-like habitats were probably common along the San Pedro River prior to 1900 (Hendrickson and Minckley 1984, Jackson et al. 1987). These habitats are beginning to recover.

The Huachuca water umbel was located on the San Pedro River RNCA in 1994. Mark Fredlake (Bureau, Sierra Vista, AZ) and Dave Gori (The Nature Conservancy, Tucson, AZ) located 43 patches of Huachuca water umbel during 1995 and 1996. These patches occur in five disjunct areas, including approximately two miles downstream of Fairbank, near Brunchow Hill downstream of Charleston, immediately north and south of Highway 90, approximately 2.5 miles downstream of Highway 90, and approximately one mile north of Hereford. The umbel is sensitive to flooding and populations may disappear while others become established during and after severe flood events. Two patches of Huachuca water umbel on the San Pedro River were lost during a winter flood in 1994 and had still not recolonized that area as of May of 1995, demonstrating the dynamic and often precarious nature of occurrences within a riparian system (Al Anderson, Grey Hawk Ranch, *in litt.* 1995). However, after high flows in 1996, no apparent loss or reduction in approximately 12 Huachuca water umbel patches were noted by Dr. Peter Warren (The Nature Conservancy, Tucson, pers. comm. 1997). The entire San Pedro RNCA is considered potential habitat for the Huachuca water umbel. It is the largest contiguous potential habitat of the umbel, and as such is considered the most important site for recovery.

Few human impacts to umbel habitat in the San Pedro River have occurred since establishment of the RNCA; however, recreation and associated impacts are becoming increasingly evident. The greatest threat to umbel habitat on the San Pedro River is continued groundwater pumping in excess of recharge in the Sierra Vista subwatershed. These effects are addressed in the "EFFECTS OF THE PROPOSED ACTION" below. Recreation is occurring in some areas, and may be adversely affecting the umbel through trampling and bank erosion in some areas, particularly at the Highway 90 locality.

Two Bureau allotments include grazing of cattle in riparian areas of the San Pedro River RNCA, including the Babocomari allotment (5208) and the Brunchow Hill allotment (5251). Trespass cattle also occur on the RNCA both inside and outside of allotments, particularly near the confluence of the Babocomari and San Pedro rivers, and on the San Pedro River at and just below Highway 90, at Fairbank, and in the vicinity of the St. David Diversion.

The umbel was found in Empire Gulch in the Empire Cienega allotment in 1996 by Peter Warren. Only a very small patch of Huachuca water umbel was found. During a second visit to the site, Dr. Warren was unable to locate the umbel (P. Warren, pers. comm. 1997). However, potential habitat is widespread along Cienega Creek and Dr. Warren believes (pers. comm. 1997) habitat conditions are improving for the umbel with recent improvements in grazing management. Cattle lightly graze the area where the water umbel occurs in Empire Gulch (P. Warren, pers. comm. 1997).

EFFECTS OF THE PROPOSED ACTION

Effects of livestock grazing in riparian systems, and specifically, on the Huachuca water umbel and its habitat, are many and complex. Cattle are attracted to water and forage in riparian areas and, as a result, spend a disproportionate time in riparian areas, if not

controlled. Grazing can alter plant species composition and growth form, density of stands, vigor, and seed production (Ryder 1980). Heavy grazing in riparian areas typically results in reduced understory and bankline vegetation, bushy growth forms caused by browsing of terminal buds, and in some cases, replacement of native species by nonnatives such as saltcedar, *Tamarix chinensis* (Krueper 1995). Reduced vegetation cover and trampling of banks results in increased soil erosion and higher peak flows (Lusby 1979). Even minor trampling of soils can result in significant damage to floral and soil structure components (Kuss and Hall 1991). Other effects include decreased water quality (Szaro 1989), soil compaction (Lusby et al. 1971, Fleischner 1994), and decreased nutrient retention (Sewards and Valet 1995).

Light grazing occurs in the habitat of the umbel in Empire Gulch. Cattle likely do not eat Huachuca water umbel, but plants can be trampled. The umbel, however, expands rapidly in disturbed sites and can recover quickly from light trampling (Warren et al. 1991). Light trampling may also reduce cover of other plants and provide favorable colonization sites for Huachuca water umbel (Service 1997). Peter Warren (pers. comm. 1997) believes that the level of grazing occurring in Empire Gulch is not detrimental to that umbel population.

Grazing during the life of the project on the Brunchow Hill allotment and trespass cattle may adversely affect Huachuca water umbel on the San Pedro River. Grazing in the RNCA appears to be localized, but increasing (Sally Stefferud, Service, Phoenix, AZ, pers. comm. 1997). Jim Rorabaugh (Service, Phoenix, AZ, pers. comm. 1997) observed abundant trailing and manure along the river between Kingfisher Pond (south of Highway 90) and Highway 90 in July 1997. In the general area where the umbel occurs near the Highway 90 bridge, Sally Stefferud observed in April 1997 fresh cattle tracks; cattle manure; bank trampling; browsing of cottonwoods, willows, cattails, and bulrush; and extensive trailing. She noted that the banks in these areas were almost completely covered with hoof prints and that the vegetation near the water appeared "mowed". Although effects to the umbel were not evaluated by Stefferud, this level of cattle grazing is not compatible with maintenance of an umbel population at this site. Grazing levels at other sites where the umbel occurs on the San Pedro River are unknown; however, Stefferud, and other staff of the Fish and Wildlife Service have observed cattle or cattle sign at numerous locations in the RNCA over the last several years. Since the draft biological opinion was issued, the Bureau has made a concerted effort to remove trespass cattle. As of September 10, 1997, these efforts have resulted in removal of 79 trespass cattle from the RNCA (Mark Fredlake, Bureau of Land Management, Sierra Vista, AZ, pers. comm. 1997).

Grazing in the watershed of a riparian system can also affect riparian functions. Disturbance of soils, cryptobiotic crusts, and removal of vegetation in the watershed by grazing combine to increase surface runoff and sediment transport and decrease infiltration of precipitation (Belsky and Blumenthal 1997, Busby and Gifford 1981, DeBano and Schmidt 1989, Belnap 1992, Gifford and Hawkins 1979, Blackburn 1984). Effects are cumulative and interactive. Loss of vegetation cover and trampling of soils promote deterioration of soil structure which

in turn accelerates vegetation loss (Figure 3). These changes in the watershed tend to increase peak flows and reduce low flows (DeBano and Schmidt 1989), making the stream more "flashy". The Huachuca water umbel is sensitive to changes in water level and may be eliminated during floods or drought. Thus, changes in the watershed attributable to grazing can reduce habitat quality for the umbel.

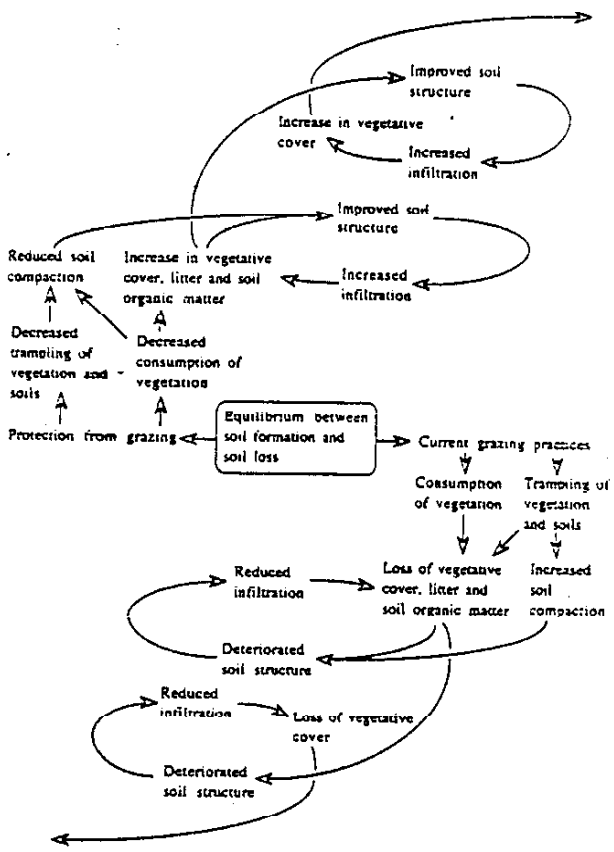

Figure 3: Effects of livestock grazing on soils (from Belsky and Blumenthal 1997)

Adverse effects to watershed function are especially well-documented for heavy grazing regimes; however, less information is available for watersheds grazed moderately or lightly. In regard to comparisons of watershed condition under light, moderate, or ungrazed regimes, some studies show no difference in soil loss, infiltration capacity, or bulk density among (Blackburn 1984), while others show measurable differences in watershed function (Gifford and Hawkins 1978).

Assessing the effects of grazing in the 19 allotments east of the San Pedro River on watershed function is problematic because no assessment of watershed conditions have been made. The only information we have available to us is range condition, which is a measure of the percentage ofthe potential species composition of the natural vegetation represented by the current plant community. Watershed condition, as we refer to it here, is a measure of current versus potential condition of soils and vegetation communities in regard to water infiltration rates, erosion rates, and runoff rates. A watershed in good condition will have low rates of erosion and runoff and high rates of infiltration, given the potential of the site in terms of existing soils and potential vegetation communities. As discussed above, grazing disturbs soils and alters vegetation communities in a way that often degrades watershed condition. Range condition is related to grazing intensity, and grazing intensity is related to watershed condition; thus range condition and watershed condition are likely related, as well. However, the relationship between range condition and watershed condition is complex; in southeastern Arizona the two are probably often, but not necessarily,

correlated. This is particularly true where native perennial grasses are, or should be, abundant. Exceptions may be areas in which Lehmann lovegrass is common. Areas dominated by Lehman lovegrass may exhibit good watershed condition but poor range condition. Assuming range condition is largely correlated with watershed condition, portions of the allotments in fair or poor condition are expected to exhibit lower water infiltration and retention rates, greater sediment transport, and erosion of surface soils and headcutting, in comparison to rangelands in good or excellent condition, given similar soils, terrain, and potential vegetation communities. Of 19 allotments in the watershed, the percentage of lands in the excellent (potential natural community), good (late seral), fair (mid seral), and poor condition classes (early seral) are one, 12, 42, and 45, respectively (Table 7). Eighty-seven percent is in either fair or poor condition; forty-five percent of the Bureau lands in the allotments are in poor condition. Ranges in fair and poor condition are those lands where the plant community is 49 to 25 and 24 to 0 percent of a site's potential, respectively. Although these figures do not conclusively support degraded watershed condition, they are suggestive of degraded watersheds, with associated adverse effects to the Huachuca water umbel and its habitat. The Bureau is in the process of developing a procedure for evaluating watershed condition. When this procedure is developed and data from these allotments are collected, this analysis may warrant reevaluation. Range condition is indexed to watershed conditions for other species in several places in this biological opinion, as well. When a process to evaluate watershed condition is developed, the Service encourages the Bureau to reinitiate consultation on a proposal to replace these references and uses of range condition with measures of watershed condition wherever appropriate.

Also important for determining effects are the trends in range condition. Long-term improvements in range condition suggest that grazing management is currently adequate to allow at least some level of recovery in vegetation communities. Range condition trend in the 19 allotments is static in twelve allotments, upward in six, and downward in one.

As described in previous effects sections in this document, the Service considers effects in non-Bureau portions of the allotments interrelated and interdependent to the proposed action in those allotments in which the Bureau administers more than 30 percent of the lands in the allotments. Ten of the allotments (Powers, Cleveland, Escapule, Susnow, Brunchow Hill, Lucky Hills, Marco, Ramirez, Albert Thomas, and J.E. Warren) fall into this category. Total Bureau acres in the 19 allotments plus non-Federal acres in the 10 interrelated and interdependent allotments is 81,451. No information was provided by the Bureau in regard to range condition and trend in the non-Bureau portions of these allotments. However, it is unlikely that State or private lands within these allotments are in better condition.

Groundwater pumping in the Sierra Vista subwatershed has increased dramatically since the early 1960's (ASL 1994). Annual water use exceeds supplies by approximately 11,200 acre-feet and has resulted in cones of depression in the aquifer at areas with significant groundwater pumping. These areas include Sierra Vista and Fort Huachuca, Huachuca City, and the Hereford - Palominas (Water and Environmental Systems Technology, Inc. 1994). Although the relationships between groundwater pumping and river flow are complicated,

continued unmitigated groundwater withdrawal threatens to reduce or eliminate baseflows in the San Pedro River (Arizona Department of Water Resources 1991, ASL 1995, Water and Environmental Systems Technology, Inc. 1994). A reduction in baseflow as a result of groundwater pumping in the Sierra Vista - Fort Huachuca area could occur within 25 years, but such effects could be reduced by water conservation, watershed management, effluent recharge, or other measures to reduce water use or increase recharge (ASL 1995, Water and Environmental Systems Technology, Inc. 1994). The San Pedro River is the largest contiguous habitat of the Huachuca water umbel and is considered the most important recovery area for the taxon.

As discussed above, one of the effects of livestock grazing on watersheds is reduced water infiltration rates as a result of reduced vegetation cover and compaction of soils (Lull 1959). In a forested area of Colorado, a five year exclusion of cattle resulted in a 60 percent increase in water infiltration rates, whereas infiltration rates on nearby grazed areas declined (Smith 1967). In the Davis Mountains-Big Bend area of Texas, Leithead (1959) suggested that ranges in good condition absorb moisture five to six times faster than ranges in poor condition. On Walnut Gulch in the San Pedro River watershed, Arizona, Tromble et al. (1974) found that infiltration rates were 33 percent higher in ungrazed areas as compared to heavily grazed rangelands. Gifford and Hawkins (1978) reviewed literature on the effects of grazing on infiltration rates and drew the following conclusions:

1. There is an influence of grazing on infiltration. Ungrazed rates are statistically different from grazed (at any intensity) beyond the 90 percent level.

2. It is difficult to distinguish between the influences of moderate and light grazing. They may be considered (from a statistical sense) to be identical.

3. There is a distinct impact from heavy grazing which is statistically different from that of light/moderate grazing.

4. There is a large standard error associated with the data.

Based on studies in many vegetation communities under a variety of grazing strategies, Gifford and Hawkins (1978) found that the effect of grazing on infiltration rates can be roughly estimated as follows: Moderate/light grazing reduces infiltration rates to about 0.75 of the ungrazed condition, and heavy grazing reduces infiltration to about 0.67 of the moderate/light condition, or 0.5 of the ungrazed condition.

Gifford and Hawkins' (1978) review indicates that grazing significantly affects infiltration under a variety of conditions and vegetation communities. As discussed earlier, the major threat to the water umbel on the San Pedro River is the likelihood that groundwater pumping in excess of recharge will in time lower the groundwater elevation and result in dewatering of the San Pedro River. Infiltration is necessary for recharge of the aquifer. Changes in infiltration rates over the watershed are expected to be correlated with changes in recharge

rates. An estimated 1.2 million acre-feet of precipitation falls on the Sierra Vista subwatershed. Of this only 13,860 acre-feet (one percent) is recharged into the groundwater aquifer (ASL 1994). Conceptually, very small increases in infiltration rates could yield relatively large increases in groundwater recharge. For instance if infiltration into the groundwater aquifer increased by one percent throughout the Sierra Vista subwatershed, recharge would exceed all current groundwater uses and losses, and in time and at current pumping rates, the cones of depression in the aquifer would diminish. Based on the review by Gifford and Hawkins (1978), grazing on the 19 allotments is likely reducing infiltration rates. Whether such reduction is causing a reduction in recharge is unknown. Most aquifer recharge occurs in and along stream courses that drain the mountains on the edges of the watershed (ASL 1994) (Huachuca, Mule, Dragoon, and Whetstone mountains), rather than on the bajada where the Bureau allotments occur. However, some level of recharge probably occurs in the Bureau allotments. Extrapolating from Gifford and Hawkins' analysis, this recharge is likely reduced as a result of grazing activities. The level of reduction is probably small in relation to the recharge throughout the watershed. Nevertheless, reduced recharge resulting from grazing may be contributing to the current deficit between groundwater recharge and use.

Reduced infiltration rates caused by grazing also results in increased runoff. In the Black Hills National Forest livestock grazing resulted in a 60 percent increase in summer storm runoff (Orr 1975). Runoff in turn promotes soil erosion. Smith (1967) found three to 10 times more sediment loss in grazed pastures as compared to ungrazed pastures. In another study, following elimination of livestock from the watershed, vegetation cover increased 150 percent, the proportion of annual summer runoff dropped 72 percent, and sediment loss dropped 50 percent (Forsling 1931). Based on these findings, rangelands in the 19 allotments in fair and poor condition are expected to contribute significantly greater sediment loads and runoff to the San Pedro River than if these lands were ungrazed. Elevated sediment loads caused by grazing could bury patches of water umbel and higher peak flows caused by increased runoff could scour out plants and cause downcutting and loss of wetland habitat.

The Bureau's proposal includes possible chemical and mechanical control of vegetation, prescribed fire, and range improvement projects in the upland portions of any allotment. Range improvement and vegetation management on the upland portion of allotments in Table 7 would likely lead to improvement of watershed condition and reduced effects to the umbel as a result of the grazing program. The extent of such planned activities in the 19 allotments was not described by the Bureau.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past

Federal and private actions are considered in the Environmental Baseline. Thirteen of the 17 extant populations occur entirely or in part on Federal lands. Thus, the effects of most actions on this plant will be subject to section 7 consultation and are not considered cumulative. The most serious cumulative effect of which the Service is aware is groundwater pumping in excess of recharge in the upper San Pedro River subwatershed. As discussed above, groundwater pumping threatens to lower groundwater elevations and reduce or eliminate surface flows in the San Pedro River (ASL 1994). The City of Sierra Vista has proposed effluent recharge and management of surface runoff, which may prevent dewatering of some reaches, but would also alter water quality and flow regimes, with unknown effects on the water umbel and its habitat.

Effectiveness of Proposed Mitigation

The Bureau proposed substantial specific mitigation measures for the Huachuca water umbel that would eliminate adverse effects caused by trespass cattle in the riparian zone of the San Pedro River within the San Pedro RNCA, and eliminate the potential for impacts to the riparian corridor from range improvement projects and chemical or mechanical vegetation management. Additional measures are proposed that would improve the condition of the watershed in the allotments in Table 7; however, the level of improvement would be directly related to the effort and resources devoted by the Bureau to these activities. Prompt and thorough implementation of proposed mitigation measures is imperative to limit what the Service believes are serious threats to the Huachuca water umbel.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of the Huachuca water umbel. We present this conclusion for the following reasons:

1. The proponent's project description includes substantial features to minimize the adverse effects of the action on the Huachuca water umbel.

2. Although the San Pedro River is the most important site for recovery of the species and the proposed action adversely affects this site, the action would not affect Huachuca water umbel at 15 of 17 localities where the species is extant.

CONCLUSION

After reviewing the current status of the Huachuca water umbel, the environmental baseline for the action area, and the anticipated effects of the Safford/Tucson Field Offices' grazing program, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Huachuca water umbel. No critical habitat has been designated for this species, thus none will be affected.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the Huachuca water umbel. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. In developing plans for improving range condition in the allotments in Table 7, the Bureau should seek out partners in the Sierra Vista Subwatershed that have an interest in enhancing groundwater recharge.

2. The Bureau should establish cattle exclosure plots in a variety of situations to document the rate of recovery of vegetation and soils in portions of the allotments in poor condition.

3. The Bureau should evaluate aquatic habitats on the Babocomari River, in the Babocomari allotment, as potential habitat for the Huachuca water umbel, and coordinate with the Service on actions to enhance any such habitat found there.

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

(Note: research or other activities that result in collection of Huachuca water umbel or parts thereof require appropriate permits from the Service and Arizona Department of Agriculture.)

Desert Pupfish

STATUS OF THE SPECIES

The desert pupfish was listed as an endangered species, with critical habitat, on April 30, 1986 (Service 1986). The name desert pupfish is often incorrectly applied to all 10 pupfish species in the American Southwest (Williams et al. 1989, Pister 1996). There are two recognized *Cyprinodon macularius* subspecies, *C. m. macularius* and *C. m. eremus* and one undescribed form (McMahon and Miller 1985, Miller and Fuiman 1987). Critical habitat has been designated in Arizona at Quitobaquito Spring and in California along parts of San Felipe Creek, Carrizo Wash, and Fish Creek Wash (Service 1986b).

The desert pupfish is a member of the family Cyprinodontidae. Desert pupfish are usually less than 3.0 in total length; adults are more often 1.6-2.0 in. Males are larger than females and become bright blue during the breeding season.

Under the proper conditions, desert pupfish may begin breeding as early as six weeks of age. However, most breeding does not occur until their second summer (Moyle 1976a). Male pupfish are intensely territorial during the breeding season. The males patrol and defend individual territories that are 5.4 to 22 ft^2 and in water less than 3 ft deep (Barlow 1961, Minckley 1973, Moyle 1976a).

The desert pupfish breeding system includes consort-pair breeding and territoriality (Service 1993c). Territoriality develops in large habitats with high primary productivity, limited breeding substrates, and high population densities. Consort-pair breeding usually occurs in habitat with low primary productivity, low population density, or abundant breeding habitat (Kodric-Brown 1981). Female desert pupfish lay only one egg at a time (Constanz 1981). However, one female may produce 50-800 eggs in one season (Crear and Haydock 1971). The life span of an individual is one to three years in the wild (Minckley 1973, Moyle 1976a, Kynard and Garrett 1979).

Larval desert pupfish feed on invertebrates (Crear and Haydock 1971). Adult pupfish are omnivorous and may feed on algae, invertebrates, detritus, and plants (Cox 1966, 1972; Naiman 1979). Pupfish are active during the day. Desert pupfish have been found in a variety of habitats, from the margins of large rivers to springs and cienegas. Pupfish can survive extremely harsh conditions that are lethal to most other fishes. They can survive temperatures up to 113°F (Lowe et al. 1967), dissolved oxygen concentrations to 0.1-0.4 mg/l (Barlow 1958), and high salt concentrations of 68 g/l (Lowe et al. 1967). Pupfish can also tolerate sudden changes in both temperature and salinity (Kinne 1960, Lowe and Heath 1969).

Historical distribution of desert pupfish included the Gila River basin, lower Colorado River, Rio Sonoyta basin, Salton Sink basin, and Laguna Salada basin (Eigenmann and Eigenmann 1888, Garman 1895, Gilbert and Scofield 1898, Evermann 1916, Thompson 1920, Jordan 1924, Coleman 1929, Jaeger 1938, Miller 1943, Minckley 1973, 1980; Black 1980, Turner 1983, Miller and Fuiman 1987). Historic collection localities occurred in Mexico in Baja California and Sonora and in the United States in California and Arizona. Populations and distribution probably expanded and contracted historically as regional and local climatic conditions varied.

Thirteen natural populations persist; nine of these are in Mexico. Approximately 20 transplanted populations exist in the wild (Service 1993c). Many natural and transplanted populations are imperiled by one or more threats. Threats to the species include loss and degradation of habitat through groundwater pumping or diversion, predation and competition from nonnative fish species, populations outside of historic range, populations of questionable genetic purity, restricted range, small populations, and environmental contaminants (Service 1984a).

ENVIRONMENTAL BASELINE

On Bureau lands administered by the Safford and Tucson Field Offices, the desert pupfish is known to occur only at Howard Well on the Fan Allotment (5114) and at Cold Spring Seep on the Day Mine allotment (4606). Howard Well is located adjacent to San Simon Creek, northeast of Bowie, in southern Graham County. Cold Spring Seep is located adjacent to the Gila River, near Eden, also in Graham County. The pupfish has also been recorded at Finley Tank on the Appleton-Whittell Biological Research Sanctuary near Elgin, Cochise County, which is in close proximity to Bureau-managed lands. The Phoenix RMP designated the Bureau lands adjacent to the Sanctuary as an ACEC to be managed for research and to maintain the area's biological integrity. The area is neither grazed nor open to mineral or oil/gas location, leasing or sales. The Bureau has entered into a cooperative agreement with the Audubon Society through a Memorandum of Understanding to manage the area for "the protection of the land and its ecological communities from disturbance." The current habitat status at Finley Tank is unknown. Finley Tank is outside the historic range of this subspecies (Bagley et al. 1991), and the population there may include hybrids between subspecies. If hybrids are present, the population is of limited value for conservation and recovery of the species. Pupfish populations at Cold Spring Seep, Howard Well, and Finley Tank are all the result of intentional transplants.

One of the pools at Cold Spring Seep appears to be foul (stagnant and brackish) and no longer supports fish. The cause of poor water quality at this site is unknown. One small pool remains with pupfish. Riparian development at this site is a marsh or cienega type that appears stable and healthy. At Howard Well the pupfish population status is largely unknown but appears to be declining, or the species may be absent (Bureau 1997c). Likely causes include the increased density of cattails, predation by bullfrogs, and a decrease in the outflow of the artesian wells (Bureau 1996a). Pupfish populations are considered extant until declared extirpated, based on a number of criteria. To date, the Howard Well population is still considered extant.

The Fan allotment, which includes Howard Well, is in the maintain category and includes 8,510 acres, all of which are Bureau-administered (Table 3). Acres in excellent, good, fair, and poor condition are 600, 2,000, 3,000, and 2,910, respectively (Table 5). Range condition trend is downward. Fair/poor range condition is due in part to the presence of several nonnative species, such as salt cedar, bermuda grass, and Johnson grass, *Sorghum halepense* (Bureau 1997c). The pond at Howard Well is fenced to exclude livestock and fed by an artesian water source. The pond is not connected to any surface drainages and does not collect surface runoff from storm events.

The Day Mine allotment, which includes Cold Spring Seep, is in the improve category, and is 96 percent Bureau-administered lands. Total acreage in the allotment is 57,491 (Table 3). Bureau acres in excellent, good, fair, and poor condition are 900, 44,098, 6,402, and 3,856, respectively. Range condition trend is upward (Table 5). Past monitoring has shown little sign of cattle in or around Cold Spring Seep. The spring is not located in a drainage that can

be scoured by flood events (Bureau 1996a). A two-track road provides access to within approximately 300 feet of the spring. An existing biological opinion (2-21-90-F-018) addresses stocking of pupfish and maintenance of Cold Spring Seep. Cold Spring Seep is scheduled to be fenced to exclude livestock in 1997.

EFFECTS OF THE PROPOSED ACTION

Effects of the grazing program can be segregated into direct and indirect effects. Direct effects include trampling of and ingestion of fish eggs and larvae by cattle (Roberts and White 1992, Bureau 1996a). Most fish larvae use shallow water along the margins of aquatic habitat and are weak swimmers at hatching. They are not likely to avoid being stepped on or ingested by livestock drinking water. Due to the fact that fish generally produce an abundance of eggs and larvae this impact is likely to be negligible. Adult fish are generally more mobile and can avoid danger (Moyle and Cech 1982). Pupfish habitat at Howard Well is fenced to exclude livestock, thus as long as the exclosure remains intact, no direct effects to pupfish as a result of cattle trampling or ingestion can occur at this site. Cold Spring Seep is currently not fenced; however, the Bureau (1996a) reports evidence of cattle at this site is rarely observed. Thus, few direct effects are likely to occur under current grazing practices, and the seep is scheduled to be fenced in 1997.

Indirect effects include alterations of riparian and aquatic habitats at Howard Well and Cold Spring Seep, modifications of the watershed resulting from grazing that may adversely affect the desert pupfish, and possible adverse effects of range improvement projects, vegetation management, and prescribed fire. The possible indirect impacts of cattle grazing in riparian and aquatic components of pupfish habitat include pollution from cattle wastes, and consumption and trampling of plants that support a diverse and productive pupfish habitat (Bureau 1996a). However, the exclosure at Howard Well should preclude these effects. Under current grazing regimes cattle use of Cold Spring Seep is minimal, and once fenced, effects should be precluded.

Effects of cattle grazing on watersheds include alterations of vegetation communities, increased soil erosion and runoff, decreased infiltration rates, damage to cryptobiotic crusts, and increased soil compaction. These effects are described in detail in the "EFFECTS OF THE PROPOSED ACTION" for the Pima pineapple cactus and the Huachuca water umbel, and are included here by reference. As discussed in the latter "EFFECTS" section, degradation of watersheds can cause downcutting, loss of perennial flow, loss of riparian vegetation, increased sedimentation, and higher peak flows in streams and rivers fed by degraded watersheds.

Although 69 percent of the Fan allotment is in fair or poor condition, Howard Well is not in a drainage, does not collect stream or stormwater runoff, and is fed by an artesian well. Thus, watershed effects of grazing (if any) are unlikely to adversely affect pupfish habitat at this site. Watershed conditions on the Day Mine allotment are likely good, because 80 percent of the Bureau lands in the allotment are in good condition, and only 19 percent are in

fair or poor condition. The pasture of the Day Mine allotment that includes Cold Spring Seep is grazed ephemerally, and only when sufficient ephemeral forage is present. Cold Spring Seep is also not located in an area that would be subject to scouring floods. The Bureau (1996a) found that because the Cold Spring Seep supports hydrobiid snails, it is almost certain that watershed effects from grazing and range improvements have not caused the spring to go dry in the past, even when former stocking rates were much higher than today's permitted number. These factors suggest that, like Howard Well, pupfish habitat at Cold Spring Seep would not be affected appreciably by watershed effects from grazing, under current grazing practices.

The Bureau's proposed action allows for development of range improvement projects, mechanical or chemical control of vegetation, prescribed fire, and planting/seeding of nonnative plants. These actions would primarily affect the uplands in the allotments. Indirect effects due to changes in the watershed are unlikely to adversely affect pupfish, as just discussed. However, range improvements that redistribute cattle in a way that increases use of Cold Spring Seep or increases cattle use near Howard Well, and thus increases the chance that cattle may breach the exclosure there, could result in increased trampling and ingestion of pupfish eggs and larvae, and degradation of riparian and aquatic habitat, as discussed above. New wells developed near Howard Well or Cold Spring Seep could lower the artesian head at Howard Well or reduce water levels at Cold Spring Seep, resulting in reduced aquatic habitat for pupfish.

Illegal introductions of nonnative fishes are routinely made by the public (e.g. topminnow, red shiners, and guppies in Watson Wash, sunfish in Martin Well)(Bureau 1996a). The release of nonnative fish by the public has been a major factor in the spread of these species (Moyle 1976a&b). Nonnative fish are transported for bait and sporting purposes (Moyle 1976a&b), for mosquito control (Meffe et al. 1983), and release of aquarium fishes (Deacon et al. 1964). Development of new roads to or near Howard Well or Cold Spring Seep could facilitate public use of these areas and increase the chances that nonnative fish may be intentionally introduced into pupfish habitat. Maintenance of existing routes to or near Howard Well or Cold Spring Seep could have a similar effect. Development of new stock tanks near Howard Well or Cold Spring Seep could provide habitat for nonnative fish, which could be spread by anglers to pupfish habitat.

No effects from the Safford/Tucson Field Offices' grazing program are expected at Finley Tank on the Appleton-Whittell Biological Research Sanctuary. As noted in the "ENVIRONMENTAL BASELINE," no grazing occurs on Bureau lands adjacent to Finley Tank.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act

and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline. Due to the extent of the lands in the area of the Fan and Day Mine allotments administered by the Bureau, nearly all actions that are reasonably expected to occur in the general area of the pupfish localities would be subject to section 7 consultations. The primary cumulative effect is maintenance of and possible stocking of nonnative game fish in any tanks or other waters on non-Federal lands in the vicinity of Howard Well and Cold Spring Seep. Fish from such tanks could be transferred as bait fish or as illegal introductions into pupfish habitat. Non-Federal activities at or near Finley Tank may be conducted by the National Audubon Society, but past management at the site suggests significant adverse effects of such activities are unlikely.

Effectiveness of Proposed Mitigation

The Bureau proposes a number of measures that mitigate to some degree potential adverse impacts to the desert pupfish, including prioritizing implementation of Safford District RMP decisions in regard to management of occupied or potential pupfish habitat, developing site-specific measures with the Service and Arizona Game and Fish Department that address allotment-specific problems, complying with the 1989 biological opinion for management of Cold Spring Seep (2-21-89-F-018)(see discussion in "CONSULTATION HISTORY"), maintaining the exclosure at Howard Well, and consulting with the Service at the project level. Construction of an exclosure fence at Cold Spring Seep in 1997 will provide substantial protection from trampling and impacts to riparian and aquatic habitats. Other aspects of the Bureau's proposal, such as implementation of the Riparian Policy and limitations on utilization will also benefit the pupfish and its habitat. The details of some of these measures are yet to be developed and in some cases implementation schedules are unknown; thus the degree to which they may mitigate adverse effects cannot be determined.

SUMMARY OF EFFECTS

The Service believes the effects described above are neither likely to jeopardize the continued existence of the desert pupfish nor result in adverse modification or destruction of desert pupfish critical habitat. We present this conclusion for the following reasons:

1. The proponent's project description includes features to reduce to some degree direct and indirect impacts of the proposed action on the desert pupfish and its habitat.

2. The desert pupfish occurs only at two small sites in the project area. A third site (Finley Tank) is located on adjacent private lands, but cattle do not graze the neighboring Bureau lands.

3. One of the two sites (Howard Well) is protected by a cattle exclosure and the other site (Cold Spring Seep) is rarely used by cattle and is scheduled to be fenced in 1997.

4. Howard Well and Cold Spring Seep are fairly well protected from watershed effects of grazing.

5. No critical habitat occurs in or near the project area.

CONCLUSION

After reviewing the current status of the desert pupfish, the environmental baseline for the action area, and the anticipated effects of the proposed Safford/Tucson Field Offices' grazing program, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the desert pupfish and is not likely to destroy or adversely modify desert pupfish critical habitat.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

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

AMOUNT OR EXTENT OF TAKE

The Service anticipates the following forms of take as a result of the proposed action. This anticipated take is separate from take anticipated in the Service's biological opinion on Cold Spring Seep (2-21-90-F-018):

1) Direct loss of pupfish larvae and eggs at Cold Spring Seep due to trampling and ingestion by cattle.

2) Harassment and harm to pupfish from increased levels of turbidity, pollution of water from cattle feces, reduction of bankline cover due to trampling, and grazing by cattle at Cold Spring Seep.

This biological opinion does not authorize any form of take not incidental to the Safford/Tucson Field Offices' grazing program. If the incidental take authorized by this opinion is exceeded, the Bureau must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim, the Bureau must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. The Bureau should provide to this office an explanation of the cause of the taking. Incidental take of pupfish is difficult to detect and monitor. Therefore, we have defined the following parameters as indicators that anticipated incidental take has been exceeded.

1) Cattle found inside the exclosure at Howard Well are not removed immediately or any gaps in the fence are not repaired as soon as possible.

2) Cattle found inside the exclosure at Cold Spring Seep (once the exclosure fence is constructed) are not removed immediately and any gaps in the fence are not repaired as soon as possible.

3) Cattle use at Cold Spring Seep or inside the exclosure at Howard Well is moderate or heavy, cattle use of Cold Spring Seep occurs year-round, or the riparian-wetland communities at Cold Spring Seep or Howard Well are not in a properly functioning condition due to grazing, as defined in the Arizona Standard and Guidelines (see "DESCRIPTION OF THE PROPOSED ACTION".

EFFECT OF THE TAKE

In this biological opinion, the Service finds the anticipated level of take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

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

1. Actions shall be taken to ensure the integrity of the exclosure at Howard Well.

2. No action shall be taken that would result in increased grazing pressure at Cold Spring Seep and Finley Tank.

3. Activities that may result in a take of desert pupfish or destruction of pupfish habitat shall be evaluated, monitored, and modified as needed to reduce potential adverse impacts to pupfish.

4. The Bureau shall monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regards to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. Terms and conditions are nondiscretionary. Terms and conditions 1., 2.b., and 3.a. are adapted from Bureau (1996a).

The following term and condition implements reasonable and prudent measure number 1:

The exclosure fence around Howard Well shall be monitored and maintained as needed, but at least annually, to prevent cattle use within the exclosure.

The following term and condition implements reasonable and prudent measure number 2:

a. Prior to fence construction, the Bureau shall ensure that any changes in pasturing, season of use, stocking levels, construction or maintenance of range improvements, and other aspects of the grazing program do not result in an increase in cattle use at Cold Spring Seep.

b. The Bureau shall construct a fence in 1997 to exclude cattle from Cold Spring Seep. The fence shall be monitored and maintained as needed, but at least annually, to prevent cattle use within the exclosure.

c. The Bureau shall continue its policy of excluding cattle from lands adjacent to Finley Tank.

The following terms and conditions implement reasonable and prudent measure number 3:

a. The Bureau shall cooperate with the Service and Arizona Game and Fish Department to identify other project-level measures to protect populations of pupfish from grazing program impacts as specific impacts are identified. Project-level measures to mitigate adverse effects of grazing actions shall be approved by the Service.

b. The Bureau will evaluate all stock tanks in the Fan and Day Mine allotments for their degree of risk to introduce nonnative fish to pupfish habitat. The Bureau will then, in conjunction with the Service and Arizona Game and Fish Department, develop and implement management techniques or practices for the tanks in each risk category.

Management techniques may include, but are not limited to, replacement of the existing tanks with alternative water sources, treatments to eliminate fish, or other appropriate methods. Proposed tanks will undergo the same evaluation for risk, and will include development of a mitigation plan approved by the Service.

c. The Bureau shall continue its policy of excluding cattle from lands adjacent to Finley Tank.

The following term and condition implements reasonable and prudent measure number 4:

The Bureau shall submit annual monitoring reports to the Arizona Ecological Services Field Office by March 15 beginning in 1998. These reports shall briefly document for the previous calendar year the effectiveness of the terms and conditions, numbers of desert pupfish observed, and cause of mortality, if any fish are found dead and such cause can be determined. The report shall include summaries reports of the condition of habitat at Cold Spring Seep and Howard Well and other monitoring data, if such data/information is collected. The report shall make recommendations for modifying or refining these terms and conditions to enhance desert pupfish protection or reduce needless hardship on the Bureau and its permittees.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the desert pupfish. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau should regularly monitor pupfish populations at Howard Well and Cold Spring Seep and report the results of such monitoring to this office.

2. In coordination with Arizona Game and Fish Department, the Bureau should remove the bullfrogs and control cattail invasion at Howard Well.

3. The Bureau should investigate the apparent decreased flow from artesian sources at Howard Well and take action as needed to restore or supplement flows to pupfish habitat.

4. The Bureau should investigate water quality problems at Cold Spring Seep and take action to correct these problems.

5. The Bureau should coordinate with the Service on pupfish locations that apparently no longer support the species, and any recommendations on habitat suitability and extant/extirpated population status.

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

(Note: control of bullfrogs and capture/take of fish requires appropriate permits from Arizona Game and Fish Department and, for listed species, from the Service.)

Spikedace

STATUS OF THE SPECIES

The spikedace was listed as a threatened species on July 1, 1986 (Service 1986c). Critical habitat was designated for spikedace on March 8, 1994, including Aravaipa Creek, portions of the Gila River in New Mexico, and the upper Verde River (Service 1994a). The final critical habitat for spikedace has been set aside and enjoined from enforcement pending compliance with the National Environmental Policy Act, as a result of a 1996 10th Circuit Court decision.

Spikedace are a small silvery fish whose common name alludes to the well-developed spine in the dorsal fin (Minckley 1973). Spikedace historically occurred throughout the mid-elevations of the Gila River drainage, but is currently known only from Aravaipa Creek (Graham and Pinal Counties, Arizona), the upper Gila River (Grant and Catron Counties, New Mexico), the middle Gila River (Pinal County, Arizona), Eagle Creek (Greenlee County, Arizona), and the Verde River (Yavapai County, Arizona) (Barber and Minckley 1966, Minckley 1973, Anderson 1978, Barrett et al. 1985, Bestgen 1985, Marsh et al. 1990, Sublette et al. 1990, Jakle 1992, Knowles 1994). Habitat destruction, and competition and predation from introduced nonnative fish species are the primary causes of the species decline (Miller 1961, Williams et al. 1985, Service 1986c, Service 1991b, Douglas et al. 1994).

Spikedace live in flowing water with slow to moderate water velocities over sand, gravel, and cobble substrate (Propst et al. 1986, Rinne and Kroeger 1988). Specific habitat for this species consists of shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand/gravel bars, and eddies at downstream riffle edges (Propst et al. 1986). Spikedace spawn from March through May with some yearly and geographic variation (Barber et al. 1970, Anderson 1978, Propst et al. 1986). Spawning has not been observed, but spawning behavior indicates eggs are laid over gravel and cobble where they adhere to the substrate. Spikedace live about two years with reproduction occurring primarily in one-year old fish (Barber et al. 1970, Anderson 1978, Propst et al. 1986). It feeds primarily on aquatic and terrestrial insects (Schreiber 1978, Barber and Minckley 1983, Marsh et al. 1989).

The effects of historic and present perturbations in the Gila River basin have resulted in fragmentation of spikedace range and isolation of remnant spikedace populations. Recent taxonomic and genetic work on spikedace indicate there are substantial differences in morphology and genetic makeup among remnant spikedace populations. Anderson and Hendrickson (1994) found that spikedace from Aravaipa Creek are morphologically distinguishable from spikedace from the Verde River, while spikedace from the upper Gila River and Eagle Creek populations have intermediate measurements and partially overlap the Aravaipa and Verde populations. Mitochondrial DNA and allozyme analyses have found similar patterns of geographic variation within the species (Tibbets 1992).

Although the spikedace is currently listed as threatened, the Service has found that it warrants uplisting to endangered status. Reclassification is pending; however, work on it is precluded due to work on other higher priority listing actions (Service 1994b). The need for reclassification is not due to data on declines in the species itself, but is based upon increases in serious threats to a large portion of its habitat.

ENVIRONMENTAL BASELINE

Within the project area, spikedace are found in Aravaipa Creek and may be present in the lower San Pedro River. In Aravaipa Creek, spikedace are presently found in suitable habitat throughout the area of perennial flow (Barber and Minckley 1966, Minckley 1973, Velasco 1994). For several years spikedace were thought to be extirpated in the San Pedro and middle Gila river (between Coolidge and Ashurst-Hayden Dams) systems with the exception of Aravaipa Creek. However in 1991, a single spikedace was collected in the Gila River near Florence (Jakle 1992), suggesting the species may occur elsewhere on the Gila and lower San Pedro rivers downstream of the Aravaipa confluence.

Aravaipa Creek is a tributary of the San Pedro River in Pinal and Graham counties, Arizona. It is a perennial stream of about 10 cubic feet per second (cfs) base flow with a median flow of 16 cfs (Minckley 1981). Aravaipa Creek is a flashy stream with flood flows occurring during summer and winter storms. The two-year flood event is estimated at 3,790 cfs and the 50-year event at 22,100 cfs [Federal Emergency Management Agency (FEMA) 1994]. The January-February 1993 flooding peaked at an estimated 13,000 cfs (FEMA 1994).

The Aravaipa Creek watershed is large, encompassing about 537 mi^2 [US Geological Survey (USGS) 1993]. Perennial flow is currently confined to a segment of about 15 to 20 mi within Aravaipa Canyon, although in the past five years the creek has often flowed all the way to the San Pedro River.

Aravaipa Creek supports a relatively intact native fish community and few nonnative fish, a rare situation in the Gila River basin (Barber and Minckley 1966, Minckley 1981, Velasco 1994). All native fish species in Aravaipa Creek are either Federally-listed or species of concern, including roundtail chub, *Gila robusta*; longfin dace, *Agosia chrysogaster*; speckled dace, *Rhinichthys osculus*; desert sucker, *Catastomus [Pantosteus] clarki*; Sonora sucker,

Catostomus insignis; spikedace, and loach minnow. Nonnative species recorded include yellow bullhead, *Ameirus natalis*; black bullhead, *Ameirus melas*; green sunfish, *Lepomis cyanellus*; mosquitofish, *Gambusia affinis*; carp, *Cyprinus carpio*; and fathead minnow, *Pimephales promelas*. Red shiner, *Cyprinella lutrensis*, have been found in Aravaipa Creek, but have not yet become established (Velasco 1994). Largemouth bass, *Micropterus salmoides*, are also occasionally found in the creek.

Upland vegetation includes foothills palo verde, *Cercidium microphyllum*; creosote, *Larrea tridentata*; ocotillo, saguaro, barrel cacti *Ferocactus* spp.; velvet mesquite, and catclaw acacia (Minckley 1981). Riparian vegetation includes cottonwood, *Populus fremontii*; willow, *Salix* spp.; sycamore; ash, *Fraxinus velutina*; walnut, seep-willow, *Baccharis salicifolia*; saltcedar, water cress, and mimulus, *Mimulus* sp. (FEMA 1994, Minckley 1981).

Aravaipa Creek is a moderate velocity stream with a relatively low gradient (less than one percent). The substrate is primarily gravel-cobble with some bedrock in the canyon center and increasing amounts of sand and fine sediment below the canyon. Habitat is predominantly riffles and runs with pools being formed by bedrock, canyon walls, and large woody material (Barber and Minckley 1966, Minckley 1981, Rinne 1985, Velasco 1994). The canyon bottom is narrow and side slopes are steep (30 to 60 degrees) (FEMA 1994). Most floodplain terraces have been irrigated and farmed over the past 100 years. In the project area, most of the non-wilderness valley bottom is privately owned. The largest of the private parcels belongs to The Nature Conservancy, which holds the land as a nature preserve. The remaining parcels are mainly private residences, although many are second or weekend homes. Agricultural operations are occurring on several of the parcels.

In Aravaipa Creek there are a number of threats to the spikedace and its habitat. Aravaipa Creek and its watershed have been subjected to substantial human uses since the settlement of the area by Europeans. The watershed, like many in the desert southwest, has been altered by grazing, mining, timber harvest, water development, irrigated agriculture, roads, recreation, and other human uses (Minckley 1981, Bahre 1991). These uses have altered runoff, sediment transport, and groundwater recharge patterns within the basin and may have caused changes in the perennial flow of Aravaipa Creek. Minckley (1981) reports that comparisons of recent and 80 to 120 year-old accounts and photographs reveal that the dry incised stream channel near Klondyke was historically a marshy area of perennial water. He also reports that riparian forests were more massive in size and development with a larger component of younger trees, and that common reed, *Phragmites australis*, first noted by Bell in 1869 (as cited in Minckley 1981), has been eliminated from Aravaipa Creek.

Aravaipa Creek has not been perennial to the confluence with the San Pedro River within historic times (Hutton 1859 as cited in Davis 1986). However, the average perennial length and duration has decreased, within a range of substantial yearly variation. Hutton recorded extensive cottonwood, sycamore, and ash along the lower five miles of the stream that he believed to be intermittent. That riparian forest has mostly disappeared, indicating a likely decrease in duration or amount of surface or subsurface flow. With the loss of the cienega

below Klondyke, the perennial length of Aravaipa Creek decreased, a trend which continued with the introduction of groundwater pumping into the Aravaipa watershed. Adar (1985) estimates the present usual beginning of perennial flow to be about two miles downstream from its 1900 location.

Human uses along Aravaipa Creek have resulted in alterations to the stream channel. Diversion dams have been, and continue to be, constructed in several places to channel water into irrigation ditches. These generally consist of using heavy equipment to push up an earth and rock berm which impounds small areas but washes out in high water. Channelization has taken place along many segments of the stream. Riprap, earthen dikes, and other forms of channel control have been constructed. Although none of these is a major channel modification, their effects are cumulative. Constraining a stream channel may cause upstream and downstream channel modifications, and erosion and failure of such structures often causes radiating erosion (Rosgen 1994). Minckley (1981) notes that in photographs from prior to 1900, streambanks along the east end of the perennial flow were less incised than at present.

In the late 1800's and early 1900's mining was occurring at various locations in the Aravaipa watershed. A lead mill was built at Klondyke in 1925 and the tailings from that mill are located on the bank of Aravaipa Creek. Recent changes in the stream channel are resulting in erosion of the tailings into the creek. Surface and groundwater violations of water quality have been documented in the area of the tailings (Hyde 1993).

Although Aravaipa Creek presently supports fewer nonnative species than many of Arizona's streams, the number and distribution of nonnative species is increasing. In 1981, four nonnative fishes were known from the watershed and only two of those were recorded from Aravaipa Creek itself (Minckley 1981). By 1992, eight nonnative fishes were known from Aravaipa Creek and at least four of those were thought to be reproducing in the creek (Velasco 1994). The remaining four were thought to originate from movement out of ponds, stock tanks, and the San Pedro River. Green sunfish, largemouth bass, and yellow and black bullhead are all predatory species that consume spikedace. Red shiner is thought to be highly detrimental to small native cyprinids, such as spikedace through competition and/or predation (Bestgen 1986; Marsh et al. 1989; Rinne 1991). Although red shiner invaded the entire perennial length of Aravaipa Creek in 1990-91, they did not establish a population and have only been found once since, in lower Aravaipa Creek in October 1993 (Bettaso 1993).

Bureau lands in Aravaipa Creek were withdrawn from grazing in 1974 with the exception of the Brandenburg Mountain allotment, which contains only approximately 0.1 mi of Aravaipa Creek. As a result of an Arizona State/Bureau land exchange in 1986, an additional 0.1 mi reach of Aravaipa Creek in the Quintana allotment came into public ownership. The only Bureau-authorized grazing in Aravaipa Creek occurs in these two 0.1 mi reaches. Reaches of Aravaipa Creek in private ownership have also been fenced through Service Partners for Wildlife Projects. Removal of grazing from most of the public lands in Aravaipa Creek has resulted in improved riparian/aquatic habitat conditions (Bureau 1997c). Improvements in

riparian/aquatic habitat conditions have occurred through the combined efforts of the permittees, the Bureau, and other concerned parties and agencies.

In the 19th century the San Pedro River was marshy with beaver ponds but was incised in some reaches (Etz 1938, Hendrickson and Minckley 1984). Reports vary as to whether the river was perennial throughout its length; but some authors reported ephemeral flows downstream of Tres Alamos in the lower San Pedro. Perennial waters in the lower basin persist today at Bingham Swamp near Redington, a reach approximately 6.5 mi downstream of Redington, and at Cook's Lake near the Aravaipa confluence.

Jakle (1995a&b) sampled fish from 1991 through 1994 along reaches of the Gila River just downstream of the project area and on the San Pedro River in the project area from Dudleyville to Lewis Springs. Sampling stations on the Gila River included seven sites from just below Coolidge Dam to the Ashurst-Hayden Diversion Dam. Six stations were sampled on the San Pedro River including the Dudleyville Crossing, Aravaipa confluence, San Manuel Crossing, Hughes Ranch near Cascabel, near Charleston, and near Lewis Springs. Thirteen species and a hybrid sunfish were collected on the Gila River. Native species included longfin dace, Sonora sucker, desert sucker, and a single spikedace collected at Cochran Crossing. On the San Pedro River, 11 species were collected, including two native species: longfin dace and desert sucker. No spikedace were collected on the San Pedro River. Numbers and distribution of desert suckers and longfin dace on the San Pedro and Gila rivers, and Sonora sucker on the Gila River increased markedly following high flows in 1993. Cumulative absolute abundance of nonnative fish did not change after high flows, although mosquitofish were greatly reduced in the Gila River and were not found at sampling stations on the San Pedro after the high flows.

When spikedace populations are at low levels, they can be very difficult to locate. Fish sampling data from the lower San Pedro and middle Gila rivers is limited and localized. Perennial flows in the Gila River, perennial and ephemeral flows that connect reaches of the San Pedro River with the Gila River and Aravaipa Creek, and the spikedace record at Cochran Crossing suggest that a small number of spikedace may be present in the project area on the lower San Pedro River from the Aravaipa confluence to Dudleyville, and possibly downstream of the project area on the middle Gila River. Based on findings for other native fish in these reaches, numbers of spikedace may increase temporarily in this area following flood events.

Previous Bureau section 7 consultations concerning effects of grazing on spikedace are listed in Table 2 and are discussed in "CONSULTATION HISTORY". Other formal consultations include non-jeopardy opinions issued in 1993 and 1994 for construction of riprap banks on Aravaipa Creek. In 1994, a biological opinion was issued finding jeopardy and adverse modification of critical habitat for spikedace (and loach minnow) from the potential for the Bureau of Reclamation's Central Arizona Project to introduce and spread nonnative aquatic species. The reasonable and prudent alternative for removal of jeopardy included the construction on Aravaipa Creek of a paired set of barriers to upstream fish movement. This

action is expected to substantially reduce future adverse impacts to spikedace and loach minnow through predation and competition by nonnatives. However, disruption of localized spikedace and loach minnow habitat is expected from construction and operation of the barriers. A February 15, 1995, non-jeopardy biological opinion on a proposed rerouting of a section of the Aravaipa road on the west end of the wilderness was superseded by a November 7, 1996, non-jeopardy biological opinion on a proposed bridge at that site.

EFFECTS OF THE PROPOSED ACTION

The adverse effects of livestock grazing on native fishes of the Southwest, and of spikedace in particular, have long been recognized (Chamberlain 1904, Miller 1961, Hendrickson and Minckley 1984, Minckley 1985, Williams et al. 1985, Service 1989b, Marsh et al. 1990, Minckley et al. 1991b, Rinne and Minckley 1991, Service 1991b, Clarkson and Wilson 1995). While some of the most serious of those effects took place in the late 1800's, ongoing livestock grazing continues to exert adverse effects on the remaining native fish species. Effects of ongoing grazing inhibit recovery from, and are exacerbated by, the underlying habitat alteration and destruction that occurred as a result of serious overgrazing of the late 1800's and early 1900's.

The most important allotments in regard to effects to spikedace are those that include occupied aquatic habitat (Aravaipa Creek) followed in order of importance by those within the watershed of occupied habitat, allotments in likely habitat (lower San Pedro from the Aravaipa confluence to Dudleyville), and allotments in the watershed of likely habitat. Allotments with large acreages of occupied habitat or of the Aravaipa watershed are most critical to this analysis. Allotments in the Aravaipa area, including occupied habitat of spikedace, or in the watershed of occupied spikedace habitat, are listed in Table 11. Management category, range condition and trend, size, grazing systems, and other information on allotments are presented in Tables 2, 3, and 4.

The Quintana, Hell Hole, South Rim, Brandenberg Mountain, and Massacre allotments all include portions of Aravaipa Creek (Table 11). However, the only grazing that currently occurs in Aravaipa Creek is trailing of less than ten cattle per year in the Hell Hole allotment, and grazing on 0.2 mi of Aravaipa Creek in the Quintana and Brandenburg Mountain allotments. Trailing on the Hell Hole allotment has not occurred in recent years, and the permittee on the Quintana allotment prefers not to run his cattle in the creek bottom (Bureau 1996a; Bill Brandau, Bureau, Safford, AZ, pers. comm. 1997). The Bureau's proposed action calls removal of direct effects of grazing in the riparian zone of Aravaipa Creek that may jeopardize the continued existence of the spikedace. Measures to achieve this objective may include elimination of grazing.

Although range condition and trend are not always related to watershed condition, we assume here that in many or most cases the two are closely correlated because range condition is related to grazing pressure, and grazing pressure is closely related to watershed condition

Table 11: Allotments in spikedace habitat, or in the watershed of occupied spikedace habitat (Aravaipa Creek)

Allotment	Occupied Habitat	
	Aquatic	Watershed
Painted Cave 4518		X
Quintana 4519	X	X
Dry Camp 4520		X
South Aravaipa 4521		X
Aravaipa 4522		X
Horse Mtn 4524		X
Laurel Cyn 4525		X
Hell Hole 4528	X[1]	X
South Rim 4529	X[1]	X
Brandenberg Mtn 4530	X	X
Massacre 4532	X[1]	X

[1]Withdrawn from grazing

(see "EFFECTS OF THE PROPOSED ACTION" for the Pima pineapple cactus and Huachuca water umbel). The Bureau (1997c) believes that current range condition "can be tied to the grazing pressure over 100 years." The South Rim allotment, which of the allotments in Table 11 contains the largest portion of the Aravaipa watershed, is not currently grazed and is likely to be deferred for at least several years (Bureau 1996a). The percentages of the allotment in excellent, good, fair, and poor condition are 22, 53, 25, and 0. Range condition trend is upward. Of the other allotments in the watershed of Aravaipa Creek, 50 percent or more of Bureau-administered lands are in fair or poor condition. These allotments include South Aravaipa, Aravaipa, Laurel Canyon, Dry Camp (2), and Massacre (Table 5). In all these allotments range condition trend is static. The Painted Cave, Quintana, Dry Camp, Horse Mountain, Hell Hole, and Brandenberg Mountain allotments all have more than 50 percent of their acreage in good or excellent condition. Trend in two of these (Painted Cave and Brandenberg Mountain) is static; trend in the other allotments is upward. Total Bureau acreage in the Aravaipa watershed in poor or fair condition is 24,525. Total acreage in good or excellent condition is 51,463 (Table 5). In accordance with previous discussions (see "EFFECTS OF THE PROPOSED ACTION" for Pima pineapple cactus), grazing activities on non-Federal lands within allotments in which the Bureau administers more than 30 percent of the lands are considered interrelated and interdependent to the proposed action. Allotments in this category include Painted Cave, Quintana, Dry Camp, Aravaipa, Horse Mountain, Hell Hole, and South Rim. Non-Federal lands in these

allotments, plus Bureau lands in all of the allotments in Table 11 total 89,949. The effects of grazing activities on these lands include direct and indirect effects of the Bureau's action plus the interrelated and interdependent effects on the non-Bureau portions of the allotments. Although range condition and trend in the non-Federal portions of these allotments were not reported by the Bureau, condition and trend is likely similar to that found on Bureau lands within the allotments.

Effects of the grazing program on spikedace can be segregated into direct effects to fish and effects to spikedace habitat that result in indirect impacts to the species. Direct effects of cattle grazing in the aquatic habitats of Aravaipa Creek include trampling (Roberts and White 1992, Bureau 1996a) of spikedace, particularly eggs and larval fish in the shallow margins of the creek. Eggs and larval fish may also be ingested by cattle drinking from the stream. Direct effects could also occur to spikedace as a result of range improvement project construction or vegetation management projects in Aravaipa Creek. Prescribed fire in the uplands could also spread to the riparian vegetation of Aravaipa Creek where the fire or fire suppression activities could directly injure or kill spikedace.

Indirect effects include impacts of grazing and associated activities that alter spikedace habitat quality or quantity. Indirect effects could occur in aquatic habitats where spikedace occur or in the watershed of such habitats.

A general discussion of how grazing within wetted areas affects riparian function, hydrology, and vegetation was included in the "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel and is incorporated here by reference. However, riparian processes altered by grazing and hoof action affect fish habitat in many specific ways and warrants elaboration. Cattle presence on streambanks destabilizes streambanks through chiseling, sloughing, compaction, and collapse and results in wider and shallower stream channels (Armour 1977, Platts and Nelson 1985b, Platts 1990, Meehan 1991). This causes progressive adjustments in other variables of hydraulic geometry and results in changes to the configuration of pools, runs, riffles, and backwaters; levels of fine sediments and substrate embeddedness; availability of instream cover; and other fish habitat factors (Bovee 1982, Rosgen 1994). It also changes the way in which flood flows interact with the stream channel and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation. These effects occur at all levels of cattle presence, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). Damage begins to occur almost immediately upon entry of the cattle onto the streambanks and use of riparian zones may be highest immediately following entry of cattle into a pasture (Goodman et al. 1989, Platts and Nelson 1985a). Vegetation and streambank recovery from long rest periods may be lost within a short period following grazing reentry (Duff 1979). Bank configuration, soil type, and soil moisture content influence the amount of damage with moist soil being most vulnerable to damage (Marlow and Pogacnik 1985, Platts 1990). Cattle presence on streambanks retards rehabilitation of previous damage as well as causing additional alteration (Platts and Nelson 1985a). Channel erosion in the form of downcutting or lateral expansion may result (Heede and Rinne 1990, Bureau 1990).

Cattle grazing in and on riparian vegetation may cause changes in the structure, function, and composition of the riparian community (Szaro and Pase 1983, Warren and Anderson 1987, Platts 1990, Schulz and Leininger 1990, Schulz and Leininger 1991, Stromberg 1993a). Species diversity and structural diversity may be substantially reduced and nonnative plant species may be introduced and spread in cattle feces. Reduction in riparian vegetation quantity and health, and shifts from deep rooted to shallow rooted vegetation contribute to bank destabilization and collapse and production of fine sediment (Meehan 1991).

Loss of riparian shade results in increased fluctuation in water temperatures with higher summer and lower winter temperatures (Karr and Schlosser 1977, Platts and Nelson 1989). Temperature tolerances are unknown for spikedace, but the species appears to be relatively tolerant of warm water. Alteration of water temperature patterns may be of more importance in assessing effects to spikedace than alteration of highs and lows. Initiation of spawning in spikedace is believed to be related to water temperature (Barber et al. 1970, Langhorst and Marsh 1986, Propst et al. 1986, Tyus and Karp 1990). Changes in water temperature fluctuations and timing may disrupt spawning initiation.

Increased water temperature fluctuations may also adversely affect larval spikedace. Larvae have a much more limited thermal range than do adults and exhibit subtle habitat shifts to accomplish thermal regulation. Increasing temperature fluctuations in shallow edgewater areas may cause direct mortality of larvae through thermal shock or may cause larvae to move out into deeper, faster water where they are more vulnerable to predation or to being swept downstream.

Increases in nutrients in streams have been documented to result from livestock grazing (Kauffman and Krueger 1984). Increased nutrients may beneficially affect spikedace through increased food production. However, given the habitat used by spikedace, the species apparently requires a high level of dissolved oxygen. Excessive nutrient input and resulting algal growth may result in temporary conditions of oxygen depletion with resulting stress or death to individual spikedace.

Litter is reduced by trampling and churning into the soil, thus reducing cover for soil, plants, and wildlife (Schulz and Leininger 1990). The capacity of the riparian vegetation to filter sediment and pollutants to prevent their entry into the river and to build streambanks is reduced (Lowrance et al. 1984, Elmore 1992).

Increased sediment production and transport is probably the most commonly acknowledged effect of livestock grazing (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994). Adverse effects of stream sedimentation to fish and fish habitat have been extensively documented (Murphy et al. 1981, Wood et al. 1990, Newcombe and MacDonald 1991, Barrett 1992, Megahan et al. 1992). Adult and juvenile spikedace are not inordinately sensitive to moderate amounts of sediment. However, excessive sedimentation may cause channel changes that are adverse to the species. Excessive sediment may fill backwaters that provide larval and juvenile spikedace habitat, and sediment deposition in the main channel

may cause a tendency toward stream braiding, thus reducing adult spikedace habitat. Excessive sediment may smother invertebrates, reducing spikedace food production and availability and related turbidity may reduce spikedace ability to see and capture food. Spikedace are believed to use gravel/cobble/coarse sand substrates for spawning (Propst et al. 1986, Minckley et al. 1991a). Excessive sediment covers those habitats and reduces reproductive success.

Reduction in aquatic habitat complexity due to livestock grazing effects is probably the most important adverse effect to spikedace. Habitat complexity allows partitioning of habitat among the various fish species and their life stages. Reduction of habitat complexity increases inter-species and inter-lifestage conflicts. It also exacerbates the adverse effects of generalistic nonnative species on native species (Bestgen 1986, Rinne and Minckley 1991, Baltz and Moyle 1993, Douglas et al. 1994). Most nonnative species in Aravaipa Creek are predatory and decreased habitat complexity results in decreased hiding cover, thus making predator-naive native species more vulnerable to predation (Minckley 1983, Fraser et al. 1987). Cover is an important factor in the ability of fish species to avoid adverse effects from flooding (Bulkley and Pimentel 1983, Meffe 1984). Livestock grazing and its attendant reduction in habitat complexity make spikedace more vulnerable to death and displacement from flooding, at the same time that livestock effects on the watershed and streambanks contribute to increased flood volume, velocity, and abrasive power.

Physical damage to streambanks and channels in conjunction with loss or reduction of riparian vegetation may change the timing and magnitude of streamflow (Stabler 1985, Meehan 1991). Flood flows may increase in volume and decrease in duration, and low flows may decrease in volume and increase in duration. Cattle trampling and grazing of the riparian corridor makes banks and vegetation more susceptible to severe damage during catastrophic flooding (Platts et al. 1985).

Although these direct and indirect effects of cattle grazing within the wetted areas of Aravaipa Creek can cause substantial adverse changes to spikedace habitat and direct mortality or injury of spikedace, grazing authorized by the Bureau in the riparian zone of Aravaipa Creek is currently very limited in extent, and the Bureau does not propose to increase grazing pressure. The Bureau (1996a) suggests that only 0.2 mi of Aravaipa Creek is currently subject to grazing. Less than ten cattle have been trailed in the creek up to three times per year in the Hell Hole allotment.

Watershed effects of grazing are discussed in detail in the "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel and the Pima pineapple cactus. These discussions are relevant to spikedace and are incorporated here by reference. Summarizing from those discussions, grazing in the watershed of Aravaipa Creek is expected to cause damage and destruction of cryptobiotic crusts with resulting increased soil erosion, reduced water infiltration, increased runoff, reduced nutrient content of soils (Belnap 1992, Harper and St Clair 1985, Belnap and Gardner 1993), and secondary changes in vegetation communities and loss of vegetation cover (Menke 1988). Hoof action on soils and grazing of shrubs and

grasses is also expected to result in elevated soil erosion and runoff, reduced water infiltration, changes in vegetation communities, and loss of vegetation cover (Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Although the way in which these factors would manifest and the magnitude of their effect in the watershed would depend on local site conditions such as soils, vegetation communities, precipitation, and slope, watershed effects of grazing are generally expected to be more evident where stocking levels are high and rangelands are in fair or poor condition. As discussed, 24,525 acres, or 32 percent of Bureau lands in the Aravaipa watershed are in poor or fair condition. The allotment with the largest portion of the Aravaipa watershed, the South Rim allotment, is currently in non use.

Changes in the watershed resulting from grazing can cause increased sedimentation, higher peak flows and channel incisement, and lower base flows along Aravaipa Creek, and changes in riparian vegetation and channel morphology that may cause injury and mortality of spikedace and adversely alter spikedace habitat quality. The Bureau (1996a) suggests that adverse effects of degraded watershed condition are likely to be small, because lands where most of the precipitation occurs in the watershed are not administered by the Bureau. The Bureau found that approximately 20 percent of the 537 mi^2 Aravaipa watershed is managed by the Bureau, and of that less than one percent occurs at elevations above 7,000 feet where 90 percent of the precipitation falls. Percentage of lands in the watershed that are administered by the Bureau and are in fair or poor condition is 7.1 percent.

Although most precipitation falls at high elevations in the watershed, outside of Bureau lands, watershed effects on the allotments should not be disregarded, because of the proximity of the allotments to Aravaipa Creek. Flows from higher elevations traverse drainages in the allotments, which if degraded by grazing, may contribute elevated levels of sediment and exhibit other characteristics of degraded watershed described above. This is turn could effect riparian function and spikedace habitat in Aravaipa Creek. Of particular concern are large acreages in the Painted Cave (5,711 acres), South Rim (8,382 acres), and Hell Hole (1,000 acres) allotments that are in fair condition. These allotments are immediately adjacent to or include portions of Aravaipa Creek.

As discussed, in the project area spikedace may occur in localized reaches or in small numbers in the San Pedro River from the Aravaipa confluence to Dudleyville. Bureau allotments in this area apparently do not include the river itself (Appendix 1) but do include portions of the watershed. In particular, the Dudleyville (4516) and Eskiminzin (4542) allotments are adjacent to this reach of the San Pedro River and contain significant acreages of Bureau lands. Fifty-three and 47 percent of Bureau lands in the Dudleyville allotment are in fair and poor condition, respectively. All of the Bureau lands in the Eskiminzin allotment are in good condition (Table 5).

The Bureau's proposed action also includes development of range improvement projects, chemical or mechanical vegetation manipulation, and prescribed fire. The Bureau (1996a) anticipates few new range improvement projects in the Aravaipa basin. These projects are

primarily designed to distribute cattle and allow greater management capability. They can result in improved range condition and watershed condition, if stocking rates are not increased. Localized temporary disturbance from construction of pipelines, fences, and other projects would cause negligible and localized increases in erosion and runoff. Of greater concern are development and maintenance of stock tanks, which may support populations of nonnative fishes, or may provide habitat into which nonnative fishes may be introduced as sport fish or for other purposes. These fish may subsequently be introduced into Aravaipa Creek or may traverse drainages between stock tanks and the creek during storm events. Once into Aravaipa Creek, nonnatives would prey upon and/or compete with spikedace, and could potentially greatly reduce or eliminate spikedace from portions of the creek. Of particular concern would be introduction of a species not currently known from Aravaipa Creek. Any new construction or reconstruction of roads to stock tanks would facilitate public access and increase the chance that nonnative fish may be introduced or moved among tanks and Aravaipa Creek.

Chemical or mechanical vegetation manipulation would likely be used in the uplands in areas of degraded range condition. If successful, such actions could improve watershed condition and function. Vegetation manipulation is highly unlikely to be conducted in the riparian corridor but would likely have adverse effects to vegetation communities. In addition, some herbicides, such as Roundup, are highly toxic to fish. Prescribed fire in uplands could also be used to improve range condition and trend, although temporary adverse effects to spikedace and its habitat may occur through soil erosion, increased runoff, sedimentation of Aravaipa Creek, and potential toxicity from ash and smoke following the fire. If fire spread to the riparian zone of Aravaipa Creek itself, reduction or elimination of riparian vegetation could cause dramatic changes in channel morphology, water temperature, water quality, and other components of spikedace habitat.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline.

Cumulative effects to spikedace in Aravaipa Creek include ongoing activities in the watershed such as livestock grazing and associated activities outside of the allotments addressed herein, irrigated agriculture, groundwater pumping, stream diversion, bank stabilization, channelization without a Federal nexus, and recreation. Some of these activities, such as irrigated agriculture are declining and are not expected to contribute substantially to cumulative long-term adverse effects to spikedace.

Other activities, such as recreation are increasing. Members of the Aravaipa Property Owners' Association report (pers. com. 1993) increasing amounts of non-wilderness

recreation use along Aravaipa Creek. Because most of the stream bottom below the wilderness is privately owned, a potential exists for increasing residential or commercial use of the area. Increasing recreational, residential, or commercial use of the private lands along the creek would likely result in increased cumulative adverse effects to spikedace through increased water use, increased pollution, and increased alteration of the streambanks through riparian vegetation suppression, bank trampling, and erosion. An increase in human structures in the area would likely lead to more bank stabilization and channelization, changing the availability and quantity of suitable spikedace habitat.

The San Pedro River from the Aravaipa confluence to Dudleyville is mostly privately owned. Many of the same non-Federal activities that affect Aravaipa Creek, such as agriculture, livestock grazing, development, groundwater pumping, bank stabilization and channelization without a Federal nexus, etc., also occur on the lower San Pedro River.

In 1991, the American Fisheries Society adopted a position statement regarding cumulative effects of small modifications to fish habitat (Burns 1991). That statement concludes that accumulation of localized or small impacts, often from unrelated human actions, pose a serious threat to fisheries. It also points out that some improvement efforts to fish habitat may not result in cumulative increases in status of the species but instead may simply mitigate cumulative habitat alterations from other activities.

Effectiveness of Proposed Mitigation

The Bureau proposes numerous measures that substantially reduce the effects of the proposed action on spikedace. Most importantly, the Bureau proposes for the life of the project: 1) elimination of direct effects of grazing in the riparian zone of Aravaipa Creek that may jeopardize the continued existence of the spikedace, 2) working with the Service and Arizona Game and Fish Department to limit risk of nonnative fish introduction due to stock tank construction, operation, and maintenance, and 3) deferral or other management of livestock grazing to assure conditions in the Aravaipa watershed are maintained or improved. Coordination with the Service and Arizona Game and Fish Department is also proposed to identify site-specific measures to protect spikedace. Such measures could include deferring grazing on the Quintana and Brandenberg Mountain allotments, construction of stock tanks so they can be emptied to control nonnative fish, replacement of nonnative fish in stock tanks with native fish, use of troughs instead of stock tanks, and implementation of a prescribed fire plan in the desert grasslands of the Aravaipa watershed to enhance watershed function. Several general features of the grazing program such as limits on utilization, drought policy, and Arizona Standard 2 (Riparian-wetland sites) all act to reduce adverse effects of the action.

Prompt and thorough implementation of proposed mitigation measures is imperative to remove what the Service believes are very serious threats to spikedace and its habitat.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of the spikedace. We present this conclusion for the following reasons:

1. The Bureau proposes substantial measures that reduce the potential impacts of the proposed action

2. No grazing or trailing of cattle that would jeopardize the continued existence of the spikedace would occur on Bureau lands in Aravaipa Creek. Measures to reduce impacts could include removal of grazing for the life of the project from Bureau lands in Aravaipa Creek.

3. A process would be implemented that would reduce or eliminate the threat of nonnative fish introduction posed by stock tanks in the watershed of Aravaipa Creek.

4. The Bureau proposes measures to maintain or improve the condition of the Aravaipa Creek watershed.

CONCLUSION

After reviewing the current status of spikedace, the environmental baseline for the action area, the anticipated effects of the proposed grazing program, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of spikedace. Critical habitat has been designated for spikedace but was set aside and enjoined from enforcement by a Federal Court ruling. Thus, for the purposes of this consultation, no critical habitat exists for spikedace, thus none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant,

as appropriate, in order for the exemption in section 7(o)(2) to apply. The Bureau has a continuing duty to regulate the activity covered by this incidental take statement. If the Bureau (1) fails to require any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

Take of spikedace is anticipated as a result of 1) direct effects of trailing or grazing in Aravaipa Creek, 2) construction of any fences across Aravaipa Creek, 3) maintenance of existing stock tanks that could provide habitat for nonnative fish and facilitate introduction of nonnative fish to Aravaipa Creek, 4) activities in the watershed, such as livestock grazing, prescribed fire, vegetation management, and construction of range improvement projects that may cause watershed degradation and subsequent changes in sedimentation rates, riparian vegetation, and hydrology, and subsequent increased mortality or injury of spikedace.

The anticipated level of spikedace incidental take cannot be directly quantified because of the rapid population fluctuations inherent in spikedace populations, changes in instream habitat distribution over time, the uncertain extent and location of project-level components of the proposed action, such as prescribed fire and range improvement projects, and uncertainties regarding direct effects of such activities on spikedace. Therefore, anticipated levels of incidental take are indexed to the total fish community and habitat. Anticipated take will be considered to have been exceeded if: 1) immediate action is not taken to remove, as soon as possible, any unauthorized cattle found on Bureau-administered lands in the riparian corridor of Aravaipa Creek, and 2) range condition in the allotments in Table 11 deteriorates below that shown in Table 5, and cattle grazing cannot be ruled out as a cause of the deterioration.

This biological opinion does not authorize any form of take not incidental to implementation of the Safford/Tucson Field Offices' grazing program. If the incidental take authorized by this opinion is exceeded, the Bureau must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim, the Bureau must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. The Bureau should provide to this office an explanation of the cause of the taking.

EFFECT OF THE TAKE

In this biological opinion, the Service finds the anticipated level of take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

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

1. Measures shall be taken to eliminate the direct effects of grazing in the riparian zone of Aravaipa Creek.

2. The Bureau shall coordinate with the Service to ensure that project-level activities are designed to minimize take of spikedace.

3. Measures shall be included in project-level activities to reduce take of spikedace to the extent possible.

4. The Bureau shall monitor grazing activities and incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regard to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. With the exception of measure (a), the Bureau's mitigation measures for spikedace are included here by reference. Terms and conditions are nondiscretionary.

1. The following term and condition implements reasonable and prudent measure number 1:

a. No grazing or of cattle shall occur on Bureau-administered lands in the riparian corridor of Aravaipa Creek through the life of the project (December 31, 2006). Actions shall be taken, including fencing, monitoring for and removal of trespass cattle, and other measures to ensure grazing does not occur on Bureau lands in Aravaipa Creek.

b. Trailing of cattle in spikedace habitat shall be limited to no more than 10 cattle through Aravaipa Creek no more than three times per year on the Hell Hole allotment. Photos of the typical effects of trailing shall be taken in the Hell Hole allotment. Trailing shall be conducted so that 1) cattle are present for the shortest period of time possible in riparian/aquatic habitats, 2) the shortest route across the stream/river is taken, 3) trailing across streams/rivers is conducted as infrequently as possible, and 4) whenever possible, trailing is conducted when bankline soil moisture is relatively low.

2. The following term and condition implements reasonable and prudent measure number 2:

A mitigation plan shall be developed by the Bureau in coordination with the Service for each range improvement project that would degrade watershed condition or aquatic/riparian habitat, or that would facilitate access to stock tanks or Aravaipa Creek; prescribed fire; and vegetation management projects in the allotments in Table 11 and in the

Dudleyville and Eskiminzin allotments. Mitigation plans for prescribed fire shall limit to the extent practicable the possibility that fire would spread to Aravaipa Creek or the Gila River. Mitigation plans shall be approved by the Service.

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

a. All reasonable efforts shall be made to minimize disturbance within the wetted areas of Aravaipa Creek or tributary channels.

b. No heavy equipment shall be used off-road during project activities within the wetted areas of Aravaipa Creek (this term and condition does not limit use or maintenance of existing routes.)

c. All reasonable efforts shall be made to ensure that no pollutants enter surface waters during action implementation.

d. Grazing in allotments in Table 11 and the Dudleyville and Eskiminzin allotments shall strictly adhere to the Bureau's Arizona Standards and Guidelines, the Upland Livestock Utilization Standard, Safford Drought Policy, Arizona Ephemeral Grazing Policy, and Riparian Area Policy.

4. The following terms and conditions implement reasonable and prudent measure number 4:

a. Inventory, monitoring, and evaluations as described in the Bureau's proposed action (Bureau 1996a) and applicable sections of the Bureau Manual shall be conducted in the allotments in Table 11 and the Dudleyville and Eskiminzin allotments.

b. The Bureau shall submit annual monitoring reports to the Arizona Ecological Services Field Office by March 15 of each year beginning in 1998. These reports shall briefly summarize for the previous calendar year: 1) the effectiveness of these terms and conditions and 2) any documentation of take. If such activities/monitoring occur, the report shall also include summaries of: 1) grazing actions initiated or completed including range improvement projects, prescribed fires, and vegetation management in the allotments in Table 11 and the Dudleyville and Eskiminzin allotments; 2) allotment monitoring results; 3) fish monitoring data; 4) riparian, stream channel photopoint, channel geomorphology transects, and other monitoring data collected; 7) photos documenting typical effects of trailing, and 8) records of downed or damaged exclosure fencing or incidents of cattle within the riparian corridor of Aravaipa Creek and action taken to remove the cattle. The report shall also make recommendations for modifying or refining these terms and conditions to enhance spikedace protection or reduce needless hardship on the Bureau and its permittees.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for spikedace. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau should develop and implement a prescribed fire plan to enhance watershed function in the semi-desert grasslands of the Aravaipa watershed.

2. The Bureau should conduct surveys for spikedace in the Gila River from the Aravaipa confluence to Dudleyville and report to the Service the findings of such surveys.

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

(Note: control of or capture of fish requires appropriate permits from Arizona Game and Fish Department, and for listed species, from the Service.)

Gila Topminnow

STATUS OF THE SPECIES

The Gila topminnow was listed as an endangered species on March 11, 1967, without critical habitat. The Gila topminnow is a small, live-bearing fish found in the Gila, Sonora, and de la Concepcion River basins in Arizona, New Mexico, and Sonora, Mexico (Minckley 1973, Vrijenhoek et al. 1985), but is listed only in the United States. It was once among the commonest fishes of the Gila River Basin (Hubbs and Miller 1941). Destruction of its habitat through water diversion, stream downcutting, backwater draining, vegetation clearing, channelization, water impoundment, livestock grazing, and other human uses of natural resources; plus competition with and predation by nonnative fish species, most notably mosquitofish, have resulted in extirpation of the Gila topminnow throughout most of its range (Meffe et al. 1983, Service 1984b).

Male Gila topminnow are smaller than females, rarely greater than one inch, while females are larger, reaching two inches. Body coloration is tan to olivaceous, darker above, lighter below, often white on the belly. Breeding males are usually darkly blackened, with some golden coloration of the midline, and with orange or yellow at base of the dorsal fin. Fertilization is internal and sperm packets are stored which may fertilize subsequent broods.

The brood development time is 24 to 28 days. Two to three broods in different stages develop simultaneously in a process known as superfetation. Gila topminnow give birth to one to 31 young per brood (Schoenherr 1974). Larger females produce more offspring (Minckley 1973).

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

Gila topminnow and many other poeciliids can tolerate a wide variety of physical and chemical conditions. They are successful colonizers in part because of this tolerance and in part because one gravid female can start a population (Meffe and Snelson 1989). Minckley (1969, 1973) described their habitat as edges of shallow aquatic habitats, especially where abundant aquatic vegetation exists.

Gila topminnows are known to occur in streams fluctuating from 43 to 97°F, pH from 6.6 to 8.9, dissolved oxygen levels of 2.2 to 11 milligrams/liter, and can tolerate salinities approaching those of sea-water (Meffe et al. 1983). Topminnows can burrow under mud or aquatic vegetation when water levels decline (Deacon and Minckley 1974, Meffe et al. 1983). Sonoran topminnows, *Poeciliopsis occidentalis*, regularly inhabit springheads with high loads of dissolved carbonates and low pH (Minckley et al. 1977, Meffe 1983, Meffe and Snelson 1989). This trait has helped protect small populations of topminnows from mosquitofish which are usually rare or absent under these conditions.

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

ENVIRONMENTAL BASELINE

Currently, there are nine remaining natural topminnow sites (Bagley et al. 1991) plus two others that are likely extirpated. Only three sites remain uncontaminated by mosquitofish (Abarca et al. 1994). Of the 300+ reintroductions conducted by the Arizona Game and Fish Department and others, only 21 remain extant (Brown and Abarca 1992).

In the project area, populations have been documented in recent years at Cienega Creek, southeast of Tucson, Pima County; Cold Spring Seep located near the town of Eden, Graham Co.; Big Spring and Watson Wash both located north of Thatcher, Graham Co.; Martin Well, Graham Co.; Little Nogales Spring, Pima Co.; and Nogales Spring, Pima Co.

Allotments containing these populations, and the status of populations are presented in Table 12. Information about these allotments, including range condition and trend, are found in Tables 3 and 5, and are discussed below. Gila topminnow were introduced to Cold Spring Seep and Martin Well in 1989.

Cienega Creek on the Empire Cienega allotment is one of the last places in Arizona supporting an intact native fish fauna uncontaminated by exotic fish. The creek provides habitat essential for the survival of Gila topminnow. In addition, Cienega Creek supports by far the largest population of topminnow in the United States. A fall population estimate for Cienega Creek was approximately 2.5 million topminnow, conservatively, for 6.5 mi of perennial habitat sampled (Bureau 1996a). Another 1.1 mi of topminnow habitat in Mattie Canyon and 0.9 mi in Empire Gulch, tributaries to Cienega Creek, were not included in this estimate. Some areas supported extremely high densities (up to 53/ft^2) of topminnow (Simms and Simms 1992). The stream segment below the narrows at Cienega Creek has not been part of the annual monitoring, but topminnow are usually observed there in abundance.

Consultation on an interim grazing plan for the Empire Cienega allotment was completed January 8, 1996, (see Table 2 and CONSULTATION HISTORY). The Service found that the proposed action was not likely to jeopardize the continued existence of the Gila topminnow. The allotment is in the improve category and acreages of Bureau lands in excellent, good, fair, and poor condition are 7,308, 22,654, 6,576, and 0, respectively. Range condition is upward (Table 5). The Bureau (1996a) believes range condition and hydrologic function in the allotment may not improve appreciably without fire disturbance.

Surveys for fish at Nogales and Little Nogales Springs on the Empirita allotment have not produced any Gila topminnow since 1989 (Doug Duncan, Service, Phoenix, AZ, pers. comm. 1997). An on-site visit shortly after the Bureau acquired these springs indicated that habitat appears to be in good condition. The Empirita allotment also contains approximately 0.25 mi of Cienega Creek, which contains an extant population of Gila topminnow. Acreages of Bureau lands in excellent, good, fair, and poor range condition are 200, 1,000, 320, and 0, respectively. The allotment is in the improve category and range condition trend is upward.

At a pond at Martin Well on the Fan allotment, no topminnow have been detected since 1989 when a single topminnow was caught. During the spring of 1997, the aquatic habitat went dry for unknown reasons (Lynn Saline, Bureau of Land Management, Safford, AZ, pers. comm. 1997). The source of fish that occurred at Martin Well is unknown, but was likely introduced illegally or the single topminnow found there may have been misidentified. It is likely that this population was extirpated by the large mosquitofish population. The pond was dry as of spring of 1997 (Bureau 1997a). Although Gila topminnow are apparently extirpated, the pond at Martin Well is considered recovery habitat. The pond at Martin Well is fenced from livestock and fed by an artesian water source. The pond is not connected to any surface drainages and does not collect surface runoff from storm events. Watershed and

Table 12: Allotments and aquatic sites containing extant populations or recently extant but possibly extirpated localities of the Gila topminnow.

Allotment	Site(s)	Extant? (Date Last Observed[1])
Empire Cienega (6090)	Cienega Creek, Mattie Cyn, Empire Gulch	Yes (1997)
Day Mine (4606)	Cold Spring	Yes (1996)
Empirita (6210)	Nogales Spring	? (1989)
	Little Nogales Spring	? (1989)
	Cienega Creek	Yes
Fan (5114)	Martin Well	No (1989)
Kimball Comm. (4609)	Watson Wash	Yes (1996)
Bryce (4608)	Big Spring	? (1991)

[1]From Bureau (1996a) and Service files

range condition for this allotment was discussed in the desert pupfish section of this opinion. Sixty-nine percent of the Bureau lands in the allotment are in poor or fair condition; range condition trend in downward. The allotment is in the maintain category.

Despite the contamination of its habitat with exotic fishes and pollutants, Gila topminnow at Watson Wash in the Kimball Community allotment continue to thrive. Visits to the area have revealed large numbers of topminnow readily visible along the water course (Bureau 1996a). The Kimball Community allotment is permitted for ephemeral use, although the Bureau (1997c) has no record of cattle being grazed on the allotment. The allotment is in the custodial category. Range condition of all Bureau lands in the allotment (1,520 acres) is good.

At Big Spring on the Bryce allotment, a dam that formed a large pool habitat for the fish washed out in 1991. Topminnow have not been detected at Big Spring since that time. The introduction is considered failed, but the site is still considered important recovery habitat. Big Spring is located inside a livestock exclosure. The spring is protected from damaging flood flows by a shale outcrop. The permittee reports never having seen trespass cattle inside the exclosure (letter to the Bureau from Gary Bryce dated August 4, 1997).

On the Day Mine Allotment, Cold Spring Seep was stocked with topminnow after the Bureau consulted with the Service in 1989 (see Table 2, CONSULTATION HISTORY, and the desert pupfish section in this opinion). One of the pools at Cold Spring Seep appears to be

foul (stagnant and brackish) and no longer supports fish. The cause of poor water quality at this site is unknown. Riparian development at this site is a marsh or cienega type that appears stable and healthy. The seep is scheduled to be fenced in 1997 to prevent livestock entry. Desert pupfish also occur at this site; the ENVIRONMENTAL BASELINE for Cold Spring in the desert pupfish section of this opinion is included here by reference.

Several ponds have been created at the source of natural springs located at the foot of the Gila Mountains including Tom Nephew Pond, Tom Niece Pond, and two ponds at Porter Wash. These ponds are considered to be potential habitat (Bureau 1996a).

Aggregate effects of other Federal actions include the maintenance of artesian ponds for sport fishing, including Martin Well. Posey Well supports mosquitofish and a variety of other nonnative fishes that are likely to have an adverse effect on topminnow. Roads that allow public access to topminnow habitat may present an adverse effect depending on the activities that the public engages in at the particular site (e.g. wading, transfer of nonnative fish, bathing, etc.).

EFFECTS OF THE PROPOSED ACTION

Effects of the grazing program can be segregated into direct and indirect effects. Direct effects include trampling of and ingestion of fish eggs and larvae by cattle (Roberts and White 1992, Bureau 1996a). Most fish larvae use shallow water along the margins of aquatic habitat and are weak swimmers at hatching. They are not likely to avoid being stepped on or ingested by livestock drinking water. Due to the fact that fish generally produce an abundance of eggs and larvae this impact is likely to be negligible. Adult fish are generally more mobile and can avoid danger (Moyle and Cech 1982).

Grazing is largely excluded from Gila topminnow habitat on Cienega Creek, and exclosures protect Gila topminnow habitat at Big Spring and Martin Well. Cold Spring Seep is not fenced; however, the Bureau (1996a) reports evidence of cattle at this site is rarely observed, thus few direct effects are likely to occur under current grazing practices. Fencing of the site this year should further reduce the chance of direct effects.

Indirect effects include alterations of riparian and aquatic habitats; modifications of the watershed resulting from grazing that may adversely affect the Gila topminnow; and possible adverse effects of range improvement projects, vegetation management, and prescribed fire. These indirect effects are discussed in detail for the spikedace and desert pupfish, and are included here by reference.

Sites that are fenced to exclude livestock (portions of Cienega Creek, Martin Well, and Big Spring) would not be subject to either direct or indirect effects of grazing in the riparian and aquatic habitats of the topminnow. In Cienega Creek, while the possibility for damage to habitat and pollution from livestock waste exist from winter grazing employed on the north end of the creek; riparian fencing, and the presence of flowing water in Cienega Creek will

largely prevent the possibility of severe adverse effects such as a fish kill. Range improvements including water gaps and crossing lanes on Cienega Creek where cattle will have access to the creek, will likely result in some small level of fish mortality from trampling and ingestion of fish with water consumption. Similar effects are anticipated from the winter grazing at the north end of Cienega Creek. Minor pumping of ground water occurs adjacent to Cienega Creek. The effects of this pumping were evaluated in the Service's January 8, 1996, biological opinion on the interim grazing plan for the Empire Cienega allotment. The Service's analysis concluded that groundwater pumping would not result in measurable effects to the Cienega Creek aquifer. That analysis and conclusion are incorporated by reference herein.

On the Empirita allotment some small level of fish mortality from trampling and water consumption can be anticipated on the 0.25 mi reach of Cienega Creek, and Nogales and Little Nogales springs, which are grazed in the warm season (Bureau 1996a). Some damage to streambanks, increased erosion and sedimentation, and destruction of riparian vegetation is anticipated at these sites. Pollution from livestock waste is anticipated; however, this is expected to be minimal due to the presence of flowing water on Cienega Creek, and Nogales and Little Nogales springs.

Similar direct and indirect impacts in the riparian and aquatic habitat at Cold Spring Seep are anticipated. However, the likelihood of such impacts occurring is small due to the very limited ephemeral grazing that occurs within the pasture that includes Cold Spring Seep. Past monitoring has shown little sign of cattle in or around Cold Spring Seep.

Effects of cattle grazing on watersheds include alterations of vegetation communities, increased soil erosion and runoff, decreased infiltration rates, damage to cryptobiotic crusts, and increased soil compaction. These effects are described in detail in the "EFFECTS OF THE PROPOSED ACTION" for the Pima pineapple cactus and the Huachuca water umbel, and are included here by reference. As discussed in the latter "EFFECTS" section, degradation of watersheds can cause downcutting, loss of perennial flow, loss of riparian vegetation, increased sedimentation, and higher peak flows in streams and rivers fed by degraded watersheds.

Although the effects of livestock grazing on watershed function depend on many site-specific factors, we assume that watershed condition is in many or most cases correlated with range condition, because range condition is related to grazing pressure, and grazing pressure adversely affects watershed condition. This assumption is supported a large body of information on the effects of grazing on soils, vegetation, cryptobiotic crusts, and other watershed characteristics. Although watershed condition can affect adjacent riparian and aquatic habitat, watersheds of topminnow sites are generally in good condition, or the sites are mostly isolated from watershed effects. For instance, although 69 percent of the Fan allotment is in fair or poor condition, watershed effects are expected to be negligible at Martin Well, because this site is fed by an artesian well, is not in a drainage, and does not collect surface runoff. Cold Spring Seep in the Fan allotment is also not located in an area

that would be subject to scouring floods. The Bureau (1996a) found that because the Cold Spring Seep supports hydrobiid snails, it is almost certain that watershed effects from grazing and range improvements has not caused the spring to go dry in the past, even when former stocking rates were much higher than today's permitted number.

Other sites are potentially subject to minor watershed effects. Range condition is good on Bureau lands in the Kimball Community allotment where the Watson Wash population is located. Also, this allotment is only grazed ephemerally; thus grazing effects on watershed condition are likely minimal. On the Empire Cienega allotment, range condition is predominantly good or excellent. The Service's 1996 biological opinion on the interim grazing plan for the Empire Cienega allotment predicted that watershed condition would improve with implementation of the interim plan. On the Empirita allotment Bureau acreages in excellent, good, fair, and poor condition are 200, 1,000, 320, and 0, respectively; condition trend is upward (Table 5). Thus, watershed condition is likely in relatively good condition on the Empirita allotment.

On the Bryce allotment, which includes Big Spring, Bureau acreages in excellent, good, fair, and poor condition are 80, 11,325, 3,830, and 5,639 acres, respectively; condition trend is static (Table 5). These figures suggest watershed condition is mostly good, but the Bureau finds (1996a) that habitat at Big Spring may be affected adversely from watershed effects until watershed conditions improve. In contrast, the permittee states that numbers of cattle have decreased and range condition has improved recently (letter from Gary Bryce to the Bureau dated August 4, 1997.) Adverse effects to Big Spring as a result of degraded watershed are likely to be limited due to the naturally low cover that occurs, sandy soil type, presence of artesian water source at Big Spring, protection of the spring from flood flows, and good range condition (Bureau 1996a).

The Bureau's proposed action allows for development of range improvement projects. For the Empire Cienega allotment, effects of specific range improvement projects anticipated at the time of consultation were evaluated in the Service's 1996 biological opinion on the interim grazing plan. That evaluation is incorporated here by reference. Range improvement projects would primarily affect the uplands in the allotments and are mostly designed to distribute cattle and allow greater management capability. They can result in improved range condition and watershed condition, if stocking rates are not increased. However, range improvements that redistribute cattle in a way that increases use of unfenced topminnow sites, such as Cold Spring Seep, or increases cattle use near exclosures and thus increases the chance that cattle may breach an exclosure, could result in increased trampling and ingestion of topminnow eggs and larvae, and degradation of riparian and aquatic habitat, as discussed above. New wells developed near topminnow sites could lower the artesian head at springs or reduce stream flow, resulting in reduced aquatic habitat for Gila topminnow. Future springbox repair at Big Spring is likely to disturb topminnow habitat.

Localized temporary disturbance from construction of pipelines, fences and other projects would cause negligible and localized increases in erosion and runoff. Work on Gila

topminnow sites, including but not limited to berm/dam repair, dredging, vegetation removal, nonnative organism removal, or any other work in the water or on associated wells at topminnow localities, may also result in temporary disturbance or direct impacts that may cause death or injury of Gila topminnow. Of greater concern are development and maintenance of stock tanks, which may support populations of nonnative fishes, or may provide habitat into which nonnative fishes may be introduced as sport fish or for other purposes. Illegal introductions of nonnative fishes are routinely made by the public (e.g. topminnow, red shiners, and guppies in Watson Wash, sunfish in Martin Well) (Bureau 1996a). Once nonnatives are in the area, fish may subsequently be introduced into Gila topminnow habitat or may traverse drainages between stock tanks and topminnow habitat during storm events. Once into topminnow sites, nonnatives would prey upon and/or compete with topminnow, and could potentially greatly reduce or eliminate topminnow populations. Any new construction or reconstruction of roads to stock tanks or Gila topminnow sites would facilitate public access and increase the chance that nonnative fish may be introduced or moved among aquatic sites.

Chemical or mechanical vegetation manipulation would likely be used in the uplands in areas of degraded range condition. If successful, such actions could improve watershed condition and function. Vegetation manipulation is highly unlikely to be conducted in riparian sites but would likely have adverse effects to vegetation communities. In addition, some herbicides, such as Roundup, are highly toxic to fish. Prescribed fire in uplands could also be used to improve range condition and trend, although temporary adverse effects to Gila topminnow and its habitat may occur through soil erosion, increased runoff, and sedimentation following fire. If fire spread to riparian vegetation at Cienega Creek or other topminnow sites, reduction or elimination of riparian vegetation could cause dramatic adverse effects to channel morphology, water temperature, water quality, and other components of Gila topminnow habitat.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline. Due to the extent of the lands administered by the Bureau, most actions that are reasonably expected to occur in the vicinity of Gila topminnow localities in the project area would be subject to section 7 consultations. However, considerable private and/or State lands occur near Gila topminnow localities at Nogales and Little Nogales springs, Cold Spring Seep, Watson Wash, and Big Spring. Non-Federal activities not subject to section 7 consultation, such as livestock grazing, development, groundwater pumping, water diversions and channelization, mining, and other activities with potentially adverse effects to Gila topminnow populations are anticipated in these areas. Of primary concern is maintenance of and possible stocking of nonnative game fish in any tanks or other waters on non-Federal lands in the vicinity of the

localities listed in Table 12. Fish from such tanks could be transferred as bait fish or as illegal introductions into Gila topminnow habitat, or could traverse drainages between such tanks and topminnow habitat, particularly during storm events.

Private lands in the watershed of Cienega Creek, particularly near Sonoita, are rapidly being developed into ranchettes. Potential impacts associated with growth in this area include possible transport of nonnative fish by residents, increased recreational use of Cienega Creek, increased groundwater pumping with potential impacts to base flows in Cienega Creek, and degradation of the watershed as a result of development and other activities.

Effectiveness of Proposed Mitigation

The Bureau proposes a number of measures that mitigate to some degree potential adverse impacts to the Gila topminnow as a result of the proposed action. The Bureau proposes to maintain the cattle exclosure around Martin Well, and proposes construction of an exclosure around Cold Spring Seep. The Bureau also proposes to cooperate with the Service and Arizona Game and Fish Department to identify site-specific measures to protect populations of topminnow from grazing program impacts as specific impacts are identified. These measures could include construction of stock ponds in a way that they could be emptied to control nonnative predatory fish, surveys of stock waters for nonnative fish, replacement of nonnative fish populations with native fish in perennial stock ponds, and implementation of prescribed fire in grassland vegetation types in the Cienega Creek watershed to improve the condition of the watershed. The details of many of these measures are yet to be developed and in some cases implementation schedules are unknown; thus the degree to which they may or may not mitigate adverse effects cannot be determined.

Other aspects of the Bureau's proposal, such as implementation of the Riparian Policy, limitations on utilization, drought policy, and Arizona Standard 2 (Riparian-wetland sites) all act to reduce possible adverse effects of grazing.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of the Gila topminnow. We present this conclusion for the following reasons:

1. The proponent's project description includes features to reduce to some degree direct and indirect impacts of the proposed action on the Gila topminnow and its habitat.

2. The most important site for the Gila topminnow in the allotments is Cienega Creek. Portions of the creek are fenced to exclude livestock. The Gila topminnow population is apparently large and healthy at this site under current grazing practices.

3. Martin Well and Big Spring are protected by cattle exclosures and one other topminnow site (Cold Spring Seep) is rarely used by cattle and proposed to be fenced in 1997.

4. Watershed effects are unlikely to occur to Gila topminnow or its habitat because these sites are either isolated from nearby surface hydrology or the watersheds are apparently in good condition.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, and the anticipated effects of the proposed Safford/Tucson Field Offices' grazing program, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Gila topminnow. No critical habitat has been designated for this species, thus none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

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

AMOUNT OR EXTENT OF TAKE

Take anticipated in this biological opinion is separate from take anticipated in the Service's biological opinions for Cold Spring Seep and the Interim Grazing Plan for Cienega Creek (Table 2). Take anticipated under the Cold Spring Seep biological opinion was associated with stocking of fish into the site and maintaining the habitat; no take was anticipated as a result of the livestock grazing program. In the current opinion, the Service will anticipate

take associated with grazing activities at and near Cold Spring Seep. The take statement for the Interim Grazing Plan for Cienega Creek addressed all aspects of the grazing program in the Empire Cienega allotment as it was known at that time. The only actions anticipated under the current proposed action not considered in that consultation are range improvement projects beyond that described in the opinion, and any proposed vegetation management or prescribed fire. Thus, the only additional take anticipated for the Empire Cienega allotment would be associated with these projects. The Service anticipates the following forms of take as a result of the proposed action:

1) Direct loss or injury of Gila topminnow resulting from work in the water or on associated wells at Cold Spring Seep, Watson Well, Big Spring, Nogales Spring, and Little Nogales Spring. Such work may include but is not limited to repair of berms or dikes, dredging, vegetation removal, nonnative organism removal, or any other work in the water or on associated wells.

2) Direct loss of Gila topminnow larvae and eggs in Cienega Creek in the Empirita allotment, Nogales and Little Nogales springs, Watson Wash, and Cold Spring Seep prior to fencing due to trampling and ingestion by cattle.

3) Adverse effects to topminnow habitat resulting from grazing in riparian and aquatic habitats with subsequent resulting harassment or harm to Gila topminnow from increased levels of turbidity, pollution of water from cattle feces, reduction of bankline cover due to trampling, and modification of other components of topminnow habitat on Cienega Creek in the Empirita allotment, Nogales and Little Nogales springs, Watson Wash, and Cold Spring Seep.

4) Harassment and harm to Gila topminnow from adverse effects to aquatic and riparian habitats at Nogales and Little Nogales springs, and at Big Spring resulting from watershed degradation.

5) Possible introduction of nonnative fish to Gila topminnow habitat as a result of constructing and maintaining aquatic habitats in the form of stock tanks, and possible direct or indirect effects to Gila topminnow caused by range improvement projects, prescribed fire, and vegetation management.

This biological opinion does not authorize any form of take not incidental to the Safford/Tucson Field Offices' grazing program. If the incidental take authorized by this opinion is exceeded, the Bureau must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim, the Bureau must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. The Bureau should provide to this office an explanation of the cause of the taking. Incidental take of Gila topminnow is difficult to detect and monitor. Therefore, we have defined the following parameters as indicators that anticipated incidental take has been exceeded.

1) Immediate action is not taken to remove, as soon as possible, any cattle found within the exclosures at Big Spring, and Cold Spring Seep (after constructed).

2) Cattle use at Cold Spring Seep, Cienega Creek in the Empirita allotment, Nogales and Little Nogales springs, or Watson Wash occurs year-round, or the riparian-wetland community at these sites is not in a properly functioning condition, as defined in the Arizona Standard and Guidelines (see "DESCRIPTION OF THE PROPOSED ACTION".

3) Long-term range condition declines in the Empirita, Bryce, or Kimball Community allotments, and cattle grazing cannot be ruled out as a cause of the decline.

EFFECT OF THE TAKE

In this biological opinion, the Service finds the anticipated level of take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

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

1. The Bureau shall ensure maintenance of the integrity of the exclosures at Big Spring and, after constructed, at Cold Spring Seep.

2. No action shall be taken that would result in increased grazing pressure at Cold Spring Seep, Nogales or Little Nogales springs, Cienega Creek on the Empirita allotment, or Watson Wash.

3. Action shall be taken to ensure that watershed effects to Gila topminnow habitat on the Empirita, Kimball Community, and Bryce allotments do not increase.

4. Activities that may result in a take of Gila topminnow or destruction of Gila topminnow habitat shall be evaluated, monitored, and modified as needed to reduce potential adverse effects to the species.

5. The Bureau shall monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regard to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. Terms and

conditions are nondiscretionary. Terms and conditions 1 and 4.a. are adapted from Bureau (1996a).

The following term and condition implements reasonable and prudent measure number 1:

The exclosure fences around Big Spring and (after constructed) at Cold Spring Seep, shall be monitored and maintained as needed, but at least annually, to prevent cattle use within the exclosure.

The following terms and conditions implement reasonable and prudent measure number 2:

a. The Bureau shall ensure that any changes in pasturing, season of use, stocking levels, construction or maintenance of range improvements, and other aspects of the grazing program do not result in an increase in cattle use at Cold Spring Seep prior to fence construction, Nogales and Little Nogales springs, Cienega Creek on the Empirita allotment, or at Watson Wash. Measures to ensure that grazing pressure does not increase may include construction of exclosures to protect Gila topminnow populations.

b. The Bureau shall construct in 1997 a livestock exclosure around Cold Spring Seep.

The following terms and conditions implement reasonable and prudent measure number 3:

a. The Bureau shall take action as necessary to ensure that long-term range condition does not deteriorate and remains in good or excellent condition on the Empirita, Kimball Community, and Bryce allotments.

b. Grazing in the Empirita, Kimball Community, and Bryce allotments shall strictly adhere to the Bureau's Arizona Standards and Guidelines, the Upland Livestock Utilization Standard, Safford Drought Policy, Arizona Ephemeral Grazing Policy, and Riparian Area Policy.

The following terms and conditions implement reasonable and prudent measure number 4:

a. A mitigation plan shall be developed by the Bureau in coordination with the Service for each range improvement project that may adversely affect Gila topminnow or its habitat, prescribed fire, and vegetation management project in the allotments listed in Table 12 (excluding projects in the Fan allotment and those addressed in previous consultations - see Table 2 and Bureau 1996a). Mitigation plans for prescribed fire shall limit to the extent practicable the possibility that fire would spread to riparian habitat at Gila topminnow localities listed in Table 12 (with the exception of Martin Well). Mitigation plans shall be approved by the Service.

b. The Bureau will evaluate all stock tanks on the allotments in Table 12 (with the exception of the Fan allotment) for their degree of risk to introduce nonnative fish to Gila topminnow habitat. The Bureau will then, in conjunction with the Service and Arizona Game and Fish Department, develop and implement management techniques or practices for the tanks in each risk category. Management techniques may include, but are not limited to, replacement of the existing tanks with alternative water sources, treatments to eliminate fish, or other appropriate methods. Proposed tanks will undergo the same evaluation for risk, and will include development of a mitigation plan approved by the Service.

c. Inventory, monitoring, and evaluations as described in the Bureau's proposed action (Bureau 1996a) and applicable sections of the Bureau Manual shall be conducted in the Empirita, Kimball Community, and Bryce allotments.

The following term and condition implements reasonable and prudent measure number 4:

The Bureau shall submit annual monitoring reports to the Arizona Ecological Services Field Office by March 15 beginning in 1998. These reports shall briefly document for the previous calendar year the effectiveness of the terms and conditions, and documentation of take, if any. If such monitoring occurs, the report shall also summarize the condition of habitat at Gila topminnow localities, and fish monitoring data, including numbers of Gila topminnow observed, presence of nonnative fish, etc. The report shall make recommendations for modifying or refining these terms and conditions to enhance Gila topminnow protection or reduce needless hardship on the Bureau and its permittees.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the Gila topminnow. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau should regularly monitor Gila topminnow populations at the localities listed in Table 12 and report the results of such monitoring to this office.

2. The Bureau should investigate water quality at Cold Spring Seep and take action to correct degraded water quality.

3. The Bureau should implement prescribed fire on the Cienega Creek watershed to improve watershed condition.

4. The Bureau should work with the Service and Arizona Game and Fish Department on planning for further introductions of Gila topminnow into suitable habitat.

5. The Bureau should coordinate with the Service and Arizona Game and Fish Department on recommendations of extant/extirpated status.

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

(Note: capture, collection, or reintroductions of fish require appropriate permits from Arizona Game and Fish Department, and for listed species, from the Service)

Loach Minnow
STATUS OF THE SPECIES

The loach minnow was listed as a threatened species on October 28, 1986. Critical habitat was designated for loach minnow on March 8, 1994, including portions of the San Francisco, Tularosa, Blue, and upper Gila Rivers, and Aravaipa Creek. Critical habitat for the loach minnow has been enjoined from enforcement by the New Mexico District Court (Coalition of Arizona-New Mexico Counties for Stable Economic Growth vs. U.S. Fish and Wildlife Service, No. 95-1285-M Civil D.N.M., filed 4 March 1997) pending compliance with the National Environmental Policy Act.

The loach minnow is a small, slender, elongate fish with markedly upwardly-directed eyes (Minckley 1973). Historic range of the loach minnow included the basins of the Verde, Salt, San Pedro, San Francisco, and Gila Rivers (Minckley 1973, Sublette et al. 1990). Competition and predation by nonnative fish and habitat destruction have reduced the range of the species by about 85 percent (Miller 1961, Williams et al. 1985, Marsh et al. 1989). Loach minnow remains in limited portions of the upper Gila, San Francisco, Blue, Black, Tularosa, and White Rivers; and Aravaipa, Eagle, Campbell Blue, and Dry Blue Creeks in Arizona and New Mexico (Barber and Minckley 1966, Silvey and Thompson 1978, Propst et al. 1985, Propst et al. 1988, Marsh et al. 1990, Knowles 1995).

The loach minnow is a bottom-dwelling inhabitant of shallow, swift water over gravel, cobble, and rubble substrates (Rinne 1989, Propst and Bestgen 1991). The loach minnow uses the spaces between, and in the lee of, larger substrate for resting and spawning (Propst et al. 1988, Rinne 1989). It is rare or absent from habitats where fine sediments fill the interstitial spaces (Propst and Bestgen 1991). Some studies have indicated that the presence of filamentous algae may be an important component of loach minnow habitat (Barber and Minckley 1966). The life span of a loach minnow is about two years (Britt 1982, Propst and Bestgen 1991). Loach minnow feeds exclusively on aquatic insects (Schreiber 1978, Abarca 1987). Spawning occurs primarily in March through May (Britt 1982, Propst et al. 1988); however, under certain circumstances loach minnow also spawn in the autumn (Vives and

Minckley 1990). The eggs of the loach minnow are attached to the underside of a rock that forms the roof of a small cavity in the substrate on the downstream side. Limited data indicate that the male loach minnow may guard the nest during incubation (Propst et al. 1988, Vives and Minckley 1990).

Recent biochemical genetic work on loach minnow indicate there are substantial differences in genetic makeup among remnant loach minnow populations. Remnant populations occupy reaches of the Gila basin that are isolated from each other. Tibbets (1992) recommended that the genetically distinctive units of loach minnow should be managed as separate units to preserve the existing genetic variation.

Although the loach minnow is currently listed as threatened, the Service has found that it warrants uplisting to endangered status. Reclassification is pending; however, work on it is precluded due to work on other higher priority listing actions (Service 1994b). The need for reclassification is not due to data on declines in the species itself, but is based upon increases in serious threats to a large portion of its habitat.

ENVIRONMENTAL BASELINE

Within the project area, the loach minnow is found in Aravaipa Creek, two tributaries to Aravaipa Creek: Deer Creek (Hell Hole) in the Hell Hole allotment and in Turkey Creek in the South Rim allotment, and has been collected on Bureau lands in the San Francisco River above Clifton. In Aravaipa Creek, the loach minnow is presently found in suitable habitat throughout the area of perennial flow, which is a reach approximately 15 to 20 mi in length in Aravaipa Canyon (Barber and Minckley 1966, Minckley 1973, Velasco 1994). The population in Turkey Creek is small and limited to an area near the confluence (Bureau 1996a). The Bureau (1996a) considers the loach minnow population in Deer Creek to be large and self-sustaining.

Environmental baseline for Aravaipa Creek presented in the discussion for the spikedace is included here by reference. This baseline also applies to Turkey Creek and Deer Creek. Allotments in the Aravaipa Creek area in which loach minnow occur or that are in the watershed of occupied habitat are presented in Table 11. Threats to spikedace in Aravaipa Creek and its watershed are also threats to the loach minnow and affect the loach minnow and its habitat in a similar fashion. Previous consultations with the Bureau on this species are summarized in Table 2 and in Bureau (1996a). In 1996, the Service also consulted with the Apache-Sitgreaves National Forest on maintenance of road crossings on the San Francisco River through Bureau and State lands in the project area and onto Forest lands (2-21-96-F-233).

On the San Francisco River the loach minnow occurs in the Red Hickey Hills (4005) and San Francisco (4002) allotments (Bureau 1996a). These allotments, as well as a portion of the Metcalf (4001) allotment, are within the watershed of the San Francisco River where the species occurs. Information on these allotments is presented in Tables 3 and 5.

The San Francisco River has undergone substantial modification within the past century and a half. In 1846, the mouth of the San Francisco River was described as having thick borders of flags and willows with some larger cottonwood and beaver dams in "great numbers" (Emory 1848). Beaver were abundant along the San Francisco River in the early 1800's; the 1826 Pattie expedition took 250 beaver pelts from the mouth of the river to near the headwaters (Pattie 1833). By the turn of the century, beaver had been reduced to a minor element in the system and agriculture, livestock grazing, roads, mining, timber harvest, and other human activities within the watershed had substantially altered the hydrologic and sediment regimes and the river channel (Olmstead 1919, Leopold 1946). Extensive harvest of wood of all types for timbers and fuel at the mines at Clifton-Morenci and the fuelwood needs of the local population decimated both the upland and riparian woodlands (Bahre 1991). In addition to water diversions, timber harvest, roads, and toxic discharges from mines in the Clifton area, placer mining was practiced on the San Francisco River above Clifton (Dobyns 1981). Although the proportional contribution of natural forces and human forces in stream channel erosion in the Southwest has been widely discussed, there is substantial evidence that human activities have been a major contributing factor (Duce 1918, Leopold 1924a, Leopold 1924b, Bryan 1925, Leopold 1946, Hastings 1959, Hastings and Turner 1980, Dobyns 1981, Bahre 1991). Large floods in the 1890-1906 period accelerated the erosion of the destabilized system resulting in a river channel similar to that present today.

Today, the lower San Francisco River channel is a wide unvegetated expanse of cobble, gravel, boulder, and sand with a braided and shifting wide, shallow low-flow channel. River terraces or benches are small eroding remnants of former river banks. The unstable nature of the existing channel is illustrated by frequent changes in road and low-water crossing locations due to changes in the river course. Crossings may change in location up to one-quarter mile or more (Csargo and Myers 1996). Riparian vegetation is sparse and lacking in structural diversity. It consists primarily of seep willow, *Baccharis salicifolia*, cottonwood seedlings and saplings, and the nonnative salt cedar. Sedges, *Carex* sp., which are a key element in healthy stable streambanks, are uncommon. On the San Francisco allotment, where livestock grazing along the river is authorized, there is virtually no herbaceous cover (see photos in "San Francisco Road Crossing Data Sheets" in Csargo and Myers 1996). Present uses of the San Francisco watershed and valley bottom continue to contribute to the deteriorated condition of the river, although at a level reduced from that of the late 1800's.

Timber harvest, road, and grazing activities within the watershed continue to contribute erosion, vegetation change, and alteration of the hydrologic regime. Upstream of the project area near Glenwood, Pleasanton, and Reserve, New Mexico, farms, ranches, and towns occur along the river bottom as well as pastures and irrigated agriculture. There are a number of small diversion structures and irrigation canals. The river is completely diverted near Glenwood and Pleasanton during the low flow periods and substantial nutrient loads are added in irrigation return flows (Propst et al. 1988). Although the lower San Francisco River bottom above Martinez Ranch was closed to vehicle use in 1987, some unauthorized off-road-vehicle use in the river bottom continues to occur upstream from the end of the

road. A four-wheel drive road exists from the RU Ranch to Clifton, which includes 8.7 mi of the floodplain in the San Francisco allotment. Within that length, there are 26 low-water ford crossings.

The San Francisco River, like all streams remaining in the Gila River basin, has also been subject to introduction of a number of nonnative fish and other aquatic species, although natives still dominate. Nonnative species adversely affect the native fish community through competition and predation (Courtenay and Stauffer 1984, Marsh et al. 1989, Marsh and Brooks 1989, Blinn and Runck 1990, Propst et al. 1992, Carmichael et al. 1993, Douglas et al. 1994). Nonnative species occurring in the San Francisco River include red shiner, channel catfish; flathead catfish, *Pylodictis olivaris*; mosquitofish, carp, fathead minnow; smallmouth bass, *Micropterus dolomeiui*; and softshell turtle, *Trionyx spiniferus* (Anderson and Turner 1977, Minckley and Sommerfeld 1979, J.M. Montgomery Consulting Engineers 1985, Papoulias et al. 1989, Bagley et al. 1995).

The fish fauna of the lower San Francisco River is depauperate in species and in numbers. In 1904, Chamberlain (1904) found no fish of any species during surveys from the mouth of the river up to the Blue River. He reported local stories of previously abundant fish and speculates that the loss of those fish was due to flooding, heavy silt loads, mining effluent, and extensive water diversion. In 1979, surveys found the lower San Francisco to support "few individual fishes and little biomass" (Minckley and Sommerfeld 1979). Numbers of fish collected during the 1994-96 surveys were low, although not alarmingly so (Bagley et al. 1995).

In addition to loach minnow, four other native fishes remain in the lower San Francisco River; the speckled dace, longfin dace, desert sucker, and Sonora sucker. Gila chub, *Gila intermedia*, is still found in two tributaries to the lower San Francisco, but not in the river itself (Anderson and Turner 1977, Minckley and Sommerfeld 1979, J.M. Montgomery Consulting Engineers 1985, Papoulias et al. 1989, Bagley et al. 1995). Of the four remaining native species, the loach minnow is the rarest. Loach minnow have been extirpated from portions of the San Francisco River by human activities, and outside of moderate-sized areas where suitable and conditions have prevailed, their occurrence is irregular and fragmented (Propst et al. 1988).

Although the historical records of the San Francisco River fish fauna are few, those records, plus some from the San Francisco River upstream and Gila River downstream, can be used to construct a list of fish species that were most probably historically found in the San Francisco River through the project area. This information can be combined with early descriptions of the river and its valley bottom, from which it appears that the river was narrower with more distinct streambanks and riparian cover. Aquatic habitat was apparently much more varied and complex, as well. Based on this information, probably eight species of native fish have been extirpated from the San Francisco River in the past century. Reintroduction of one of those, the razorback sucker, has been attempted with uncertain success. The reason for the extirpation of over 60 percent of the native San Francisco River

fish fauna can only be speculated upon but is presumed to be tied to the substantial human alteration of the aquatic habitats along with introduction of nonnative species.

The distribution of the loach minnow in the San Francisco River in Arizona is not well known. The first known record of the loach minnow in the Arizona portion of the river was in 1977 (Anderson and Turner 1977), although it had been recorded in the upstream New Mexico portion of the San Francisco River since the 1940's (LaBounty and Minckley 1972). Since 1977, loach minnows have been found throughout the Arizona portion of the San Francisco River although in low numbers (Anderson and Turner 1977, Minckley and Sommerfeld 1979, J.M. Montgomery Consulting Engineers 1985, Papoulias et al. 1989, Bagley et al. 1995). The loach minnow was found during recent surveys at the confluence of the San Francisco River and Hickey Canyon (upstream of the project area) and at the Forest/Bureau boundary on the San Francisco allotment (Bagley et al. 1995). Downstream of the Forest/Bureau boundary loach minnow distribution is unclear. Surveys conducted in 1983-84 located no loach minnows below Hickey Canyon (J.M. Montgomery Consulting Engineers, 1985). However, P.C. Marsh (in Bureau 1996a) reported loach minnow in the San Francisco River above Clifton. There is substantial habitat that appears suitable for the loach minnow for several miles below the Forest/Bureau boundary. The downstream extension of the loach minnow in the San Francisco River probably fluctuates over time depending upon water and sediment levels, flooding, and other factors.

EFFECTS OF THE PROPOSED ACTION

Effects to the loach minnow occupying Aravaipa Creek as a result of the proposed livestock grazing program are very similar to those described for spikedace. Effects to loach minnow in the San Francisco River can be largely extrapolated from the spikedace discussion. Both direct and indirect effects occur. Direct effects include trampling of loach minnow, particularly eggs and larval fish, and ingestion of eggs and larval fish by cattle drinking from occupied habitat in Aravaipa and the San Francisco River. Direct effects may also occur as a result of range improvement project construction or vegetation management projects in Aravaipa Creek or the San Francisco River. Prescribed fire in the uplands could potentially spread to the riparian zone of occupied aquatic habitat where fire or fire suppression activities could injure or kill a loach minnow.

Indirect effects include alteration of loach minnow habitat that may affect fish survival, reproduction, or other life history parameters. Such effects could occur either in the aquatic habitats occupied by the species or in the watershed. Mechanisms by which project activities may indirectly affect loach minnow include: 1) watershed alteration; 2) physical destruction and alteration of streambanks, stream channels, and water column; 3) alteration of the riparian vegetation community; 4) alteration of the faunal community; and 5) effects from associated features of the grazing program, including range improvement projects, mechanical or chemical vegetation management, and prescribed fire. These mechanisms are discussed in detail in the "EFFECTS OF THE PROPOSED ACTION" for the spikedace and are included here by reference.

Grazing in aquatic habitats of Aravaipa Creek currently only occurs in the 40-acre Bureau parcel in the Quintana allotment, on approximately 0.1 mi of the creek in the Brandenburg Mountain allotment, and in the form of trailing in the Hell Hole allotment (Bureau 1996a). The permittee in the Quintana allotment prefers not to run cattle in Aravaipa Creek and trailing of cattle in the Hell Hole allotment would occur no more than three times per year; trailing has not ocurred in recent years (Bureau 1996a). No grazing currently occurs in occupied loach minnow habitat in Deer Creek or Turkey Creek, which are tributaries of Aravaipa Creek.

The permittees on the San Francisco and Red Hickey Hills allotments attempt to limit livestock use in the riparian zone of the San Francisco River to prevent animals from moving along the river and out of the allotments. However, the grazing permits for these allotments do not prevent grazing in the riparian zone. The Bureau (1996a) reports that the Bureau-administered portions of the San Francisco and Red Hickey Hills allotments include 1.5 and 0.1 mi of the San Francisco River, respectively. Information available to the Service is inadequate to quantify total miles of river in these allotments but, based on Appendix 1, probably several miles of the San Francisco River occurs in both allotments.

Discussions for spikedace in this opinion identified adverse effects to the watershed of Aravaipa Creek resulting from grazing in 11 allotments. Watershed condition in these allotments affect loach minnow habitat in Aravaipa Creek in a similar fashion to that described for spikedace. Of particular concern are portions of the watershed in fair condition, notably 5,711 acres in the Painted Cave allotment, 8,323 acres in the South Rim allotment, and 1,000 acres in the Hell Hole allotment. These allotments are immediately adjacent to or include portions of Aravaipa Creek. On Bureau lands in fair condition in these allotments, the Bureau proposes to take action within three years that will result in a long-term upward trend in range condition.

Bureau-administered lands in the San Francisco and Red Hickey Hills allotments total 73 and 45 percent of the total land area in the allotments, respectively. As discussed for other species, the Service considers grazing on the non-Federal portions of allotments in the improve category to be interdependent and interrelated to grazing on the Federal portion in those allotments in which Bureau lands exceed 30 percent of the total acreage in the allotment, thus effects to loach minnow habitat in both the Bureau and non-Federal portions of the San Francisco and Red Hickey Hills allotments will be evaluated here.

Csargo and Myers (1996) noted that herbaceous riparian vegetation was nearly absent from Bureau and State lands along the San Francisco River in the San Francisco allotment. Scouring in the steep, narrow canyon through which the river flows limits development of riparian vegetation, but observations by Csargo and Myers (1996) suggest cattle grazing contributes to the observed lack of herbaceous cover. They noted heavy use of herbaceous plants in the San Francisco allotment near the boundary of the Apache-Sitgreaves National Forest. They also noted that some plant species that occur on Forest lands immediately upstream, where cattle are excluded, are rare or absent on the Bureau lands. In addition,

they noted that many of the cottonwood seedlings in the San Francisco allotment were browsed by cattle. No information is available to the Service on the extent of grazing in the riparian zone of the San Francisco River in the Red Hickey Hills allotment.

Allotments within the watershed of loach minnow habitat on the San Francisco River include the San Francisco, Red Hickey Hills, and Metcalf allotments. Based on Appendix 1 and other maps, the San Francisco and Red Hickey Hills allotments appear to be entirely or mostly within the San Francisco River watershed. Only lands in the eastern portion of the Metcalf allotment appear to be within that portion of the San Francisco watershed above Clifton where loach minnow have been found. Bureau-administered lands in the Metcalf allotment within the watershed appear to be limited to a few sections. All Bureau lands in the Metcalf allotment are in fair condition. Bureau lands in the San Francisco allotment include 3,000 acres in good condition and 925 acres in fair condition. Bureau lands in the Red Hickey Hills allotment include 2,000 acres in good condition and 460 acres in fair condition. Bureau lands in the Metcalf allotment total 27 percent of the total land in the allotment, and as such, activities of the non-Federal portions of this allotments are not considered interrelated or interdependent to activities on the Federal portion. Total acres (Federal and non-Federal) in the San Francisco and Red Hickey Hills allotments, in which Bureau lands exceed 30 percent of the total, are 5,405 and 5,523 acres, respectively. The range condition of non-Federal lands within the allotment is unknown, but the Service assumes that condition is similar to that on the Federal portion. If this is the case, then total acreages of the San Francisco allotment in good and fair condition would be roughly 4,100 and 1,305 acres, respectively. Acreages in the Red Hickey Hills allotment in good and fair condition would be roughly 4,480 and 1,043.

As discussed elsewhere, range condition is assumed to be correlated in many or most cases to watershed condition and function. The effects of grazing on watersheds and how such effects manifest in loach minnow habitat are the same as that discussed for spikedace habitat in Aravaipa Creek. In the San Francisco River watershed, areas of the Metcalf, San Francisco, and Red Hickey Hills allotments in fair condition are of particular concern; however, the Bureau proposes to take action within three years to affect a long-term upward trend in range condition in these areas.

Also as discussed for spikedace, minor disturbance to watershed function may occur as a result of range improvement project construction. Vegetation management projects should result in improved watershed condition, particularly if such projects are not accompanied by an increase in stocking rates. Prescribed fire could have a dramatic but temporary effect causing elevated rates of erosion and runoff; however, prescribed fire should result in long-term improvement of watershed condition.

Construction or reconstruction of stock tanks would provide new potential habitat for introduction of nonnative fish. Existing stock tanks may also support nonnative fish. Once in the watershed, these fish could be transported by anglers or others to Aravaipa Creek or adjacent tributary loach minnow habitat, or into habitat on the San Francisco River.

Nonnative fish could also disperse into loach minnow habitat via drainages that may carry ephemeral flows during storm events. Introduction of fish is of particular concern on Aravaipa Creek where relatively few nonnative fishes occur. However, introduction of nonnatives into the San Francisco River, especially species that do not current occur there, could cause extirpation of loach minnow.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline.

Cumulative effects to loach minnow in Aravaipa Creek include ongoing activities in the watershed such as livestock grazing and associated activities outside of the allotments addressed herein, such as irrigated agriculture, groundwater pumping, stream diversion, bank stabilization, channelization without a Federal nexus, and recreation. Some of these activities, such as irrigated agriculture are declining and are not expected to contribute substantially to cumulative long-term adverse impacts on loach minnow.

Other activities, such as recreation are increasing. Members of the Aravaipa Property Owners' Association report (pers. comm. 1993) increasing amounts of non-wilderness recreation use along Aravaipa Creek. Because most of the stream bottom below the wilderness is privately owned, a potential exists for increasing residential or commercial use of the area. Increasing recreational, residential, or commercial use of the private lands along the creek would likely result in increased cumulative adverse effects to the loach minnow through increased water use, increased pollution, and increased alteration of the streambanks through riparian vegetation suppression, bank trampling, and erosion. An increase in human structures in the area would likely lead to more bank stabilization and channelization, changing the availability and quantity of suitable loach minnow habitat.

Within the project area, lands along the San Francisco River is a mix of Bureau, State, and private lands (Appendix 1). Upstream of the project area, most of the river is administered by the Apache-Sitgreaves National Forest. Non-Federal activities such as grazing and road construction and maintenance occur on the State and private lands. Recreation in the area is light and in general has a minor impact on the river. Private lands are used almost entirely for livestock grazing, which is managed in conjunction with grazing on Federal allotments.

Effectiveness of Proposed Mitigation

The Bureau proposes substantial measures to reduce potential adverse effects of the proposed action. In particular, the Bureau proposes to eliminate direct effects of grazing in riparian areas of Aravaipa Creek and the San Francisco River that may jeopardize the continued

existence of the loach minnow. According to the Bureau's proposed action, this may include elimination of grazing. The Bureau states that construction of a fence on the San Francisco River to exclude cattle would be difficult because of land ownership patterns and topography, and that maintenance of such a fence would be impossible (Bureau 1997c). However, the Apache-Sitgreaves National Forest recently fenced and successfully excluded cattle from the San Francisco River immediately upstream of the project area. The Service believes that excluding cattle from the Bureau lands on the San Francisco River would indeed by difficult, but is not impossible or unreasonable. Such fencing may be the only way to meet the Bureau's project objective of eliminating the direct effects of grazing that may jeopardize the continued existence of the razorback sucker.

The Bureau also proposes to work with the Service to evaluate risk of nonnative fish introduction due to stock tanks construction, operation and maintenance, and to take action to limit that risk; and Bureau lands within allotments in the Aravaipa watershed and the San Francisco River watershed above Clifton would be maintained or improved, including taking action to improve areas in fair condition. In addition, the Bureau proposes to cooperate with Arizona Game and Fish Department and the Service on development of site-specific measures to protect loach minnow. The Bureau (1996a) provided a list of possible site-specific measures, which included possibly deferring grazing in riparian areas of the Quintana, Brandenberg Mountain, Red Hickey Hills, and San Francisco allotments, eliminating nonnative fish from stock tanks, implementation of a prescribed fire plan in the semi-desert grassland portions of watersheds containing loach minnow habitat, and other possible activities.

Several other components of the Bureau's proposed action tend to limit the nature and extent of adverse effects to loach minnow. The most important of these are implementation of the Upland Livestock Utilization Standard, Riparian Area Policy, Drought Policy, and the Arizona Standards and Guidelines.

Prompt and thorough implementation of the proposed mitigation measures will be imperative to reduce or eliminate what the Service believes are very serious threats to the loach minnow.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of the loach minnow. We present this conclusion for the following reasons.

1. The Bureau proposes substantial measures that largely reduce or eliminate the adverse effects of the grazing program.

2. No trailing or grazing of cattle that would jeopardize the continued existence of the loach minnow would occur in loach minnow habitat on Bureau lands in the San Francisco River or

Aravaipa Creek. Measures to minimize adverse effects could include removal of cattle from these riparian systems.

3. On Bureau lands within the allotments and in the watersheds of Aravaipa Creek or the San Francisco River, a process would be implemented to reduce or eliminate the threat of nonnative fish introduction posed by stock tanks.

4. Watershed condition would be improved or maintained on Bureau lands in the allotments in the watershed of Aravaipa Creek and in the watershed of the San Francisco River on the San Francisco and Red Hickey Hills allotments.

CONCLUSION

After reviewing the current status of the loach minnow, the environmental baseline for the action area, the anticipated effects of the proposed grazing program, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the loach minnow. Critical habitat designated for loach minnow has been set aside and enjoined from enforcement; thus no consultation is required for the effects of the proposed action on critical habitat.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

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

AMOUNT OR EXTENT OF TAKE

Take of loach minnow is anticipated as a result of 1) trampling, ingestion, or other direct effects of grazing or trailing in the riparian zone of the San Francisco River and Aravaipa Creek, 2) construction of any fences across Aravaipa Creek or the San Francisco River, 3) maintenance of existing stock tanks that could provide habitat for nonnative fish and facilitate introduction of nonnative fish to Aravaipa Creek and the San Francisco River, and 4) activities in the watershed, such as livestock grazing, prescribed fire, vegetation management, and construction of range improvement projects that may cause watershed degradation and subsequent changes in sedimentation rates, riparian vegetation, and hydrology, and subsequent increased mortality or injury of loach minnow.

The anticipated level of loach minnow incidental take cannot be directly quantified because of the rapid population fluctuations inherent in loach minnow populations, changes in instream habitat distribution over time, the uncertain extent and location of project-level components of the proposed action, such as prescribed fire and range improvement projects, and uncertainties regarding direct effects of such activities on loach minnow. Therefore, anticipated levels of incidental take are indexed to the total fish community and habitat. Anticipated take will be considered to have been exceeded if: 1) immediate action is not taken to remove any unauthorized cattle found on Bureau administered lands in the riparian corridor of Aravaipa Creek and the San Francisco River, and 2) range condition in the allotments in Table 11 and in the watershed of the San Francisco River in the San Francisco, Red Hickey Hills, and Metcalf allotments deteriorates below that shown in Table 5, and cattle grazing cannot be ruled out as a cause of the deterioration.

This biological opinion does not authorize any form of take not incidental to implementation of the Safford/Tucson Field Offices' grazing program. If the incidental take authorized by this opinion is exceeded, the Bureau must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim, the Bureau must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. The Bureau should provide to this office an explanation of the cause of the taking.

EFFECT OF THE TAKE

In this biological opinion, the Service finds the anticipated level of take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

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

1. Action shall be taken to eliminate direct effects of grazing on the loach minnow in the San Francisco River and Aravaipa Creek.

2. The Bureau shall coordinate with the Service to ensure that project-level activities are designed to minimize take of loach minnows.

3. Measures shall be included in project-level activities to reduce take of loach minnows to the extent possible.

4. The Bureau shall monitor grazing activities and incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regard to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. With the exception of measure (a), the Bureau's mitigation measures for loach minnow are included here by reference. Terms and conditions are nondiscretionary.

The following term and condition implements reasonable and prudent measure number 1:

a. No grazing of cattle shall occur on Bureau-administered lands in the riparian corridors of Aravaipa Creek or on the San Francisco River in the San Francisco and Red Hickey Hills allotments through the life of the project (December 31, 2006). Actions shall be taken, including fencing, monitoring for and removal of trespass cattle, and other measures to ensure grazing does not occur on Bureau lands in Aravaipa Creek or the San Francisco River on the San Francisco (4002) and Red Hickey Hills (4005) allotments.

b. Trailing of cattle in loach minnow habitat shall be limited to 10 cattle through Aravaipa Creek on the Hell Hole allotment no more than three times per year, and trailing along the San Francisco River in the San Francisco allotment for no more than 0.25 mi and no more than twice a year. Photos of typical effects of trailing shall be taken in both the Hell Hole allotment and the San Francisco allotment. Trailing shall be conducted so that 1) cattle are present for the shortest period of time possible in riparian/aquatic areas, 2) the shortest route across the stream/river is taken, 3) trailing across streams/rivers is conducted as infrequently as possible, and 4) whenever possible, trailing is conducted when bankline soil moisture is relatively low.

The following term and condition implements reasonable and prudent measure number 2:

A mitigation plan shall be developed by the Bureau in coordination with the Service for each range improvement project that may adversely affect the loach minnow or its habitat, prescribed fire, and vegetation management project in the allotments in Table 11 and

in the San Francisco River watershed in the San Francisco, Red Hickey Hills, and Metcalf allotments. Mitigation plans for prescribed fire shall limit to the extent practicable the possibility that fire would spread to Aravaipa Creek or the San Francisco River. Mitigation plans shall be approved by the Service.

2. The following terms and conditions implement reasonable and prudent measure number 3:

a. All reasonable efforts shall be made to minimize disturbance within the wetted areas of Aravaipa Creek and its tributary channels, and the San Francisco River.

b. The Bureau shall authorize no off-road use of heavy equipment during project activities within the wetted areas of Aravaipa Creek and the San Francisco River.

c. All reasonable efforts shall be made to ensure that no pollutants enter surface waters during action implementation.

d. Grazing in allotments in Table 11 and the San Francisco, Red Hickey Hills, and Metcalf allotments shall strictly adhere to the Bureau's Arizona Standards and Guidelines, the Upland Livestock Utilization Standard, Safford Drought Policy, Arizona Ephemeral Grazing Policy, and Riparian Area Policy.

3. The following terms and conditions implement reasonable and prudent measure number 4:

a. Inventory, monitoring, and evaluations as described in the Bureau's proposed action (Bureau 1996a) and applicable sections of the Bureau Manual shall be conducted in the allotments in Table 11 and in the watershed of the San Francisco River in the San Francisco, Red Hickey Hills, and Metcalf allotments.

b. The Bureau shall submit annual monitoring reports to the Arizona Ecological Services Field Office by March 15 of each year beginning in 1998. These reports shall summarize for the previous calendar year: 1) the effectiveness of these terms and conditions, and 2) documentation of take, if any. If such activities or monitoring occur, summaries shall also be included of 1) grazing actions initiated or completed including range improvement projects, prescribed fires, and vegetation management in the allotments in Table 11 and in the San Francisco River watershed in the San Francisco, Red Hickey Hills, and Metcalf allotments; 2) allotment monitoring results; 3) fish monitoring data, including numbers and locations of loach minnow observed, presence of nonnative fish, etc.; 4) riparian, stream channel photopoint, channel geomorphology transects, and other monitoring data collected; 5) photo documentation of effects of trailing, and 6) records of downed or damaged exclosure fencing or incidents of cattle within the Bureau-administered riparian corridors of Aravaipa Creek and the San Francisco River, and action taken to remove the cattle. The report shall also make recommendations for modifying or refining these terms and conditions to enhance loach minnow protection or reduce needless hardship on the Bureau and its permittees.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for loach minnow. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau should develop and implement a prescribed fire plan to enhance watershed function in the semi-desert grasslands of the Aravaipa and San Francisco River watersheds.

2. The Bureau should conduct surveys for the loach minnow in the San Francisco River through the San Francisco and Red Hickey Hills allotments and report to the Service the findings of such surveys.

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

(Note: capture or collection of fish requires appropriate permits from Arizona Game and Fish Department and, for listed species, from the Service).

Razorback Sucker
STATUS OF THE SPECIES

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

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

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

The razorback sucker is the only representative of the genus *Xyrauchen* and was described from specimens taken from the "Colorado and New Rivers" (Abbott 1861) and Gila River (Kirsch 1889) in Arizona. This native sucker is distinguished from all other suckers by the sharp-edged, bony keel that rises abruptly behind the head. The body is robust with a short and deep caudal peduncle (Bestgen 1990). The razorback sucker may reach lengths of more than three ft and weigh 11 to 13 pounds (Minckley 1973). It is a long lived species, reaching the age of at least the mid-40's (McCarthy and Minckley 1987).

Life history information for the razorback sucker was recently summarized by Bestgen (1990), Minckley and Deacon (1991), and in the biological support document for critical habitat designation (Service 1993d). The life history information presented in this biological opinion is primarily taken from these sources.

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

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

Spawning takes place in the late winter to early summer depending upon local water temperatures. Various studies have presented a range of water temperatures at which

spawning occurs. In general, temperatures between 50° and 68°F are appropriate for spawning (summarized in Bestgen 1990). Spawning areas include gravel bars or rocky runs in the main channel (Tyus and Karp 1990), and flooded bottomlands (Osmundson and Kaeding 1989). There is an increased use by adults of higher velocity waters in the spring, although this is countered by movements into warmer, shallower backwaters and inundated bottomlands in early summer (McAda and Wydoski 1980, Tyus and Karp 1989, Osmundson and Kaeding 1989).

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

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

The razorback sucker was listed as an endangered species due to declining or extirpated populations throughout the range of the species. The causes of these declines are changes to the biological and physical features of the habitats. Tyus and Karp (1989) and Osmundson and Kaeding (1989) considered that cumulative environmental impacts from competition with and predation by nonnative fish, high winter flows, reduced high spring flows, seasonal changes in river temperatures, and lack of inundated shorelines and bottomlands are factors that potentially limit the survival, successful reproduction, and recruitment of the razorback sucker. The effects of these changes have been most clearly noted by the almost complete lack of natural recruitment to any population in the historic range of the species. Populations are generally small and composed of aging adults.

Recovery efforts under the Recovery Implementation Program in the Upper Colorado River Basin have begun but significant recovery results have net yet been achieved. In the Lower Colorado River Basin, efforts to reintroduce the species to the Gila, Salt and Verde rivers have not been successful in establishing self-sustaining populations. Reintroduction efforts

continue in the Verde River. Augmentation programs along the lower Colorado River are working to replace the aging razorback sucker populations in Lakes Havasu and Mohave with young fish from protected-site rearing programs. These activities may prevent the imminent extinction of the species in the wild, but appear less capable of ensuring long-term survival or recovery. Overall, the status of the razorback sucker in the wild continues to decline.

ENVIRONMENTAL BASELINE

Within the project area, razorback suckers likely occur in small numbers in the Gila and San Francisco rivers, and in Bonita and Eagle creeks. Historically, the razorback sucker was found at least as far upstream as Fort Thomas but was extirpated by the late 1970's. Hundreds of thousands of small razorback suckers were released into the Gila River, Bonita Creek, and Eagle Creek from 1981 through 1987 (Bureau 1996a); however, these releases have not been successful in establishing a self-sustaining population. No razorback suckers were found during preliminary surveys of the Gila River in 1991. However, the Bureau (1996a) reported a large razorback sucker found on Bonita Creek in 1991. It is likely that small or very small numbers of the released razorback suckers survived in the Gila River, Eagle Creek, and Bonita Creek in the project area. Fish may have also moved upstream onto the San Francisco River. In the project area, critical habitat was designated for the razorback sucker in 1994 on the Gila River and its 100-year floodplain from the Arizona-New Mexico border to Coolidge Dam, including San Carlos Reservoir.

Both the Gila and San Francisco rivers rise in western New Mexico and flow south and west to their confluence in the upper end of the Gila Box RNCA. Both Bonita and Eagle creeks flow south from their origins south of the Mogollon Rim. Considerable information on the physical, chemical and biological attributes of the general area of the Gila Box NRCA is available in the 1979 Resource Inventory for the Gila River Complex, Eastern Arizona (Minckley and Sommerfield 1979). Information from this source is incorporated by reference.

The Gila River and its tributaries, Eagle Creek, Bonita Creek, and the San Francisco River are largely perennial with mean discharges of 183 cfs for the Gila River at Clifton, 187 cfs for the San Francisco River at Clifton, and 42 cfs for Eagle Creek. Bonita Creek is not gauged (Arizona State University 1979). Flood flows in excess of 140,000 cfs have been reported on the San Francisco and Gila rivers through the project area (Arizona State University 1979). Vegetation in the watershed of the Gila basin in the project area is a mosaic of communities from Petran subalpine conifer forest at the highest elevations to Sonoran Desert scrub along the lower elevations of the Gila River Valley (Brown 1982a). Desert scrub and semidesert grasslands predominate in the Bureau allotments in this area.

The Gila River is subject to the effects of Federal, State and private actions. There are both new and long-term ongoing actions in the action area. Impacts of these human activities on the Gila River watershed have had profound effects on the river and associated riparian areas. Water diversions and return flows, flood control projects, livestock grazing, timber

harvest, recreational activities, and changes in annual flows due to off-stream uses of water have impaired the ability of the aquatic habitats to support native fish. For the most part, the effects of most Federal activities on fish habitat did not undergo section 7 consultation due to the lack of listed species in the area until 1991, but the probable effects of these types of activities on habitat for razorback sucker have been documented in other areas. The reconstruction of the City of Safford's water supply system has been recently the subject of section 7 consultation. Significant effects to the riparian and aquatic habitats along Bonita Creek resulted from this action. Development and implementation of a restoration plan was required in the biological opinion. The Service also consulted with Federal Highways Administration in regard to the Solomon bridge construction at the Sanchez Crossing and found that the action would not jeopardize the continued existence of the razorback sucker nor destroy or adversely modify critical habitat. Consultations with the Bureau on the razorback sucker in the project area are listed in Table 2 and discussed in the "CONSULTATION HISTORY."

In the chronicles of the 1540-1542 expedition of Francisco Vasquez de Coronado, the Gila River from near the confluence with the San Pedro River to Geronimo was described as a deep and reedy stream (Calvin 1946). In the early 1800's the Gila River in eastern Arizona was described as "beautiful, running between banks covered with tall cottonwoods and willows. This bottom land extended back a mile on each side. Beyond rose high and rather barren hills" (Pattie 1962). On a 15-mile reach of the Gila River from the confluence with the San Carlos River to Bylas, just upstream of the project area, Turner (1974) documented a conversion from riparian forests of cottonwood, willow, seep willow, and other native species to a community dominated by saltcedar. Turner noted that the channel in this area had changed from narrow (pre-1900) to broad (early 1900) to narrow (1960). Floods in the early 1900s likely caused a widening of the channel at that time. The channel again widened after flooding from 1965-1967 (Arizona State University 1979). Flooding since 1970 has caused additional changes in vegetation communities (Qi 1995).

Although there are no major facilities that regulate flows upstream of San Carlos Reservoir, many canals and diversions are present in the Gila basin. Portions of the flow in Eagle Creek is diverted at a low-head dam to Morenci for domestic and industrial purposes. Flows are similarly diverted from Bonita Creek for use by the City of Safford. In the Safford Valley, groundwater pumping has lowered the water table along the Gila River up to 25 feet (Lilburn and Associates 1984). A four-wheel drive road runs the length of the San Francisco River above Clifton and includes numerous crossings (see "ENVIRONMENTAL BASELINE" for loach minnow). Mining is historically significant in the area, particularly in the Clifton-Morenci area (Arizona State University 1979). Downstream of San Jose the river bottom is largely privately-owned; much of it is developed for agriculture and ranching.

With the exception of upper Bonita Creek, razorback sucker habitat in the project area supports populations of several species of nonnative fish. These fish prey on and/or compete with razorback suckers, limiting the potential for self-sustaining populations (Minckley et al. 1991, Service 1993d, Bureau 1996a).

Large scale grazing in the Gila River watershed began in the early 1870's. Overgrazing followed by drought in the 1890's resulted in reduction in range capacity and reduced numbers of cattle. Today, in many areas of the Gila watershed grazing is the only significant human-caused disturbance (Arizona State University 1979). In 1979, Arizona State University noted "far greater development of vegetation" in areas farther than 3.2 to 4.8 mi from water sources or on steep slopes and rugged terrain, and attributed this to grazing. At that time cattle were preventing cottonwood seedling survival in Bonita and Eagle creeks, and on the Gila and San Francisco rivers. Vegetative reproduction by sycamores was similarly suppressed. In contrast, recent photos of lower Eagle Creek and the Gila River submitted to the Service by an applicant, show good recruitment of cottonwoods and willows in the areas photographed, suggesting conditions may have improved (August 18, 1997, letter from Jeff Menges' attorneys to the Service, Phoenix, AZ).

Currently, four miles of the Gila River is grazed yearlong (Morenci allotment), 17 miles have been deferred, and four miles are grazed in the winter and spring (Smugglers Peak allotment) (Bureau 1996a). Riparian grazing on the Morenci allotment will be deferred within three years, but currently 75 head of cattle use the Gila River (Bureau 1996a). The Bureau (1996a) suggests that excluding cattle from the Gila River will be difficult in this allotment because cattle trespass onto the Gila River from private lands in the allotment on Eagle Creek. However, in 1996 the Bureau received a Water Protection Fund grant to construct a fence across Eagle Creek. Despite trespass cattle, Jeff Menges, the permittee on the Smuggler Peak and Zorilla allotments reports that since implementing a winter grazing system on the Gila River, cottonwood and willow recruitment has been excellent (August 7, 1997, letter from Jeff Menges to the Service, Phoenix, AZ).

As discussed in the "EFFECTS OF THE PROPOSED ACTION" for loach minnow, cattle grazing occurs in the river bottom of the San Francisco River on the Red Hickey Hills and San Francisco allotments; however, the Bureau (1996a) states that the permittees do not prefer to graze cattle in the river bottom because they lose livestock downstream. Grazing is apparently suppressing riparian vegetation development on the San Francisco allotment (Csargo and Myers 1996). Winter grazing currently occurs on approximately 3.5 miles of Bonita Creek (Bureau 1997c). Grazing in eight miles of Bonita Creek is deferred, a reach that is "largely free of grazing impacts" (Bureau 1996a). Grazing occurs on private lands along Eagle Creek. The Bureau does not administer any lands on Eagle Creek and therefore does not authorize grazing activities in the wetted areas of Eagle Creek.

Table 8 lists allotments that include portions of streams or rivers where razorback suckers may occur, or that are in the watersheds of rivers and streams where the species may occur. Included are 55 allotments that are within approximately three miles of the Gila or San Francisco rivers, or Eagle or Bonita creeks. Other allotments are in the watersheds of other tributaries or are in the upper watersheds of razorback sucker habitat. The Bureau (1996a) found that 120 allotments under consultation are in the watershed of the Gila River. However, allotments in Table 8 are most likely to affect razorback sucker habitat because of their proximity to aquatic habitat or because they include aquatic habitat. Total Bureau-

administered lands in the allotments in Table 8 is 483,501 acres (Table 3). Bureau acres in excellent, good, fair, and poor range condition in these allotments are 19,418, 274,250, 151,214, and 38,619, respectively (Table 5).

EFFECTS OF THE PROPOSED ACTION

Direct Effects to Razorback Suckers

Effects of livestock grazing on fishes are discussed in detail in the "EFFECTS OF THE PROPOSED ACTION" for the desert pupfish, spikedace, and loach minnow. These discussions are largely applicable here, as well. However, because of the apparent scarcity of razorback suckers in the project area, effects of the livestock grazing program on individual fish or fish populations probably occur infrequently.

Direct effects to fish include trampling of razorback sucker eggs and larval fish, and ingestion of eggs and larval fish by cattle drinking from occupied habitat. Because razorback suckers are rare in the project area, and most eggs and larvae probably fall prey to nonnative fish, the probability of this type of effect to occur is low. Direct effects to fish may also occur as a result of range improvement project construction or vegetation management projects in aquatic habitats of the Gila or San Francisco rivers, or Bonita Creek in the project area. Prescribed fire in the uplands could potentially spread to the riparian zone of occupied aquatic habitat where fire or fire suppression activities could injure or kill razorback suckers.

Indirect Effects to Razorback Suckers through Modification of Habitat

Because razorback suckers are currently very rare in the project area, effects to habitat that subsequently effect individual razorback suckers and thus affect the survival of the species, are unlikely to occur. However, because of the small size of this population and the overall status of the species, any losses to this population caused by the grazing program have an impact on the survival of this already very endangered species. Also of importance is how habitat alteration may affect the recovery potential of this species. A designated critical habitat, the Gila River from the New Mexico border west to Coolidge Dam is one of several reaches of Southwestern rivers that the Service believes is critical to the survival and recovery of the razorback sucker. None of the critical habitat reaches currently support viable, self-sustaining razorback sucker populations. The reason for this, as discussed in "STATUS OF THE SPECIES", is that multiple factors have rendered these habitats largely unsuitable for razorback sucker recruitment. Habitat alteration attributable to grazing activities have contributed to these deteriorated habitat conditions.

Indirect effects to razorback suckers include alteration of habitat that may affect fish survival, reproduction, or other life history parameters. Such effects could occur either in the aquatic habitats occupied by the species or in the watershed. Mechanisms by which project activities may indirectly affect razorback suckers include: 1) watershed alteration; 2) physical destruction and alteration of streambanks, stream channels, and water column; 3) alteration

of the riparian vegetation community; 4) alteration of the faunal community; and 5) effects from associated features of the grazing program, including range improvement projects, mechanical or chemical vegetation management, and prescribed fire. These mechanisms are discussed in detail in the "EFFECTS OF THE PROPOSED ACTION" for the spikedace, are broadly applicable for razorback sucker, and are included here by reference.

Effects to habitat may originate in riparian and aquatic habitats, or in the watersheds of such habitats. Of particular concern is grazing in the Gila and San Francisco rivers, and in Bonita Creek. Four miles of the Gila River in the Morenci allotment is grazed by 75 cattle yearlong. Another four miles of the Gila River in the Smugglers Peak allotment is grazed in winter and spring. Grazing is deferred on another 17 miles of the Gila River. Winter grazing occurs on approximately 3.5 miles and is deferred on another eight miles of Bonita Creek. (Bureau 1996a, 1997c). In the immediate watershed of razorback sucker habitat in the project area, grazing occurs on 483,501 acres of Bureau-administered lands. Percentages of this acreage in excellent, good, fair, and poor condition are 4, 57, 31, and 8. As discussed elsewhere in this opinion, grazing activities on non-Federal portions of allotments are considered interrelated and interdependent to grazing on the Federal portions in allotments in which the Bureau administers more than 30 percent of the land. Range condition on the non-Federal portions of the allotments were not reported by the Bureau (1996a); however, they are likely similar to condition on the Bureau-administered portions of the allotments. Additional acreage in other allotments occurs in the upper portions of these watershed.

Range condition is assumed to be closely correlated with watershed condition and function. The effects of grazing on watersheds and how such effects manifest in razorback sucker habitat are similar to that discussed for spikedace habitat in Aravaipa Creek and are incorporated here by reference. Areas of the watershed in fair or poor condition (189,833 acres of Bureau-administered lands) are of particular concern. Lilburn and Associates (1984) reported the Gila River watershed above Safford is approximately 12,000 mi^2. Allotment acreage from Table 8 is 6 to 7 percent of this total; areas in fair or poor condition are 2.5 percent (note that these percentages would be less if Lilburn's figure included the watershed below Safford). Although a relatively minor portion of the watershed, the allotments in Table 8 include reaches of razorback sucker habitat and/or are in the immediate watershed of these habitats; thus effects of the grazing program are more immediate and less buffered than if the allotments were located in a remote portion of the watershed.

As discussed for spikedace, minor disturbance to watershed function may occur as a result of range improvement project construction. Vegetation management projects should result in improved watershed condition, particularly if such projects are not accompanied by an increase in stocking rates. Prescribed fire could have a dramatic, but temporary effect, causing elevated rates of erosion and runoff; however, prescribed fire would likely result in long-term improvement of watershed condition.

Construction or reconstruction of stock tanks in allotments in or near razorback sucker habitat may facilitate introduction of nonnative fish to habitats of the razorback sucker. Maintenance of existing tanks could also provide habitat for nonnative fish. Most tanks go dry regularly or periodically and do not provide good habitat for fish. However, some tanks are perennial or nearly so and nonnatives could persist for some time in ephemeral waters, as well. Nonnatives are often transported by anglers or others to and from tanks. Fish could also spread to razorback sucker habitat from such tanks via drainages that may flow perennially or ephemerally between the tanks and stream or river habitat. Once into razorback sucker habitat, these nonnative fish would likely prey on any razorback sucker eggs or larvae, or compete with razorback suckers. Of particular concern would be introduction of nonnative fish species not currently in these systems.

Effects to Critical Habitat

Effects analyses for critical habitat must determine if the proposed action would destroy or adversely modify critical habitat. "Destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical (50 CFR 402.02). The primary constituent elements identified as necessary for the survival and recovery of the razorback sucker are (Service 1994c):

> **Water.** This includes a quantity of water of sufficient quality (i.e. temperature, dissolved oxygen, lack of contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage of the razorback sucker.
>
> **Physical Habitat.** Including areas of the Colorado River system (including the Gila River drainage system in the project area) that are inhabited or potentially habitable by razorback suckers for use in spawning, nursery, feeding, and rearing, or corridors between these areas. In addition to river channels, these areas also include bottom lands, side channels, secondary channels, oxbows, backwaters, and other areas in the 100-year floodplain, which when inundated provide spawning, nursery, feeding, and rearing habitats, or access to these habitats.
>
> **Biological Environment.** Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation and competition, although considered normal components of this environment, are out of balance due to introduced nonnative fish species in many areas.

Indirect effects described above affect critical habitat on the Gila River. Cattle grazing within critical habitat can adversely affect those habitats regardless of the season in which grazing occurs. Physical damage to streambanks and channels in conjunction with loss or reduction of riparian vegetation may change the timing and magnitude of streamflow (Stabler 1985, Meehan 1991). Flood flows may increase in volume and decrease in duration, and low flows may decrease in volume and increase in duration. Cattle trampling and grazing of the riparian corridor make banks and vegetation more susceptible to severe damage during catastrophic flooding (Platts et al. 1985).

Reduction in aquatic habitat complexity due to livestock grazing effects is one of the most important adverse effect to razorback sucker critical habitat. Habitat complexity allows partitioning of habitat among the various fish species and their life stages. Reduction of habitat complexity increases inter-species and inter-lifestage conflicts. It also exacerbates the adverse effects of generalistic nonnative species on native species (Bestgen 1986, Rinne and Minckley 1991, Baltz and Moyle 1993, Douglas et al. 1994). Most nonnative species in razorback sucker habitat are predatory and decreased habitat complexity results in decreased hiding cover, thus making predator-naive native species, such as the razorback sucker, more vulnerable to predation (Minckley 1983, Fraser et al. 1987). Cover is also an important factor in the ability of fish species to avoid adverse effects from flooding (Bulkley and Pimentel 1983, Meffe 1984). Livestock grazing and its attendant reduction in habitat complexity make razorback suckers more vulnerable to death and displacement from flooding, at the same time that livestock effects on the watershed and streambanks contribute to increased flood volume, velocity, and abrasive power.

Increased sediment production and transport is probably the most commonly acknowledged effect of livestock grazing (Platts 1990, Meehan 1991, Johnson 1992, Weltz and Wood 1994). Adverse effects of stream sedimentation to fish and fish habitat have been extensively documented (Murphy et al. 1981, Wood et al. 1990, Newcombe and MacDonald 1991, Barrett 1992, Megahan et al. 1992). Excessive sedimentation may cause channel changes that are adverse to razorback suckers. Excessive sediment may smother invertebrates, reducing razorback sucker food production and availability.

Increases in nutrients in streams have been documented to result from livestock grazing (Kauffman and Krueger 1984). Increased nutrients may beneficially affect razorback suckers through increased food production. However, excessive nutrient input and resulting algal growth may result in temporary conditions of oxygen depletion with resulting stress or death to individual razorback suckers.

Cattle presence on streambanks destabilizes streambanks through chiseling, sloughing, compaction, and collapse and results in wider and shallower stream channels (Armour 1977, Platts and Nelson 1985b, Platts 1990, Meehan 1991). This causes progressive adjustments in other variables of hydraulic geometry and results in changes to the configuration of pools, runs, riffles, and backwaters; levels of fine sediments and substrate embeddedness; availability of instream cover; and other fish habitat factors (Bovee 1982, Rosgen 1994). It

also changes the way in which flood flows interact with the stream channel and may exacerbate flood damage to banks, channel bottoms, and riparian vegetation. These effects occur at all levels of cattle presence, but increase as number of livestock and length of time the cattle are present increase (Marlow and Pogacnik 1985). Damage begins to occur almost immediately upon entry of the cattle onto the streambanks and use of riparian zones may be highest immediately following entry of cattle into a pasture (Goodman et al. 1989, Platts and Nelson 1985a). Vegetation and streambank recovery from long rest periods may be lost within a short period following grazing reentry (Duff 1979). Bank configuration, soil type, and soil moisture content influence the amount of damage with moist soil being most vulnerable to damage (Marlow and Pogacnik 1985, Platts 1990). Cattle presence on streambanks retards rehabilitation of previous damage as well as causing additional alteration (Platts and Nelson 1985a).

Grazing and associated activities in the watershed may also adversely affect critical habitat. Watershed effects of grazing are discussed in detail in the "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel and the Pima pineapple cactus. These discussions are relevant to razorback sucker and are incorporated here by reference. Summarizing from those discussions, grazing in the watershed of razorback sucker habitat is expected to cause damage and destruction of cryptobiotic crusts with resulting increased soil erosion, reduced water infiltration, increased runoff, reduced nutrient content of soils (Belnap 1992, Harper and St Clair 1985, Belnap and Gardner 1993), and secondary changes in vegetation communities and loss of vegetation cover (Menke 1988). Hoof action on soils and grazing of shrubs and grasses is also expected to result in elevated soil erosion and runoff, reduced water infiltration, changes in vegetation communities, and loss of vegetation cover (Klemmedson 1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Webb and Stielstra 1979, McClaran and Anable 1992). Although the way in which these factors would manifest and the magnitude of their effect in the watershed would depend on local site conditions such as soils, vegetation communities, precipitation, and slope, watershed effects of grazing are generally expected to be more evident where stocking levels are high and rangelands are in fair or poor condition. As discussed, 189,833 acres of Bureau-administered lands in the immediate watershed of razorback sucker habitat are in poor or fair condition.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed action. Effects of past Federal and private actions are considered in the Environmental Baseline.

Many activities without a Federal nexus occur and are expected to continue to occur in potential habitat of the razorback sucker and in the watersheds of such habitat through the project area. Farming and ranching activities occur in the bottom of the Gila River,

particularly downstream of the San Jose Diversion. Groundwater pumping in the Safford area threatens the baseflow of the Gila River. Livestock grazing on the private and State lands portions of the Bureau allotments as well as outside of allotments has the same effects as those described here but are not subject to consultation. Water diversions, agricultural return flows, flood control and channelization projects, recreational activities, particularly in the riverbottoms, all are expected to occur outside of section 7 consultations. Most activities in the watersheds of the Gila and San Francisco rivers, or in Bonita Creek, will likely be Federal actions requiring consultation due to the extent of Federal lands (Bureau and Forest Service) in the project area.

Effectiveness of Proposed Mitigation

The Bureau proposes substantial measures to eliminate or reduce most of the potential adverse effects of the proposed action. Most notably, the Bureau proposes to eliminate direct effects of grazing that may jeopardize the continued existence of the razorback sucker on Bureau-administered lands of the Gila River, and the riparian corridors of Bonita Creek, and the San Francisco River. Measures to eliminate such effects may include exclusion of cattle. The Bureau stated that fencing the Gila River through the Smuggler Peak allotment to exclude cattle is unreasonable as a means to eliminate direct effects (Bureau 1997c); however, with limited trailing across the river the permittee would still have access to upland areas of the allotment. The Bureau also believes that construction of an exclosure fence on the San Francisco River would be difficult because of the land ownership pattern and rough topography, and that maintenance of such a fence would be impossible (Bureau 1997c). The Apache-Sitgreaves National Forest recently constructed a fence that successfully excludes cattle from the San Francisco River immediately upstream of the project area. The Service believes that construction and maintenance of an exclosure fence on the Bureau portion of the river would indeed be difficult, but is not impossible, and may be the only way to eliminate direct effects that may jeopardize the continued existence of the razorback sucker.

The Bureau also proposes to work with the Service to evaluate risk of nonnative fish introduction and take action to limit that risk from stock tank construction, maintenance, and operation; implement actions to improve the condition of watersheds; and develop and implement mitigation plans approved by the Service for prescribed fire, vegetation management, and range improvement projects. In addition, the Bureau proposes to cooperate with the Service, Arizona Game and Fish Department, National Park Service, the Forest Service, Arizona State Lands Department, the San Carlos Apache Tribe, and private land owners within the upper Gila River watershed to seek and implement solutions to problems involving recovery of the razorback sucker. If determined by this aforementioned group to be necessary, the Bureau may conduct surveys for razorback suckers and nonnative fish, eliminate nonnative fish populations in stock tanks found to be a threat to razorback suckers, and on allotments that are determined to have unacceptable effects on the razorback sucker, implement grazing strategies that will reduce the identified impacts to a mutually acceptable level. These grazing strategies may include changes in season of use, stocking levels, or

grazing systems; construction, relocation, or removal of range improvements; or complete deferment of grazing on allotments or portions of allotments.

Several other components of the Bureau's proposed action tend to limit the nature and extent of adverse effects to the razorback sucker and its habitat. The most important of these are implementation of the Upland Livestock Utilization Standard, Riparian Area Policy, Drought Policy, and the Arizona Standards and Guidelines.

Prompt and thorough implementation of the Bureau's mitigation measures are imperative to eliminate or reduce what the Service believes are very serious threats to the razorback sucker and its critical habitat.

SUMMARY OF EFFECTS

The Service believes the effects described above are neither likely to jeopardize the continued existence of the razorback sucker nor likely to result in adverse modification or destruction of critical habitat. We present this conclusion for the following reasons:

1. The Bureau proposes substantial measures that eliminate or reduce the adverse effects of the action to the razorback sucker and its critical habitat.

2. The Bureau proposes to eliminate direct effects of grazing that may jeopardize the continued existence of the razorback sucker on Bureau lands in the project area.

3. The Bureau proposes to work with the Service to limit possible risks of nonnative fish introduction as a result of stock tank construction, operation, and maintenance.

4. The Bureau proposes to take action to ensure that range condition does not deteriorate on Bureau lands in the watershed of razorback sucker habitat, and to improve range condition in areas of fair or poor condition.

5. Numbers of razorback suckers in the project area are likely very low due to predation by nonnative fish and degraded habitat conditions.

CONCLUSION

After reviewing the current status of the razorback sucker, the environmental baseline for the action area, the anticipated effects of the proposed grazing program, and cumulative effects, it is the Service's biological opinion that the proposed action is neither likely to jeopardize the continued existence of the razorback sucker nor likely to destroy or adversely modify critical habitat designated for the species.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

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

AMOUNT OR EXTENT OF TAKE

Take of razorback sucker is anticipated as a result of 1) direct effects of grazing in the riparian zones of the Gila and San Francisco rivers, and Bonita Creek, 2) construction of any fences across the Gila River or other potentially suitable habitat, 3) construction, operation, and maintenance of stock tanks that could provide habitat for nonnative fish and facilitate introduction of nonnative fish to the Gila River or other potentially suitable habitat, 4) activities in the watershed, such as livestock grazing, prescribed fire, vegetation management, and construction of range improvement projects that may cause watershed degradation and subsequent changes in sedimentation rates, riparian vegetation, and hydrology, and subsequent increased mortality or injury of razorback sucker.

The anticipated level of incidental take cannot be directly quantified because of presumed very low numbers of razorback suckers in the project area, potentially rapid population fluctuations inherent in fish populations, changes in instream habitat distribution over time, the uncertain extent and location of project-level components of the proposed action, such as prescribed fire and range improvement projects, and uncertainties regarding effects of such activities on razorback suckers. Therefore, anticipated levels of incidental take are indexed to the total fish community and habitat. Anticipated take will be considered to have been

exceeded if: 1) immediate action is not taken to remove, as soon as possible, any cattle found on Bureau-administered lands in the riparian corridors of the Gila or San Francisco rivers, and Bonita Creek, and 2) long-term trends in range condition in the allotments in Table 8 deteriorates, and cattle grazing cannot be ruled out as a cause of the deterioration.

This biological opinion does not authorize any form of take not incidental to implementation of the Safford/Tucson Field Offices' grazing program. If the incidental take authorized by this opinion is exceeded, the Bureau must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim, the Bureau must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. The Bureau should provide to this office an explanation of the cause of the taking.

EFFECT OF THE TAKE

In this biological opinion, the Service finds the anticipated level of take is neither likely to result in jeopardy to the species nor in destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

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

1. The Bureau shall take action to eliminate or greatly reduce direct effects of grazing in the riparian and aquatic habitats of the razorback sucker.

2. The Bureau shall coordinate with the Service to ensure that project-level activities are designed to minimize take of razorback sucker.

3. Measures shall be included in project-level activities to reduce take of razorback sucker to the extent possible.

4. The Bureau shall monitor grazing activities and incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regard to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. Terms and conditions are nondiscretionary. With the exception of measure (a), the Bureau's mitigation measures for razorback sucker are included here by reference as terms and conditions.

The following term and condition implements reasonable and prudent measure number 1:

a. No grazing of cattle shall occur on Bureau-administered lands in the 100-year floodplain of the Gila River, and the riparian corridors of Bonita Creek and the San Francisco River through the project area for the life of the project (through December 31, 2006). Actions shall be taken, including fencing, monitoring for and removal of trespass cattle, and other measures to ensure grazing do not occur on these lands.

b. Trailing through razorback sucker habitat shall be limited to moving cattle across the Gila River between the Smuggler and Zorilla allotments no more than twice a year, trailing on approximately 0.25 mi of the San Francisco River in the San Francisco allotment no more than twice a year, and trailing on Bonita Creek to move cattle between pastures. Photos documenting typical effects of trailing shall be taken in each area and submitted to the Service in the annual monitoring report described in the mitigation measures. Trailing shall be conducted so that: 1) cattle are present for the shortest period of time possible in riparian/aquatic areas, 2) the shortest route across the river is taken, 3) trailing across riparian/aquatic areas is conducted as infrequently as possible, 4) trailing is conducted when bankline soil moisture is relatively low, whenever possible, and 5) trailing across Bonita Creek is limited to the shortest routes possible, not to exceed 1.5 mi of the creek.

No further terms and conditions are identified to reduce take.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the razorback sucker. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau should develop and implement a prescribed fire plan to enhance watershed function in the semi-desert grasslands of allotments in Table 8.

2. The Bureau should fully implement the Gila Box RNCA Plan.

3. The Bureau should work with owners of non-Federal lands in the allotments in Table 8 to develop cooperative projects to improve watershed condition.

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

(Note: capture or collection of fish requires appropriate permits from Arizona Game and Fish Department and, for listed species, from the Service.)

Southwestern Willow Flycatcher
STATUS OF THE SPECIES

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

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

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

The States of California and New Mexico list the southwestern willow flycatcher as endangered (California Department of Fish and Game 1992, and New Mexico Department of Game and Fish 1988). The State of Arizona considers the southwestern willow flycatcher a species of special concern (Arizona Game and Fish Department 1996). The Service included the southwestern willow flycatcher on its Animal Notice of Review as a category 2 candidate species on January 6, 1989 (Service 1989c). A proposal to list the southwestern willow flycatcher as endangered, with critical habitat, was published on July 23, 1993 (Service 1993e), and a final rule without critical habitat was published on February 27, 1995 (Service 1995a), becoming effective on March 29, 1995. Critical habitat was designated in a Federal Register notice published July 22, 1997 (62 FR 39129-39147, also see correction at 62 FR 44228).

Life History

The southwestern willow flycatcher forages within and above dense riparian vegetation, taking insects on the wing or gleaning them from foliage (Wheelock 1912, Bent 1960). No information is available on specific prey species; however, fecal samples containing identifiable invertebrate body parts were collected during banding operations from more than 70 southwestern willow flycatchers in California, Arizona, and southwestern Colorado (Mark Sogge, U.S. Geological Survey, Flagstaff, AZ, pers. comm. 1996). These samples could yield important data on prey use at various locations and timing throughout the breeding season.

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

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

Whitfield, who has accumulated the largest data set on southwestern willow flycatchers, reported the following data on survivorship of adults and young: of 58 nestlings banded since 1993, 21 (36 percent) returned to breed; of 57 birds banded as adults (after hatch year) since 1989, 18 (31 percent) returned to breed at least one year (10 males, eight females), five (nine percent) returned to breed for two years (all males), and two (3.5 percent) returned to breed for three years (M. Whitfield, Kern River Preserve, California, pers. comm., 1996).

Whitfield (1995) also documented statistically significant variation in return rates of juveniles as a function of fledging date; approximately 21.9 percent of juveniles fledged on or before July 20th returned to the study area the following year, whereas only 6.4 percent of juveniles fledged after July 20th returned the following year.

Walkinshaw (1966), who studied *E.t. traillii* in Michigan, estimated that 40.9 percent of the males at his study site returned to breed for at least two years, 22.7 percent returned for at least three years, 13.6 percent returned for at least four years, and at least 4.5 percent returned during their fifth year. Female return rates were substantially lower. Only 22.6 percent returned to breed for one year. Whitfield and Walkinshaw do not incorporate potential emigration rates into their estimates of returns and, thus, may underestimate actual survivorship. However, these data are consistent with survival rates for other passerines (Gill 1990, chapter 21), suggesting that the life span of most southwestern willow flycatchers is probably two to three years (i.e. most flycatchers survive to breed one or two seasons).

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

Habitat Use

The southwestern willow flycatcher breeds in dense riparian habitats from sea level in California to over 7,000 ft in Arizona and southwestern Colorado. Throughout its wide geographic and elevational range, its riparian habitat can be broadly described based on plant species composition and habitat structure (Sogge et al. 1997). These attributes are among the most conspicuous components of flycatcher habitat, but not necessarily the only important components. They are easily identified from photographs or during field visits and have been useful in conceptualizing, selecting, and evaluating suitable survey habitat. Photographs

and accompanying text provided in Sogge et al. (1997) characterize the considerable variation in habitat structure and plant species composition found at breeding sites throughout the southwestern willow flycatcher's range. Two components that vary less across this subspecies' range are vegetation density and the presence of surface water. Those and other characteristics, such as size and shape of habitat patches, are described further below.

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

Monotypic willow: Nearly monotypic, dense stands of willow (often *S. exigua* or *S. geyeriana*) 10 to 23 ft in height with no distinct overstory layer; usually very dense structure in at least lower 7 ft; live foliage density is high from the ground to canopy.

Monotypic nonnative: Nearly monotypic, dense stands of nonnatives such as saltcedar (*Tamarisk* sp.) or Russian olive, *Elaeagnus angustifolia*, 13 to 33 ft in height forming a nearly continuous, closed canopy (with no distinct canopy layer); lower 7 ft may be very difficult to penetrate due to branch density; however live foliage volume may be relatively low from 3 to 7 ft above ground; canopy density uniformly high.

Native broadleaf dominated: Comprised of dense stands of single species (often Goodding's or other willows) or mixtures of native broadleaf trees and shrubs including, but not limited to, cottonwood, willows, boxelder, ash, buttonbush, and stinging nettle from 13 to 50 ft in height; characterized by trees of different size classes; may have distinct overstory of cottonwood, willow or other broadleaf species, with recognizable subcanopy layers and a dense understory of mixed species; exotic/introduced species may be a rare component, particularly in understory.

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

There are other potentially important dimensions or characteristics of southwestern willow flycatcher habitat, including: size, shape, and distribution of vegetation patches; hydrology; prey types and abundance humidity); and interspecific competition. Underlying these are factors relating to population dynamics, such as demography (i.e. birth and death rates, age-

specific fecundity), the distribution of breeding groups across the landscape, flycatcher dispersal patterns, migration routes, site fidelity, philopatry, and degree of conspecific sociality (e.g. coloniality). Most of these attributes are not well understood for the southwestern willow flycatcher. However, some of these factors may be critical to understanding current population dynamics and habitat use. For example, characterizations of suitable breeding habitat may be significantly biased if observed patterns of habitat use are influenced by intrinsic dispersal patterns and capabilities rather than overall habitat quality.

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

The size and shape of occupied riparian habitat patches vary considerably. Southwestern willow flycatchers have been found nesting in patches as small as 2 acres (e.g. Grand Canyon) and as large as several hundred acres (e.g. Roosevelt Lake, Lake Mead). When viewed from above, the mixed vegetation types in particular often appear as a mosaic of plant species and patch shapes and sizes. In contrast, narrow, linear riparian habitats one or two trees wide do not appear to contain attributes attractive to nesting flycatchers. However, flycatchers have been found using these habitats during migration.

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

Nest placement and nesting substrate

Southwestern willow flycatcher nests are open cup structures, approximately 3 in high and 3 in wide (outside dimensions), exclusive of any dangling material at the bottom. Nests are typically placed in the fork of a branch with the nest cup supported by several small-diameter vertical stems. The main branch from which the fork originates may be oriented vertically, horizontally, or at an angle, and stem diameter for the main supporting branch can be as small as 1.2 to 1.6 in. Vertical stems supporting the nest cup are typically 0.4 to 0.8 in in diameter. Occasionally, southwestern willow flycatchers place their nests at the juncture of stems from separate plants, sometimes different plant species. Those nests are also characterized by vertically-oriented stems supporting the nest cup. Spencer et al. (1996)

measured the distance between flycatcher nests and shrub/tree center for 38 nests in monotypic saltcedar and mixed native broadleaf/saltcedar habitats. In monotypic saltcedar stands (n=31), nest placement varied from 0.0 (center stem of shrub or tree) to 8.2 ft. In the mixed riparian habitat (n=7), nest placement varied from 0.0 to 10.8 ft.

Nest height relative to the base of nest substrate also varies across the southwestern willow flycatcher's range and may be correlated with height of nest substrate and/or overall canopy height. Table 13 presents data on nest heights in different riparian habitat types across the flycatcher's range. Southwestern willow flycatcher nests have been found as low as 2.0 ft above the ground to 46 ft above the ground. The data presented in Table 13 demonstrate that flycatchers using predominantly native broadleaf riparian habitats nest relatively low to the ground (between 5.9 and 6.9 ft on average), whereas those using mixed native/nonnative and monotypic nonnative riparian habitats nest relatively high above the ground (between 14 and 24 ft).

Historic egg/nest collections and species' descriptions from throughout the southwestern willow flycatcher's range confirm the bird's widespread use of willow for nesting (Phillips 1948, Phillips et al. 1964, Hubbard 1987, Unitt 1987, T. Huels in litt. 1993, San DiegoNatural History Museum 1995). Of the 34 nests found by Brown in 1902 near Yuma on the lower Colorado and Gila rivers, 33 were in Goodding's willow and one was in arrowweed. Data from historic egg collections from southern California and more current studies indicate that 75 to 80 percent of nests were placed in willows (San Diego Natural History Museum 1995). Currently, southwestern willow flycatchers use a wide variety of plant species for nesting substrates. At the monotypic willow stands that characterize high elevation sites in Arizona, Geyer willow was used almost exclusively for nesting (Muiznieks et al. 1994). At the inflow to Lake Mead on the Colorado River, Goodding's willow was the primary nesting substrate (R. McKernan unpubl. data). Along a 20-mile stretch of the Gila River in Grant County, New Mexico, where boxelder is the dominant understory species, 76 percent of flycatcher nests were placed in boxelder, with the remainder in Russian olive and saltcedar on average (Skaggs 1995). At the inflows of Tonto Creek and Salt River to Roosevelt Lake in Gila County, Arizona, both of which are comprised of monotypic stands of saltcedar, 100 percent of flycatcher nests were placed in saltcedar (Muiznieks et al. 1994, Sferra et al. 1995, Spencer et al. 1996). On the San Luis Rey River in San Diego County, California, approximately 90 percent of flycatcher nests were placed in live oak, *Quercus agrifolia*, which became the dominant plant species adjacent to the stream after willows were removed in the 1950s as a water conservation measure and a reservoir upstream reduced flood frequency and streamflow volume (W. Haas, San Diego Natural History Museum, pers. comm., 1995). Other plant species that southwestern willow flycatcher nests have been documented in include: buttonbush, black twinberry, *Lonicera involucrata*, Fremont cottonwood, white alder, *Alnus rhombifolia*; blackberry, *Rubus ursinus*; Russian olive; and *S. hindsiana*.

Table 13. Nest height and nest substrate height data by riparian habitat type for the southwestern willow flycatcher.

Habitat Type	n	Mean Nest Ht Relative to Base of Nest Substrate [ft] ± 1 STD (range)	Mean Nest Substrate Height [ft] ± 1 STD (range)	Source
Monotypic stands of Geyer willow (Apache Co., AZ)	33	5.9 Ý1.0 (3.3 - 7.5)	14 Ý1.6 (11 - 20)	Muiznieks et al. (1994), Sferra et al. (1995) Spencer et al. (1996, 1997)
Mixed native broadleaf, predominantly Goodding's willow (Yuma Co., AZ)	28	6.9 Ý2.6 (3.9 - 16)	-	H. Brown 1902 collections (T. Huels in litt.)
Mixed native broadleaf (Kern Co., CA)	134	6.9 Ý0.3 (2.0 - 33)	18 Ý1.0 (3 - 46)	Whitfield and Strong (1995)
Mixed native broadleaf/saltcedar (throughout AZ)	70	16 Ý5.9 (4.9 - 34.5)	7.4 Ý2.3 (3.5 - 17.0)	Muiznieks et al. (1994), Sferra *et al.* (1995) Spencer et al. (1996, 1997)
Mixed native broadleaf/nonnative (Grant Co., NM)	45	24 Ý12 (6.6 - 46)	41.7 Ý17 (13 - 92)	Skaggs (1995)
Monotypic saltcedar (throughout AZ)	43	14 Ý4.3 (8.9 - 26)	25 Ý6.6 (11 - 39.4)	Muiznieks et al. (1994), Sferra *et al.* (1995) Spencer et al. (1996, 1997)

Territory size

Southwestern willow flycatcher territory size, as defined by song locations of territorial birds, probably changes with population density, habitat quality, and nesting stage. Early in the season, territorial flycatchers may move several hundred feet between singing locations (Sogge et al. 1995, Petterson and Sogge 1996). It is not known whether these movements represent polyterritorial behavior or active defense of the entire area encompassed by singing locations. However, during incubation and nestling phases territory size, or at least the activity centers of pairs, can be very small and restricted to an area less than one acre. Sogge et al. 1995 estimated a breeding territory size of 1.2 acre for a pair of flycatchers occupying a 1.5 acre patch on the Colorado River. Activity centers may expand after young are fledged but while still dependent.

Distribution and abundance

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

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

Overall, Unitt (1987) documented the loss of more than 70 breeding locations rangewide, including locations along the periphery and within core drainages that form this subspecies' range. Unitt estimated that, rangewide, the southwestern willow flycatcher population probably was comprised of 500 to 1,000 pairs. Following is a state by state comparison of historic and current data for the southwestern willow flycatcher. Since 1992 more than 800 historic and new locations have been surveyed rangewide to document the status of the

southwestern willow flycatcher (some sites in southern California have been surveyed since the late 1980s). Survey efforts in most states were done under the auspices of the Partners In Flight program, which served as the coordinating body for survey training sessions and review and synthesis of data. The extensive and, in some cases, intensive nature of these efforts have provided a critical baseline for the current distribution, abundance, and reproductive success of southwestern willow flycatchers rangewide.

California

The historic range of southwestern willow flycatchers in California apparently included all lowland riparian areas in the southern third of the state. It was considered a common breeder where suitable habitat existed (Wheelock 1912, Willett 1912, 1933, Grinnel and Miller 1944). Unitt (1984, 1987) concluded that it was once common in the Los Angeles basin, the San Bernardino/Riverside area, and San Diego County. Specimen and egg/nest collections confirm its former distribution in all coastal counties from San Diego Co. to San Luis Obispo Co., as well as in the inland counties, Kern, Inyo, Mohave, San Bernardino, and Imperial. Unitt (1987) documented that the flycatcher had been extirpated, or virtually extirpated (i.e., few territories remaining) from the Santa Clara River (Ventura Co.), Los Angeles River (Los Angeles Co.), Santa Ana River (Orange and Riverside counties), San Diego River (San Diego Co.), lower Colorado River (Imperial and Riverside counties and adjacent counties in AZ), Owen's River (Inyo Co.), and the Mohave River (San Bernardino Co.). Its former abundance in California is evident from the 72 egg and nest sets collected in Los Angeles County, alone, between 1890 and 1912, and from Herbert Brown's 34 nests and nine specimens taken in June of 1902 from the lower Colorado river near Yuma. Local collections of this magnitude suggest that this subspecies was locally very abundant.

Survey and monitoring efforts since the late 1980s have confirmed the southwestern willow flycatcher's presence at 18 locations on 11 drainages in southern California (including Colorado River). Current known flycatcher breeding sites are restricted to three counties: San Diego, Riverside, Santa Barbara, and Kern. Combining survey data for all sites surveyed since the late 1980s for a composite population estimate, the total known southwestern willow flycatcher population in southern California is 114 territories (Table 14). Of the 18 sites where flycatchers have been documented, 72 percent (13) contain five or fewer territorial flycatchers; 22 percent (four sites) have single pairs, or unmated territorial birds. Only three drainages are known to have 20 or more flycatcher territories: the San Luis Rey River (San Diego Co.), South Fork Kern River (Kern Co.), and Santa Ynez River (Santa Barbara Co.).

Authorized (permitted) and unauthorized activities in riparian habitats continue to adversely affect occupied flycatcher habitat in southern California. For example, approximately 0.6 mi of occupied habitat on the Santa Ynez River in Santa Barbara County was modified or completely eliminated in 1996 when expansion of agricultural fields resulted in clearing of riparian vegetation (Service in litt.). Despite the vast potential for riparian habitat and southwestern willow flycatcher recovery on Camp Pendleton in San Diego County, a programmatic section 7 consultation resulted in a conservation target of 20 southwestern

willow flycatcher pairs (Table 15). The Base currently has approximately 22 pairs of flycatchers, in contrast to the 348 pairs of the sympatric and endangered least Bell's vireo, *Vireo bellii pusillus*, which through the Base's conservation efforts increased from a low of 27 pairs in 1984. Army Corps of Engineers operations of Lake Isabella (Kern County) will result in long-term inundation of the 1,200-acre South Fork Wildlife Area, also proposed critical habitat for the flycatcher. The Wildlife Area represents a significant recovery area occupied by eight to 10 pairs of flycatchers prior to inundation and lies downstream of one of California's largest southwestern willow flycatcher breeding groups on the Kern River Preserve.

Arizona

Historic records for Arizona indicate the former range of the southwestern willow flycatcher included portions of all major river systems (Colorado, Salt, Verde, Gila, Santa Cruz, and San Pedro) and major tributaries, such as the Little Colorado River and headwaters, and White River. Unitt (1987) noted that "probably the steepest decline in the population levels of *extimus* has occurred in Arizona." The bird has been extirpated, or virtually extirpated from the Santa Cruz River (Pima Co.), upper San Pedro River (Cochise Co.), lower San Pedro River at PZ Ranch (Pinal Co.), Blue River (Greenlee Co.), Colorado River at Lees Ferry (Coconino Co.), Colorado River (Yuma Co.), Gila River (Yuma Co.), and Verde River at Tuzigoot Bridge (Yavapai Co.). Currently, 150 territories are known from 39 sites along nine drainages statewide, including the Colorado River (Table 14). As in California, the majority of breeding groups in Arizona are extremely small; of the 39 sites where flycatchers have been documented, 74 percent (29) contain five or fewer territorial flycatchers. Moreover, 15 to 18 percent of all sites in Arizona are comprised of single, unmated territorial birds.

Permitted activities and stochastic events also continue to adversely affect the distribution and extent of occupied and potential breeding habitat throughout Arizona. For example, the Bureau of Reclamation is operating the new conservation space at Roosevelt Lake, which at capacity would totally inundate the riparian stands occupied by Arizona's largest breeding group (Table 15). As a result of Reclamation's operations on the lower Colorado River, the 180-acre Goodding's willow stand at the inflow to Lake Mead has been partially inundated since September 1995. Despite partial inundation, approximately eight pairs of flycatchers were documented nesting at the inflow during the 1996 breeding season. As of April 1997, inundation of that habitat was nearly complete. Reclamation (1996) projected the mortality of that stand sometime during 1997 as a result of prolonged inundation of root crowns (i.e. > two growing seasons).

In June of 1996, a catastrophic fire destroyed approximately 0.6 mi of occupied habitat on the lower San Pedro River in Pinal County. That fire resulted in the forced dispersal or loss of up to eight pairs of flycatchers (Paxton et al. 1996). In June of 1995, approximately three miles of occupied riparian habitat burned on the Gila River in Pinal County (Bureau of Land Management in litt.). It is not known how many flycatchers occupied that location.

Table 14. Rangewide population status for the southwestern willow flycatcher (based on composite of 1993-1995 survey data and 1996 survey data from lower Colorado River)[1].

	No. of Sites with Territories	No of. Drainages with Territories	No. of Sites (Drainages) with È5 Territories	with 6-20 Territories	with >20 Territories	Total No. of Territories
New Mexico	19	8	16 (6)	2 (0)	1 (2)	173
Arizona	39	9	29 (4)	10 (4)	0 (2)	150
California	18	11	13 (8)	3 (1)	2 (3)	114
Colorado	6	5	6 (5)	0 (0)	0 (0)	13
Utah	2	1	2 (1)	0 (0)	0 (0)	2
Nevada	1	1	1 (1)	0 (0)	0 (0)	2
Texas	?	?	?	?	?	?
Total	85	35	67 (24)	15 (4)	3 (7)	454

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

Table 15. Agency actions that have undergone section 7 consultation and levels of incidental take permitted for the southwestern willow flycatcher rangewide.

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

Nevada			
Gold Properties Resort (Clark Co.)	1995	BIA	Harm to 1 flycatcher from habitat loss
New Mexico			
Corrales Unit, Rio Grande (Bernalillo Co.)	*1995*	*Corps*	*None*
Rio Puerco Resource Area	*1996*	*BLM*	*Consultation in process*
Farmington District Resource Management Plan	*1996**	*BLM*	*Consultation in process*
Mimbres Resource Area Management Plan	*1996**	*BLM*	*Consultation in process*

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

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

Approximately 1.2 mi of riparian habitat burned in Graham County in the vicinity of Safford during 1996. It is not known whether that area was occupied by southwestern willow flycatchers; however, it did lie just downstream of an occupied patch that was partially eliminated by Solomon Bridge (Table 15). The anticipated effects of construction of the Solomon Bridge was dispersal of flycatchers into adjacent habitat. The capability of adjacent habitat to absorb that dispersal was compromised by the fire near Safford.

New Mexico

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

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

Unitt (1987), Hubbard (1987), and more recent survey efforts have documented extirpation or virtual extirpation in New Mexico on the San Juan River (San Juan Co.), near Zuni (McKinley Co.), Blue Water Creek (Cibola Co.), and Rio Grande (Dona Ana Co. and Socorro Co.). Survey and monitoring efforts since 1993 have documented 173 flycatcher territories on eight drainages (Table 14). Approximately 135 of these territories occur in remnant strips of riparian forest within a 20-mile stretch of the Gila River in Grant Co (Skaggs 1995). This area contains the largest known breeding group rangewide. This reach of the Gila River is contained by flood-control levees that do not facilitate regeneration of riparian trees such as willow and cottonwood. Thus, under existing conditions, habitat suitable for the southwestern willow flycatcher is not regenerating and, in time, this largest population may be lost. Outside of Grant County few flycatchers remain. Statewide, 84 percent (16) of the 19 sites with flycatchers contain five or fewer territorial birds. Six sites are comprised of single pairs or unmated territorial flycatchers, and six others are comprised of two pairs or two unmated territorial birds.

Texas

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

historically-occupied portions of the Rio Grande, the Service believes it is likely that the southwestern willow flycatcher has been extirpated from Texas.

Colorado

The taxonomic status and the historic distribution and abundance of willow flycatchers in southwestern Colorado remains unclear due to a lack of specimen data and breeding records. Preliminary data on song dialects suggests that the few birds recently documented in southwestern Colorado may be *E.t. extimus*. These sightings have prompted State and Federal agencies to delineate provisional boundaries for southwestern willow flycatchers and sponsor statewide survey efforts. Survey efforts since 1993 have documented a total of six locations in Delta, Mesa, and San Miguel counties where southwestern willow flycatchers have been found (Table 14). Two locations have single, unmated males; two locations have single pairs, and the remaining two locations are comprised of four to seven territories each.

On March 9, 1997 a fire started by an adjacent landowner burned a 79-acre portion of the Escalante Wildlife Area near Delta, Colorado. That location comprised one of the largest known breeding sites for southwestern willow flycatchers in Colorado with approximately seven pairs occupying the site in 1996.

Utah

Specimen data reveal that the southwestern willow flycatcher historically occurred in southern Utah along the Colorado River, San Juan River, Kanab Creek, Virgin River, and Santa Clara River (Unitt 1987). Their northern boundary in south-central Utah remains unclear due to a lack of specimen data. The southwestern willow flycatcher no longer occurs along the Colorado River in Glen Canyon where Lake Powell inundated historically-occupied habitat, nor in unflooded portions of Glen Canyon near Lee's Ferry where southwestern willow flycatchers were documented nesting in 1938. Similarly, recent surveys on the Virgin River and tributaries and Kanab Creek have failed to document their presence (McDonald et al. 1995). Single, territorial males and possibly a pair of southwestern willow flycatchers were documented at two locations on the San Juan River (San Juan Co.) in 1995, but breeding was not confirmed (Sogge 1995b). The population totals for Utah are summarized in Table 14.

Nevada

Unitt (1987) documented three locations in Clark County from which southwestern willow flycatchers had been collected, but were not found after 1970. Current survey efforts have documented a single location with two unmated males on the Virgin River in Clark County (Tomlinson in litt.)(Table 14).

Rangewide, the current known population of southwestern willow flycatchers stands at approximately 454 territories (Table 14). These results indicate a critical population status;

more than 75 percent of the locations where flycatchers have been found are comprised of five or fewer territorial birds and up to 20 percent of the locations are comprised of single, unmated individuals. The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances [e.g., approximately 142 mi straight-line distance between breeding flycatchers at Roosevelt Lake, Gila Co., AZ, and the next closest breeding groups known on either the San Pedro River (Pinal Co.) or Verde River (Yavapai Co.)]. Additional survey effort, particularly in southern California, may discover additional small breeding groups. However, rangewide survey efforts have yielded positive results in less than 10 percent of surveyed locations. Moreover, survey results reveal a consistent pattern rangewide: the southwestern willow flycatcher population as a whole is comprised of extremely small, widely-separated breeding groups or unmated individuals.

The data presented in Table 14 represents a composite of surveys conducted since 1992. Locations that had southwestern willow flycatchers for only one year were tabulated as if the location is still extant. Given that extirpation has been documented at several locations during the survey period, this method of analyses introduces a bias that may overestimate the number of breeding groups and overall population size. In addition, females have been documented singing as frequently as males. Because the established survey method relies on singing birds as the entity defining a territory (Tibbitts et al. 1994), double-counting may be another source of sampling error that biases population estimates upward. The figure of 454 southwestern willow flycatcher territories is an approximation based on considerable survey effort, both extensive and intensive. Given sampling errors that may bias population estimates positively or negatively (e.g., incomplete survey effort, double-counting males/females, composite tabulation methodology), natural population fluctuation, and random events, it is likely that the total population of southwestern willow flycatchers is fluctuating at between 300 and 500 territories with a substantial proportion of individuals remaining unmated. If all extant sites were fully protected, at such low population levels random demographic, environmental, and genetic events could lead to extirpation of breeding groups and eventually render this species extinct. The high proportion of unmated individuals documented during recent survey efforts suggests the southwestern willow flycatcher may already be subject to a combination of these factors (e.g., uneven sex ratios, low probability of finding mates in a highly fragmented landscape).

Southwestern willow flycatcher reproductive success

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

attempts, delayed fledging, and reduced survivorship of late-fledged young, and; (6) nest loss due to predation appears more constant from year to year and across sites, generally in the range of 30 to 50 percent.

On the South Fork Kern River (Kern Co., CA), Whitfield (1993) documented a precipitous decline in the southwestern willow flycatcher breeding population from 1989 to 1993 (44 to 27 pairs). During that same period cowbird parasitism rates between 50 and 80 percent were also documented (Whitfield 1993) (Table 16). A cowbird trapping program initiated in 1993 reduced cowbird parasitism rates to < 20 percent. Southwestern willow flycatcher population numbers appear to have stabilized at 32 to 34 pairs in 1993, 1994, and 1995 (Whitfield 1994, Whitfield and Strong 1995). Predation rates have remained relatively constant in the range of 33 to 47 percent (Table 16). Southwestern willow flycatcher nest success increased from 26 percent prior to cowbird trapping to 48 percent after trapping was implemented (Whitfield and Strong 1995). In addition, the number of young fledged also increased from 1.01 young/pair to 1.73 young/pair during the same period.

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

The number of unmated, territorial, and paired southwestern willow flycatchers detected on the Colorado River in the Grand Canyon has remained low since monitoring began in 1982. Brown (1994) reported that at least 50 percent of the southwestern willow flycatcher nests monitored in the Grand Canyon between 1982 and 1987 were parasitized by brown-headed cowbirds. Brown (1994) did not report data on productivity. Given that the probability of successfully fledging a single chick is low when a nest is parasitized and the high proportion of nests parasitized during Brown's study, it is likely that southwestern willow flycatcher productivity during that period was also low. In 1992, when comprehensive nest monitoring was initiated, two pairs were present, with only one establishing a nest. That nest successfully fledged three chicks (Sogge and Tibbitts 1992). In 1993, one breeding pair, one

male with two females, and six unpaired males were detected. Three nests were found, all of which were parasitized by brown-headed cowbirds (Table 16). No southwestern willow flycatchers were successfully reared in Grand Canyon in 1993 (Sogge et al. 1993). Four pairs and one unpaired male occupied Grand Canyon in 1994. Nine nests were attempted, at least four of which were parasitized by cowbirds. All nesting attempts eventually failed due to predation or abandonment (Sogge and Tibbitts 1994). In 1995, one breeding pair and three unpaired males were detected (Sogge et al. 1995). One nest was found with a single cowbird egg on May 23. On June 4, three southwestern willow flycatcher eggs were present, but the cowbird egg was missing. That nest successfully fledged one chick. In summary, since 1992, 10 known pairs of southwestern willow flycatchers have made 14 nesting attempts in the Grand Canyon, two of which successfully fledged a total of four chicks. This low rate of reproduction indicates that, even with the protections provided annually by the National Park Service (i.e., camping and other activities are prohibited at southwestern willow flycatcher breeding sites), this area is a population sink (Pulliam 1988) where reproduction is not adequate to replace adults and population persistence requires emigration from other breeding areas.

On the Verde River in Yavapai Co., AZ, R.D. Ohmart (Arizona State University, Tempe, AZ, pers. comm.) discovered four pairs of southwestern willow flycatchers in 1992 at Clarkdale. The breeding status and reproductive success of those birds was not determined. In 1993, two pairs were present and one nest was documented. The nest contained a single cowbird nestling and eventually failed (Muiznieks et al. 1994) (Table 16). In 1994, two pairs and one unpaired male were present. Two nests were found, one of which successfully fledged two chicks, the other fledged a single cowbird (Sferra et al. 1995). Data from a more limited monitoring effort in 1995 indicate that two unpaired males occupied the Clarkdale site (Sogge 1995a). Surveys during the 1996 breeding season failed to detect any southwestern willow flycatchers at the Clarkdale site. However, one nesting pair was discovered at Tavasci Marsh approximately 1.5 mi east of the Clarkdale site. Thus, although since its discovery the Clarkdale site has had only several pairs, cowbird parasitism and nest loss due to depredation resulted in poor reproductive success and may have been responsible for abandonment or extirpation at this site.

Elsewhere in Arizona, population loss or undetected dispersal of breeding groups has been documented since 1993. For example, surveys in 1993 estimated five territorial males at Dudleyville Crossing on the San Pedro River. However, surveys in 1994 and 1995 failed to detect any southwestern willow flycatchers at that location (Muiznieks et al. 1994, Sferra et al. 1995, Spencer et al. 1996). Southwestern willow flycatchers detected in 1993 at Soza Wash on the San Pedro River were not detected in follow-up surveys in 1995, and an individual observed at Ister Flat on the Verde River was not detected in follow-up surveys during 1994. It is not known whether these events represent mortality of southwestern willow flycatchers, changes in habitat quality, or simply a vagile tendency inherent to this species. At other locations on the San Pedro River in Pinal Co., such as Cook's Lake and PZ Ranch, southwestern willow flycatcher breeding group size has remained stable.

Table 16. Nest predation and brood parasitism for the southwestern willow flycatcher across its range[1].

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

[1] *Sources: Sogge and Tibbitts (1992), Sogge et al. (1993), Brown (1994), Maynard 1994, Muiznieks et al. (1994), Sogge and Tibbitts (1994), Cooper (1995), Skaggs (1995), Sogge (1995a), Sogge et al. (1995), Spencer et al. (1995), Whitfield and Strong (1995).*

[2] *Proportion of nests containing at least one brown-headed cowbird egg.*

* *Brown-headed cowbird control program implemented.*

However, in 1996 a catastrophic fire destroyed much of the breeding habitat at PZ Ranch resulting in nest loss, abandonment of that site and, perhaps, mortality of adults (Paxton et al. 1996).

On the Little Colorado River in Apache Co., AZ, a cowbird parasitism rate of 22 percent was documented in 1994 (Table 16). In 1995 the parasitism rate was zero. Nest loss due to depredation, however, remained relatively constant (Table 16). On the Rio Grande in Socorro Co., NM, parasitism rates increased from 20 percent in 1994 to 66 percent in 1995. In 1996, water was diverted above that breeding location and no southwestern willow flycatchers were present (D. Leal, Service, Albuquerque, NM, pers. comm., 1996). It is not known whether those birds dispersed elsewhere or if that breeding group was extirpated. Finally, on the Gila River in Grant Co., NM, Skaggs (1995) monitored 46 nests from a breeding group of approximately 135 pairs. From a subset of 25 nests whose contents were checked directly or inferred through observation, Skaggs estimated a cowbird parasitism rate of between 16 and 27 percent for 1995 (Table 16).

The data presented above and in Table 16 demonstrate that cowbird parasitism and nest depredation are affecting southwestern willow flycatchers throughout their range. Cowbirds have been documented at more than 90 percent of sites surveyed (Sogge and Tibbitts 1992, Sogge et al. 1993, Camp Pendleton 1996, Muiznieks et al. 1994, Sogge and Tibbitts 1994, T. Ireland 1994 in litt., Whitfield 1994, C. Tomlinson 1995 in litt., Griffith and Griffith 1995, Holmgren and Collins 1995, Kus 1995, Maynard 1995, McDonald et al. 1995, Sferra et al. 1995, Sogge 1995&1996, San Diego Natural History Museum 1995, Stransky 1995, Whitfield and Strong 1995, Griffith and Griffith 1996 in litt., Skaggs 1995, Spencer *et al.* 1996.) Thus, the potential for cowbirds to be a persistent and widespread threat remains high. Cowbird trapping has been demonstrated to be an effective management strategy for increasing reproductive success for the southwestern willow flycatcher as well as for other endangered Passerines (e.g., least Bell's vireo, black-capped vireo, *Vireo atricapillus*; and golden-cheeked warbler, *Dendroica chrysoparia*). It may also benefit juvenile survivorship by increasing the probability that parents fledge birds early in the season. Expansion of cowbird management programs has the potential to not only increase reproductive output and juvenile survivorship at source populations, but also to potentially convert small, sink populations into breeding groups that contribute to population growth and expansion.

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

ENVIRONMENTAL BASELINE

In the project area since 1993, southwestern willow flycatchers were documented at seven localities between Kearney and several miles south of Dudleyville, and seven localities

between Geronimo and San Jose on the Gila River. Three new sites yielded birds in 1997 near Pima and Thatcher. Another site near Ft. Thomas was occupied. No breeding birds were observed on public land in the upper San Pedro, Cienega Creek, or riparian areas within the Muleshoe Ranch TNC Preserve despite three years of call surveys prior to 1996 (Jack Whetstone, Bureau of Land Management, Sierra Vista, AZ, pers. comm. 1996). One breeding bird was observed near Cascabel along the San Pedro River in 1995 (Whetstone, pers. comm. 1996). On the upper San Pedro in 1996 flycatchers were found near Saint David and in 1997, one flycatcher nest was found near Kingfisher (or Young-Block) ponds, two territorial males were found upstream, and one was downstream of Kingfisher ponds (T. McCarthy, AGFD, pers. comm. 1997). Surveys have not been complete in suitable habitat for this species. Many areas have been targeted with respect to various projects requiring endangered species evaluations. Results of surveys along the lower San Pedro River indicate that local populations are severely depressed and may consist of only scattered breeding pairs at best (Sferra et al. 1995). Very few individual birds were found along the Gila River and its tributaries in the Safford area (Sferra et al. 1995). There are no known breeding flycatchers on public land on the Gila River, Bonita Creek, San Francisco River, Cienega Creek, Muleshoe riparian area, and Aravaipa Creek.

Suitable or potential habitat occurs on the mainstem Gila River; San Pedro River and some tributaries such as Hot Springs and Redfield Canyons, Aravaipa Creek, Eagle Creek, Bonita Creek, and the San Francisco River (Table 17). Along the Gila River and tributaries, eight allotments appear to exhibit yearlong grazing management. On the San Pedro River RNCA, two Bureau allotments include deferred rotation grazing of cattle in riparian areas, including the Babocomari allotment (5208) and the Brunchow Hill allotment (5251). Unauthorized cattle also occur at various localities outside of those allotments in the RNCA, particularly near the confluence of the Babocomari and San Pedro rivers, on the San Pedro in the vicinity of the St. David Diversion, on the San Pedro in the vicinity of Highway 90, and at Fairbank. Cattle use is in evidence during the breeding season for the southwestern willow flycatcher. The entire RNCA lies within five miles of agricultural or domestic development that is often characterized as favorable to brown-headed cowbirds. Cowbirds readily fly five miles between feeding and breeding areas.

The contribution of cowbirds along the Gila River downstream of the San Jose Diversion from nearby allotments is likely overwhelmed and masked by the agricultural and other development as far west as the San Carlos Apache Reservation boundary. Allotments (excluding those downstream of the San Jose Diversion) with public lands within five miles of occupied, suitable, or potential habitat are displayed in Table 17.

EFFECTS OF THE PROPOSED ACTION

The Bureau is proposing to manage its riparian areas for "proper functioning condition." The Service believes riparian systems that have achieved proper functioning condition will have areas of habitat suitable for southwestern willow flycatchers that vary in location and time,

given that other favorable physical and biological requirements are met, such as width of floodplain.

The proposed action is complex and varied. Two key components are implementation of the standards and guidelines for rangeland management and the proposed mitigation measures for the southwestern willow flycatcher. The Bureau would, during the term of this consultation, implement changes to grazing practices that improve riparian habitat of the southwestern willow flycatcher, including excluding cattle from April 1 to September 1 in occupied habitat and unsurveyed suitable habitat. The Bureau would also evaluate and cooperate on actions to lessen the effects of brown-headed cowbird parasitism.

Currently, these components are not fully implemented and there is likely to be some lag time before implementation. During this interval, cattle on some allotments would be grazing within riparian corridors, riparian functions on those areas not properly functioning or functioning at risk would continue that way, allotments with downward trends would continue, and those in poor or fair condition (low to mid seral) would also continue. The length of time each of these effects would continue is expected to vary, but they are listed above in the previous sentence from shortest to longest term. Before full implementation of anticipated mitigation, some areas supporting flycatchers would be subject to a lack of tree regeneration and continued cowbird parasitism. Disturbance from cattle and related management activities during the flycatcher breeding season would continue to occur.

The overuse of riparian areas by livestock has been a major factor in degradation and decline of willow flycatcher habitat (Tibbitts et al. 1994, Service 1993e). Grazing in the riparian area during the growing season of willows and cottonwoods often precludes their regeneration. These trees, particularly willows are favored by this species. Livestock grazing, particularly yearlong or during the growing season in riparian areas, can reduce the diversity and density of riparian plant species especially, cottonwood and willows. Livestock can reduce the suitability of riparian areas by reducing canopy cover especially at the lower levels preferred by flycatchers. When cattle grazing is reduced or eliminated willow flycatcher numbers can rebound (Service 1993e). Direct destruction of nests, eggs, and nestlings by foraging cattle has been documented (Tibbitts et al. 1994).

Trampling of banks and reduction in riparian vegetation due to grazing can cause changes in channel morphology and stability that can further adversely affect riparian plant communities. These effects are described in detail in the "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel and spikedace, and are included here by reference. Livestock tend to concentrate in riparian areas for forage, water, and shade, due to the aridity of the surrounding uplands. Riparian areas often comprise a small percentage of the total acreage of a given allotment resulting in a tendency to cause degradation of riparian areas regardless of the stocking rate. Adjusting livestock numbers does not in of itself guarantee that riparian areas within a given allotments will be protected from overuse by livestock. Therefore adjusting permitted use alone may have little beneficial effect on changes in modifying willow flycatcher habitat.

Table 17: Allotments with potential effects to southwestern willow flycatchers and their habitat (Source: Bureau 1996a; Tables 8 and 8A, Appendix 4, allotment maps, and flycatcher overlays).

Allotment Number (Name)	Occupied/suitable, potential habitat in allotment	Allotment with public land within 5 miles of occupied/suitable, potential habitat	Riparian Function[1] (miles)	Management[2]
4002 (San Francisco)	X (San Francisco R.)		PFC 2.0	YL
4003 (Morenci)	X (Eagle Cr. - no Bureau lands in Eagle Creek)		PFC 3.7, FAR 3.0	YL
4615 (Johnny Creek)	X (Bonita Cr.)		FAR 3.9	NU, DR
4616 (Bonita Creek)	X (Bonita Cr.)		PFC 2.0, FAR 5.6	WI, NU, DR
4617 (Bull Gap)	X (Bonita Cr.)		PFC 2.O, FAR 4.8	NU, YL
4010 (Smugglers Peak)	X (Gila upstr. of San Jose)		PFC 1.0, FAR 4.0	WI, YL
4011 (Zorilla)		X (Gila upstr. of San Jose)		DR
4014 (Gila)	X (Gila upstr. of San Jose)		FAR 4.0	YL, DR
4021 (Twin C)	X (Gila upstr. of San Jose)		FAR 4.5	NU, DR
4001 (Metcalf)		X (Gila upstr. of San Jose)	PFC 2.5 mi	YL
4022 (County Line)		X (Gila upstr. of San Jose)	FAR 0.5 mi	NU, DR
4023 (Buck Canyon)		X (Gila upstr. of San Jose)		DR
4031 (San Jose Comm.)		X (Gila upstr. of San Jose)		E
4032 (Yuma Wash)		X (Gila upstr. of San Jose)		YL

Allotment Number (Name)	Occupied/suitable, potential habitat in allotment	Allotment with public land within 5 miles of occupied/suitable, potential habitat	Riparian Function[1] (miles)	Management[2]
4033 (Tollgate)		X (Gila upstr. of San Jose)		DR
4613 (Lone Star)		X (Gila upstr. of San Jose)		DR
4614 (County Line)		X (Gila upstr. of San Jose)		NO DATA
4618 (Turtle Mtn.)	X (Eagle, Bonita Crks.)		FAR 2.8	NU, YL
5024 (Harper)	X (Gila upstr. of San Jose)		NF 0.75	YL
5035 (Sheldon Mtn.)	X (Gila upstr. of San Jose)		NF 1.75	NU, YL
5041 (Rhyolite Peak)		X (Gila upstr. of San Jose)		DR
5049 (Woods Cyn.)		X (Gila upstr. of San Jose)		DR
5066 (Wilky)		X (Gila upstr. of San Jose)		SEAS, YL
4529 (South Rim)	X (Aravaipa)		PFC 39.1, FAR 2.0	NU, DR
4518 (Painted Cave)		X (Aravaipa)	PFC 2.6	NU, DR
4520 (Dry Camp)		X (Aravaipa)	PFC 3.8, FAR 5.0	NU, DR
4528 (Hell Hole)		X (Aravaipa)	PFC 6.0	NU, YL
4401 (Muleshoe)	X		PFC 12.3, FAR 8.8	NU

Allotment Number (Name)	Occupied/suitable, potential habitat in allotment	Allotment with public land within 5 miles of occupied/suitable, potential habitat	Riparian Function[1] (miles)	Management[2]
4402 (Soza Mesa)	X (no cows?)		NO DATA	UNALLOT-ED? DR
4409 (Soza Wash)	X		PFC 0.6	NU, DR
4539 (Hotwell)	X (lower San Pedro R.)		NF 1.0	NU
4516 (Dudleyville)		X (lower San Pedro R.)		NU
4532 (Massacre)		X (lower San Pedro R.)		YL
4533 (Zapata)		X (lower San Pedro R.)		YL
4534 (Dry Camp)		X (lower San Pedro R.)		YL
4536 (Reliable)		X (lower San Pedro R.)	NF 0.6	NU
4537 (Copper Creek)		X (lower San Pedro R.)	NF 0.7	NU, DR
4542 (Eskiminzin)		X (lower San Pedro R.)		E
5205 (Powers)		X (San Pedro RNCA)		YL
5226 (Monzingo)		X (San Pedro RNCA)		DR
5232 (Joseph J. Escapule)		X (San Pedro RNCA)		YL
5252 (Lucky Hills)		X (San Pedro RNCA)		DR
5261 (Q Miller)		X (San Pedro RNCA)		DR

Allotment Number (Name)	Occupied/suitable, potential habitat in allotment	Allotment with public land within 5 miles of occupied/suitable, potential habitat	Riparian Function[1] (miles)	Management[2]
5268 (Ramirez)		X (San Pedro RNCA)		YL
5274 (Cox)		X (San Pedro RNCA)		DR
5284 (Albert Thomas)		X (San Pedro RNCA)		YL
5295 (J.E. Warren Jr.)		X (San Pedro RNCA)		DR
5208 (Babocomari)	X (San Pedro RNCA)		PFC 1.2, FAR 2.0	SEAS, DR
5251 (Brunchow Hill)	X (San Pedro RNCA)		NO DATA	DR
6090 (Empire/Cienega)	X (Cienega Creek)		PFC 8.1, FAR 6.5, NF 4.2, UNK 1.1	SEAS, RR
6210 (Empirita)	X (Cienega Creek)		FAR 1.5	SEAS, DR

[1]PFC=proper functioning condition, FAR=functional at risk, NF=not functional, and UNK=unknown
[2]YL=yearlong, DR=deferred rotation, RR=rest rotation, E=ephemeral, SEAS=seasonal, NU=nonuse, WI=winter

Grazing animals and management activities among riparian vegetation during the breeding season for the flycatcher can disturb the birds and disturb or destroy their nests, or render them more vulnerable to predation, as many nests are well within the likely contact zone of cattle, horses, or people. Livestock handling facilities and cattle themselves tend to attract brown headed cowbirds, leading to a greater incidence of nest parasitism than would otherwise occur. Cattle grazing and man-made pastures creates bare ground and open areas preferred by cowbirds. Brown-headed cowbirds, historically associated with bison, have adapted to expansion of agriculture and have experienced rapid population growth and range expansion in this century (Lowther 1993). Livestock watering developments can result in a denuded area due to the concentration of livestock. These sites on public lands are less attractive for cowbirds due to that fact that supplemental feeding is not authorized on public land, although it may occur on non-Federal lands within the allotment. Hence, a prime cowbird food source, spilled feed grains and seeds in leftover hay, are not available in and around livestock corrals on public land, but may be on adjacent private land. Accumulations of seeds and a variety of insects with feces and water nearby may be abundant at corrals and water sources on public lands.

Watershed effects on allotments with downward trends or poor or fair (low to mid seral) range condition, that diminish stream and riparian development, would be similar to those discussed for the spikedace and Huachuca water umbel. Livestock grazing can initiate changes in structure, composition, and ground cover in the upland plant community. Such changes can be evidenced by rangeland condition and trend results (Bureau 1996a). These changes are often linked to widespread changes in watershed hydrology that may be detrimental to the flycatcher. However, many grazing and grazing-related activities outside the growing season, greater than five miles from rivers and riparian corridors, and within carrying capacity can have negligible effects to the flycatcher or the ecosystem upon which it depends.

The Bureau proposed prescribed fire, chemical and mechanical vegetation management, and range improvement projects as part of the proposed action. Prescribed fire and vegetation management are unlikely to be proposed in riparian vegetation where suitable or occupied flycatcher habitat occurs. However, prescribed fire in the uplands could spread to riparian habitat and destroy nests and habitat. Vegetation management and prescribed fire are conducted, in part, to improve range condition. These projects have the potential to improve watershed condition and benefit adjacent riparian areas. Range improvement projects in the uplands may cause temporary and negligible damage to watersheds, but are likely to result in better distribution and management of grazing, and ultimately to better range and watershed condition. Development of range improvements in riparian habitats is unlikely, but construction fences or roads could disturb flycatchers and result in damage to riparian habitat.

Effects of Differing Grazing Systems

Year-long grazing in riparian areas can depress willow flycatcher populations by modification of habitat. Cottonwood and willow seedlings may be grazed or trampled thus reducing survival rates. Established vegetation may be hedged to a height of six to seven feet. This can alter available vegetation structure within the preferred range of willow flycatcher.

Rest rotation, Santa Rita rotation, and deferred rotation systems do not, in and of themselves, improve riparian areas in terms of willow and/or cottonwood cover. Seedlings of willow and cottonwood trees may emerge on favorable sites during periods of livestock rest. These systems may not provide a long enough rest period to allow sufficient establishment time for seedlings. Cattle can concentrate in riparian areas under these systems and allow for excessive use or trampling of seedlings, thus reducing survival rates and causing modification to habitat. Livestock can concentrate in riparian zones under these systems and modify the structure of the habitat. This can be avoided by riparian pastures that can provide positive control of livestock use in riparian areas, thus allowing for sufficient time for growth and recovery. This has been accomplished on a number of allotments, such as Empire Cienega, portions of Bonita Creek, on Aravaipa Creek, and portions of the Gila River.

Winter grazing and winter seasonal rotation may be compatible with some of the habitat needs of willow flycatcher. Livestock are only in the allotment and/or pastures during the cool season and they tend to concentrate less in the riparian zone as compared to during the warmer months. Vegetation is dormant and has limited grazing use, thus reducing the hedging effect by livestock use during warm seasons. Use by livestock is a lower intensity and vegetation has an opportunity to recover during the growing season. Winter grazing or systems with special provision for resting riparian areas both appear to provide benefits through reducing modification to habitat.

Bonita Creek, Smuggler Peak, Gila, Empire Cienega: These allotments have permitted use set at carrying capacity, implemented grazing systems, seasonal riparian or no use of riparian, range improvements for the most part are located outside or some distance from the riparian areas, riparian policy is implemented and are within special management areas with the exception of the Empire Cienega. As mitigation for the razorback sucker, the Bureau proposes to eliminate adverse effects of grazing that may jeopardize the continued existence of the razorback sucker. Measures to accomplish this may include removal of cattle grazing and trailing on Bureau-administered lands in Bonita Creek and the 100-year floodplain of the Gila River. In addition, in the Upper Gila-San Simon Grazing EIS a commitment was made to remove cattle grazing in Bonita Creek and the Gila River for a minimum of three to five years to "improve habitat conditions for all species reliant upon the aquatic and associated riparian areas." No assessment of cowbird parasitism of willow flycatcher nests has been made at this time.

South Rim, Twin C, Soza Wash and Bullgap: Permitted use is set at carrying capacity, livestock are fenced out of the riparian area, range improvements are outside of the riparian

area, riparian policy is implemented, and they are within a special management area. The South Rim allotment is currently in non-use. No assessment of cowbird parasitism of willow flycatcher nests has been made at this time.

Muleshoe and Hotwell: These allotments are currently not grazed. No assessment of cowbird parasitism of willow flycatcher nests has been made at this time.

San Francisco, Morenci, and Gila: These allotments have year-long grazing in the riparian areas which have potential willow flycatcher habitat. Yearlong grazing may result in a decline in riparian vegetation and nesting habitat or in the failure of riparian vegetation to recover. Incidental take of willow flycatcher nestlings and chicks could be occurring since livestock are present in the riparian zone during the nesting season. The Bureau proposes, as one possible option, to prohibit grazing of livestock on Bureau-administered lands in the Gila and San Francisco rivers. No assessment of cowbird parasitism of willow flycatcher nests has been made at this time.

Brunchow Hill, Babocomari, and Empirita: These allotments have yearlong grazing, but in the riparian zones of the San Pedro and Babocomari rivers and Cienega Creek deferred rotation grazing is practiced. On the Empirita allotment, a coordinated grazing management plan has been completed. Although not all improvements are in place, the permittee has instituted a limited grazing rotation. The riparian portion of Cienega Creek is grazed every year, but not yearlong and only occasionally during the growing season. On the Babocomari allotment, a draft livestock management plan is scheduled to be completed in 1997-8. Grazing has been managed to improve range condition in the uplands and enhance recovery of the riparian area. Since 1988, the riparian area of the Babocomari River has only been grazed once during the growing season; grazing of the riparian area is typically winter season. The Brunchow Hill allotment includes a portion of the San Pedro River RNCA. Grazing in this allotment is governed by a grazing management plan. Fencing has not yet been completed and grazing rotation called for in the plan has not been implemented. Rotation occurs based on existing forage conditions. No cattle run by this permittee have been grazed in the riparian zone of the San Pedro River for the last two or three years, although trespass cattle have been present. A coordinated grazing management plan is scheduled to be developed and completed for the allotment in 1999. The Bureau proposes no authorized grazing in the riparian corridor of the San Pedro River in the San Pedro River RNCA, as mitigation for other species. Trespass cattle would be removed from areas closed to grazing, including closed portions of the San Pedro RNCA.

Effects to Critical Habitat

Effects analyses for critical habitat must determine if the proposed action would destroy or adversely modify critical habitat. "Destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the

basis for determining the habitat to be critical (50 CFR 402.02). The primary constituent elements identified as necessary for the survival of the southwestern willow flycatcher in the final critical habitat rule are:

1. Space for individual and population growth

2. Food, water (seasonal wetland), air, light, minerals, and other nutrients or physiological requirements

3. Cover or shelter,

4. Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal, and

5. Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of the species

Among the activities identified in the final rule that may adversely modify critical habitat are: 1) "activities that remove, thin, or destroy riparian vegetation by mechanical, chemical (herbicides or burning), or biological (grazing) means," 2) any "activities which alter the quantity or quality of surface or subsurface water flow," 3) "destruction/alteration of the species' habitat by discharge of fill material, draining, ditching, tilling, pond construction, and stream channelization" 4) "excessive use of riparian areas and uplands for livestock use", and 5) "development of recreational facilities and off-road vehicle operation." The rule finds that excessive use of riparian areas and uplands by livestock may affect the volume and composition of riparian vegetation, may physically disturb nests, may alter floodplain dynamics such that regeneration of riparian habitat is impaired or precluded, and may facilitate brood parasitism by brown-headed cowbirds.

Item four suggests that some forms or systems of riparian livestock grazing may not result in modification of critical habitat, so long as livestock use of riparian areas and uplands is not "excessive", the volume and composition of riparian vegetation remains unchanged, grazing does not facilitate cowbird parasitism, and nests are not disturbed by cows or other grazing activities.

Critical habitat in the project area occurs on the lower San Pedro River from Winkleman to near the confluence with Aguaja Canyon, and on the upper San Pedro River from approximately Benson to Hereford. No Bureau allotments include any portion of critical habitat on the lower San Pedro River, although allotments occur nearby in the watershed, including allotments near and on Aravaipa Creek, as well as allotments along the San Pedro River. These allotments and effects of grazing are discussed in part in the "EFFECTS OF THE PROPOSED ACTION" for the spikedace and loach minnow. The Bureau has proposed measures for spikedace and loach minnow to ensure that watershed condition in the Aravaipa

watershed and in the San Pedro River watershed downstream of the Aravaipa confluence remain in good condition.

In the upper San Pedro, the Bureau administers the San Pedro River RNCA. As discussed in the "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel, authorized grazing on the upper San Pedro River is limited to a small portion of the Brunchow Hill allotment (5251). Although the San Pedro River RNCA remains a model of how removal of grazing can result in dramatic and rapid recovery of riparian vegetation communities, trespass cattle have been observed at numerous localities in the RNCA over a number of years, they appear to be increasing, and cattle have caused localized destruction of riparian vegetation and trampling of banks (see "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel.) S. Stefferud (pers. comm. 1997) noted heavy use of cattle just below the Highway 90 bridge in 1997; Angie Brooks (Service, Phoenix, AZ, pers. comm., 1997) noted signs of cattle just north of the Highway 90 bridge in 1997. The flycatcher nest detected on the San Pedro River in 1997 was at Kingfisher Pond, which is located near the San Pedro House, just north of the Highway 90 bridge. The other three singing males were located nearby. Thus, cattle grazing is occurring adjacent to these flycatcher localities and may be adversely affecting foraging or nesting habitat used by these birds, or may be facilitating brood parasitism.

Also as discussed for the Huachuca water umbel, 87 percent of Bureau lands in 19 allotments in the eastern watershed of the upper San Pedro River are in poor or fair range condition. The Service believes that grazing in the watershed is likely contributing to watershed degradation with associated adverse effects to the hydrology, channel morphology, and riparian vegetation of the San Pedro River. However, adverse effects to the hydrology of the river may not be readily apparent in light of the improvement in riparian condition that has taken place since authorized cattle grazing was excluded from the RNCA in 1988. As discussed for the Huachuca water umbel, reduced infiltration rates caused by grazing may be reducing aquifer recharge which in turn contributes to the current problem of groundwater pumping exceeding recharge. Groundwater pumping threatens to lower the groundwater elevation and dewater the San Pedro River (ASL 1994). Prescribed fire conducted in the watershed could potentially spread to the San Pedro River and adversely affect proposed critical habitat; however, probably few areas in these allotments contain enough fine fuels at this time to carry a fire.

The Bureau proposed as mitigation for the Huachuca water umbel removal of trespass cattle from the RNCA, closure of the Bureau administered lands in riparian zone in the Brunchow allotment, and improvement of watershed condition on Bureau lands in the 19 allotments in the eastern watershed of the upper San Pedro River. Mitigation measures for the flycatcher call for exclusion of cattle from occupied habitat from April 1 to September 1, management of suitable habitat so its suitable characteristics are not eliminated or degraded, and actions to reduce cowbird parasitism. These measures would reduce potential impacts to the flycatcher and its critical habitat. Since issuance of the draft biological/conference opinion, the Bureau has begun the process of removing trespass cattle from the San Pedro River RNCA.

However, until all these protective measures are fully implemented, adverse effects to critical habitat may continue to occur. Although effects of trespass grazing in the RNCA are evident and locally heavy, and range condition in the watershed is mostly fair or poor, the apparent density of riparian vegetation, particularly in the understory and on the streambanks, has increased since grazing and off-road vehicle use were deauthorized in 1988.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed action. Effects of past Federal and private actions are considered in the Environmental Baseline.

Cumulative effects are expected to be similar to those described for the Huachuca water umbel in regard to the San Pedro River, razorback sucker as it relates to the Gila and San Francisco rivers, and Bonita Creek, spikedace and loach minnow in regard to Aravaipa Creek, and Gila topminnow in regard to Cienega Creek. Many activities without a Federal nexus occur and are expected to continue to occur in occupied, suitable, or potential habitat of the southwestern willow flycatcher and in the watersheds of such habitats throughout the project area. Farming and ranching activities occur in the bottom of the Gila River, particularly downstream of San Jose Diversion and to a lesser extent along the San Pedro River. Groundwater pumping in the Safford area threatens the base flow of the Gila River, just as pumping in the Sierra Vista and Hereford/Palominas areas threaten base flow of the upper San Pedro River. Diversion of streamflow for agriculture and pumping of groundwater occurs along all major stream courses within the action area, usually on private land. These types of activities can result in lower stream flows or complete drying of the stream course for all or part of the year. The result is reduced survival of cottonwood and willow which must have water available to their root zones throughout the year.

Dewatering combined with more than negligible grazing levels in the riparian zone can further reduce the quality and availability of nesting habitat for willow flycatcher. Livestock grazing on the private and State lands portions of the Bureau allotments as well as outside of allotments have the same effects as those described here but are not subject to consultation. Pasture development and livestock developments (corrals, wells, etc.) on private land adjacent to and within five miles of riparian areas provides suitable habitat for cowbirds with resulting increased incidence of cowbird parasitism. Nest parasitism combined with high grazing levels within the riparian zone, whether public or private, can depress willow flycatcher nesting or eliminate nesting entirely. Water diversions, agricultural return flows, recreational activities, particularly in the river bottoms, all are expected to occur outside of section 7 consultations. Flood control and channelization projects will typically require Federal permitting and therefore effects of such actions are not cumulative. Many actions in the watersheds of the Gila and San Francisco rivers, or in Eagle and Bonita creeks, will likely be Federal actions

requiring consultation due to the extent of Federal lands (Bureau and Forest Service) in the project area.

Effectiveness of Proposed Mitigation

The Bureau proposed substantial mitigation measures for the southwestern willow flycatcher that would reduce or eliminate most adverse effects to the species and its critical habitat (see **"Proposed Mitigation Measures"**). Most notably, the Bureau proposes to map suitable-occupied, suitable-unoccupied, and suitable-unsurveyed habitat in the project area; conduct flycatcher surveys, and develop and implement management guidelines, including exclusion of cattle from habitat during the breeding season. The Bureau also proposes investigating livestock concentrations and cowbird populations within five miles of occupied and unsurveyed suitable habitat, and control cowbirds as necessary. Mitigation measures for other species, particularly the Huachuca water umbel on the San Pedro River RNCA, also provide significant protection to occupied habitat and flycatchers. Mitigation measures for several other species, including razorback sucker, loach minnow, spikedace, and cactus ferruginous pygmy-owl provide significant protection of potentially suitable habitat.

Prompt and thorough implementation of these measures is imperative to reduce or eliminate what the Service believes are very serious threats to the southwestern willow flycatcher and its proposed critical habitat.

SUMMARY OF EFFECTS

The Service believes the effects described above neither likely to jeopardize the continued existence of the southwestern willow flycatcher, nor likely to adversely modify or destroy proposed critical habitat. We present this conclusion for the following reason:

The Bureau proposes substantial measures for this and other species that dramatically reduce or eliminate the adverse effects of the action. These measures are summarized above under "Effectiveness of Proposed Mitigation Measures".

CONCLUSION

After reviewing the current status of the southwestern willow flycatcher, the environmental baseline for the action area, the cumulative effects, and the anticipated effects of the proposed Safford/Tucson Field Office's grazing program, it is the Service's biological opinion that the proposed action is neither likely to jeopardize the continued existence of the southwestern willow flycatcher opinion nor likely to destroy or adversely modify southwestern willow flycatcher critical habitat.

The survival of the flycatcher is likely to depend on the rate that its habitat can be increased over the immediate future. Because so much former flycatcher habitat on non-Federal lands has been lost to urbanization and agriculture, management of Bureau lands is very important

in achieving survival and recovery of the subspecies. Actual and potential impacts to flycatchers from activities in certain aspects of the grazing program have been identified. Effects to critical habitat may occur from Bureau actions on holdings in and near the San Pedro River RNCA, and represent a significant portion of critical habitat on the San Pedro River.

INCIDENTAL TAKE STATEMENT

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

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

AMOUNT OR EXTENT OF TAKE

Take may be in the form of harm, harassment, injury, or death resulting from the loss of a nesting site, loss or disturbance of a nest, loss or modification of adjacent habitat that could accommodate population expansion, and nest parasitism by cowbirds. Livestock are known to pull down or brush against nests while foraging in or walking through riparian areas. Incidental take of willow flycatcher chicks is a likely effect of grazing in riparian areas during the nesting season. The Service anticipates incidental take of southwestern willow flycatchers will be difficult to detect or determine for the following reasons:

1) The number and location of cowbirds and flycatchers will vary from season to season.

2) The small, fluctuating number of breeding flycatchers in a given location precludes the application of numerical standards for take. In addition, nest placement and nest heights may hinder attempts to document the outcome of all nesting attempts at a given location.
3) The initial success of the cowbird management program cannot be predicted.

While the Service cannot predict the exact level of take that could occur, it is anticipated that cowbird parasitism could result in the take of an entire nestling cohort in some habitat patches within the project area. The Service, however, has determined that the level of take can be minimized or eliminated and would therefore not be likely to result in jeopardy to the species. This biological opinion does not authorize any form of take not incidental to the Safford/Tucson Field Offices' grazing program.

EFFECT OF THE TAKE

The Service has determined that the level of anticipated take is neither likely to result in jeopardy to the species nor adverse modification or destruction of critical habitat.

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

REASONABLE AND PRUDENT MEASURES

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

1. Actions shall be taken to ensure effects of grazing in riparian habitats, with subsequent direct effects to the southwestern willow flycatcher, are minimized.

2. Actions shall be taken to ensure that effects of grazing activities in the watersheds of southwestern willow flycatcher habitat that may result in direct effects to flycatchers, are minimized.

3. Where grazing activities may be facilitating brood parasitism, the Bureau shall take action to minimize effects to the flycatcher

4. The Bureau shall monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regards to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. Terms and conditions are nondiscretionary. The Bureau's proposed mitigation measures are included here by reference.

The following terms and conditions implement reasonable and prudent measure number 1:

(a) The Bureau shall take immediate action to remove trespass cattle from the San Pedro River RNCA as soon as possible, and measures shall be implemented, including continuing to construct, inspect, and maintain fences, and working diligently with adjacent landowners, to ensure that trespass does not continue.

(b) The Bureau shall work with private landowners in the Brunchow Hill allotment to exclude livestock from Bureau-administered lands in that allotment within the RNCA.

(c) AMPs shall be completed within three years (or according to a schedule approved by the Service) for any allotments in the improve category listed in Table 7 that currently do not have them.

(d) Existing AMPs for any allotments in Table 7 shall be implemented no later than October 1998.

(e) AMPs developed pursuant to item c. shall be implemented no later than two years after completion.

(f) The Bureau shall take action by October 1998 that will result in a long-term upward trend in range condition in the "improve" allotments in Table 7.

(g) For allotments in the "custodial" category in Table 7, the Bureau shall work with other landowners in the allotment to improve range condition in areas of fair or poor range condition. Actions the Bureau could take with others may include developing grazing strategies, planning and developing range improvement projects and vegetation management, and providing technical assistance.

(h) The Bureau shall work with Natural Resource Conservation Service and landowners in the allotments to develop and implement watershed improvement projects that will increase infiltration.

(i) The Bureau shall not develop or maintain range improvement projects in the riparian corridor of the San Pedro River, except for fences, cattle guards, and gates to exclude and better manage cattle. Also, the Bureau shall not conduct chemical or mechanical vegetation management or prescribed fire in the riparian zone of the San Pedro or Babocomari rivers for the purpose of managing livestock.

(j) Construction, maintenance, or management activities in the riparian zone of suitable or occupied habitat shall occur outside the southwestern willow flycatcher breeding season.

(k) Construction, maintenance, or management activities in the riparian zone of suitable or occupied habitat shall be planned to avoid removing willows and cottonwoods.

(l) Fence maintenance of exclosures, riparian pastures, or boundary fences, and sweeps of occupied or unsurveyed suitable habitat on allotments identified in Table 17 to push out cattle, will be conducted before each southwestern willow flycatcher breeding season.

The following terms and conditions implement reasonable and prudent measure number 2:

(a) A mitigation plan shall be developed by the Bureau in coordination with the Service for each range improvement project and vegetation management project that may adversely affect the southwestern willow flycatcher, and for each prescribed fire in the allotments in Table 17. Mitigation plans for prescribed fire shall limit to the extent practicable the possibility that fire would spread to riparian habitat in the allotments. Mitigation plans shall be approved by the Service.

(b) Grazing on Bureau-administered lands within allotments in Tables 6 and 16 shall strictly adhere to the Bureau's Arizona Standards and Guidelines, the Upland Livestock Utilization Standard, Safford Drought Policy, Arizona Ephemeral Grazing Policy, and Riparian Area Policy.

The following term and condition implements reasonable and prudent measure number 3:

New livestock management facilities that are likely to attract and support cowbirds must be located beyond five miles of occupied, suitable, or potential southwestern willow flycatcher habitat unless such facilities are: 1) located within five miles of suitable or occupied habitat on the Gila River downstream of the San Jose Diversion, or 2) crucial to protection of the riparian habitat, and 3) cowbird trapping is implemented to counteract the effect of the facility.

The following term and condition implements reasonable and prudent measure number 4:

The Bureau shall submit annual monitoring reports to the Arizona Ecological Services Field Office by March 15 of each year beginning in 1998. These reports shall briefly summarize for the previous year: 1) effectiveness of these terms and conditions, and 2) documentation of take, if any. If such activities or monitoring occur, the report shall also summarize: 1) inventory, monitoring, and evaluations as described in the Bureau's proposed action (Bureau 1996a) and applicable sections of the Bureau Manual for the allotments in Tables 6 and 16, 2) results of a re-assessment of riparian functioning condition conducted every five years to assess achievement of habitat improvement, 3) grazing actions initiated or

completed, including range improvement projects, prescribed fire, and vegetation management in the allotments in Tables 6 and 16, and 4) records of downed or damaged riparian exclosure fences and action taken to remove trespass cattle. The report shall also make recommendations for modifying or refining these terms and conditions to enhance protection of the southwestern willow flycatcher and to reduce needless hardship on the Bureau its permittees.

CONSERVATION RECOMMENDATION

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for southwestern willow flycatcher. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau should consider adding protective guidance based on the reasonable and prudent measures and terms and conditions as an amendment to the RMP/EISs applicable to the Safford and Tucson Field Offices.

2. The Bureau should develop a fire management program that directs protection to riparian habitats and avoids affects to flycatchers to the maximum extent practicable if fires do occur.

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

(Note: capture or control of cowbirds requires appropriate permits from Arizona Game and Fish Department and the Service.)

Cactus Ferruginous Pygmy-owl

STATUS OF THE SPECIES

The Service included the cactus ferruginous pygmy-owl on its Animal Notice of Review as a category 2 candidate species throughout its range on January 6, 1989 (54 FR 554). After soliciting and reviewing additional information, the Service elevated *Glaucidium brasilianum cactorum* to category 1 status throughout its range on November 21, 1991 (56 FR 58804). A category 1 species was, at that time, defined as a species for which the Service has on file substantial information to support listing, but for which a proposal to list has not been issued as it is precluded at present by other listing activities.

On May 26, 1992, a coalition of conservation organizations (Galvin et al. 1992) petitioned the Service, requesting listing of the pygmy-owl as an endangered subspecies under the Act. The petitioners also requested designation of critical habitat. In accordance with Section 4(b)(3)(A) of the Act, on March 9, 1993, the Service published a finding that the petition presented substantial scientific or commercial information indicating that listing may be warranted, and initiated a status review on the pygmy-owl (58 FR 13045). In conducting its status review, the Service solicited additional comments and biological data on the status of the cactus ferruginous pygmy-owl, through mailings, a notice in the Federal Register (58 FR 13045), and other means.

On December 12, 1994, the Service published a 12-month finding on the petitioned action (59 FR 63975). This finding indicated that listing of the cactus ferruginous pygmy-owl was warranted and a proposed rule was published on the same date to list the pygmy-owl as endangered in Arizona with critical habitat and as threatened in Texas without critical habitat. New information was received during comment periods indicating that population levels are higher in Arizona and Texas than was known at the time of the proposed rule. The Service determined that the Arizona population still warranted endangered status. Conversely, the new information indicated that listing the species as threatened in Texas was not warranted. Listing was finalized on March 10, 1997 and was effective on April 9, 1997.

Description and Range

The cactus ferruginous pygmy-owl is a small bird, approximately 6.75 in long. Males average 2.2 ounces, and females average 2.6 ounces. The cactus ferruginous pygmy-owl is reddish-brown overall, with a cream-colored belly streaked with reddish-brown. Some individuals are grayish, rather than reddish-brown. The crown is lightly streaked, and paired black-and-white spots on the nape suggest eyes. There are no ear tufts, and the eyes are yellow. The tail is relatively long for an owl and is colored reddish-brown with darker brown bars. The call of this diurnal owl, heard primarily near dawn and dusk, is a monotonous series of short notes.

The cactus ferruginous pygmy-owl is one of four subspecies of the ferruginous pygmy-owl. It occurs from lowland central Arizona south through western Mexico, to the States of Colima and Michoacan, and from southern Texas south through the Mexican States of Tamaulipas and Nuevo Leon. The northernmost record for the pygmy-owl is from New River, Arizona, approximately 35 mi north of Phoenix. South of these regions and through Central America, *G. b. ridgwayi* replaces *G. b. cactorum*. Throughout South America, *G. b. brasilianum* is the resident subspecies (Fisher 1893, van Rossem 1937, Friedmann et al. 1950, Schaldach 1963, Phillips et al. 1964, de Schauensee 1966, Karalus and Eckert 1974, Oberholser 1974, Johnsgard 1988). Additionally, Konig and Wink (1995) have identified a fourth subspecies of pygmy-owl from central Argentina. This new subspecies is *G. b. stranecki*.

The cactus ferruginous pygmy-owl (hereafter "pygmy-owl" unless otherwise noted) was described by van Rossem (1937), based on specimens from Arizona and Sonora. It is distinguished from *G. b. ridgwayi* and *G. b. brasilianum* by its shorter wings and longer tail,

and by generally lighter coloration (van Rossem 1937, Phillips et al. 1964). *G. b. cactorum* occurs in several color phases, with distinct differences between regional populations (Sprunt 1955, Burton 1973, Tyler and Phillips 1978, Hilty and Brown 1986, Johnsgard 1988). Some investigators (e.g., van Rossem 1937, Tewes 1993) have suggested that further taxonomic investigation is needed, primarily to determine whether the current *G. b. cactorum* comprises more than one subspecies. *G. b. cactorum* is widely recognized as a valid subspecies (e.g., Friedmann et al. 1950, Blake 1953, Sprunt 1955, Phillips et al. 1964, Monson and Phillips 1981, Millsap and Johnson 1988, Binford 1989). The American Ornithologists' Union (AOU) recognized *G. b. cactorum* in its 1957 Checklist of North American Birds (AOU 1957), but subsequent lists did not include the subspecies (AOU 1983).

Critical Habitat

Critical habitat, including 290 river miles in Arizona, was included in the draft rule, but was determined to be not prudent in the final rule.

Nesting Ecology

The pygmy-owl nests in a cavity in a tree or large columnar cactus. Cavities may be naturally formed (e.g., knotholes) or excavated by woodpeckers. No nest lining material is used. The pygmy-owl has also nested in fabricated nest boxes (Proudfoot et al. 1994a, Proudfoot 1996). Three, four, five, and occasionally six eggs are laid (Bent 1938; Heintzelman 1979; Glenn Proudfoot; Texas A&M University at Caesar Kleberg Wildlife Research Institute, unpubl. data 1996) and are incubated for approximately 28 days. The young fledge about 28 days after hatching. The pygmy-owl begins nesting activities in late winter to early spring. It is nonmigratory throughout its range (Bendire 1888, Griscom and Crosby 1926, Oberholser 1974, Johnson et al. 1979).

Habitat Selection

The pygmy-owl occurs in a variety of subtropical, scrub, and woodland communities, including riverbottom woodlands, woody thickets or bosques, coastal plain oak associations, thornscrub, tropical deciduous forest, and desert scrub. Unifying habitat characteristics among these communities are fairly dense woody thickets or woodlands, with trees and/or cacti large enough to provide nesting cavities. Throughout its range, the pygmy-owl occurs at low elevations, generally below 4,000 ft (Swarth 1914, Karalus and Eckert 1974, Monson and Phillips 1981, Johnsgard 1988, Enriquez-Rocha et al. 1993).

In the western portion of its range, the pygmy-owl appears to use riparian woodlands and bosques dominated by mesquite and cottonwood, Sonoran Desert scrub (usually with relatively dense saguaro cactus forests), and Sinaloan deciduous forest (van Rossem 1945, Phillips et al. 1964, Karalus and Eckert 1974, Millsap and Johnson 1988). Fisher (1893) found the pygmy-owl to be "quite common" in thickets of intermixed mesquite and saguaro

cactus near the New River, Arizona. Prior to the mid-1900s, the pygmy-owl was also described as "not uncommon", "of common occurrence", and "fairly numerous" resident of lowland central and southern Arizona in cottonwood forests, mesquite-cottonwood woodlands, and mesquite bosques along the Gila, Salt, Verde, San Pedro, and Santa Cruz rivers, and various tributaries (Breninger 1898 in Bent 1938, Gilman 1909, Swarth 1914). Bendire (1888) noted that he had taken "several" along Rillito Creek near Fort Lowell, in the vicinity of Tucson, Arizona. The pygmy-owl also occurs in Sonoran Desert scrub associations in southern and southwestern Arizona, comprised of palo verde, ironwood, mesquite, acacia, bursage, and columnar cacti such as the saguaro and organ pipe cactus (Phillips et al. 1964, Davis and Russell 1984 and 1990, Monson and Phillips 1981, Johnson and Haight 1985a, Johnsgard 1988).

In the past, the pygmy-owl's occurrence in Sonoran Desert scrub was apparently less common and predictable. It was more predictably found in xero-riparian habitats (very dense desert scrub thickets bordering dry desert washes) than more open, desert uplands (Monson and Phillips 1981, Johnson and Haight 1985a, Johnson-Duncan et al. 1988, Millsap and Johnson 1988, Davis and Russell 1990). The pygmy-owl was also noted to occur at isolated desert oases supporting small pockets of riparian and xero-riparian vegetation (Howell 1916, Phillips et al. 1964).

Both riparian and desert scrub habitats are likely to provide several requirements of the pygmy-owl ecology. Trees and large cacti provide cavities for nesting and roosting. Also, these habitats along watercourses are known for their high density and diversity of animal species that constitute the pygmy-owl's prey base (Carothers 1977, Johnson et al. 1977, Johnson and Haight 1985b, Stromberg 1993a). In addition, the dense vegetation along these washes provides protective cover from aerial predators.

In southern Texas, the pygmy-owl's habitat includes coastal plain oak associations as well as the Tamaulipan Thornscrub of the lower Rio Grande valley region, which is comprised of mesquite, *Prosopis glandulosa* var *glandulosa*; hackberry, oak, and Texas ebony, *Pithecellobium ebano* (Griscom and Crosby 1926, Bent 1938, Oberholser 1974, Tewes 1992, Wauer et al. 1993). In northeastern Mexico, it occurs in lowland thickets, thornscrub communities, riparian woodlands, and second-growth forest (van Rossem 1945, AOU 1983, Enriquez-Rocha et al. 1993, Tewes 1993). In central and southern Arizona, the pygmy-owl's primary habitats were riparian cottonwood forests, mesquite bosques, and Sonoran desert scrub, but the subspecies currently occurs primarily in Sonoran Desert scrub associations of palo verde, *Cercidium* spp.; bursage, *Ambrosia* spp., ironwood, *Olneya tesota*; mesquite, acacia, *Acacia* spp., and giant cacti such as saguaro and organ pipe (Gilman 1909, Bent 1938, van Rossem 1945, Phillips et al. 1964, Monson and Phillips 1981, Johnson-Duncan et al. 1988, Millsap and Johnson 1988). Farther south in northwestern Mexico, the pygmy-owl occurs in Sonoran Desert scrub, Sinaloan thornscrub, and Sinaloan deciduous forest as well as riverbottom woodlands, cactus forests and thornforest (Enriquez-Rocha et al. 1993). The pygmy-owl's diet includes birds, lizards, insects, small mammals (Bendire 1888, Sutton 1951, Sprunt 1955, Earhart and Johnson 1970, Oberholser 1974), and frogs (Proudfoot et al. 1994b).

Population Dynamics

Hunter (1988) found fewer than 20 verified records of pygmy-owls in Arizona for the period of 1971 to 1988. Although pygmy-owls are diurnal and frequently vocalize in the morning, the subspecies was not recorded or reported in any breeding bird survey data in Arizona (Robbins et al. 1986). Formal surveys for the pygmy-owl on Organ Pipe Cactus National Monument began in 1990, with one bird located that year. Beginning in 1992, survey efforts on the Monument were conducted in cooperation with the Arizona Game and Fish Department. In 1992, surveys located three single pygmy-owls in Arizona (Fish and Wildlife Service and National Park Service, unpubl. data 1992). In 1993, more extensive surveys again located three single pygmy-owls in Arizona (Arizona Game and Fish Department unpubl. data 1993, Felley and Corman 1993). During 1993-1994 surveys, one pair of owls was detected in north Tucson, near the sightings in 1992 and 1993 (Collins and Corman 1995). Two individual owls were found in northwest Tucson during 1995 surveys, and an additional owl was detected at Organ Pipe Cactus National Monument (Lesh and Corman 1995).

In 1996, the Arizona Game and Fish Department focused survey efforts in northwest Tucson and Marana, and detected a total of 16 birds, two of which were a pair, and two of which were fledged young. An additional three pygmy-owls were detected on Organ Pipe Cactus National Monument in 1996, with three additional but unconfirmed reports (Harold Smith, National Park Service, Organ Pipe Cactus National Monument, in litt. 1996). While additional individual birds have been identified since the proposed rule was published, total individuals in Arizona are still extremely low at 19 (Abbate 1996).

The available information indicates that distinct eastern and western populations of the pygmy-owl may be defined. The pygmy-owl occurs along the lower Rio Grande River and the coastal plain of southern Texas and northeastern Mexico. It also occurs in lowland areas of northwestern Mexico and southern Arizona. The pygmy-owl's elevational distribution, the distribution of habitat, and recorded locations indicate that these eastern and western ranges of the pygmy-owl are geographically isolated from one another and are ecologically distinct. In the U.S., the eastern and western portions of the pygmy-owl's range are separated by the basin-and-range mountains and intervening Chihuahuan Desert basins of southeastern Arizona, southern New Mexico, and western Texas. Although Grossman and Hamlet (1964) suggested that the pygmy-owl's range included this U.S.-Mexico border region, the pygmy-owl has never been recorded in this 500-mi wide area (Bailey 1928, Phillips et al. 1964, Oberholser 1974, Sartor O. Williams, New Mexico Department of Game and Fish, in litt. 1991).

In Mexico, the eastern and western populations are separated by the highlands of the Sierra Madre Oriental and Occidental, and the Mexican Plateau. The pygmy-owl is considered rare on the Mexican Plateau and/or above elevations of 4,000 ft on the west, and above 1,000 ft on the east (Friedman et al. 1950). Some sources describe the eastern and western ranges as contiguous at the southern end of its range, near the southern end of the Mexican Plateau in central Mexico (Johnsgard 1988). Other sources describe these two ranges as being disjunct

(Burton 1973). In his description of the subspecies, van Rossem (1937) found that Texas specimens exhibited characteristics of both *G. b. cactorum* and *G. b. ridgwayi*. Ultimately, he did not assign Texas ferruginous pygmy-owls to *G. b. cactorum*, but noted that Ridgway (1914, in Van Rossem 1937) considered them distinct from *G. b. ridwayi*, and left the taxonomy of Texas pygmy-owls to be *G. b. cactorum* (e.g., Oberholser 1974, Millsap and Johnson 1988).

In addition to geographic separation, the pygmy-owl's eastern and western populations occupy different habitats. Although some broad similarities in habitat physiognomy are apparent (e.g., dense woodlands and thickets), floristically these eastern and western habitats are very dissimilar. The desert scrub and thornscrub associations in Arizona and western Mexico are unlike any habitats occupied by the pygmy-owl in eastern Mexico and southern Texas. Also, the oak association habitat occupied on coastal plains in southern Texas is unlike any habitat available in the western portion of the pygmy-owl's range. However, the Tamaulipan Thornscrub habitat of the east and the riverbottom mesquite-cottonwood bosque habitat once found in Arizona are more similar in physiognomy and to a slight degree in floristic makeup.

The potential for genetic distinctness further supports a distinction between eastern and western pygmy-owl populations. The fact that the pygmy-owl is nonmigratory throughout its range suggests that genetic mixing across wide areas may be infrequent. Considerable variation in plumage between regional populations has been noted, including specific distinctions between Arizona and Texas pygmy-owls (van Rossem 1937, Burton 1973, Tyler and Phillips 1978, Johnsgard 1988).

The above information indicates that eastern and western populations of the cactus ferruginous pygmy-owl are distinct, based on geographic isolation, distribution and status of habitat, and potential morphological and genetic distinctness. Further, the status of the subspecies in Mexico is currently unclear.

To date, the Service is aware of only one genetic study completed on pygmy-owls in the United States. Using toe clippings or blood samples, Zink et al. (1996) extracted DNA from pygmy-owls on the Norias Division of the King Ranch and from Rio Corona, Tamaulipas, Mexico. Data obtained from this study indicate that there is very little genetic difference between birds on the King Ranch and those in Tamaulipas, Mexico, and the authors concluded that any division between the two populations would therefore have occurred recently, likely within the last 75 years.

Environmental stochasticity, demographic stochasticity, catastrophes, and genetic stochasticity are recognized as interacting factors that might contribute to a population's extinction (Hunter 1996). Environmental stochasticity refers to random variation in habitat quality parameters such as climate, nutrients, water, cover, pollutants, and relationships with other species such as prey, predators, competitors, or pathogens. Demographic stochasticity is uncertainty due to random variation in reproductive success and survivorship of individuals. Catastrophes are events such as droughts or hurricanes that occur randomly. Genetic stochasticity is the

random variation in gene frequencies of a population due to genetic drift, bottlenecks, inbreeding, and similar factors. When these factors interact with one another, there are likely to be positive feedback loops, or snowballing of effects, such that a random environmental change like habitat fragmentation can result in population and genetic changes by preventing dispersal. These factors are much more likely to cause extinction when a species' numbers are already extremely low. The small, fragmented population of pygmy owls in Arizona does not have the ability to resist change or dramatic fluctuations over time caused by one or more of the factors mentioned above.

Reasons for Listing and Rangewide Trend

The pygmy-owl is threatened by past, present, and potential future destruction and modification of its habitat, throughout a significant portion of its range in the U.S., and, to a less well-known extent, in portions of its range in Mexico (Phillips et al. 1964; Oberholser 1974; Johnson et al. 1979; Monson and Phillips 1981; Johnson and Haight 1985a; Hunter 1988; Jahrsdoerfer and Leslie 1988; Millsap and Johnson 1988; Ditto 1993; Tewes 1993; Mays 1996; Wahl, pers. comm. 1992). The severity of habitat loss and threats varies across the pygmy-owl's range. Population numbers have been drastically reduced in Arizona, which once constituted its major U.S. range. In Texas, the pygmy-owl has been virtually extirpated from the lower Rio Grande valley but persists in oak associations on the coastal plain north of the Rio Grande valley. The majority of these losses are due to destruction and modification of riparian and thornscrub habitats. It is estimated that between 85 to 90 percent of low-elevation riparian habitats in the southwestern U.S. have been modified or lost. These alterations and losses are attributed to urban and agricultural encroachment, woodcutting, water diversion and impoundment, channelization, livestock overgrazing, groundwater pumping, and hydrologic changes resulting from various land-use practices (e.g., Phillips et al. 1964, Carothers 1977, Kusler 1985, Arizona Game and Fish Department 1988, Service 1988b, General Accounting Office 1988, Jahrsdoerfer and Leslie 1988, Szaro 1989, Dahl 1990, State of Arizona 1990, Bahre 1991). Status information for Mexico is very limited, but some observations suggest that although habitat loss and reduced numbers are likely to have occurred in northern portions of the two subspecies in Mexico, the pygmy-owl persists as a locally common bird in southern portions of Mexico. Habitat loss and population status are summarized below for the four populations of the pygmy-owl.

The trend of Sonoran Desert scrub habitats and pygmy-owl occupancy is not as clear. Historical records from this habitat in Arizona are few. This may be due to disproportionate collecting along rivers where humans were concentrated, while the upland deserts were less intensively surveyed. Johnson and Haight (1985a) suggested that the pygmy-owl adapted to upland associations and xero-riparian habitats in response to the demise of Arizona's riverbottom woodlands. However, conclusive evidence to support this hypothesis is not available. It may be that desert scrub habitats simply are of lesser quality and have always been occupied by pygmy-owls at lower frequency and density (Johnson and Haight 1985b, Taylor 1986). While historical records of pygmy-owls do exist for Sonoran Desert scrub in

areas such as the Santa Catalina foothills, they generally note that the birds are rare in these areas (Kimball 1921).

The pygmy-owl has declined throughout Arizona to the degree that it is now extremely limited in distribution in the State (Davis and Russell 1979, Johnson et al. 1979, Monson and Phillips 1981, Arizona Game and Fish Department 1988, Johnson-Duncan et al. 1988, and Millsap and Johnson 1988). Riverbottom forests and bosques, which supported the greatest abundance of pygmy-owls, have been extensively modified and destroyed by clearing, urbanization, water management, and hydrological changes (Willard 1912, Brown et al. 1977, Rea 1983, Szaro 1989, Bahre 1991, Stromberg et al. 1992, Stromberg 1993a). Cutting for domestic and industrial fuelwood was so extensive throughout southern Arizona that, by the late 19th century, riparian forests within tens of miles of towns and mines had been decimated (Bahre 1991). Mesquite was a favored species, because of its excellent fuel qualities. The vast forests of large mesquites along the Santa Cruz River in the Tucson area described by Swarth (1905) and Willard (1912) were lost to this threat, as did the heavy mesquite thickets where Bendire (1888) collected pygmy-owl specimens along Rillito Creek, a Santa Cruz River tributary, also in what is now Tucson. Only remnant fragments of these bosques remain. Cottonwoods were also felled for fuelwood, fenceposts, and for the bark, which was used as cattle feed (Bahre 1991). In recent decades, the pygmy-owl's riparian habitat has continued to be modified and destroyed by agricultural development, woodcutting, urban expansion, and general watershed degradation (Phillips et al. 1964, Brown et al. 1977, State of Arizona 1990, Bahre 1991, Stromberg et al. 1992, Stromberg 1993a). Sonoran Desert scrub has been affected to varying degrees by urban and agricultural development, woodcutting, and livestock grazing (Bahre 1991).

In addition to clearing woodlands, pumping of groundwater and the diversion and channelization of natural watercourses are also likely to have reduced pygmy-owl habitat. Diversion and pumping result in diminished surface flows, and consequent reductions in riparian vegetation are likely (Brown et al. 1977, Stromberg et al. 1992, Stromberg 1993a). Channelization often alters stream banks and fluvial dynamics necessary to maintain native riparian vegetation. The series of dams along most major southwestern rivers (e.g., the Colorado, Gila, Salt, and Verde) have altered riparian habitat downstream of dams through hydrological and vegetational changes, and have inundated habitat upstream.

Livestock overgrazing in riparian habitats is one of the common causes of riparian degradation (e.g., Ames 1977, Carothers 1977, Behnke and Raleigh 1978, Forest Service 1979, General Accounting Office 1988). Effects of overgrazing include changes if plant community structure, species composition, relative species abundance, and plant density. These changes are often linked to more widespread changes in watershed hydrology (Brown et al. 1974, Rea 1983, General Accounting Office 1988), and are likely to affect the habitat characteristics critical to the pygmy-owl.

The pygmy-owl is highly sought by bird watchers, who concentrate at several of the remaining known locations of pygmy-owls in the United States. Limited, careful bird

watching is probably not harmful; however, excessive attention by bird watchers may at times constitute harassment and affect the occurrence and behavior of the pygmy-owl (Oberholser 1974, Tewes 1993). For example, in early 1993, one of the few areas in Texas known to support the pygmy-owl continued to be widely publicized (American Birding Association 1993). The resident pygmy-owls were found at this highly-visited area only early in the breeding season; later in the season they could not be detected. O'Neil (1990) also indicated that five birds initially detected in southern Texas failed to respond after repeated visits by birding tours. Oberholser (1974) and Hunter (1988) additionally indicated that, in southern Texas, recreational birdwatching may disturb owls at highly visited areas.

One disease potentially affecting the pygmy-owl, as identified by the Arizona Game and Fish Department (D. Shroufe, in litt. 1996), is trichomoniasis. Because owls prey on finches, sparrows, and other seed-eating birds known to carry trichomoniasis, they have a higher risk of contracting the disease. According to Boal and Mannan (1996), raptors in urban areas experience a higher exposure rate to trichomoniasis, and the result is high mortality of raptor nestlings. No studies have been completed to date on the pygmy-owl in urban or other areas to determine if, in fact, pygmy-owls have been affected by this disease.

Recent work by Proudfoot (1996) indicates that snake predation may be an additional factor adversely affecting the pygmy-owl population on the Norias Division of the King Ranch. Proudfoot noted that nest boxes previously containing eggs would later be discovered empty, without sufficient time having elapsed to allow for fledging to occur. A lack of egg shell remains in nest boxes may indicate that snakes have predated nests containing pygmy-owl eggs. Although long-tailed weasels, *Mustela frenata*, also occur in this study area, the lack of egg shell remains and the nest box configuration indicate that weasels are not likely to have eaten the eggs. Nest boxes are typically 5.5 x 5.5 x 18 in with a 2.0 in entrance hole placed 12 in above the box bottom.

Proudfoot (1996) has observed the indigo snake, *Drymarchon corais*, climbing trees on the King Ranch and notes that the indigo snake is known to prey on cavity nesting green-cheeked Amazon parrots, *Amazona viridigenalis*. Proudfoot notes that, from 1993 to 1996, eight out of 112 available nest boxes (or 232 nest box opportunities) were used. Where flashing was placed around trees to prevent the possibility of predation by snakes, eggs were not disturbed. For the four nest boxes left unprotected, three were predated before the eggs hatched, and the fourth was predated following hatching. Proudfoot further noted that fecundity (the number of young successfully raised per year), for natural cavities was approximately one-third that of fecundity for nest boxes, and speculates that eggs and birds in natural cavities were likely to have been predated by both snakes and long-tailed weasels, resulting in a lower fecundity rate (G. Proudfoot, pers. comm. 1996).

No conservation plans or habitat restoration projects specific to the cactus ferruginous pygmy-owl exist for lands managed by the U.S. Government, Indian Nations, State agencies, or private parties. The Forest Service, Bureau, and Bureau of Reclamation have focused some attention on modifying livestock grazing practices in recent years, particularly as they affect

riparian ecosystems. Several of these projects are in the former range of the pygmy-owl, including some historical nesting locations. In addition, some private landowners in southern Texas are accommodating and funding research and have expressed an interest in carrying out conservation measures to benefit the pygmy-owl.

Pesticides may pose an additional threat to the pygmy-owl, as it occurs in floodplain areas that are now largely agricultural. Jahrsdoerfer and Leslie (1988) note that >100pesticides are used on agricultural crops throughout the lower Rio Grande Valley, with use beginning in the late 1940s. Pesticide application occurs year-round. Because crops, such as cotton, are grown repeatedly year after year, an accumulation of resistant pesticides may result. Pesticide contamination is described as "widespread" throughout the inland waters of the lower Rio Grande Valley, and includes concentrations of DDT, dieldrin, endrin, lindane, endosulfan, Guthion, and PCBs which exceeded 1976 EPA criteria for propagation of fish and wildlife. Without appropriate precautions, these agents may potentially affect pygmy-owls through direct toxicity or effects on their food base. No quantitative data on the effects of this potential threat on the pygmy-owl are known at this time, however, the effects of pesticides such as DDT on the reproductive success of other bird species are well known.

The pygmy-owl nests in cavities excavated by woodpeckers in trees or large cacti. Increasing competition with nonnative European starling, *Sturnus vulgaris*, for nest cavities may be a threat to cavity nesters like the pygmy-owl. Starlings were first reported as occurring in Arizona in 1946 (Monson 1948).

An additional potential threat to the pygmy-owl is low recruitment. Recruitment is the number of young who survive long enough to leave the nest per nesting attempt. Proudfoot (1996) found through a study of four active nest cavities that only one was successful in fledging young. The recruitment rate for this study was therefore 1.0 (four nesting attempts with four young fledging from one nest, while the other three nests failed). We do not know what recruitment rate would be necessary for the pygmy-owl because of the lack of information on reproduction, longevity, natality, and mortality for this subspecies. However, Proudfoot estimated that, based on information for the eastern screech owl, *Otus asio*, a recruitment rate of 2.25 was necessary for a stable pygmy-owl population.

Potential future threats to pygmy-owl habitat in Arizona persist. The Service is aware of five specific housing and development projects operating or in the planning stages that would affect habitat where the majority of birds in Arizona currently exist. Housing and industrial development continue to expand in and near Tucson and Marana, and the northwest portion of the Tucson area is experiencing rapid growth. It was estimated that only 60 percent of the people living in the Tucson area are in the City of Tucson itself, even though the city limits continue to be expanded to keep up with urban expansion (Sierra Club 1988; Duane Shroufe, AGFD, in litt. 1996).

D. Shroufe (in litt. 1996) has estimated the number of suitable habitat acres in the northwest Tucson area, where the majority of birds for the western population are found, to be 54,400

vegetation strata. The density of annuals and grasses, as well as shrubs, are important to the prey base upon which the pygmy-owl depends. Shrubs and large trees provide protection against aerial predation for juvenile and adult pygmy-owls. Saguaros and large trees provide an appropriate substrate for nesting cavities.

The largest known population of pygmy-owls is in the northwest Tucson and Marana area. Survey results for 1996 found 16 birds in this area, including one pair and two fledged young. Survey results in 1997 located nine birds, including one pair and four fledged young. The area supporting these owls falls within the boundaries of the Bureau's Tucson Field Office.

While there have been no recent reports of pygmy-owls in most areas within the jurisdiction of the Tucson and Safford Field Offices, the numerous records provided above indicate that pygmy-owls were at one time found at least in small numbers throughout the geographic area encompassed by the proposed action. The Safford and Tucson Offices of the Bureau report that surveys were conducted for pygmy-owls in 1997 for sections of the Gila River near its confluence with Bonita Creek, one mile of Bonita Creek upstream of its confluence with the Gila River, portions of Turkey Creek from its confluence with Aravaipa Creek and upstream for 1.25 mi, and that portion of Aravaipa Creek from its confluence with Turkey Creek downstream for 1.3 mi. No pygmy-owls were detected during these surveys. The Bureau notes there is suitable habitat for pygmy-owls on 27 allotments within the jurisdictions of the Tucson and Safford Field Offices.

EFFECTS OF THE PROPOSED ACTION

Of the 27 allotments with potential pygmy-owl habitat, 13 contain riparian habitat that will not be grazed. These include the South Rim, Muleshoe, Twin C, Johnny Creek, Bullgap, and Copper Creek allotments. Additionally, four allotments have partial exclusion of livestock from riparian habitat through their grazing systems and the use of range improvements. The remaining three allotments (Morenci, San Francisco, and Gila) currently have year-long grazing in riparian habitat. The Bureau has determined that yearlong grazing is adversely affecting riparian habitat due to the tendency for livestock to congregate in riparian areas versus upland areas.

Table 5 in Bureau (1996a) provides an effects analysis for allotments with an effect determination for each of the six activities being analyzed under the grazing program for this project (permitted use, grazing system, utilization, range improvements, riparian management, and special area management). For the San Francisco allotment, the Bureau has determined that permitted use, utilization, range improvements, and special area management would have no effect on the pygmy-owl. The Bureau further determined that the grazing system, which is year-long grazing for this allotment, is likely to adversely affect the pygmy-owl, and that riparian area management is also likely to adversely affect the pygmy-owl.

For the Morenci allotment, the Bureau has determined that permitted use, utilization, and range improvements would have no effect on the pygmy-owl, while special area management

may affect, but is not likely to adversely affect the pygmy-owl. The Bureau determined that the grazing system and riparian area management are likely to adversely affect the pygmy-owl. For the Gila allotment, the Bureau determined that permitted use and utilization would have no affect on the pygmy-owl, while the grazing system, range improvements, and special area management may affect, but are not likely to adversely affect the pygmy-owl. The Bureau determined that riparian area management for the Gila allotment is likely to adversely affect the pygmy-owl. The Bureau concludes that incidental take could occur on those allotments with potential habitat and year-long grazing where there are no improvements to keep livestock out of suitable habitat.

As noted in the above in the section entitled "Reasons for Listing and Rangewide Trend," the loss of riparian habitat to a variety of uses, including livestock overgrazing, is considered one of the causes contributing to the decline of the pygmy-owl. Ohmart and Anderson (1986) note that structural complexity and mean canopy height of riparian forests are generally reduced where riparian systems are under heavy water management, livestock grazing, pollution, or recreational activities. Arizona Department of Environmental Quality (1993) notes that changes to plant community structure and age class structure occur by direct consumption of plants and by disturbances to soils. Because the most palatable plants are eaten first, remaining plants have a competitive advantage and become more widespread. Young, palatable plants of all species are consumed before they can mature and set seed. Furthermore, disturbance of soils may prevent establishment of seedlings, and can affect the roots of riparian plants with shallow root systems. Chaney et al. (1990) note that depleted upland vegetation can cause livestock to concentrate in riparian areas, causing further riparian losses. Damage to riparian areas from grazing without proper control of intensity, season, and duration can be long-lasting and potentially irreversible.

Stromberg (1993a&b) notes that unregulated livestock grazing has been implicated as one of the primary causes of decadent age structures of trees, where stands have large, old trees, but few saplings or small trees. Additionally, Stromberg (1993a&b) notes that reduced seedling establishment can result from browsing, trampling of seeds, and reduction of a stabilizing herbaceous cover. Soil compaction associated with grazing can reduce the growth rate of existing trees by decreasing water percolation and the abundance of mycorrhizae and other critical soil components. Additional information on the effects of livestock grazing in riparian communities is found in the "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel, spikedace, and southwestern willow flycatcher.

Grazing in the watersheds of riparian communities may also affect riparian vegetation communities, stream hydrology, and channel morphology. In particular, degraded watersheds can result in higher peak flows, lower base flows, erosion and sedimentation of stream channels, and other effects, which are described in detail in the "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel.

In Sonoran Desert scrub communities, the Bureau indicates that grazing levels have been set for minimal effects to the range and are not expected to result in take of the pygmy-owl. The

acres. Surveys completed in 1996 covered 17.0 mi^2 of this area (Abbate 1996). The Arizona Game and Fish Department notes that, while 60 percent of this land is in State Trust or Bureau ownership, much of the land may be subject to development because the Town of Marana is developing a General Plan for future growth that may incorporate these areas. In addition, the Bureau is evaluating a proposal to sell all of its land within this area to a developer.

In Sonoran desert scrub potential threats include the increased risk of wildfire associated with invasion of nonnative grasses such as red brome, *Bromus tectorum*, and buffelgrass, *Pennisetum ciliare*. An additional threat in the Organ Pipe Cactus National Monument area is the increasing visitation and through-traffic from the international port of entry at Lukeville (H. Smith, in litt. 1996).

In addition, expanding human populations in the border region are expected to continue to increase impacts and threats discussed above. Further, extensive industrial, municipal, and agricultural developments facilitated by the North American Free Trade Agreement are anticipated along the U.S.-Mexico International border. These developments may result in accelerated habitat loss and demands on groundwater.

Further, because the pygmy-owl is nonmigratory, there may be an additional limitation on the flow of genetic material between populations which may reduce the chance of demographic and genetic rescue from immigration from adjacent populations.

ENVIRONMENTAL BASELINE

Pygmy-owls were historically widespread in the project area. Hunter (1988) and the Arizona Game and Fish Department Heritage Data Management System (HDMS) reported two birds from the San Pedro River near Dudleyville in 1985 and again in 1986. Records for the Gila River within the proposed project area include three individuals near present-day Geronimo (Aiken 1937), an individual at the Gila River/Bonita Creek confluence in 1985, and an individual at the San Francisco and Gila Rivers confluence in 1978 (Hunter 1988). In the greater Tucson Valley records include one specimen collected at Camp Lowell in 1872 (Bendire 1888); an individual observed in eastern Tucson in 1975 (Hunter 1988); one pair with young in Sabino Canyon in 1976 (Hunter 1988); eight individual records of a pair with young from 1980 to 1987 (nesting records were not verified for these reports) (Hunter 1988); owls reported in northwest Tucson in 1988 and 1989 (Arizona Game and Fish Department HDMS); one individual in northwest Tucson in 1993 (Arizona Game and Fish Department HDMS); and one pair of birds in northwest Tucson in 1994 (Hunter 1988). In southern Arizona, two individuals were reported along Sonoita Creek in 1975 (Hunter 1988), and one individual was observed in 1986 in the Pajarito Mountains (Hunter 1988).

Currently, all known pygmy-owls are found within the palo verde-mixed cacti series of the Arizona Upland Subdivision of Sonoran Desert scrub (Brown 1982b). Occupied sites are characterized by an abundance of saguaros or large trees, and a diversity of plant species and

Bureau notes that fourteen allotments within Sonoran Desert scrub communities have potential habitat for the pygmy-owl. Two of these allotments (Hay Hook and Hot Well) are currently in nonuse, while three have rotation type grazing systems. The remaining nine allotments have year-long grazing. The Bureau has concluded that, because of adjusted permit use, grazing systems, and upland utilization standards, no adverse effects are anticipated in Sonoran Desert scrub allotments with suitable habitat for the pygmy-owl habitat.

Plant species found within Sonoran Desert scrub occupied by pygmy-owls include saguaro cacti, blue palo verde, *Cercidium floridum*, ironwood, acacia, prickly pear and cholla (*Opuntia* spp.), with dense patches of triangle-leaf bursage, *Ambrosia deltoidea*, and other herbaceous species in the understory. A study conducted on the Sierra Ancha grazing allotment of the Tonto National Forest near Roosevelt Reservoir indicated that cattle diets were mainly annual grasses and forbs for March, April, and early May, and that shrubs made up only three to 10 percent of the diet in these months. However, in May, as annuals begin to dry up and jojoba, *Simmondsia chinensis*, and mesquite start to grow, livestock begin browsing more heavily on these species. Jojoba made up 53 percent of their diet in late May, declining to 13 percent in October. Mesquite ranged from 15 to 40 percent of their diet from June through October (Smith et al. 1993a).

Smith et al. (1993b) conducted an additional study on the Santa Rita Experimental Range south of Tucson, Arizona. Their study determined that grasses comprised approximately 55 percent of the year-round diet, reaching a peak of 78 percent in the summer and a low of 35 percent in early spring. Forbs were found to comprise minor percentages of the diet except in early spring when borages made up approximately 33 percent of the diet. Shrubs made up approximately 33 percent of the diet yearlong, peaking at 55 percent in winter and 45 percent in spring. Smith et al. (1993b) note that *Opuntia* spp. and mesquite were the major shrub components. The study also noted that utilization levels were 40 to 50 percent, so that selected forage was not influenced by a shortage of specific species due to overgrazing.

The United States General Accounting Office (GAO 1991) determined that "...domestic livestock grazing on the Bureau's hot desert allotments continues to impose the risk of long-term environmental damage to a highly fragile resource." The GAO states that historic grazing practices reduced the productivity and vigor of the hot desert ecosystems, and believes that evidence suggested that grazing practices continued to reduce productivity and vigor, noting that recovery could take decades in some areas, and that damage may be irreversible in others. The GAO notes that there continues to be evidence that, while grazing practices have changed substantially, current grazing practices continue to degrade some lands. Among the effects of grazing noted by the GAO are trampling of vegetation, removal of vegetation, trampling of habitat for endangered species, elimination of vegetation components, and grazing too heavily on key species. The GAO indicates that "Furthermore, changes in the amount and composition of vegetation caused by overgrazing can be detrimental to native wildlife that are unable to adapt to the alterations."

The GAO report additionally notes that a study conducted by the Bureau between 1978 and 1989 indicates that if livestock grazing were discontinued, recovery would begin. Specifically, the GAO indicates that less soil erosion would occur, water infiltration would increase, soils would generally improve, vegetation would gain in health and vigor, cover would increase and would benefit both soil and wildlife.

The effects of grazing on cryptobiotic crusts and resulting effects on plant species composition is discussed in the "EFFECTS OF THE PROPOSED ACTION" for Pima pineapple cactus within this biological opinion. As additionally noted in that discussion, grazing can result in soil erosion and compaction, reduced water infiltration rates, and increased runoff, leaving less water for plant production. Livestock grazing can also result in decreased shrub cover and desirable shrubs.

Nearest to the largest known pygmy-owl population in northwestern Tucson and Marana are nine Bureau allotments, including Newman Peak (6004), Fresnal Canyon (6022), Owl Head (6083), Cross Triange (6144), Deep Well (6211), Balcom (6006), Claflin (6029), Rail-X (6121), and Guild Wash (6151). A total of 57,520 acres of Bureau lands occur in these allotments, of which 50,489 are in fair range condition. Range condition trend is static in all nine allotments. Ranges in fair condition exhibit from 25 to 49 percent of a site's potential plant community (Bureau 1994). This suggests that the majority of Bureau lands in the nine allotments have been adversely affected by past and/or current livestock grazing, although other factors such as long-term drought and/or proliferation of nonnative plants may have played a role in range condition. However, nonnative perennial plants are less of a factor in Sonoran desert scrub than in desert grasslands, and Sonoran desert shrubs, trees, and cacti are adapted to surviving short-term drought.

In Sonoran Desert scrub, pygmy-owls are typically found in very well-developed, thickets of desert vegetation. Grazing that reduces the structure and composition of desert scrub communities below the site's potential likely adversely affect the suitability of the site as pygmy-owl habitat. Although grazing in semidesert grassland and Chihuahuan desert scrub can cause a decrease in grasses and increases in shrubby species (Bahre 1995, Holecheck et al. 1994), this effect has not been documented in Sonoran desert scrub. Grazing can result in reduced shrub cover (Webb and Stielstra 1979) and reduced desirable shrubs (Orodho et al. 1990) in Mojave desert scrub and Great Basin desert scrub, respectively. Browsing of shrubs and young trees, trampling or browsing of saquaros and their nurse plants (Abouhalder 1992), and adverse effects to soils and cryptobiotic crusts (described in the "EFFECTS OF THE PROPOSED ACTION" for the Pima pineapple cactus) are mechanisms by which the structure and composition of Sonoran desert scrub could be affected by grazing. Reduction in shrub, tree, and columnar cactus cover and regeneration would degrade pygmy-owl habitat.

Changes to the structure and composition of riparian and Sonoran Desert scrub communities can result in a decreased prey base for the pygmy-owl, increased susceptibility of the pygmy-owl to its aerial predators, lack of suitable nesting structures, and habitat fragmentation. The Service is particularly concerned with year-long grazing in riparian and Sonoran Desert scrub

habitat. The Service believes that this type of grazing can, in the long-term, decrease potential nesting habitat for the pygmy-owl by suppressing regeneration of trees in riparian areas and by inhibiting survival of saguaros.

Construction of range improvements, prescribed fire, planting or seeding of nonnative plants, and chemical or mechanical vegetation management could result in direct effects to pygmy-owls. Construction of a pipeline, stock tank, or other improvement could disturb pygmy-owls or result in destruction of nesting or foraging habitat. Prescribed fire in uplands could spread to and destroy riparian habitat occupied or potentially occupied by pygmy-owls. Seeding or planting of nonnative plants could increase the chances of catastrophic fire that destroys nest sites and foraging habitat, particularly in semi-desert grassland and Sonoran Desert scrub (see "EFFECTS OF THE PROPOSED ACTION" for the Pima pineapple cactus). Chemical or mechanical vegetation management, which often targets reduction of shrubby species, could degrade pygmy-owl habitat.

The proposed project area encompasses a large portion of the historic range of this species, and includes areas historically occupied by pygmy-owls. The Bureau has indicated that allotments in the project area encompass potential habitat for this species; however, surveys completed to date have been limited and it is not possible to ascertain occupancy status. The Service believes that there is a potential for pygmy-owls to occur in the Bureau's allotments and to be adversely affected by the proposed action. Loss of vegetation essential for foraging and cover from aerial predators, as well as the potential decrease in nesting cavities due to the loss of saguaros and browsing on mesquite, and suppression of riparian tree regeneration, as documented by the Bureau (1996a) would adversely affect this species.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline. Due to the extent of the lands in the project area administered by Federal agencies, particularly the Bureau and the Forest Service, many of the actions that are reasonably expected to occur in the general area of the quarries would be subject to section 7 consultations. However, many activities are expected to occur on private and State lands that are not subject to the section 7 process. Development of non-Federal lands in the northwest Tucson area is ongoing and presents a significant threat to the largest known population of pygmy-owls in Arizona. Other activities expected to occur on non-Federal lands in potential pygmy-owl habitat include agricultural uses, continued grazing on private lands, and woodcutting.

Cumulative effects for potential habitat areas on the Gila and San Francisco rivers are described in the razorback sucker discussion. Cumulative effects on the San Pedro River and Aravaipa Creek are discussed in the writeups for Huachuca water umbel and spikedace,

respectively. Cumulative effects at Cienega Creek are described in the writeup for Gila topminnow.

Effectiveness of Proposed Mitigation

The Bureau has proposed substantial measures to reduce or eliminate both direct and indirect impacts on the pygmy-owl and its habitat. These measures include elimination of livestock grazing conflicts from riverine riparian areas within suitable occupied habitat or potential habitat. Measures to eliminate conflicts may include elimination of grazing from these areas. Grazing conflicts would also be removed from desert scrub habitats near the largest known population of pygmy owls in northwest Tucson and Marana. Measures may include removing cattle from these areas. Other allotments would undergo a habitat assessment and habitat would be mapped. A study would be conducted to determine the effects of grazing on the pygmy-owls habitat and implement actions as necessary to minimize those effects. The Bureau also proposes implementing their riparian policy, prioritizing implementation of the Safford District RMP, and development of site-specific management actions in cooperation with the Service and Arizona Game and Fish Department at the activity plan level that address allotment specific conflicts between the grazing program and threatened and endangered species and their habitat requirements.

The Bureau's mitigation measures described above mitigate or establish a process that will reduce or eliminate, most adverse effects of the proposed action. The prompt and thorough implementation of the above measures is imperative to avoid what the Service believes are very serious threats to the cactus ferruginous pygmy-owl.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of the cactus ferruginous pygmy-owl. We present this conclusion for the following reasons:

1. The proponent's project description includes substantial features and options to mitigate the direct and indirect impacts of the proposed action on the pygmy-owl and its habitat.

2. The direct and indirect effects of grazing will be minimized from areas of likely occupied or potentially suitable habitat.

3. The mitigation measures establish a process whereby suitable and occupied habitat can be identified and adverse effects minimized.

CONCLUSION

After reviewing the current status of the cactus ferruginous pygmy-owl, the environmental baseline for the action area, and the anticipated effects of the proposed action, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the cactus ferruginous pygmy-owl. No critical habitat has been designated for the species, thus none will be affected.

INCIDENTAL TAKE STATEMENT

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

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

AMOUNT OR EXTENT OF TAKE

The Service anticipates that 215,709 acres of public lands supporting potential habitat for the pygmy-owl, within the pygmy-owl's historic range, and near known locations of pygmy-owls could be degraded as pygmy-owl habitat as a result of the proposed action. The Service anticipates that take associated with the proposed project would occur in the form of harm due to significant habitat modification or degradation on these lands. Because of the limited amount of habitat suitable for pygmy-owl nesting and occupancy, the Service believes that additional losses, modifications, or degradation of remaining suitable riparian and Sonoran Desert scrub habitat would significantly impair essential behavioral patterns of the pygmy-owl including breeding, feeding, and/or sheltering, leading to possible injury or death of any

pygmy-owls in the allotments. The effects of grazing on pygmy-owl habitat would be on-going throughout the life of the proposed project. This take statement covers the life of the proposed action, ending on December 31, 2006. The Service has developed this incidental take statement based on the premise that the mitigation measures provided above will be implemented.

The anticipated level of pygmy-owl anticipated take cannot be directly quantified because of a lack of survey data in the project area, the difficulty in finding or documenting take, the uncertain extent and location of project-level components of the proposed action, such as prescribed fire and range improvement projects, and uncertainties regarding direct effects of such activities on the pygmy-owl. Therefore, anticipated levels of incidental take are indexed to condition of the habitat. Anticipated incidental take will be considered to have been exceeded if during the course of the proposed action: 1) cattle grazing is not disallowed or temporarily suspended in the nine allotments described in part, if determined by the Service to be necessary, (b) of the mitigation measures, 2) grazing is not disallowed or temporarily suspended in riverine riparian areas of the 11 allotments listed in part (a) of the mitigation measures, or 3) the results of studies described in part (c)(3) is not promptly conducted and used to develop and implement protective measures as described in part (c)(d) of the mitigation measures. If, during the course of the action, the amount or extent of the incidental take anticipated is exceeded, the Bureau must reinitiate consultation with the Service immediately to avoid violation of section 9. In the interim, the Bureau must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species, as required by 50 CFR 402.14(i). An explanation of the causes of the taking should be provided to the Service.

EFFECT OF THE TAKE

The Service has determined that this level of anticipated take is not likely to result in jeopardy to the species when all of the reasonable and prudent measures are implemented.

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

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the cactus ferruginous pygmy-owl:

1. Action shall be taken to eliminate direct effects of cattle grazing on those habitats that, based on current knowledge, have the greatest potential to support pygmy-owls.

2. Activities that may result in a take of cactus ferruginous pygmy-owl or destruction of pygmy-owl habitat shall be evaluated, monitored, and modified as needed to reduce potential adverse effects to the pygmy-owl.

3. The Bureau shall monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regards to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. Terms and conditions are nondiscretionary. With the exception of measures (a) and (b), the Bureau's proposed mitigation measures are included here by reference as terms and conditions.

The following terms and conditions implement reasonable and prudent measure number 1:

a. Maintain habitat features necessary to support breeding populations of pygmy-owls within their historic range by excluding cattle from riverine riparian areas on Bureau lands in the following allotments:

#4001 - Metcalf	#4002 - San Francisco
#4003 - Morenci	#4010 - Smuggler Peak
#4014 - Gila	#4021 - Twin C
#4022 - County Line	#4615 - Johnny Creek
#4616 - Bonita Creek	#4617 - Bullgap
#4618 - Turtle Mtn	

Trailing of cattle authorized by the Bureau on these allotments shall be limited to moving cattle across the Gila River between the Smuggler Peak and Zorilla allotments no more than twice a year, trailing on approximately 0.25 mi of the San Francisco River in the San Francisco allotment no more than twice a year, and trailing on Bonita Creek to move cattle between pastures. Trailing shall be conducted so that: 1) the fewest number of cattle are present for the shortest period of time possible in riparian/aquatic areas, 2) the shortest route across the river is taken, 3) trailing across riparian areas is conducted as infrequently as possible, 4) trailing is conducted in the winter months whenever possible, and 5) trailing across Bonita Creek is limited to the shortest routes possible, not to exceed 1.5 mi of the creek. Photos documenting typical effects of trailing in each area shall be taken.

b. The Bureau and the Service shall make site visits within four months of the date of this opinion to Bureau lands in those allotments near the largest known pygmy-owl population in northwest Tucson and Marana, as identified below. If, based on these visits, the Service determines that the lands are suitable as habitat for the pygmy-owl or would be suitable without grazing, the Bureau shall take action to remove cattle ~~cattle~~ from these areas of the

allotments. Following completion of the study described in (c)(3) of the mitigation measures, grazing may be returned to these allotments if it is determined that grazing would not remove key habitat elements for pygmy-owls or prevent habitat recovery:

#6004 - Newman Peak	#6006 - Balcom
#6022 - Fresnal Canyon	#6029 - Claflin
#6083 - Owl Head	#6121 - Rail X
#6144 - Cross Triangle	#6151 - Guild Wash
#6211 - Deep Well	

The following term and condition implements reasonable and prudent measure number 2:

In the allotments listed in the proposed mitigation measures under item 1, and in suitable habitat of any other allotment identified through the process in item 2, or by the Service, to include suitable pygmy-owl habitat, the following shall be carried out:

a. A mitigation plan shall be developed by the Bureau in coordination with the Service for each range improvement project that may adversely affect pygmy-owls or their habitat, and prescribed fire or vegetation management project. Mitigation plans for prescribed fire shall limit to the extent practicable the possibility that fire would spread to riparian habitat. Mitigation plans shall be approved by the Service.

b. No planting or seeding of nonnative plants shall be authorized by the Bureau.

The following term and condition implements reasonable and prudent measure number 3:

The Bureau shall submit annual monitoring reports to the Arizona Ecological Services Field Office by March 15 beginning in 1998. These reports shall briefly document for the previous calendar year the effectiveness of the terms and conditions, photos of areas where trailing occurred (see term and condition 1.a), and locations of pygmy-owls observed, and, if any are found dead, suspected cause of mortality. The report shall also summarize tasks accomplished under the mitigation measures and terms and conditions, and identification of suitable habitat. The report shall make recommendations for modifying or refining these terms and conditions to enhance cactus ferruginous pygmy-owl protection or reduce needless hardship on the Bureau and its permittees.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1)

responsibilities for the cactus ferruginous pygmy-owl. In furtherance of the purposes of the Act, we recommend implementing the following action:

Encourage private landowners with riparian communities on their property to seek assistance in removing cattle from riparian areas or taking other riparian restoration measures through the Service's Partners for Wildlife Program.

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

(Note: surveys involving simulated or recorded calls of cactus ferruginous pygmy-owls require an appropriate permit from the Service. Arizona Game and Fish Department should be contacted in regard to State permitting requirements.)

Lesser Long-nosed Bat
STATUS OF THE SPECIES

The lesser long-nosed bat was listed (originally, as *Leptonycteris sanborni*; Sanborn's long-nosed bat) as endangered on September 30, 1988 (53 FR 38456). No critical habitat has been designated for this species. The lesser long-nosed bat is a small, leaf-nosed bat. It has a long muzzle and a long tongue, and is capable of hover flight. These features are adaptations to feed on nectar from the flowers of columnar cactus, such as the saguaro and organ pipe cactus and from paniculate agaves, such as Palmer's agave, *Agave palmeri*, and Parry's agave, *A. parryi* (Hoffmeister 1986). Palmer's agave exhibit many characteristics of chiropterophily, such as nocturnal pollen dehiscence and nectar production, light colored and erect flowers, strong floral order, and high levels of pollen protein with relatively low levels of nectar sugar concentrations (Slauson 1996). Parry's agave demonstrates many (though not all) of these same morphological features (Gentry 1982). Slauson (1996) has demonstrated that nectar feeding bats are the principle pollinators defining seed set in Palmer's agave, though other pollinators may also be important.

The lesser long-nosed bat is migratory and found throughout its historic range, from southern Arizona and extreme southwestern New Mexico, through western Mexico, and south to El Salvador. It has been recorded in southern Arizona from the Picacho Mountains (Pinal County) southwest to the Agua Dulce Mountains (Pima County), southeast to the Chiricahua Mountains (Cochise County), and south to the international boundary. Roosts in Arizona are occupied from late April to September (Cockrum and Petryszyn 1991); the bat is not known to be present during winter in Arizona (Hoffmeister 1986). In spring, adult females, most of which are pregnant, arrive in Arizona gathering into maternity colonies. These roosts are typically at low elevations near concentrations of flowering columnar cacti. After the young are weaned these colonies disband in July and August; some females and young move to higher elevations, primarily in the southeastern parts of Arizona near concentrations of

blooming paniculate agaves. Adult males typically occupy separate roosts forming bachelor colonies. Males are known mostly from the Chiricahua Mountains but also occur with adult females and young of the year at maternity sites (Fleming 1995). Throughout the night between foraging bouts both sexes will rest in temporary night roosts (Hoffmeister 1986).

As indicated above, the lesser long-nosed bat consumes nectar and pollen of paniculate agave flowers and the nectar, pollen, and fruit produced by a variety of columnar cacti. These bats often forage in flocks. Nectar of these cacti and agaves are high energy foods. Concentrations of food resources appear to be patchily distributed on the landscape and the nectar of each plant species utilized is only seasonally available. Cacti flowers and fruit are available during the spring and early summer; blooming agaves are available through the summer. Columnar cacti occur in lower elevation areas of the Sonoran Desert region, and paniculate agaves are found primarily in higher elevation desert scrub areas, desert grasslands and shrublands, and into the oak woodland (Gentry 1982).

Lesser long-nosed bats appear to be opportunistic foragers and efficient fliers. The seasonally available food resources may account for the seasonal movement patterns of the bat. The lesser long-nosed bat is known to fly long distances from roost sites to foraging sites. Night flights from maternity colonies to flowering columnar cacti have been documented in Arizona at 15 miles, and in Mexico at 25 miles and 38 miles (Virginia Dalton, Tucson, Arizona, pers. comm. 1997; Yar Petryszyn, University of Arizona, Tucson, pers. comm. 1997). Fleming (1995) suggests that a substantial portion of the lesser long-nosed bats at the Pinacate Cave in Sonora fly 25 to 31 miles each night to foraging areas in Organ Pipe Cactus National Monument. Lesser long-nosed bats have been recorded visiting individual blooming Palmer's agaves in excess of 1,000 visits per night (Ronnie Sidner, Tucson, Arizona, pers.comm. 1997), while other agaves may not be visited at all (Liz Slauson, Desert Botanical Gardens, Phoenix, Arizona, pers. comm. 1997). Lesser long-nosed bats have been observed feeding at hummingbird feeders many miles from the closest potential roost site (Yar Petryszyn, pers. comm. 1997).

Loss of roost and foraging habitat, as well as direct taking of individual bats during animal control programs, particularly in Mexico, have contributed to the current endangered status of the species. Suitable day roosts and suitable concentrations of food plants are the two resources that are crucial for the lesser long-nosed bat (Fleming 1995). Caves and mines are used as day roosts. The factors that make roost sites useable have not yet been identified. Whatever the factors are that determine selection of roost locations, the species appears to be sensitive to human disturbance. Instances are known where a single brief visit to an occupied roost is sufficient to cause a high proportion of lesser long-nosed bats to temporarily abandon their day roost and move to another. Perhaps most disturbed bats return to their preferred roost in a few days. However, this sensitivity suggests that the presence of alternate roost sites may be critical when disturbance occurs. Interspecific interactions with other bat species may also influence lesser long-nosed bat roost requirements.

Known major roost sites include 16 large roosts in Arizona and Mexico (Fleming 1995). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy these sites was greater than 200,000. Twelve major maternity roost sites are known from Arizona and Mexico. According to the same surveys, the maternity roosts are occupied by over 150,000 lesser long-nosed bats. The numbers above indicate that although a relatively large number of these bats are known to exist, the relative number of known large roosts is small. Disturbance of these roosts and the food plants associated with them could lead to the loss of the roosts. Limited numbers of maternity roosts may be the critical factor in the survival of this species.

ENVIRONMENTAL BASELINE

Records of the lesser long-nosed bat in the project area exist for the following areas: several localities in the Santa Rita Mountains, sites near Patagonia, several sites near Canelo and the west boundary of Fort Huachuca, several canyons on the southeast slope of the Huachuca Mountains, the San Pedro River RNCA at Fairbank, sites at and near Portal and Paradise and at Hilltop Mine on the east slope of the Chiricahua Mountains, a site west of Fort Bowie, Gillespie Wash in the Pinaleno Mountains, the Muleshoe Preserve, Colossal Cave, Box Canyon in Saguaro National Monument, Sabino Canyon, and near Picacho Peak. A large maternity roost, the Old Mammon Mine, is located approximately six miles west of the project area on the Tohono O'odham Reservation, and several localities exist on the east slope of the southern Peloncillo Mountains, New Mexico (Cockrum and Petryszyn 1991). Roosts in the project area are typically transitory roosts used by adults and/or young bats in summer or fall (Fleming 1995).

Lesser long-nosed bats require suitable forage plants (paniculate agaves and saguaros) and suitable roost sites. Mines and caves occur throughout the project area that potentially could provide suitable roost sites. Agaves and or saguaros may occur almost throughout the project area as shown in Figure 1. Figure 1 of Fleming (1995) shows that the range of the lesser long-nosed bat generally overlaps the project area, except that allotments along the middle Gila River and in the Aravaipa area appear to be outside of the area described by Fleming's range map. The northern-most record for the lesser long-nosed bat in eastern Arizona is from Gillespie Wash in the southern end of the Pinaleno Mountains. However, the Aravaipa area, which is further north, supports saguaros and paniculate agaves, and although saguaros are absent from the middle Gila River, the paniculate agaves, *Agave parryi* and *Agave palmeri*, are well represented there (Benson 1982, Benson and Darrow 1982). Thus, based on the distribution of forage plants, the species could potentially occur in the Aravaipa and middle Gila River allotments, as well.

If a 40-mile radius is drawn around known roosts described in Fleming (1995) and Cockrum and Petryszyn (1991), areas within the resulting circles can be considered possible foraging areas of the lesser long-nosed bat, based on the information presented above on distances bats may fly to foraging sites. These circles cover most of the allotments in the project area, with the exception of allotments north of the Gila River, allotments south of the Gila River near

Fort Thomas and east of Safford and Tanque, allotments in the Altar Valley, extreme southeastern Arizona east of Douglas along the international boundary, and several allotments north of Oracle Junction. The Aravaipa allotments fall within the potential foraging area of a roost identified in the Muleshoe area. Roosts in or adjacent to the project area supporting large numbers (>2,000)of bats include the Old Mammon Mine in the Slate Mountains, a mine near Patagonia, and a mine at Coronado National Memorial in the Huachuca Mountains (Fleming 1995). None of these roosts are in Bureau allotments.

Threats to lesser long-nosed bat in the project area include many activities described in the "STATUS OF THE SPECIES." A large roost of 5,000 or more lesser long-nosed bats was eliminated from Colossal Cave by repeated, mostly non-lethal, measures to drive the bats out of the Cave that began in the 1920's and continued until the bats were effectively extirpated in the 1960's (Cockrum and Petryszyn 1991). Hayward and Cockrum (1971) reported declining numbers of bats in roosts in the Chiricahua Mountains, probably as a result of human disturbance in the roosts (Cockrum and Petryszyn 1991).

Activities that adversely affect the density and productivity of paniculate agaves and saguaros may adversely affect populations of lesser long-nosed bats. Clearing of vegetation for development; prescribed fire; vegetation manipulation, such as chaining, imprinting, or chemical control; and grazing all may adversely affect paniculate agaves and saguaros (Fleming 1995, Abouhalder 1992). Activities that directly or indirectly promote invasion or increased density of nonnative grasses, particularly Lehmann lovegrass, species of *Bromus*, and Mediterranean grass, *Schismus barbatus*, may result in increased fire frequency and intensity (Minnich 1994, Rogers and Steele 1980).

EFFECTS OF THE PROPOSED ACTION

Direct effects to lesser long-nosed bats as a result of proposed grazing activities are unlikely because such activities are unlikely to affect roosts and few roosts are known from Bureau allotments [exceptions are Hilltop Mines (not on Bureau lands) and a roost on the Muleshoe Preserve]. Roads constructed or maintained wholly or in part to access range improvements or other grazing-related facilities in an allotment could facilitate access to roost sites and encourage human disturbance of roosting bats or vandalism of roost habitats. Prescribed fire in the vicinity of roosts could burn into a roost via support beams in mines, smoke could drift into a mine and disturb or injure bats, and post-fire erosion of slopes could bury mine and cave entrances. The precise location of roosts in relation to allotment boundaries is unclear based on information available to the Service; however, the Muleshoe roost appears to be located in the Muleshoe allotment (4401), and Hilltop Mines appears to be in the Oak Creek (5156), Nippers (5155), or Brushy Canyon (5152) allotments. Hilltop Mines is located on lands administered by the Coronado National Forest. The Muleshoe allotment is currently in non-use; the Oak Creek, Nippers, and Brushy Canyon allotments are grazed seasonally. Other as yet undetected roosts likely occur within allotments in the project area.

Indirect effects to lesser long-nosed bats may occur through adverse effects to forage plants. Saguaros may be affected both directly and indirectly by grazing activities. Direct impacts may occur from trampling of young saguaros, grazing of nurse plants which results in reduction or removal of protective cover, or grazing of the young saguaros themselves (Abouhalder 1992). No long-term investigation has documented the influence of grazing on agave mortality or flowering stalk herbivory following fire. However, prior to the summer monsoons at Four Peaks on Tonto National Forest, livestock were observed eating the unprotected apex of several agave plants (Tricia Roller pers. comm. 1997). Cattle probably trample young agaves, as well. Direct effects due to livestock grazing are expected to be more intense where livestock congregate near water sources and less intense on steep slopes or among rocks where grazing is typically relatively light. Palmer's agave typically occurs on rocky slopes, but is also scattered within the desert grassland and oak woodland communities within the elevation range of approximately 3,000 to 6,000 ft (Gentry 1982). Like Palmers' agave, Parry's agave is typically found on rocky slopes, but at somewhat higher elevations (4,900 to 8,200 ft) (Gentry 1982). Saguaros occur in valleys, bajadas, and on slopes.

Direct effects to forage plants may also occur as a result of construction or maintenance of range improvement projects and vegetation management. Construction of fencelines, pipelines, water sources, and other range improvements can result in destruction of agaves and saguaros. Chaining, imprinting, rootplowing and herbicide use may also result in death or injury to paniculate agaves and saguaros.

Saguaros can be injured or killed by prescribed fire, particularly where fuel loads are great. In comparison to other agaves, Palmer's agave may be more susceptible to fire induced mortality due to the fleshiness of its leaves and open rosette being exposed to other fuels (Wendy Hodgson, pers. comm. 1997). The Baker prescribed fire was conducted recently in the southern Peloncillo Mountains located in the southeastern corner of the project area. According to preliminary monitoring efforts conducted after the fire, there were seven to 11 percent mortality of Palmer's agaves exposed to fire (Peter Warren, pers. comm., 1997). Additional mortality may accrue through loss of the smallest and least detectable size classes of agave. Thomas and Goodson (1992) reported an average mortality of 28 percent of five species of leaf succulents from nine burned sites in southern Arizona. Palmer's agave mortality averaged 18 percent. However, post-fire grazing may have influenced reported mortality. Concentrations of paniculate agaves are primarily on the rocky, shallow soils of hills and ridges. Other Palmer's and Parry's agaves are found scattered in areas of deep, heavy soils where thick stands of shrubs and mesquite form heavy fuel loads. The relative fuel loading and potential exposure of agaves to intense fire is lower on rocky soils. In the biological opinion for the Maverick Prescribed Fire in the Peloncillo Mountains, Arizona-New Mexico, the Service required as a term and condition that the Coronado National Forest "follow guidelines in conducting the fire in such a manner that mortality of agaves as a result of the Maverick Prescribed Fire will not exceed 20 percent of those agaves burned."

Agave mortality due to fire may affect the abundance and distribution of blooming agaves on the landscape for many years into the future, especially if there is high mortality within

certain age/size classes (e.g seedlings). In addition, natural recruitment of agaves may be very episodic and the effects of fire on the agave seed bank in the soil are unknown. Often one of the objectives of prescribed fire is to increase abundance of grasses. Grasses are probably one of the strongest competitors with agave seedlings (Tony Burgess, pers. comm. 1997). Increased abundance of grass could result in reduced agave abundance. Agave stalks, as they begin to bolt, are particularly palatable to domestic livestock and wild herbivores, including deer, javelina, rodents, and rabbits (Michelle Hawks, University of Arizona, Tucson, pers. comm. 1997; Wendy Hodgson, pers. comm. 1997). Since agaves often remain partially green, succulent, and available to herbivores when food resources are low immediately following a fire, they may be preferentially selected by herbivores. This may in turn affect the availability of agave flowering stalks to bats.

Besides direct mortality of agaves, fire may alter the availability of blooming agaves and the quality of the floral resources (nectar and pollen). By early spring, an agave plant would have physiologically committed to bolt (send up a flowering stalk). If the plant is burned and lives, bolting continues though the flower stalk is smaller with fewer flowers and a lower nectar sugar content per flower (Howell 1996; Liz Slauson, pers. comm. 1997). If the stalk burns directly, the reproductive effort of that plant and the availability of flowers and nectar to *Leptonycteris* has been lost. A fire may actually stimulate flowering in adult agaves one to two years following a burn (Liz Slauson pers. comm. 1997). However, in subsequent years following the period of increased flowering there may be a reduced number of flowering agaves. The complexity of variables influencing agave flowering may mask the affects of a burn on agave flowering within several years of a fire.

Reintroducing fire into fire-adapted communities, such as desert grassland and oak/juniper savanna systems, can also have many benefits and may improve overall long-term "ecosystem management" objectives. Among these is the reduction of woody fuels resulting in decreased probability of intense fires and resulting erosion, soil sterilization, and increased plant mortality. Ultimately, if fire continues to be excluded from fire-adapted systems a major wildfire will occur with potentially devastating effects. Returning to a more natural regime of low-intensity fires would help to maintain a mosaic of grasslands, woodlands, and shrublands across the landscape. However, even under a prescribed fire regime there are potential adverse effects of fire to forage plants that may affect resource availability for the lesser long-nosed bat.

The Bureau's Arizona Standards and Guidelines, part of the proposed action, allows for seeding or planting of nonnative plant species. As discussed in the "EFFECTS OF THE PROPOSED ACTION" for the Pima pineapple cactus, invasion by nonnative grasses into desert scrub and semi-desert grasslands have altered fire frequencies and intensity. Stands of nonnative grass, particularly Lehmann lovegrass, may increase fire intensity and elevate the adverse effects of fire on saguaros and agaves.

Indirect effects to saguaros and agaves may also result from livestock grazing. As discussed in "EFFECTS OF THE PROPOSED ACTION" for the Pima pineapple cactus, grazing may

cause soil compaction, damage cryptobiotic crusts, reduce infiltration rates, increase runoff and erosion, and alter vegetation communities. Nurse plants, which shade sensitive saguaro seedlings (Shreve 1931), may be reduced by grazing and germination sites may be adversely altered due to soil compaction, erosion, and reduced infiltration. Benson (1982) noted that seedbeds of saguaros have been locally obliterated by grazing. Neiring et al. (1963) found that enhanced reproduction of saguaros on slopes was correlated with reduced localized levels of grazing.

Project-level severity of indirect adverse effects to lesser long-nosed bats resulting from reduction in forage is dependent on the importance of forage plants in a specific project site or allotment to reproduction, survival, and growth of the bat. As discussed, most of the allotments are within reasonable foraging distance (40 miles) of known day roosts, and thus are potential foraging areas. Areas with high densities of paniculate agaves and saguaros in close proximity to roosts may be of particular importance to the lesser long-nosed bat.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline. Much of the land in the project area is managed by Federal agencies, particularly the Bureau, U.S. Forest Service, Department of Defense, National Park Service, and the Service (Appendix 1). Most roosts and localities of the lesser long-nosed bat occur on lands administered by the Coronado National Forest, Fort Huachuca, and the National Park Service. Other activities on State, private, or Tribal lands may require permits or funding from Federal agencies. Thus, many of the actions that are reasonably expected to occur in the project area that may adversely affect the lesser long-nosed bat would be subject to section 7 consultations. However, grazing, development, and other activities occur on large tracts of State and private lands within the project area and within the known range of the lesser long-nosed bat that are not subject to section 7, the effects of which are considered cumulative to proposed action. For instance, considerable development is occurring, particularly near Tucson, Green Valley, and Sierra Vista, with associated loss of saguaros and agaves. Compliance with the Act for activities on State and private lands that may affect the lesser long-nosed bat, but are not addressed by section 7 consultation, could occur through section 10(a)(1)(B) of the Act.

Effectiveness of Proposed Mitigation

The Bureau proposes no specific measures for the lesser long-nosed bat to offset or mitigate the adverse effects described above. Proposed project-level consultation, application of Arizona Standards and Guidelines, limits on utilization, threatened/endangered species surveys and other measures to reduce adverse effects of range improvement project construction, would reduce, to some degree, effects to lesser long-nosed bats and their foraging habitat.

The Bureau also proposes bat surveys in the project area that should be complete by fall of 1998, and a study of survival and recruitment of saguaros and agave (Bureau 1996b). These surveys and studies should provide information that will allow better management of the bat and its habitat.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of the lesser long-nosed bat. We present this conclusion for the following reasons:

1. The proponent's project description includes features to minimize take of lesser long-nosed bats and mitigate to some degree the direct and indirect impacts of the proposed action on the lesser long-nosed bat and its foraging habitat.

2. No large roosts or maternity roosts of lesser long-nosed bats are known to occur in the allotments addressed by the proposed action.

3. Although the project area covers a significant portion of the bat's range in Arizona, it is a relatively minor portion of the total range of the lesser long-nosed bat.

CONCLUSION

After reviewing the current status of the lesser long-nosed bat, the environmental baseline for the action area, the effects of the proposed Safford/Tucson Field Offices' grazing program, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of lesser long-nosed bat. No critical habitat has been designated for the lesser long-nosed bat; thus none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

The reasonable and prudent measures described below are nondiscretionary. The Bureau has a continuing duty to regulate the activity covered by this incidental take statement. If the Bureau (1) fails to require any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

The Service anticipates incidental take of lesser long-nosed bats will be difficult to detect for the following reason(s): the bat is wide-ranging and may use more than one roost; it has a small body size; finding a dead or impaired individual is unlikely; losses may be masked by seasonal use of roosts; and the species occurs in habitats that makes detection difficult. Therefore, we have defined the following parameters as indicators that anticipated incidental take has been exceeded.

1) Adverse effects of range improvements, prescribed fire, vegetation management, and seeding of nonnative plants to the lesser long-nosed bat and its habitat are not minimized or eliminated.

2) Grazing by livestock in the project area is not in compliance with the Arizona Standards and Guidelines, the Upland Livestock Utilization Standard, Safford Drought Policy, and Arizona Ephemeral Grazing Policy, as described in Bureau (1996a) and the "DESCRIPTION OF THE PROPOSED ACTION," herein.

This biological opinion does not authorize any form of take not incidental to the Safford/Tucson Field Offices' grazing program as described herein. If the incidental take authorized by this opinion is met, the Bureau shall immediately notify the Service in writing. If the incidental take authorized by this opinion is exceeded, the Bureau must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim, the Bureau must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. The Bureau should provide to this office an explanation of the cause of the taking.

EFFECT OF THE TAKE

In this biological opinion, the Service finds that this level of anticipated take is not likely to jeopardize the continued existence of the lesser long-nosed bat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the incidental take authorized by this biological opinion:

1) The Bureau shall ensure that the grazing program does not facilitate public access to lesser long-nosed bat roosts.

2) Defined project areas and well-defined operational procedures shall be implemented to reduce adverse effects to lesser long-nosed bat forage plants due to construction of range improvement projects, chemical or mechanical vegetation management, seeding/planting of nonnative plants, or prescribed fire.

3) The Bureau shall support surveys for lesser long-nosed bats to facilitate better management of lesser long-nosed bats and their habitat.

4) The Bureau shall graze allotments in a manner so as to protect and enhance the forage base of the lesser long-nosed bat.

5) The Bureau shall monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regards to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. Terms and conditions are nondiscretionary. Terms and conditions 2.a., 3, and 4 are adapted from Bureau (1996a&b).

1. The following term and condition implements reasonable and prudent measure number one:

The Bureau shall ensure that construction, upgrading, or maintenance of roads associated with the grazing program does not increase or facilitate public access to known day roosts of the lesser long-nosed bat.

2. The following terms and conditions implement reasonable and prudent measure number two:

a. Prior to construction of range improvement projects, pre-construction surveys shall be conducted for paniculate agaves and saguaros that may be directly affected by construction activities, or in the case of new water sources, may occur within 0.5 mi of the proposed water source. If agaves or saguaros are found during pre-construction surveys, the following measures shall be implemented:

1. Fences, pipelines, waters, and other range improvement projects shall be located to reduce as much as possible injury and mortality of agaves and saguaros.

2. Disturbance shall be limited to the smallest area practicable and projects shall be located in previously-disturbed areas whenever possible.

3. Vehicle use shall be limited to existing routes and areas of disturbance except as necessary to access or define boundaries for new areas of construction or operation.

4. All workers shall strictly limit their activities and vehicles to designated areas. Construction workers shall be informed of these terms and conditions.

b. No seeding/planting of nonnative plants shall occur on any allotments in which paniculate agaves or saguaros occur.

c. Chemical and mechanical vegetation manipulation and prescribed fire shall be designed and planned to minimize adverse effects to lesser long-nosed bat forage plants. Measures shall be developed to ensure that no more than 20 percent of agaves that are burned during prescribed fire are killed by the fire and that injury and mortality of saguaros are negligible.

d. A mitigation plan shall be developed by the Bureau in coordination with the Service for each prescribed fire or chemical or mechanical vegetation management project within 0.5 mile of a lesser long-nosed bat roost or in areas that support paniculate agaves or saguaros. The mitigation plan shall ensure that effects to lesser long-nosed bat roosts and forage plants are minimized and shall include monitoring of effects to forage plants. The plan shall be approved by the Service.

3. The following term and condition implements reasonable and prudent measure number 3:

The Bureau shall support surveys for lesser long-nosed bats in the project area. Survey results shall be shared with the Service and used to make management decisions consistent with these terms and conditions.

4. The following term and condition implements reasonable and prudent measure number 4:

Grazing in allotments supporting paniculate agaves or saguaros shall strictly adhere to the Bureau's Arizona Standards and Guidelines, the Upland Livestock Utilization Policy, Safford Drought Policy, and the Arizona Ephemeral Grazing Policy.

5. The following terms and conditions implement reasonable and prudent measure number 5:

The Bureau shall submit annual monitoring reports to the Arizona Ecological Services Field Office by March 15 of each year beginning in 1998. These reports shall briefly document for the previous current calendar year the effectiveness of these terms and conditions, and documentation of take, if any. If such activities or monitoring occur, the report shall also summarize: 1) grazing actions initiated or completed including range

improvement projects, prescribed fires, and vegetation management; 2) monitoring results of prescribed fires; 3) allotment inventory, monitoring, and evaluation results; and 4) lesser long-nosed bats detected. The report shall make recommendations for modifying or refining these terms and conditions to enhance lesser long-nosed bat protection or reduce needless hardship on the Bureau and its permittees.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendation provided here does not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the lesser long-nosed bat. In furtherance of the purposes of the Act, we recommend implementing the following action:

The Bureau, in coordination with the Service and Arizona Game and Fish Department, should investigate the effects of the grazing program on the lesser long-nosed bat and its habitat, including clarifying the distribution of the bat and forage plants on allotments, and quantifying the direct and indirect effects of livestock grazing, development of range improvement projects, and other aspects of the grazing program.

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

(Note: surveys for lesser long-nosed bats, or other bats, that involve capture or take require appropriate permits from the Service and Arizona Game and Fish Department.)

Jaguar

STATUS OF THE SPECIES

The jaguar was initially listed as endangered from the U.S. and Mexico border southward to include Mexico and Central and South America (37 FR 6476, March 30, 1972; 50 CFR 17.11, August 20, 1994). As a result of a petition, the jaguar was proposed as endangered in the United States (59 FR 35674; July 13, 1994). In a Federal Register notice dated July 22, 1997, the Jaguar was listed as an endangered species in the United States (62 FR 39147).

The jaguar is the largest species of cat now native to the Western Hemisphere. Jaguars are large muscular cats with relatively short massive limbs, a deep-chested body, and cinnamon-buff in color with many black spots. Its range in North America includes Mexico and portions of the southwestern United States (Hall 1981). A number of records of jaguars are known for Arizona, New Mexico, and Texas. Additional reports exist for California and

Louisiana. Records of the jaguar in Arizona and New Mexico have been attributed to the subspecies *Panthera onca arizonensis*. The type specimen of this subspecies was collected in Navajo County, Arizona, in 1924 (Goldman 1932). Nelson and Goldman (1933) described the distribution of this subspecies as the mountainous parts of eastern Arizona north to the Grand Canyon, the southern half of western New Mexico, northeastern Sonora, and, formerly, southeastern California. The records for Texas have been attributed to *P. o. veraecrucis*. Nelson and Goldman (1933) described the distribution of this subspecies as the Gulf slope of eastern and southeastern Mexico from the coast region of Tabasco, north through Vera Cruz and Tamaulipas, to central Texas.

Swank and Teer (1989) indicated the historical range of the jaguar included portions of the states of Arizona, New Mexico, and Texas. These authors consider the current range to occur from central Mexico through Central America and into South America as far as northern Argentina. They stated the United States no longer contains established breeding populations which probably disappeared from the United States in the 1960s. They also maintained the jaguar prefers a warm tropical climate, is usually associated with water, and is only rarely found in extensive arid areas.

Goldman (1932) believed the jaguar was a regular, but not abundant, resident in southeastern Arizona. Hoffmeister (1986) considered the jaguar an uncommon resident species in Arizona. He concluded that the reports of jaguars between 1885 and 1965 indicated a small but resident population once occurred in southeastern Arizona. Brown (1983) suggested the jaguar in Arizona ranged widely throughout a variety of habitats from Sonoran Desert scrub upward through subalpine conifer forest. Most of the records were from Madrean evergreen-woodland, shrub-invaded semidesert grassland, and along rivers.

The most recent records of jaguars in the United States are from Arizona. In 1971 a jaguar was taken east of Nogales and in 1986 one was taken from the Dos Cabezas Mountains. The latter individual reportedly had been in the area for about a year before it was killed (Ron Nowak, U.S. Fish and Wildlife Service, pers. comm., 1992).

The Arizona Game and Fish Department (1988) cited two recent reports of jaguars in Arizona. The individuals were considered to be transients from Mexico. One of the reports was from 1987 from an undisclosed location. The other report was from 1988, when tracks were observed for several days prior to the treeing of a jaguar by hounds in the Altar Valley, Pima County. An unconfirmed report of a jaguar at the Coronado National Memorial was made in 1991 (Ed Lopez, Coronado National Memorial, pers. comm., 1992).

In 1993, an unconfirmed sighting of a jaguar was reported for Buenos Aires National Wildlife Refuge (William Kuvlesky, Service, in litt., 1993). In March 1996, the presence of a jaguar was confirmed through photographs made in the Peloncillo Mountains of Arizona and New Mexico (Glenn 1996). Arizona Game and Fish Department (1997) reports a jaguar was sighted in the Baboquivari Mountains in 1996.

Brown (1983) presented an analysis suggesting there was a resident breeding population of jaguars in the southwestern United States at least into the 20th century. The Service (1990) recognized that the jaguar continues to occur in the American Southwest as an occasional wanderer from Mexico. Currently, no known breeding population of jaguar occurs in the United States.

In Arizona, the jaguar's gradual decline was concurrent with predator control associated with the settlement of land and the development of the cattle industry (Brown 1983, Service 1990a). Lange (1960) summarized the jaguar records from Arizona known up to that time. Between 1885 and 1959, the reports consisted of 45 jaguars killed, 6 sighted, and 2 recorded by sign.

Brown (1991) related that the accumulation of all known records indicated a minimum of 64 jaguars were killed in Arizona after 1900. When plotted at ten-year intervals, records of jaguars reported killed in Arizona and New Mexico between 1900 and 1980 demonstrated 'a decline characteristic of an over-exploited resident population' (Brown 1983). Brown (1983) argued that if the jaguars killed during this period originated in Mexico, the numbers of killings should not suggest a pattern but should rather be irregular and erratic.

Bailey (1905) listed seven reports of jaguars killed in Texas between 1853 and 1903. Schmidly (1983) reported another jaguar shot in Mills County in 1904. Taylor (1947) mentioned a jaguar killed near Lyford, Willacy County, in 1912. Brown (1991) indicated jaguars were common in Texas until 1870. The last reports from Texas were of individuals killed in 1946 (San Benito, Cameron County) and 1948 (Kleburg County). Nowak (1975) identified killing of jaguars for commercial sale of their furs as a factor in the extermination of a substantial resident population in central Texas during the late 19th century.

Brown (1991) did not believe the jaguar was extirpated from northern Mexico. Although jaguars were considered relatively common in Sonora in the 1930s and 1940s, he cited the most northern officially reported population as about 800 miles south of the United States-Mexico border. However, Brown suggested there may be more jaguars in Sonora than are officially reported. He mentioned reports of two jaguars which were killed in central Sonora around 1970. He also discussed assertions by the local Indians that both male and female jaguars still occurred in the Sierra Bacatete. Brown speculated that if a reproducing population of jaguars is still present in these mountains, it may be the source of individuals which travel northward through the Sierra Libre and Sierra Madera until they reach Arizona. Nowak (pers. comm., 1992) reiterated that as late as 1987 the species was still considered common in the Sierra Bacatete near Guaymas, Sonora, which is about 200 miles south of Arizona.

Brown (1989) reported biologists from Mexico said that at least two jaguars have been killed in Chihuahua. In 1987, Nowak (pers. comm., 1992) claimed that jaguars were still regularly present along the Soto la Marina River of central Tamaulipas, which is about 150 miles from the southern tip of Texas. He also hypothesized that jaguars may be entering Arizona from

Mexico due to habitat destruction in Sonora. Large stretches of natural forest were cleared in central Tamaulipas. In Arizona, by contrast, jaguar prey populations have increased, and large tracts of brush and canyon woodland are still available to provide cover for jaguars.

Although the demand for jaguar pelts has diminished, it still exists along with the business of illegal hunting of jaguars. In 1992, the Arizona Game and Fish Department personnel infiltrated a ring of wildlife profiteers which resulted in the March, 1993, seizure of three jaguar specimens of which one was allegedly taken from the Dos Cabezas Mountains in Arizona in 1986. Two of the specimens had been covertly purchased from the suspects for $9,000. During the investigation, several ties to Mexico jaguar hunting were discovered. Hounds bred and trained in the United States were sold to Mexican nationals for the purpose of hunting jaguars. Also, Mexican nationals prosecuted by the Service in 1989 for illegally importing jaguar pelts into the United States were continuing the practice of providing jaguar hunts in Mexico (Terry B. Johnson, Arizona Game and Fish Department, in litt., 1993).

Actions that may affect the jaguar include clearing of habitat, destruction of riparian areas, fragmentation or blocking of corridors that jaguars may use, and any trapping or animal control activities designed to target the jaguar or other large predators. Such activities may also prevent jaguars from recolonizing previously inhabited, or otherwise suitable, areas. M-44 ejector devices with cyanide capsules used by APHIS-ADC to accommodate stockmen concerns over predator losses may be of threat to the jaguar (Terry B. Johnson, Arizona Game and Fish Department, in litt., 1993). The jaguar may also be victims of traps targeted for other predators such as bears and cougars.

ENVIRONMENTAL BASELINE

The project area includes some of the specific locations where the most recent reports of jaguars in Arizona (and even the entire United States) have occurred. These areas include the Greaterville area, Santa Cruz River, and the Dos Cabezas, Baboquivari, and Peloncillo mountains. This area continues to include some of the most likely area where jaguars would occur in the United States. It is also the area that is most likely to provide habitat that would support the existence of jaguars in the United States.

Loss of jaguars has occurred in the project area in the past. Such loss was addressed in detail in the Status of the Species section above. Such loss has almost resulted in their extirpation in the United States. Because the project area includes some of the most likely locations of occurrence for the jaguar in the United States, similar losses may be expected to continue to occur.

Some Federal projects have occurred in the area where jaguars may be expected in southern Arizona since the time that the jaguar was proposed as endangered. However, no previous conference or biological opinions for the jaguar have been issued prior to this opinion.

A conservation agreement is in preparation to address conservation of the jaguar in Arizona and New Mexico. The agreement will serve as a template for protections that will be necessary for the conservation and recovery of the species until a recovery plan is prepared and adopted.

EFFECTS OF THE PROPOSED ACTION

Basically, the adverse effects to the jaguar expected to occur from the project is in two forms. One is loss of jaguar habitat, and the other is take by means of predator control activities.

Loss of habitat could occur in upland as well as riparian areas. However, montane and riparian areas are probably of most importance for jaguar habitat. Clearing of habitat, destruction of riparian areas, and fragmentation or blocking of corridors may prevent jaguars from recolonizing previously inhabited areas (59 FR 35674; July 13, 1994). The general effects of livestock grazing on both upland and riparian situations have been covered comprehensively in other parts of this opinion. In particular, the accounts of the effects of the action on the Pima pineapple cactus, the Huachuca water umbel, and the spikedace reveal the effects of livestock grazing on habitat in general. The general effects on habitat include soil erosion, soil compaction, hydrologic and microclimate changes, decreased vegetation cover, changes in community structure and function, impediments to movements of individuals (e.g., from fences and roads of, and perhaps other, range improvements), and reduced understory and bankline vegetation. Those effects on habitat are incorporated by reference for this section for the jaguar. The same species accounts referred to above also list several of the upland and riparian areas that are included in allotments under the proposed project. It is difficult to determine all of the allotments that could be or are used by jaguars.

Predator control activities associated with the project could result in the direct take of jaguars. The description of such activities is vague in the documentation provided for the project. Thus, the range of actions that could be taken for predators under this project is unclear. Thus, the Service must assume that the range of actions could include those that could result in take of jaguars. In an attempt to control mountain lions, jaguars could be unintentionally chased or treed by dogs. However, in the final rule listing the jaguar, the Service found that such activity would not constitute a take so long as the dogs are called off upon realization that the animal is a jaguar.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline. Much of the land in the project area is managed by Federal agencies, particularly the Bureau, U.S. Forest Service, Department of Defense, National Park Service, and the Service. Other activities on State,

private, or Tribal lands may require permits or funding from Federal agencies. Thus, many of the actions that are reasonably expected to occur in the project area that may adversely affect the jaguar would be subject to section 7 consultation. However, grazing, development, and other activities occur on large tracts of State and private lands within the project area and within the known range of the jaguar that are not subject to section 7, the effects of which are considered cumulative to proposed action. For instance, considerable development is occurring, particularly near Tucson, Green Valley, and Sierra Vista. Compliance with the Act for activities on State and private lands that may affect the jaguar, but are not addressed by section 7 consultation, could occur through section 10(a)(1)(B) of the Act.

Effectiveness of Proposed Mitigation

The Bureau proposed to inform permittees that the jaguar is proposed as endangered and protected under State law, that all State permits will be obtained prior to any predator control activities, and that major riparian thickets south of Interstate 10 and Highway 86 will be maintained. These measures provide some level of protection for the jaguar and its habitat.

SUMMARY OF EFFECTS

The Service believes the effects described above are not likely to jeopardize the continued existence of the jaguar. We present this conclusion for the following reasons:

1. Although the project area covers a significant portion of the jaguar's range in Arizona, it is a relatively minor portion of the total range of the jaguar.

2. The Bureau proposes mitigation measures that provide some level of protection to the jaguar and its habitat.

CONCLUSION

After reviewing the current status of the jaguar, the environmental baseline for the action area, the effects of the proposed Safford/Tucson Field Offices' grazing program, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the jaguar. No critical habitat has been proposed or designated for the jaguar; thus none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to

listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

The reasonable and prudent measures described below are nondiscretionary. The Bureau has a continuing duty to regulate the activity covered by this incidental take statement. If, the Bureau (1) fails to require any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7 (o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

The Service anticipates incidental take of jaguars will be difficult to detect for the following reasons: the jaguar is wide-ranging; it is difficult to find and observe; finding a dead or impaired individual is unlikely; and the species occurs in habitat that makes detection difficult. Even with the difficulty outlined above, the nature of some of the activities (e.g., predator control activities) covered by this incidental take statement could result in the direct take of jaguars. Therefore, if any of the following situations occur, the anticipated level of take will be considered to be exceeded by the Bureau.

1. Any predator control activities associated with the project are directed at, or ultimately result in death or injury of a jaguar.

2. The injury or mortality of any jaguar that occurs as a result of any activities associated with the project.

3. Jaguar habitat is not maintained in riparian corridors of the project area.

If the incidental take anticipated by this opinion is met, the Bureau should immediately notify the Service in writing. If the incidental take authorized by this opinion is exceeded, the Bureau must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim the Bureau must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. The Bureau should provide to this office an explanation of the cause of the taking.

EFFECT OF THE TAKE

In this biological opinion, the Service finds that this level of anticipated take is not likely to jeopardize the continued existence of the jaguar.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the incidental take authorized by this biological opinion:

1) Jaguars will not be subjected to any predator control activities, by any entity, associated with the project.

2) Permittees will be informed by the Bureau of the status of the jaguar and the specifics of its protection under the Act.

3) All appropriate permits will be obtained prior to any predator control activities associated with the project.

4) Jaguar habitat will be maintained in identified locations.

5) The Bureau will investigate reports of any and all observations of jaguars or their sign in the project area and will provide the Service with a report of such investigations.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regards to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. Terms and conditions nondiscretionary.

1. The following terms and condition implements reasonable and prudent measure number one:

Predator control activities associated with livestock grazing (including those conducted by APHIS-ADC or the permittees) and authorized by the Bureau shall require identification of the target animal to species before control activities are carried out. If the identified animal is a jaguar, that individual shall not be subjected to any predator control actions. If, when using dogs to tree mountain lions, a jaguar is inadvertently chased and/or treed by the dogs, the dogs shall be called off immediately once it is realized the animal is a jaguar.

2. The following term and condition implements reasonable and prudent measure number two:

Permittees shall be informed by the Bureau by letter within 30 days of receipt of this biological opinion that take of jaguar, including harm and harassment, is prohibited under the Act and could result in prosecution.

3. The following term and condition implements reasonable and prudent measure number three:

Any predator control activities authorized by the Bureau and associated with this project shall be conducted only after all appropriate permits (whether Federal, State, or other) have been obtained.

4. The following term and condition implements reasonable and prudent measure number four:

Dense, low vegetation (mesquite, saltcedar, cottonwood, willow, etc.) in major riparian or xero-riparian corridors on Bureau-administered lands south of Interstate 10 and Highway 86 shall be maintained.

5. The following term and condition implements reasonable and prudent measure number five:

The Bureau, in coordination with the Service and Arizona Game and Fish Department, shall investigate all reports that it receives of observations of jaguars in the project area. The investigation shall include appropriate field collection of data. The Bureau is encouraged to enlist the expertise of the Arizona Game and Fish Department. The Bureau shall provide a detailed report of each observation and investigation to the Arizona Ecological Services Office within 30 days of the occurrence of each incident. Such information shall also be included for the previous calendar year in an annual monitoring report to be submitted to the Service by March 15 of each year, beginning in 1998.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendation provided here does not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the jaguar. In furtherance of the purposes of the Act, we recommend implementing the following action:

The Service recommends that the Bureau fund and/or carry out research to (1) determine the distribution of jaguar habitat within the project area, (2) determine the possible

or actual distribution of jaguars within that habitat, and (3) determine means by which that habitat can be maintained and protected.

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

(Note: surveys or research that involve capture, harassment or other forms of take of jaguar require appropriate permits from the Service and Arizona Game and Fish Department.)

New Mexico Ridgenose Rattlesnake
STATUS OF THE SPECIES

The New Mexico ridgenose rattlesnake is a small (maximum of 2.05 ft total length) montane species known only from the Animas Mountains, Hidalgo County, New Mexico; Peloncillo Mountains, Hidalgo County, New Mexico and Cochise County, Arizona; and the Sierra San Luis, Sonora and Chihuahua, Mexico (Degenhardt et al. 1996; Painter 1995; Campbell et al. 1989; Andy Holycross, Arizona Game and Fish Department, Phoenix, Arizona, pers. comm. 1996). The subspecies is represented by a single specimen from Arizona, collected in Skeleton Canyon of the Peloncillo Mountains on October 24, 1996. The subspecies may also occur in the Sierra Pulpita in Chihuahua (Barker 1991). New Mexico ridgenose rattlesnake is one of five subspecies of the ridgenose rattlesnake found from montane areas of southeastern Arizona and southwestern New Mexico, south through the Sierra Madre to Zacatecas, Mexico. *C. w. obscurus* is closely related to *C. w. silus*, but the two can be distinguished based on a variety of scalation and coloration traits; the two are also distinct biochemically (Harris and Simmons 1976, Barker 1991).

The New Mexico ridgenose rattlesnake is typically found in steep, rocky canyons with intermittent streams or on talus slopes at elevations ranging from approximately 5,400 to 8,500 feet (Degenhardt et al. 1996; Painter 1995; Campbell et al. 1989; Barker 1991; A. Holycross, pers. comm. 1997). The subspecies is found in areas of Madrean evergreen woodland and Petran montane conifer forest (Pase and Brown 1982, Brown 1982b). Dominant vegetation characterizing the habitat of this subspecies includes several species of oak, *Quercus* spp.; Douglas fir, *Pseudotsuga menziesii*; Apache pine, *Pinus engelmannii*; Chihuahua pine, *P. leiophylla* var. *chihuahuana*; Arizona madrone, *Arbutus arizonica*; manzanita, *Arctostaphylos pungens*; and grasses (Degenhardt et al. 1996, Degenhardt 1972, Barker 1991). Access to rock shelters with moderate interstitial spaces is probably a key habitat component (Barker 1991); however, the subspecies also uses perennial bunch grasses for cover (Painter 1995). New Mexico ridgenose rattlesnakes apparently move less frequently, move relatively short distances, and show high fidelity to specific rock shelter sites as compared to other rattlesnake species (Holycross 1995a and 1995b, Barker 1991).

Young snakes are live born probably in late June through August (Holycross 1995b, Painter 1995). Mean litter size for 12 broods was 5.5 (Applegarth 1980). Fecal samples from 12

New Mexico ridgenose rattlesnakes captured in the Sierra San Luis contained rodent hairs, lizard scales, and parts of large centipedes, *Scolopendra* spp. (Barker 1991). Applegarth (1980) reported that the diet of *C. willardi* includes a variety of items, including rodents, birds, lizards, snakes, and arthropods. Barker (1991) suggests that *C. w. obscurus* tends to feed on rodents whereas *C. lepidus* feeds primarily on lizards and centipedes.

The New Mexico ridgenose rattlesnake was listed as a threatened species by the Service in an August 4, 1978, Federal Register notice (43 FR 34479). Critical habitat was also designated in Bear, Spring, and Indian canyons of the Animas Mountains from 6,048 to 8,320 ft elevation. At the time of listing the subspecies was not known to occur in the Peloncillo Mountains. The subspecies occurs in three (or more), small disjunct populations. As a result, its viability is sensitive to habitat destruction or modification, and collection. After publication of the Animas locality in 1961 (Bogert and Degenhardt 1961), the area was reportedly heavily collected. Harris and Simmons (1975) reported encountering 15 collectors from six states during August 1974 in the Animas Mountains. The Service (1985) estimated that as many as 130 New Mexico ridgenose rattlesnakes may have been collected in the Animas Mountains between 1961 and 1974. Collection during this time period may have significantly impacted the Animas population (Harris and Simmons 1975, Service 1985). The Animas Mountains are privately owned and access to habitat areas is now strictly controlled. However, most of the habitat of the ridgenose rattlesnake in the Peloncillo Mountains is managed by the Coronado National Forest and the Bureau, and is open to public use, thus providing more of an opportunity for illegal collecting. Fire and overgrazing may adversely affect the habitat of this subspecies (Barker 1991, Service 1985), and mining, development, and logging are potential threats (Service 1985).

Further information on the taxonomy, range, distribution, biology, and threats to the New Mexico ridgenose rattlesnake can be found in Painter (1995), Holycross (1995a&b), Applegarth (1980), Barker (1992), Campbell et al. (1989), Degenhardt et al. (1996), and Degenhardt (1972).

ENVIRONMENTAL BASELINE

Within the project area, the New Mexico ridgenose rattlesnake occurs only at the higher elevations of the Peloncillo Mountains in extreme southeastern Cochise County. This range is relatively dry and low compared to the Chiricahua Mountains to the west and the Animas Mountains to the east. The area is characterized by hilly and mountainous terrain with several major drainages, including Guadalupe, Baker, Sycamore, and Estes canyons, and Cottonwood Creek. The vegetation of lower slopes is characterized by shrubs and grasses, with velvet mesquite, juniper; *Juniperus* spp.; whitethorn acacia, *Acacia constricta*; and various perennial grasses predominating. In the higher elevations, pinyon pine, *Pinus edulis*; Apache pine, Chihuahua pine, and oaks are more abundant. Riparian vegetation is found in Guadalupe and Baker canyons, Cottonwood Creek, and at several other sites, and includes Arizona ash, Arizona sycamore, cottonwood, mesquite, and netleaf hackberry, *Celtis laevigata*.

The New Mexico ridgenose rattlesnake was first discovered in the Peloncillo Mountains in 1987 (Campbell et al. 1989). A total of 17 ridgenose rattlesnakes have been found in the Peloncillo Mountains from upper Miller Canyon on the south, to South Skeleton Canyon on the north. The snake from South Skeleton Canyon is the only New Mexico ridgenose rattlesnake recorded from Arizona. An apparent hybrid between *C. w. obscurus* and *C. lepidus* was reported by Campbell et al. 1989, but the precise collection locality is unknown. In the Peloncillo Mountains, the New Mexico ridgenose rattlesnake has been found from approximately 5,400 to 6,200 ft elevation (A. Holycross, pers. comm. 1997). Holycross (1997) considers areas above 5,000 ft from Skull Canyon on the north to the Mexican boundary to be potential habitat for the species. Holycross believes that at lower elevetaions the species probably occurs primarily in the bottoms of steep, heavily-wooded canyon. At higher elevations the species is found in woodlands, open woodlands, and chaparral on exposed slopes and plateaus. No New Mexico ridgenose rattlesnakes have been found in any Bureau allotments in Arizona, but potential habitat, as defined by Holycross, exists in the Guadalupe W., AZ; Sycamore; and Ben Snure allotments (see Figure 4), and include Bureau parcels in all three allotments.

Areas in which ridgenose rattlesnakes have been found in the Peloncillo Mountains are characteristically more arid, lower, and less vegetated than typical habitats in the Animas Mountains of New Mexico. The snakes are often found on talus slopes in the Animas Mountains, but talus is apparently absent from the Peloncillo Mountains. The species is also much more difficult to find in the Peloncillo Mountains. In the Animas Mountains in 1995, the encounter rate for ridgenose rattlesnake was one per 4.4 person-days of search time (Holycross 1995b). In 1995, no ridgenose rattlesnakes were encountered by Holycross (1995b) in the Peloncillo Mountains, despite 46 person-days of search time.

A general listing of threats to the New Mexico ridgenose rattlesnake that contribute to its status as a threatened species is found in the section "Status of the Species" above. Activities that may affect the rattlesnake in the Peloncillo Mountains include cattle grazing, commercial beargrass, *Nolina microcarpa*, harvesting, and low to moderate levels of recreational activities such as birding, backpacking, camping, hunting, and nature study. The Peloncillo Mountains are much more accessible than the Animas or San Luis ranges, which makes illegal collection and other human activities more important threats than elsewhere in the range of the snake. Also, the likely small size and possible disjunct nature of populations in the Peloncillo Mountains make animals in the project area especially vulnerable to habitat degradation and collection.

One biological opinion has been issued by the Service on the New Mexico ridgenose rattlesnake. On May 3, 1997, the Service issued a biological opinion to the Coronado National Forest for the proposed Maverick Prescribed Fire. The Service determined that the proposed action was not likely to jeopardize the continued existence of the rattlesnake. Although the Coronado National Forest was the lead agency, the area proposed for burning included parcels of Bureau lands in Sycamore Canyon and west of Hog Canyon. Other

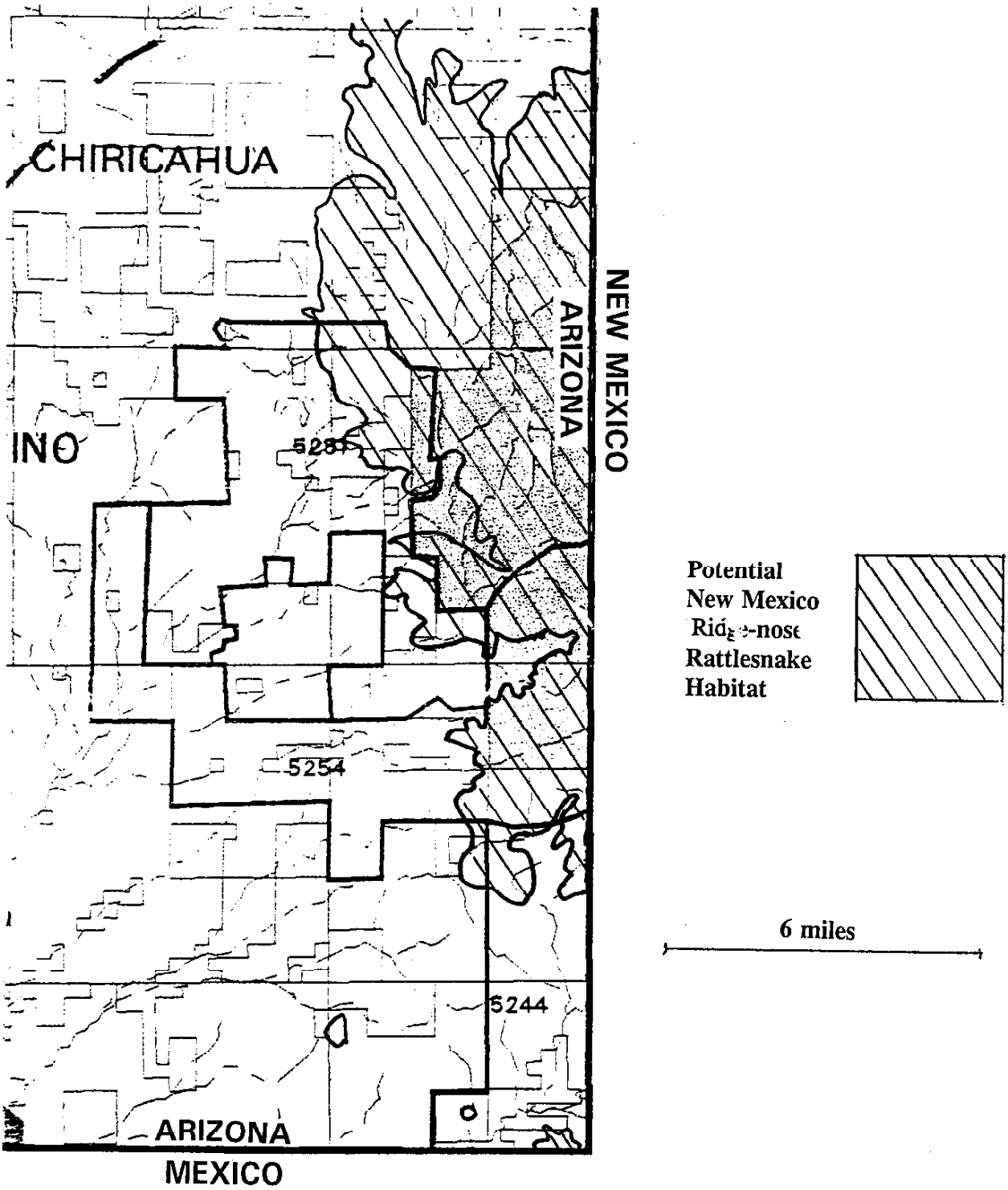

Figure 4. Potentially suitable New Mexico ridgenose rattlesnake habitat (areas above 5,000 ft) in and near the Guadalupe W., AZ (5244), Sycamore (5254), and Ben Snure (5281) allotments, Peloncillo Mountains.

Bureau lands were included in the secondary burn perimeter, in which fire would be allowed to spread under certain conditions.

Prescribed fire is rapidly becoming a valuable tool for land managers to improve rangelands and restore native grassland communities. The Malpai Borderlands Ecosystem Plan, currently in preparation, is expected to recommend prescribed fire as a vegetation management tool for a 750,000-acre planning area that includes the Animas and Peloncillo mountains (Coronado National Forest 1996). This planning effort, or at least portions that occur on Federal lands, will be the subject of future consultation.

In the Peloncillo Mountains in 1994, a wildfire burned approximately 24,000 acres in the Sycamore Canyon area and smaller fires burned near Maverick Spring (900 acres) and Cloverdale Creek (800 acres) (Allen 1994). These fires burned the upper portions of Miller Canyon and adjacent areas where several ridgenose rattlesnakes have been found. In this area, the fire was very patchy, and burned predominantly on the south-facing slope of Miller Canyon. Brush on the north-facing slope was mostly untouched by the fire. However, fuel loads on the north slope are relatively high and could burn very intensely.

In June 1997, the Maverick Prescribed Fire in the Peloncillo Mountains burned approximately 7-8,000 acres from approximately Sycamore Canyon on the south to just north of Geronimo Trail. The fire was confined primarily to areas west of the crest of the range.

EFFECTS OF THE PROPOSED ACTION

The New Mexico ridgenose rattlesnake recovery plan (Service 1985) identifies "excessive grazing" as a potential threat to the continued survival of the species. However, the effects of grazing on this or other species of rattlesnakes are speculative. Direct effects to snakes arepossible due to cattle stepping on animals. Trampling is probably most likely in the case of a small snake. Rattlesnakes are frequently killed by the public. Snakes could be killed by permittees or ranch hands that may encounter snakes, or snakes could be run over by vehicles or trampled by riders on horse back that are associated with grazing activities. Roads that are created or maintained as part of the grazing program could provide access to the public and facilitate illegal collecting or killing of ridgenose rattlesnakes.

Direct effects are also possible as a result of vegetation management, construction or maintenance of range improvement projects, or prescribed fire conducted as part of the grazing program. Snakes could be killed or injured during construction or maintenance of fencelines, pipelines, water developments, and other surface-disturbing activities. Water developments above 5,000 ft could draw cattle into rattlesnake habitat and increase the probability of trampling or habitat degradation. Well-planned vegetation management may improve habitat conditions by increasing frequency of perennial grasses, which in turn provide cover for rattlesnakes.

Of particular concern is prescribed fire. A wildfire burned through a New Mexico ridgenose rattlesnake study site in the Sierra San Luis, Chihuahua, in June and July 1991. Barker (1991) reported that the fire was extremely hot and intense. Almost all vegetation was consumed, rock piles were broken apart or covered with silt deposited from eroding hillsides, and boulders were split open from the intense heat. The encounter rate of ridgenose rattlesnakes decreased after the fire, a routinely monitored snake that was equipped with a transmitter vanished after the fire, and one of six individuals captured after the fire exhibited burns on its dorsum. However, at least two telemetered ridgenose rattlesnakes survived the fire, including one in an area that apparently burned especially hot. Barker (1991) suggested that snakes that survived the fire may have been more subject to predation as a result of reduced cover. In a burned area he observed a zone-tailed hawk, *Buteo albonotatus*, flying with a small snake in its talons that may have been a ridgenose rattlesnake. The prey base of the rattlesnake would also likely be affected by fire. Small mammal densities and diversities are typically depressed for one to three years after a fire (Wright and Bailey 1982).

During the Maverick Prescribed Fire in June 1997, three New Mexico ridgenose rattlesnakes were telemetered in areas that burned. None of these snakes were killed or injured in the fire. However, a rock rattlesnake, *Crotalus lepidus*, was killed in the fire, and a Sonoran whipsnake, *Masticophis bilineatus*, was found dead and apparently was killed by the fire (Holycross, pers. comm. 1997).

Evidence from other fires suggest snakes can be killed or injured in fires. Jeff Howland (Arizona Game and Fish Department, Phoenix, Arizona, pers. comm. 1996) reported finding a dead western diamondback rattlesnake, *Crotalus atrox*, that was apparently killed by a wildfire in the McDowell Mountains near Phoenix. Todd Esque (National Biological Service, St George, Utah, pers. comm. 1996) found a gopher snake, *Pituophis melanoleucus*, and a tiger rattlesnake, *Crotalus tigris*, apparently killed by wildfire in the Pusch Ridge fire (Santa Catalina Mountains, Arizona) and the Rock Peak fire, San Tan Mountains, Arizona, respectively.

The direct and indirect effects of any prescribed fire on Bureau allotments would be expected to result in increased mortality of New Mexico ridgenose rattlesnakes. However, the degree to which mortality may increase cannot be quantified, and would depend on the nature of the fire, the extent of rattlesnake habitat affected, and other factors. New Mexico ridgenose rattlesnakes are most likely to be killed or injured by fire during periods of surface activity. Snakes are most active after the onset of the summer rains in July through October or November (Holycross 1995b).

Although effects of prescribed fire can cause dramatic and immediate changes in ridgenose rattlesnake habitat, and some animals may be killed or injured, long term benefits to the snake and its habitat may accrue. Fire has been excluded from fire-adapted ecosystems in southeastern Arizona as a result of fire suppression, as well as over-grazing and drought that removed fine fuels. Prescribed fire, if successful, can promote reestablishment of grasslands and natural communities. Reintroducing fire back into the landscape may also prevent

devastating wildfires, such as that documented by Barker (1991) in the Sierra San Luis (Allen 1996). Recovery of vegetation communities above 4,500 ft in southeastern Arizona typically requires deferment of grazing for at least two growing seasons (Dan Robinett, Natural Resource Conservation Service, Tucson, AZ, pers. comm. 1996).

Current fire planning by the Coronado National Forest, Natural Resource Conservation Service, the Malpai Borderlands Group, and others is targeting mid- to high-elevation areas of the Peloncillo Mountains, including habitats of the ridgenose rattlesnake. Increased fire frequency in these areas is likely to result in less areas of woodland habitat and more of fire adapted communities such as grassland and chaparral. Holycross (1997) suggests that the presence of numerous woodland reptile species, such as the ridgenose rattlesnake, Sonoran mountain kngsnake, *Lampropeltis pyromelana*; mountain skink, *Eumeces callicephalus;* mountain spiny lizard, *Sceloporus jarrovi*; and Madrean alligator lizard, *Elgaria kingii*; indicates the Peloncillo Mountain may have been more heavily wooded in the past than it is at present. Holycross (1997) recommends discouraging the use of ignited prescribed fire in oak, pinyon-juniper, and pine woodlands or above 5,000 ft until it can be demonstrated that these communities have expanded in recent times, the New Mexico ridgenose rattlesnake is dependent upon them, and prescribed natural fire is incapable of restoring/maintaing a natural mosaic of vegetation communities.

The New Mexico ridgenose rattlesnake often uses large bunch grasses, such as *Muhlenbergia* and *Aristida*, for cover (C. Painter, New Mexico Game and Fish Department, pers. comm., 1996; A. Holycross, pers. comm. 1996). These grasses are also very palatable to cattle, and grazing has contributed to reduced cover by grasses and increased shrub cover in southeastern Arizona (Bahre 1995). During work from 1995-7, Holycross (1997) observed grazing in portions of ridgenose rattlesnake habitat in the Peloncillo Mountains that removed all grass cover over approximately 1.5 in in height. Grazing may also decrease the size of individual grass clumps (Avery 1992), reducing the quality of cover sites for the rattlesnake. Holycross (pers. comm. 1997) believes loss of ground cover may cause snakes to move less during key foraging or mating periods, and predation of snakes may increase because they are more visible. Reduced grass cover may also reduce fire frequency and alter vegetation communities with unknown effects to the snake, and the snake's prey base could be adversely affected by reducing seeds available for rodents, and herbivorous insect densities, which support lizard populations (Holycross 1997). Holycross (1997) recommends limiting grazing to the winter season only in ridgenose rattlesnake habitat in the Peloncillo Mountains. Grazing in many of the Coronado National Forest allotments are currently limited to winter season grazing. The Bureau (1977a) reports minimal or no grazing on Bureau lands above 5,600 ft; thus adverse effects described above as a result of Bureau-authorized grazing are not expected to be significant in ridgenose rattlesnake habitat.

The precise acreage of New Mexico ridgenose rattlesnake habitat in the Peloncillo Mountains is unknown. But most of the areas above 5,000 ft are on lands of the Coronado National Forest. Only one of the 17 ridgenose rattlesnakes from the Peloncillo Mountains has been found in Arizona, and that animal was not found on a Bureau allotment. Habitat within

Bureau allotments are probably a relatively minor percentage of the habitat in the Peloncillos.

The largest acreage of potential New Mexico ridgenose rattlesnake habitat (areas above 5,000 ft) in any of the allotments is several sections in the Sycamore allotment. However, most of this acreage is on lands managed by the Coronado National Forest. Approximately two sections of potential habitat administered by the Bureau lies in the southeastern corner of the allotment. These lands are most of the Bureau lands in the allotment, 56 percent of which are in good range condition. The other 46 percent are in fair or poor condition. Habitat in areas of fair or poor condition is assumed to be degraded to some degree by livestock grazing. In particular, bunch grasses, which are important for cover, may be reduced or lacking in these areas. Portions of the Bureau lands are within the primary and secondary burn perimeters of the Maverick Prescribed Fire. The Sycamore allotment is administered primarily by the State Lands Commission and the Coronado National Forest; Bureau lands total less than 30 percent. As discussed for other species, the effects of grazing activities on non-Bureau portions of allotments in which the Bureau owns more then 30 percent of the total land area are considered interrelated and interdependent to grazing activities on the Bureau portions of the allotment; which is not the case in the Sycamore allotment.

The Guadalupe W., AZ allotment is predominantly Bureau-administered (7,085 of 8,233 acres in the allotment), and is in the improve category. Approximately two to three sections of potential ridgenose rattlesnake habitat lies on Bureau lands in the northern portion of the Guadalupe W., AZ allotment. The range condition on this portion of the allotment was not provided by the Bureau, but cattle reportedly do not frequent the area (Bureau 1997b). Range condition on Bureau lands throughout the allotment is predominantly (64 percent) excellent or good; however, 2,500 acres are in fair condition, and 85 acres are in poor condition. Because the Bureau is the primary land owner, the effects of grazing activities on the non-Bureau portions of the allotment are considered interrelated and interdependent effects.

The Ben Snure allotment is primarily State lands - Bureau lands are less than 30 percent of the total lands in the allotment - and the allotment is in the custodial category (effects on non-Bureau lands are interrelated and interdependent to the proposed action). Range condition trend is static (Tables 2 and 4). Approximately two to three sections of potential habitat occurs on the eastern boundary of the Ben Snure allotment south of Starvation Canyon. Less than 0.5 section is administered by the Bureau in this custodial allotment. Bureau lands in the allotment are mostly (71 percent) in good condition, but the condition of potential rattlesnake habitat is unknown.

Cumulative Effects

Cumulative effects are those adverse effects of future non-Federal (state, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal, and private actions are considered in the "Environmental Baseline".

The majority of potential habitat for the ridgenose rattlesnake in the Peloncillo Mountains is administered by the Coronado National Forest. Smaller areas are privately owned or administered by the Bureau. Thus, most activities anticipated in the project area would be Federal actions subject to consultation and are not considered cumulative. Livestock grazing and other ranching activities occur on the limited private lands in the Peloncillo Mountains above 5,000 ft. These activities may result in localized habitat degradation.

Effectiveness of Proposed Mitigation

The Bureau proposed to monitor livestock use in New Mexico ridge-nosed rattlesnake habitat in the Sycamore and Guadalupe W., AZ allotments, and if livestock use becomes appreciable, they would consult with the Service. The value of this measure to reduce potential adverse effects to the New Mexico ridgenose rattlesnake is unclear, because "appreciable" is undefined. Several general features of the grazing program, such as the drought policy, Arizona Standard 1 (Upland Sites), and the Upland Livestock Utilization Standard all act to reduce adverse effects of the action to some degree.

SUMMARY OF EFFECTS

The Service believes the effects described above are neither likely to jeopardize the continued existence of the New Mexico ridgenose rattlesnake nor result in destruction or adverse modification of critical habitat. We present these conclusions for the following reasons:

1. The proponent's project description includes features to reduce to some degree direct and indirect impacts of the proposed action on the New Mexico ridgenose rattlesnake and its habitat.

2. Potential New Mexico ridgenose rattlesnake on Bureau allotments is a relatively minor percentage of potential habitat in the Peloncillo Mountains.

3. No New Mexico ridgenose rattlesnakes have been recorded on Bureau allotments.

4. Livestock use at higher elevations of the Peloncillos (above 5,600 ft), where most records of the rattlesnake occur, is reportedly infrequent.

5. No critical habitat occurs in the Peloncillo Mountains.

CONCLUSION

After reviewing the current status of the New Mexico ridgenose rattlesnake, the environmental baseline for the action area, and the anticipated effects of the proposed Safford/Tucson Field Offices' grazing program, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the New Mexico ridgenose rattlesnake. No

critical habitat has been designated for this species in the Peloncillo Mountains, thus none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

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

AMOUNT OR EXTENT OF TAKE

The Service anticipates the following forms of take as a result of the proposed action:

1) Two New Mexico ridgenose rattlesnakes as a result of direct impacts, including trampling by cattle or horses associated with grazing, snakes run over by vehicles associated with grazing, vegetation management projects, and construction and maintenance of range improvement projects.

2) Two New Mexico ridgenose rattlesnakes as a result of the direct or indirect effects of prescribed fire.

3) One New Mexico ridgenose rattlesnake as a result of indirect effects of livestock grazing, including reduction of perennial grass cover quantity or quality.

This biological opinion does not authorize any form of take not incidental to implementation of the Safford/Tucson Field Offices' grazing program. If the incidental take authorized by this opinion is exceeded, the Bureau must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim, the Bureau must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. The Bureau should provide to this office an explanation of the cause of the taking.

EFFECT OF THE TAKE

In this biological opinion, the Service finds the anticipated level of take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of New Mexico ridgenose rattlesnake:

1. The Bureau shall coordinate with the Service to ensure that project-level activities are designed to minimize take of New Mexico ridgenose rattlesnake.

2. Measures shall be included in project-level activities to reduce take of New Mexico ridgenose rattlesnake to the extent possible.

3. The Bureau shall monitor grazing activities and incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions in regard to the proposed action. These terms and conditions implement the reasonable and prudent measures described above. Terms and conditions are nondiscretionary. Terms and conditions 2.d. and 3.a. are adapted from the Bureau's proposed action.

1. The following term and condition implements reasonable and prudent measure number one:

A mitigation plan shall be developed by the Bureau in coordination with the Service for each prescribed fire, vegetation management project, and range improvement project in the Guadalupe W., AZ; Sycamore, and Ben Snure allotments above 5,000 ft. Mitigation plans shall be approved by the Service. Prescribed ignited fire above 5,000 ft shall be discouraged until it is demonstrated that oak, pinyon-juniper, and conifer woodlands have expanded in recent times; that the New Mexico ridgenose rattlesnake is not dependent on these woodland

communities; and prescribed natural fire is incapabale of restoring or maintaining a natural mosaic of vegetation communities.

2. The following terms and conditions implement reasonable and prudent measure number 2:

a. Permittees and all field personnel who implement any portion of the proposed action in the Ben Snure, Sycamore, and Guadalupe W., AZ allotments shall be informed of regulations and protective measures as described herein for the New Mexico ridgenose rattlesnake. All field personnel shall be informed that intentional killing, disturbance, or harassment of threatened or endangered species is a violation of the Act and could result in prosecution. All personnel shall be advised that care should be exercised when operating vehicles in the project area to avoid killing or injuring snakes on roads.

b. The Bureau shall authorize no blading of new roads above 5,000 ft in the Guadalupe W., AZ; Sycamore; or Ben Snure allotments.

c. To facilitate vegetation recovery after prescribed fire, livestock grazing shall be removed from burned areas above 5,000 ft in the Guadalupe W., AZ, Sycamore; and Ben Snure allotments during at least two monsoon seasons following implementation of the fire. This term and condition also applies to any burned areas resulting from the Maverick Prescribed Fire.

d. The Bureau shall ensure that the drought policy, Arizona Standard 1 (Upland Sites), and the Upland Livestock Utilization Standard are strictly applied in the Guadalupe W., AZ; Sycamore; and Ben Snure allotments above 5,000 ft. If grazing becomes appreciable above 5,000 ft, so that production and recruitment of perennial grasses are adversely affected, the Bureau shall take action to reduce grazing pressure above 5,000 ft or should consider reinitiation of consultation because such grazing may represent new information indicating the effects of the action may be greater than what was considered in this opinion.

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

a. Inventory, monitoring, and evaluations as described in the Bureau's proposed action (Bureau 1996a) and applicable sections of the Bureau Manual shall be conducted in the Guadalupe W., AZ; Sycamore; and Ben Snure allotments above 5,000 ft.

b. The Bureau shall submit annual monitoring reports to the Arizona Ecological Services Field Office by March 15 of each year beginning in 1998. These reports shall briefly summarize for the previous calendar year 1) the effectiveness of these terms and conditions, and 2) documentation of take, if any. If such activities or monitoring occur, the report shall also include summaries of: 1) grazing actions initiated or completed including range improvement projects, prescribed fires, and vegetation management in the Guadalupe W., AZ; Sycamore; and Ben Snure allotments above 5,000 ft; 2) allotment inventory, evaluation, and monitoring results for the Guadalupe W., Sycamore, and Ben Snure

allotments; and 3) any records of New Mexico ridgenose rattlesnake or evaluations of snake habitat. The report shall also make recommendations for modifying or refining these terms and conditions to enhance New Mexico ridgenose rattlesnake protection or reduce needless hardship on the Bureau and its permittees.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the New Mexico ridgenose rattlesnake. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Bureau, in coordination with Arizona Game and Fish and the Service, should inventory potential New Mexico ridgenose rattlesnake habitat on Bureau-administered lands in the Peloncillo Mountains.

2. The Bureau should, in coordination with Arizona Game and Fish Department and the Service, survey potential habitats in the Peloncillo Mountains for New Mexico ridgenose rattlesnakes, and fund research designed to clarify life history and ecology of the species, and that would quantify the effects of Bureau-authorized activities, particularly livestock grazing and recreation, on the status of the snake.

3. The Bureau should coordinate with the Coronado National Forest, Natural Resource Conservation Service, the Service, the Malpai Borderlands Group, and others on development of an Ecosystem Management Plan for the Peloncillo Mountains and surrounding areas.

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

(Note: surveys or other activities that involve capture or other forms of take of New Mexico ridgenose rattlesnake in Arizona require appropriate permits from the Service and Arizona Game and Fish Department.)

DISPOSITION OF DEAD OR INJURED LISTED ANIMALS

Upon locating a dead or injured threatened or endangered animal, initial notification must be made to the Service's Division of Law Enforcement, Federal Building, Room 8, 26 North McDonald, Mesa, Arizona (602/261-6443) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location

of the animal, a photograph, and any other pertinent information. Care must be taken in handling injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible condition. If feasible, the remains of intact specimens of listed animal species shall be submitted to educational or research institutions holding appropriate State and Federal permits. If such institutions are not available, the information noted above shall be obtained and the carcass left in place.

Arrangements regarding proper disposition of potential museum specimens shall be made with the institution prior to implementation of the action. Injured animals should be transported to a qualified veterinarian by a qualified biologist. Should any treated listed animal survive, the Service should be contacted regarding the final disposition of the animal.

CONCURRENCES

The Service concurs with the Bureau's determinations of may affect, not likely to adversely affect for the beautiful shiner, Yaqui chub, Yaqui catfish, Yaqui topminnow, American peregrine falcon, Northern aplomado falcon, bald eagle, and Mexican spotted owl. The rationale for these concurrences is detailed in the following discussions by species.

RIO YAQUI FISHES
STATUS OF THE SPECIES

Beautiful Shiner

The beautiful shiner was listed as a threatened species on August 31, 1984. Critical habitat was designated for this species for "all aquatic habitat on the San Bernardino National Wildlife Refuge" (Service 1984c). However, this was prior to the acquisition of Leslie Canyon National Wildlife Refuge, and Leslie Canyon is not part of the designated critical habitat. The beautiful shiner is a small fish of the family Cyprinidae (Minckley 1973). It occurred in the Río Yaqui in Arizona and in Sonora and Chihuahua, México and in the Mimbres River and Guzman basin in New Mexico and Chihuahua, México but has been extirpated from the Mimbres River (Hendrickson et al. 1980, Campoy-Favela et al. 1989, Sublette et al. 1990). Water diversion, stream downcutting, backwater draining, vegetation clearing, channelization, grazing, groundwater pumping, and other human uses of the natural resources resulted in the extirpation of the beautiful shiner from the United States. In 1990, beautiful shiner was reintroduced into the San Bernardino National Wildlife Refuge originating from collections made in 1989 from Río Moctezuma, Chihuahua, México. Populations now exist in Evil Twin Pond, Oasis Pond, Mesquite Pond, Little Mesquite Pond, and Twin Pond (San Bernardino Refuge memorandum dated May 26, 1994).

Habitat preferences for beautiful shiner in the Río Yaqui drainage are riffles of running streams and creeks. Where flow is intermittent, pools suffice as habitat until riffles become available in the next wet season (Hendrickson et al. 1980). Beautiful shiners on the San

Bernardino Refuge prefer the subsurface zone of the water column (16-32 in) and do not appear dependent on proximity to vegetative cover (Maes 1995).

Breeding colors of male beautiful shiners are a darkened dorsal fin and yellow-orange to orange coloration on remaining fins (Minckley 1973). Numbers of young-of-year fishes in ponds on San Bernardino NWR, indicate recruitment in beautiful shiners may approach that of the red shiner, *Cyprinella lutrensis*. However, relatively few individuals live to reproductive size class (San Bernardino Refuge files). Stream population trends are likely to differ from pond populations. Little else is known about the beautiful shiner.

Yaqui Chub

The Yaqui chub was listed as an endangered species on August 31, 1984. Critical habitat was designated for this species for "all aquatic habitat on the San Bernardino National Wildlife Refuge" (Service 1984c). However, this was prior to the addition of Leslie Creek to the San Bernardino Refuge; Leslie Creek is not part of the designated critical habitat. The Yaqui chub is a medium sized fish of the family Cyprinidae (Minckley 1973). Until recently, *Gila purpurea* was thought to occur in the basins of the Rios Sonora, Matape, and Yaqui in Arizona and Sonora, Mexico (Hendrickson et al. 1980). In 1991, it was recognized that the chub in the Rios Sonora and Matape and the Rio Yaqui system downstream from San Bernardino Creek are a different species, *Gila eremica* (DeMarais 1991). *Gila purpurea* is endemic to San Bernardino Creek in Arizona and Mexico and possibly the Willcox Playa basin in Arizona (DeMarais 1991, Varela-Romero et al. 1990). It currently occurs in Bathhouse Spring, Black Draw, House Pond, Mesquite Pond, North Pond, Oasis Pond, Robertson Cienega, Twin Pond, and Two PhD Ponds on the main portion of the San Bernardino Refuge (San Bernardino NWR memorandum May 26, 1994). Only a few individual chubs were caught during the 1994 monitoring effort. Some of those populations have been stocked into enhanced or artificially created habitats as part of the recovery program. The population in Leslie Creek was stocked in 1969 from individuals taken from Astin Spring (Minckley and Brooks 1985). A population in West Turkey Creek in the Chiricahua Mountains was stocked in 1986 and 1991 from Leslie Creek stock raised at Dexter National Fish Hatchery.

Yaqui Catfish

The Yaqui catfish was listed as a threatened species on August 31, 1984. Critical habitat was designated for this species for "all aquatic habitat on the San Bernardino National Wildlife Refuge" (Service 1984c). However, this was before the addition of Leslie Creek to the refuge; Leslie Creek is not designated critical habitat. The factors contributing to the listing of the Yaqui catfish include habitat destruction or modification of habitat, predation, inadequacy of existing regulatory mechanisms, and other factors (Service 1984c). The exotic channel catfish has interbred with the Yaqui catfish in some areas of the Rio Yaqui basin.

The Yaqui catfish is a medium to large fish of the family Ictaluridae (Minckley 1973). A captive specimen at Dexter National Fish Hatchery weighs about 17.6 pounds. The first collection of Yaqui catfish was made in San Bernardino Creek, astride the U.S.-Mexico border. Historically, Yaqui catfish were found in the Yaqui (Hendrickson et al. 1980, Campoy-Favela et al. 1989), Sonora (Miller 1940), Casa Grandes (Smith and Miller 1986, Propst and Stefferud 1994), and Fuerte river systems (Miller 1976, 1978). *Ictalurus pricei* is apparently extirpated from the Rio Casa Grandes (Smith and Miller 1986, Propst and Stefferud 1994).

In the Rio Yaqui basin, the Yaqui catfish has been found in medium to large creeks and rivers with medium to slow current over sand or rock substrates (Hendrickson et al. 1980). They also found it in small streams in clear pools over sand gravel substrates. There is little information on the life history of this species. Minckley (1985) suggested that the ecology of the Yaqui catfish and channel catfish were similar.

Yaqui Topminow

The Yaqui topminnow was listed as an endangered species on March 11, 1967. Critical habitat has not been designated for this species. The Yaqui topminnow is a small, livebearing fish of the family Poeciliidae (Minckley 1973). It is found throughout the Rio Yaqui and adjacent drainages in Arizona and Sonora, Mexico, but is listed only in the United States portion of its range (Hendrickson et al. 1980, Juarez-Romero et al. 1988, Campoy-Favela et al 1989). Its historic range in the United States historically encompassed the lower to mid elevation reaches of the Rio Yaqui basin, including Whitewater and Black Draws. Much of the habitat in those areas has been lost to water diversion, steam downcutting, backwater draining, vegetation clearing, channelization, grazing, groundwater pumping, and other human uses of the natural resources. In addition, nonnative fish have been introduced in many portions of its historic range in the United States. The mosquitofish, which is particularly damaging to Yaqui topminnow, was first found in the United States portion of the Rio Yaqui basin in 1979 (Hendrickson et al. 1980, Galat and Robertson 1992, Meffe et al. 1983).

In the United States, Yaqui topminnow are presently found only on the San Bernardino National Wildlife Refuge. On the main Refuge they are found in Bathhouse Spring, Black Draw (San Bernardino Creek), Bunting Spring, Cottonwood Spring, Evil Twin Pond, Hay Hollow storage tank, House Pond, Mesquite Pond and an unnamed pond at its outflow, Middle Spring, Oasis Pond, Robertson Cienega, Twin Pond, Two PhD Ponds, and Tule Spring (San Bernardino Refuge memorandum May 26, 1994). Topminnows are abundant in Robertson Cienega (1994 monitoring data). Many of these are stocked populations in enhanced or artificially created habitats which are part of the recovery program. The population in Leslie Creek was stocked in 1969 from individuals taken from Astin Spring in the Black Draw drainage (Minckley and Brooks 1985). The populations are generally small and fluctuate greatly.

ENVIRONMENTAL BASELINE

Populations of the four Yaqui fishes at San Bernardino Refuge and Leslie Creek, and the Yaqui chub population in West Turkey Creek of the Chiricahua Mountains are all in the general project area as shown in Figure 1. No grazing activities are authorized by the Bureau in the habitats of these fishes; however, the Glen allotment (5237) is immediately adjacent to, just west, and upstream of San Bernardino Refuge. The Guadalupe W. (5244), Ben Snure (5281), and Sycamore (5254) allotments lie upstream of San Bernardino Refuge approximately 6-14 mi to the northeast. The Twist (5228) allotment lies upstream of the refuge approximately 4-9 mi to the west-northwest. Fish habitat in Leslie Canyon is approximately 1 mi east of the western boundary of D'Amico allotment (5222), and approximately 3-7 mi downstream of the Roger Riggs allotment (5273). Yaqui chub habitat in West Turkey Creek is far removed and upstream of any Bureau allotments.

EFFECTS OF THE PROPOSED ACTION

Direct effects of grazing activities on the Yaqui fishes are essentially precluded because the Bureau does not authorize such activities in the habitats of the fishes. The only possible direct effects are those that might occur if a prescribed fire on an allotment adjacent to fish habitat (Glen and D'Amico allotments) escaped control and burned onto San Bernardino Refuge or Leslie Creek. Effects of fire on fishes and fish habitat were described in the "EFFECTS OF THE PROPOSED ACTION" for the spikedace. Such effects are unlikely because of the general lack of fine fuels in the Chihuahuan desert scrub in this area.

Indirect effects could potentially occur to Yaqui fish at San Bernardino Refuge or Leslie Creek as a result of watershed degradation attributable to grazing and resulting effects to aquatic and riparian habitats downstream. These effects are described in detail in the "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel and spikedace. Aquatic habitats at San Bernardino Refuge that support Yaqui fishes are largely artificial or modified aquatic habitats that are isolated from drainages or protected from high flows or sedimentation that might result from degraded watershed condition; however, occupied Yaqui fish habitat in Black Draw and Leslie Creek is characterized by mostly unmodified stream reaches that could potentially be affected by watershed condition upstream. Lands upstream of Black Draw are owned primarily by the Arizona State Lands Department. The nearest Bureau allotment (Roger Riggs) upstream of Leslie Creek is far removed (3-7 mi), the Bureau is a minor landowner in this allotment (424 acres) (Table 3), and sedimentation or abnormally high flows are not currently a threat to Yaqui fishes at Leslie Creek. Range condition on the Bureau lands in the allotment are good (300 acres) and fair (124 acres) (Table 5). Watershed effects of grazing should be reduced by implementation of the Arizona Standards and Guidelines, Upland Livestock Utilization Standard, Drought Policy, and other aspects of the grazing program.

CONCLUSION

The Service concurs with the Bureau's determination that the proposed action may affect, but is not likely to adversely affect the beautiful shiner, Yaqui chub, Yaqui catfish, and Yaqui topminnow. This concurrence is conditioned upon the following:

> A mitigation plan shall be developed for each prescribed fire planned in the Glen and D'Amico allotments. The mitigation plan shall minimize the chances that fire might spread to Service lands at San Bernardino National Wildlife Refuge or Leslie Canyon, and shall be approved by the Service (Arizona Ecological Services Field Office and San Bernardino National Wildlife Refuge).

American Peregrine Falcon

STATUS OF THE SPECIES

Species Description

The American peregrine falcon was listed as an endangered species on October 13, 1970 (35 FR 16047). No critical habitat has been designated for this species. The peregrine falcon is a medium-sized raptor with various subspecies distributed worldwide. The American peregrine falcon occurs across much of North America. It nests on cliffs near sources of avian prey. The peregrine falcon has traditionally been strongly associated with cliffs near large bodies of water such as seacoasts, lakes, and large rivers (Ratcliffe 1980). However, the arid American southwest has recently been demonstrated to support the largest concentration of peregrines known in North America, excluding Alaska. Studies have documented high densities of breeding pairs in the Southwest, particularly the Colorado Plateau Province (Burnham and Enderson 1987, Hays and Tibbitts 1989, Tibbitts and Bibles 1990, Brown 1991). Local concentrations of nesting pairs have also been documented in the mountains of southeastern Arizona (Tibbitts and Ward 1990a and 1990b, Berner and Mannan 1992, Ward 1993).

In the Southwest, breeding peregrines are currently found almost anywhere large (approximately °330 ft) cliffs are available, with the exception of the hottest and driest desert regions (Tibbitts and Ward 1990a, Ward 1993, US Department of the Interior unpubl. data). Large cliffs overlooking chaparral, pinyon-juniper woodland, conifer forest, and riparian habitats apparently provide high-quality habitat. These cliffs are currently occupied by breeding pairs almost wherever they occur in Arizona and southern Utah, even where surface water may be many miles distant. Even in the Sonoran desert, peregrine falcons may be found breeding where perennial surface water and associated riparian prey populations are available.

The American peregrine falcon appears to be making considerable progress toward recovery throughout much of its range. On June 30, 1995, the Service published an advance notice of a proposal to remove the American peregrine falcon from the list of endangered and

threatened wildlife, stating that data currently on file with the Service indicate that this subspecies has recovered following restrictions on the use of organochlorine pesticides in the United States and Canada and because of management activities including the reintroduction of captive-bred peregrine falcons (60 FR 34406).

Peregrines feed almost exclusively upon other birds, such as shorebirds, pigeons, doves, robins, flickers, jays, swifts, swallows, and other passerines that opportunity presents (Craig 1986). Although some individuals may become adept hunters, it is estimated that peregrine succeed in making kills only 10 to 40 percent of the time (Roalkvam 1985, Cade 1982). The falcons compensate for this inefficiency by traveling extensively when hunting. During the breeding season, a hunting range of 10 mi may be considered typical (Craig 1986). Proximity of a cliff to surface water may affect occupancy. In Arizona, nearly all nest sites which are great distances from extensive permanent water have nearby permanent water sources; rivers lakes and streams are the most important sources (Ellis 1982). The presence of rivers, riparian habitat, or other surface water in peregrine nesting habitat may be a feature in determining the presence of an adequate food supply.

The Peregrine Falcon Recovery Plan for the Southwest Population (Service 1984d) recommends against land-use practices and development which adversely alters or eliminates the character of hunting habitat or prey base within 10 mi of an eyrie, and within 1 mi of the nesting cliff.

The degree of disturbance that peregrine falcons can tolerate is generally believed to be a function of the magnitude of the disturbance, the distance from the breeding site, and the falcon's habituation to human activities. Raptors in frequent contact with human activities tend to be less sensitive to additional disturbances than raptors nesting in remote areas. However, exposure to direct human harassment may make raptors more sensitive to disturbances (Newton 1979). Where prey is abundant, raptors may even occupy areas of high human activity, such as cities and airports (Newton 1979, Ratcliffe 1980, White et al. 1988). The timing, frequency, and predictability of the disturbance may also be factors. Raptors become less sensitive to human disturbance as their nesting cycle progresses (Newton 1979). Generally, peregrine falcons are least tolerant of disturbance during the prelaying through incubation periods. After young are hatched, peregrines exhibit considerably higher levels of tolerance and are unlikely to abandon the nesting attempt (Cade 1960, Cade and White 1976, Fyfe and Olendorff 1976, Eberhardt and Skaggs 1977, Olsen and Olsen 1978, Monk 1980, Roseneau et al. 1981).

Studies have suggested that human activities within breeding and nesting territories could effect raptors by changing home range movements (Anderson et al. 1990) and causing nest abandonment (Postovit and Postovit 1987, Porter et al. 1973). In areas of steep topographic "screening," Johnson (1988) suggests that human activity within a core area of about 1,300 ft of the nest might impact peregrine breeding efforts. His recommended core area increased to 2,950 ft in areas with no topographic screening. He based these distances on a model using thresholds for flight responses, not on verified impacts on productivity.

Exposure to direct human harassment may make raptors more sensitive to disturbances (Newton 1979). Construction activities, operation of heavy machinery, and aircraft activity, all with the notable absence of direct human harassment, were generally tolerated by nesting peregrine falcons and gyrfalcons (Platt 1977, Ellis 1981, Haugh 1982, White and Thurow 1985, Ritchie 1987, White et al. 1988). Peregrines have nested in situations where there is a high level of disturbance, such as on buildings in urban settings (Cade and Bird 1990). They have also nested near potential disturbance from low level military jets and sonic booms (Ellis 1981). Peregrine falcons and golden eagles have been known to nest successfully within a few hundred meters of areas such as airports, blasting, construction, quarrying, and mining sites (Pruett-Jones et al. 1980, Haugh 1982, White and Thurow 1985, White et al. 1988). Cade and Bird (1990) discussed the possible effects on peregrines of high levels of human activity, including noise and machinery such as compressors, blowing fans, and bright night lighting. They concluded that the effects were unknown. Apparently, responses vary considerably within and among species.

ENVIRONMENTAL BASELINE

Recovery of the peregrine falcon in the Rocky Mountain/Southwest region appears to be greatest in the Colorado Plateau of southern Utah, southwest Colorado, and northern Arizona, and in adjacent habitats in Arizona, Utah and Colorado. This region has experienced high total numbers of breeding pairs, high rates of site occupancy and high reproductive success (Burnham and Enderson 1987, Enderson et al. 1991, Tibbitts and Bibles 1990, Tibbitts and Ward 1990a and 1990b, Ward 1993). Based on 1994 surveys, the current Rocky Mountain/Southwest population consists of 559 breeding pairs, surpassing the recovery objective by 376 pairs (FR 60:34406-34409).

Productivity at breeding areas in the Basin and Range Province, where the project is located, between 1992 and 1995 have had an occupancy rate of 80 percent and the highest productivity, at 1.2 young fledged per occupied territory (Garrison and Spencer 1996). The Bureau (1996a) reports that within the project area, peregrine falcons have been located recently from the Peloncillo Mountains south of Duncan, the Dos Cabezas Mountains near Wilcox, Apache Creek north of Duncan, Chiricahua Mountains, Black Rock Wash near Fort Thomas, Galiuro Mountains, Aravaipa Canyon, and Dragoon Mountains. The Bureau (1996a - Table 7) identified five allotments containing occupied breeding habitat and 32 allotments with potential habitat. Occupied breeding habitat occurs in the Hell Hole (4528) and South Rim (4529) allotments along Aravaipa Creek, Black Rock allotment in the Santa Teresa Mountains, Cement Canyon allotment (5130) in the Dos Cabezas Mountains, and Soza Wash allotment (4409) in the southern end of the Galiuro Mountains. Outside of the breeding season, peregrine falcons could occur seasonally or as transients throughout the project area.

Locations of peregrine falcons and identification of suitable habitat is based on ongoing surveys by Arizona Game and Fish Department and the Bureau (Bureau 1996a). Not all potential habitat has been surveyed in the jurisdiction of the Safford and Tucson Field Offices,

and some areas have not been surveyed recently; thus, other active breeding sites may exist in the Bureau allotments.

EFFECTS OF THE PROPOSED ACTION

The most important potential effects of the grazing program are those that may adversely affect nest sites and nesting birds, particularly early in the breeding season during prelaying through incubation (Newton 1979). The nesting season for peregrine falcons in Arizona is approximately February through July (Ward 1994). The Bureau in the mitigation measures for their proposed action has committed to surveying known or potential nest sites during the same year as any proposed surface-disturbing activities or activities that would produce loud noises or otherwise would cause disturbance to nesting peregrine falcons, as well as not conducting blasting, and operation of chainsaws or other loud power tools within 0.5 mi of active nest sites from March 1 through July 31 of each year. These measures should be adequate to eliminate most possible adverse effects of such activities on the peregrine falcon. However, the degree of disturbance that peregrine falcons can tolerate is a function, in part, of the magnitude of the disturbance. Blasting may be a particularly severe disturbance that warrants backing this activity off from nesting sites farther than 0.5 mi (Holthuijzen et al. 1990). Prescribed fire, including the effects of the fire itself and human activities involved with setting, monitoring, and controlling the fire, is another activity that if conducted during the nesting season could potentially disturb peregrine falcons or cause nest abandonment. Other potential adverse effects include degradation of watersheds and aquatic habitats, with subsequent adverse effects to prey species of the peregrine falcon. These effects should be reduced through implementation of the Arizona Standards and Guidelines, Upland Livestock Utilization Standard, Drought Policy, and other aspects of the grazing program. Continuing upward regional trends in numbers of breeding pairs, reproductive success, and site occupancy suggest that prey availability is not currently limiting recovery of the species in the Southwest.

CONCLUSION

The Service concurs with the Bureau's determination that the proposed action may affect, but is not likely to adversely affect the American peregrine falcon. This conclusion is conditioned on the following:

1. The Bureau shall survey known or potential nest sites during the same year and prior to conducting any surface disturbing activities, prescribed fire, or activities that would produce loud noises or that would otherwise cause disturbance to nesting peregrine falcons.

2. No surface disturbing activities, prescribed fire, or other activities that would produce loud noises or would otherwise cause disturbance to nesting peregrine falcons shall occur within 0.5 mi of an active nest site from March 1 through July 31. If any

blasting is proposed, such activity shall not occur within 1.0 mi of an active nest site from March 1 through July 31.

Northern Aplomado Falcon

The northern aplomado falcon was listed as an endangered species by the Service in March 1986 (Service 1986e). No critical habitat has been designated. The aplomado falcon's perceived extirpation from the United States (Service 1990b) and evidence of population declines and high levels of pesticide contamination in the eastern Mexico population (Kiff et al. 1978) were the primary reasons cited for listing this species in the northern portion of its range. Recent confirmed observations of individual aplomado falcons in south central New Mexico and west Texas, the confirmation of a breeding population in northern Chihuahua, Mexico (Montoya and Zwank 1995), and reintroduction efforts in south Texas have heightened interest in this species.

Hector (1981 and 1987) gives a thorough account of historical aplomado falcon occurrence in the United States through examination of specimen collections and historical literature. He summarized that the aplomado falcon was a regular breeding species in the desert and coastal grassland communities of southern and western Texas, and desert grassland communities of southern New Mexico and southeastern Arizona until the early 1930s (Figure 5). Aplomado falcon populations in the United States declined dramatically during the 1930s and 1940s, possibly due to a combination of collecting pressure (Hector 1983 and 1987) and habitat changes (Ligon 1961; Hector 1981 and 1987; Henry and Cathey 1995, Richardson 1996). Bayne (cited in Ligon 1961) documented the last nesting pair of aplomado falcons in the United States in May 1952 near Deming, Luna County, New Mexico. Hector (1983 and 1987) also reported that the highest nesting densities of aplomado falcons within the United States historically occurred in south-central New Mexico and southern Texas.

Within New Mexico, aplomado falcons were historically reported from Doña Ana, Eddy, Grant, Hidalgo, Lea, Luna, Otero, and Sierra counties. Presumably, suitable aplomado falcon habitat still occurs in areas of southern New Mexico (Montoya and Zwank 1995; Henry and Cathey 1995). Combinations of heavy grazing (Hector 1981), the encroachment of mesquite (Humphrey 1958; Buffington and Herbel 1965; Hector 1987; Henry and Cathey 1995), and proliferation of shrub species such as snakeweed, *Gutierrezia* spp., (A. Montoya, Service, pers. obs.) may currently affect habitat suitability of many areas in the Southwest.

Observations of aplomado falcons during the past decade have been reported sporadically throughout its historic United States range (J. Lewis, Service, Albuquerque, NM, pers. comm. 1991); however, these reports were generally discounted due to lack of documentation. Several reliable and documented observations of aplomado falcons have been reported for New Mexico and west Texas (Trans-Pecos region) since 1991 (Table 18). Whether a remnant population is present in New Mexico, or falcons are immigrating from northern Mexico, is open to speculation. However, the recent documentation of a breeding population of aplomado falcons in northern Chihuahua, Mexico (Montoya and Zwank 1995) suggests that

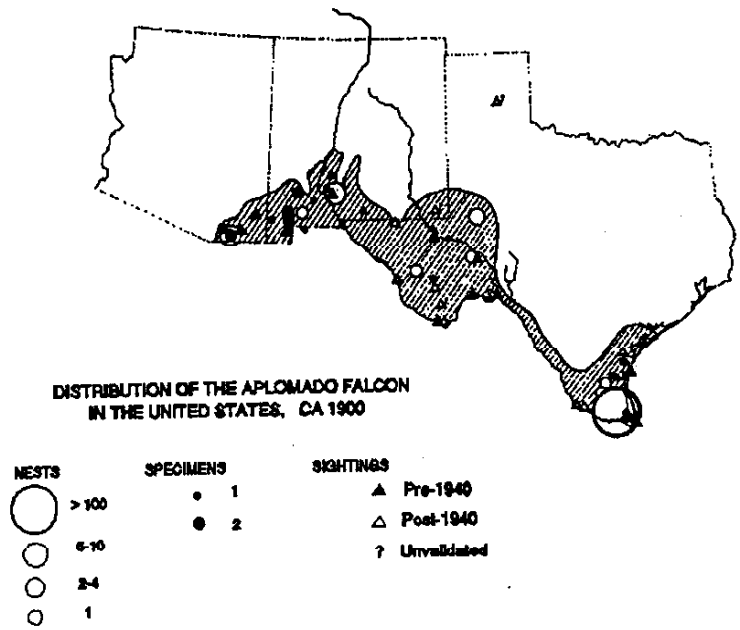

Figure 5. Historic distribution of the Aplomado falcon in the United States, ca. 1900 (Service 1990b)

this species most likely persisted in the Chihuahuan desert within close proximity to the United States. The discovery of this population also points out how easily this species can be overlooked at low densities in the vast expanses of the southwestern deserts, particularly when international borders and land ownership complicate the situation.

The recovery of endangered species is a primary objective of the Service and a significant responsibility of all Federal agencies. Recent confirmed observations of aplomado falcons on White Sands Missile Range and nesting birds in south Texas are encouraging. Current recovery efforts for the aplomado falcon have primarily focused on captive propagation and release at Laguna Atascosa National Wildlife Refuge on the southern coastal plain of Texas. This work is primarily conducted through the efforts of The Peregrine Fund and the Service.

It would be desirable if aplomado falcon populations could recover naturally through recolonization, increased natural production, or a combination of the two. However, if natural recovery is possible, it would take years or decades (Service 1990b; Ward and Ingraldi 1994). Captive propagation and release can be a valuable technique in reestablishing or augmenting species populations (Cade 1986, Griffith et al. 1989). The genetics of aplomado falcons from eastern Mexico and Chihuahua, Mexico, are currently being investigated by The Peregrine Fund (P. Jenny, The Peregrine Fund, pers. comm. 1995). The issue of whether or not released birds would be designated an "nonessential experimental population" [under Section 10(j) of the Act] can also be avoided if recovery can be attained naturally.

Table 18. Recent reliable observations of aplomado falcons from southern New Mexico and west Texas (Trans-Pecos region).

Site Location	County	Status	Year	Observer(s)
Tularosa Basin; WSMR, NM	Otero	adult	1991	A. Montoya
Near Hwy 90; Valentine, Texas; private land	Jeff Davis	adult	1992	fide; A. Montoya et al.
Hwy 380; 13 mi E of San Antonio, NM, in mosaic of BLM, State, and private land.	Caballo	adult	1992	C. Rustae
Tularosa basin, WSMR, NM	Otero	adult	1992	A. Montoya and A. Henry
Gray Ranch, NM	Hidalgo	Sub-adult	1994	F. Gill and H. Tardoff
North of Las Cruces, NM, in mosaic of BLM, State, and private land.	Doña Ana	Juvenile	1996	P. Jungemann
Along Hwy 90; 3 mi south of Van Horn, Texas; private land.	Culberson	Sub-adult (?)	1996	B. Freeman et al.
Hwy 146; 2.5 mi south of I-10, in mosaic of BLM, State, and private land.	Grant	?	1997	E. Wootten

The Arizona Game and Fish Department (Ward and Ingraldi 1994) initiated grassland raptor/aplomado falcon surveys as a means of long-term monitoring of raptors, ravens, and loggerhead shrikes, *Lanius ludovicianus*, in grassland communities of southeastern Arizona. The detection of any aplomado falcons occurring in Arizona and monitoring of specific areas with potential for aplomado falcon reintroduction was of primary interest. Ward (Arizona Game and Fish Department, Phoenix, pers. comm., 1994) also reported that the Department is investigating unconfirmed aplomado falcon reports from northern Sonora, Mexico.

Life History

Aplomado falcons are long-tailed falcons intermediate in size between the American kestrel, *Falco sparverius*, and prairie falcon, *F. mexicanus* (Hector 1983). In the United States, aplomado falcons may occur sympatrically throughout the year with the American peregrine falcon, prairie falcon, and American kestrel, and with merlin, *F. columbarius*, and Arctic peregrine falcon, *F. p. tundrius*, outside the breeding season. This emphasizes the need for careful observation of all falcons.

Adult aplomado falcons can be distinguished from other North American falcons by their long tail with alternating narrow black and white bands. The back and dorsal side of wings are blue-gray with a pronounced white trailing edge across the entire wing. A distinct broad dark or black "cummerbund" on the lower breast, which at close range shows faint white barring, may be present; the lower abdomen and undertail coverts are rufous. Adults have a white upper breast that may show variable amounts of black streaking, depending on the sex. Facial markings are striking with a blackish cap and nape that are contrasted by a bold white supraorbital (facial) stripe that forms a "V" towards the nape; at close proximity, the stripes are white towards the face and become more rufous toward the nape. Immature aplomado falcons are brownish-gray on the back and dorsal side of the wings, with the white trailing wing edges also apparent. The breast and facial stripes are cinnamon colored, with heavy blackish streaking on the breast.

Flight profiles of both adult and immature aplomado falcons are similar to other falcons, except for the longer tail. Flight is generally direct, though they will occasionally soar. Aplomado falcons pursue prey in a variety of fashions. They have been observed to pursue prey in direct linear flight (similar to a merlin), tower above prey and stoop (similar to peregrine falcons), and to "hawk" insects from a perch. Aplomado falcons have been observed to pursue prey on the ground and pairs often hunt cooperatively (Hector 1986; Montoya, pers. obs.). Aplomado falcons will occasionally follow coyotes and humans, possibly to capture flushed prey (Montoya, pers. obs.).

Aplomado falcons being released in south Texas by the Service are fitted with black (male) or silver (female) anodized aluminum bands and tarsal- or tail-mounted radio transmitters (C. Perez, Service, Albuquerque, NM, pers. comm. 1995), while the aplomado falcons captured in Chihuahua, Mexico, were equipped with colored plastic leg bands and tail-mounted radio transmitters (Montoya and Zwank 1995). All transmitters and the bands used in Chihuahua are considered temporary, while the anodization used on the bands in south Texas may fade with time.

Aplomado falcons have been documented from a variety of open woodland, savanna, and grassland habitats (Hector 1981, Service 1990b). Within the Chihuahuan desert, aplomado falcons typically occur in open grassland areas with scattered mesquite and/or yuccas, *Yucca elata* and *Y. torreyi* (Ligon 1961, Montoya and Zwank 1995). Montoya and Zwank (1995) found woody vegetation densities in home ranges of aplomado falcons in Chihuahua, Mexico,

varied from 4.9 to 61.3 plants/acre with no significant difference between nesting and non-nesting territories. Ground cover ranged from 28.9 percent to 69.5 percent on aplomado falcon territories and also did not differ significantly between nesting and non-nesting territories (means equaled 49.9 percent versus 37.8 percent, respectively).

Montoya and Zwank (1995) used the minimum convex polygon (MCP) method to determine home range sizes for individual aplomado falcons during the breeding season. Home range estimates for individual aplomado falcons with 20 or more locations surveyed (n=8) ranged from 6.1 to 55.5 mi^2).

The range of juvenile dispersal is uncertain at this time. Perez (pers. comm. 1995) noted that an individual released in 1994 traveled approximately 85 mi from the Laguna Atascosa NWR release site to the Kingsville, Texas, area, before it moved again or the radio failed. Determination of juvenile dispersal is hampered by the limited range and life span of the small radio transmitters (0.12 ounces) used for remote tracking of this species. The majority of the released radio-equipped aplomado falcons in Texas remained in the general area until the radios failed (approximately 6 months). Whether dispersal by reintroduced aplomado falcons is indicative of natural dispersal is unknown.

Aplomado falcons appear to be resident across most of their northern range where populations currently exist in Mexico (Hector 1981; Montoya, pers. obs.). Primary nesting occurs from March to June in northern Chihuahua, with aerial courtship displays being observed as early as late January and early February (Montoya, pers. obs.). In the northwest portion of their range, aplomado falcons typically use stick nests constructed by other large bird species such as Swainson's hawks, *Buteo swainsoni*, Chihuahuan ravens, *Corvus cryptoleucus*, and possibly white-tailed kites, *Eleanus caeruleus*. Nests are usually situated in forks of yuccas, or in tops of mesquites. Hector (1981) reported incubation took 32 days. Both sexes participated in incubation, with young fledging approximately 35 days after hatching. Fledglings may remain in the vicinity of the nest for at least a month after fledging (Hector 1981). Montoya and Zwank (1995) observed seven nests in northern Chihuahua, and documented that three of the seven nests fledged at least one chick, with a total of four young fledged from the seven nests (11 eggs total). Causes for nestling mortality were inconclusive, but starvation and predation by great horned owls, *Bubo virginianus*, and coyote, *Canis latrans*, were suspected (Montoya and Zwank 1995).

Research conducted by Hector (1981), Jiménez (1993), and Montoya and Zwank (1995) show a wide array of birds, insects, mammals, and reptiles have been documented in the diets of aplomado falcons. In eastern Mexico, birds comprised 94 percent of individual prey items in remains examined and 35 percent of prey items seen captured, while insects comprised approximately 65 percent of prey items seen captured (Hector 1985). However, Hector (1981) determined that birds composed 97 percent of the prey biomass. Montoya and Zwank (1995) found a similar preference for avian prey items with meadowlarks, *Sturnella neglecta* and *S. magna*, common nighthawk, *Chordeiles minor*, and mourning doves, *Zenaida macroura*, the most frequently taken avian species in northern Chihuahua.

Population Dynamics

Population size and stability: Population dynamics of aplomado falcons are similar to those known from other falcons. Falcons are generally high on the trophic scale and often their presence or absence indicates pesticide or prey base/habitat problems in an ecosystem.

Relatively little has been quantified concerning the population of aplomado falcons in Mexico. Montoya (pers. comm. 1996) estimates the population in Chihuahua at his two study sites to be between 60 and 70 individuals. There is no quantified information on this population, but there is reason to believe the population is self-sustaining and growing, as evidenced by the probable dispersing individuals found in New Mexico and west Texas.

Rangewide Status and Distribution

Until 1992, it was believed that the distribution of the northern aplomado falcon was restricted to eastern Mexico, from southern Tamaulipas south, even though no systematic survey efforts were conducted in northern or central Mexico. Hector (pers. comm. 1996) did conduct cursory surveys in northern Mexico and commented on habitat suitability but did not detect aplomado falcons at that time. In 1992, a population of aplomado falcons was confirmed in northern Chihuahua, Mexico, approximately 80 mi south and 50 mi west of the U.S. border on private ranch land (Montoya and Zwank 1995). Since the confirmation of this population, nesting aplomado falcons have been located approximately 50 mi west and reliable observations have been reported from the Galeana and Gomez Friaz areas of Chihuahua, approximately 150 mi west of Montoya's study population. The confirmation of this population in northern Chihuahua may have identified the likely source of aplomado falcons observed in New Mexico and west Texas since 1991.

Range wide trend: Within the U.S., the recovery emphasis for aplomado falcon has centered around the captive propagation and reintroduction in southern Texas, particularly around the Laguna Atascosa Refuge, and beginning in 1996, at the Matagorda Island Refuge. A pair nested and fledged one young on Port of Brownsville land in extreme southern Texas in 1995. In 1996, four territorial pairs produced three fledglings in the same vicinity (P. Jenny, The Peregrine Fund, pers. comm. 1996). To date, these reintroduced aplomado falcons are the first known nestings since the 1952 nest in the Deming, New Mexico, area (Ligon 1961). Very little recent data are available for populations in east Mexico. Keddy Hector (Service 1990) estimated populations in eastern Mexico to be as high as 77 to 104 pairs/100 mi^2. However, observations since 1991 may suggest that individuals are dispersing into the U.S., most likely from Chihuahua. In 1996, 13 juvenile aplomado falcons were banded at approximately 9 to 12 nests in Chihuahua (preliminary information per Montoya pers. comm. 1996). To date, no banded aplomado falcons have been observed in southern New Mexico or western Texas, which indicates that these birds were not released in south Texas under the reintroduction work. Until more banding is conducted in Chihuahua, we cannot be sure this is the source of the individuals being observed in New Mexico and west Texas.

Continued threats: The aplomado falcon recovery plan (Service 1990b) identified habitat alteration (i.e., brush encroachment associated with heavy grazing and agricultural development) compounded by collecting pressure and later by pesticide contamination as the likely reasons for aplomado falcon population decline in the U.S. Current factors that may threaten the recovery of the aplomado falcon in portions of its historic U.S. range include: 1) continued grazing in areas previously altered due to heavy grazing, which may prevent habitat from becoming suitable and may promote continued brush encroachment (Humphrey 1958; Buffington and Herbel 1965; Hector 1987; Henry and Cathey 1995, Richardson 1996), and proliferation of brush species such as snakeweed, *Gutierrezia* spp., (A. Montoya, Service, pers. obs.); 2) persistence of pesticide contamination; 3) incidental shooting by hunters and poachers; 4) loss of habitat due to agricultural development; and 5) fragmentation of habitat due to urban expansion and other land uses (e.g., oil and gas development).

The most important factor that originally may have limited aplomado falcon recovery in the U.S. is the conversion of large mesquite and/or yucca grasslands to creosote, *Larrea tridentata*, or mesquite desert shrub habitat. For example, it is estimated that the Jornada del Muerto went from 5 percent open grassland in 1858, to 80 percent desert shrub and virtually no open grassland today (Zimmer 1995). This change is due primarily to intensive livestock grazing, drought, and other factors (Bahre 1995), and in combination with collecting pressure (Service 1990b), most likely was responsible for the decline of the aplomado falcon by the early 1940s. Collecting pressure is not currently considered a threat. Any legal collector/falconer who wanted an aplomado falcon would have to acquire a Service endangered species collecting permit and it is unlikely that the Service would grant such a permit at this time due to the current status of the species in the U.S.

In addition to the above factors, the continued long-term grazing of historical habitat may prevent or slow habitat from recovering and becoming suitable. This is most likely important in regard to avian prey base. Knopf (1996) notes that grazing can influence birds of prey primarily by affecting densities of prey and may alter the food and cover of terrestrial nongame bird species. While the specifics of impacts to local nongame bird assemblages is poorly studied (Knopf 1996), species such as meadowlarks are known to decline in numbers with increased grazing intensity (Ryder 1980). Effects of grazing on riparian areas and wetlands, through grazing in the wetted areas of streams, rivers, or cienegas, or in the watersheds of such areas, may cause deterioration of breeding habitat of avian species that aplomado falcons prey upon (Service 1990b, and see EFFECTS OF THE PROPOSED ACTION for the southwestern willow flycatcher and cactus ferruginous pygmy-owl).

The pesticide DDT did not go into use until after 1947 (Hector 1983, 1987); therefore, it was unlikely the cause of decline, but may have further impacted an already reduced aplomado falcon population. The DDT was in use from about 1948 to the mid 1970s before it was eliminated from use in the U.S. Very preliminary data from addled eggs (n=2) retrieved in south Texas have detected PCB and mercury residues, while blood samples from released birds in the same area have indicated extremely low contamination levels (P. Jenny, The

Peregrine Fund, in litt 1996). Persistent pesticide problems are most likely an issue in areas of agricultural use.

Sensitivity to impacts: The aplomado falcon's sensitivity to impacts is relatively unknown. They are known to occur in eastern Mexico in a rural agricultural landscape in close proximity to humans. Habitats in these areas consist of open agricultural savannah. In northern Chihuahua, aplomado falcons coexist with active livestock grazing. These areas have also maintained the open mesquite and/or yucca grassland habitat, but little quantitative work has been completed to compare this habitat to vegetation conditions in the U.S.

As noted in the recovery plan, pesticide contamination was recognized as a severe impact to the aplomado population in eastern Mexico. Peakall and Kiff (1979) found an average decrease (1954-1967) in eggshell thickness of 25.4 percent that was equivalent to the maximum amount of thinning reported for any peregrine falcon population and exceeded those associated with 20 percent thinning in peregrine eggs. Eggshell thinning of over 20 percent is likely to result in reproductive failure due to egg breakage (Peakall et al. 1975). As top avian predators in their ecosystems, raptors are sensitive to bioaccumulation of persistent pesticides.

Recovery rate: The aplomado falcon recovery plan (Service 1990b) states that, "...suitable habitat in the U.S. and Mexico should be identified and protected, especially in areas close to reintroduction sites." It goes on to stress that, "Particular attention should be directed toward suitable habitat on public lands." The recovery plan also identifies criteria for downlisting the aplomado to threatened when a "...minimum self-sustaining population of 60 breeding pairs has been established in the U.S. This goal may be modified after we learn more about suitable habitat." To date, four territorial pairs are known from the U.S.

ENVIRONMENTAL BASELINE

Figure 5 displays all known confirmed sightings and collections of aplomado falcon in Arizona. All records are within the project area and include two specimens, pre-1940 sightings at two sites, and one post-1940 sighting. Benson (in Bendire 1892) found five active nests near Fort Huachuca in 1887. The species may have also nested at Fort Bowie, Dos Cabezas Mountains, Cochise County (Service 1990b).

Nesting of the species in northern Chihuahua and recent confirmed records in New Mexico suggest the species may be reoccupying portions of its former range. The 1994 sight record from the Gray Ranch, Hidalgo County, New Mexico, is in an area adjacent to the project area. The Service believes that the aplomado falcon may recolonize suitable habitat in southeastern Arizona within the life of the project. Although unconfirmed, the species may occur at present as a rare transient. The recovery plan (Service 1990b) also calls for reintroduction of the species into suitable habitat. Among potential release sites, are Buenos Aires National Wildlife Refuge, Elgin Research Ranch, Fort Huachuca, San Pedro RNCA, San Simon Valley, Santa Rita Experimental Range, and the Willcox Playa Wildlife Area. All of these sites are

within the project area; however, only the San Pedro RNCA is managed by the Bureau. Reintroduction to one or more of these sites could also occur within the life of the project.

EFFECTS OF THE ACTION

The aplomado falcon is apparently absent from Arizona as a breeding bird, although individual birds may rarely occur as transients in the project area. As discussed above, heavy grazing has contributed to the deterioration and loss of the grassland habitats of this species in Arizona, although drought, introduction of nonnative plant species, alteration of fire regimes, and development have also played a part in the conversion of grasslands to desert shrublands and loss of habitat (Bahre 1995).

In the recovery narrative of the recovery plan, the preservation of the species was found to depend on two conditions: 1) regulating the use of pesticides found to be harmful to the falcon or its prey, and 2) using habitat management techniques that protect and restore healthy grassland ecosystems. The first condition refers to pesticides such as DDT, dieldrin, and any other compounds that are injurious or degrades into compounds injurious to aplomado falcons. Any chemical control of vegetation proposed by the Bureau would not involve such chemicals. Effects of ADC-APHIS activities on the aplomado falcon were evaluated in a July 28, 1992 biological opinion. No adverse effects of predator control activities were identified, and the Service found that the overall ADC-APHIS program was not likely to jeopardize the continued existence of the aplomado falcon. No take of aplomado falcons as a result of ADC-APHIS activities was anticipated.

In regard to condition 2, the recovery plan found that exclusion of cattle and other herbivores from management sites is not necessary. Instead, "grazing, along with other management techniques, should be carefully considered as a tool to promote habitat heterogeneity and prey species diversity and abundance. Grazing programs must be carefully managed so they will not destroy ground cover and cause proliferation of brush." The Bureau (1996a) maintains that managing allotments in accordance with the Upland Livestock Utilization Standard will ensure adequate residual forage to retard shrub and brush invasion. This standard ensures that utilization of key species averages about 40 percent over a period of years. This level of utilization in desert grasslands approximates the utilization limits necessary to sustain primary forage species without a loss in productivity (Holechek 1988). The Bureau also proposes considering prescribed fire and other tools to perpetuate grassland communities within the historic range of the aplomado falcon, and would reinitiate consultation if any aplomado falcons are confirmed on any allotment during the life of the project.

Wetland and riparian areas can be important breeding areas for avian prey species of the aplomado falcon (Service 1990b). Thus, maintenance of the quality avian breeding habitat is important for establishing a prey base for aplomado falcon. As noted in the "EFFECTS OF THE PROPOSED ACTION" for the Huachuca water umbel, spikedace, southwestern willow flycatcher, and cactus ferruginous pygmy-owl, grazing in riparian areas or in the watersheds of streams, rivers, and wetlands, can adversely affect riparian function and avian habitat. The

Bureau has proposed, through the Arizona Standards and Guidelines, Riparian Area Policy, and as mitigation measures for the flycatcher, pygmy-owl, Huachuca water umbel, razorback sucker, spikedace, and loach minnow actions that would much reduce potential adverse effects to riparian or wetland avian breeding habitat.

CONCLUSION

The Service concurs with the Bureau's finding that the proposed action may affect but is not likely to adversely affect the aplomado falcon. Our conclusion is conditioned upon the following:

1. The proposed action does not result in overgrazing of grasslands within the historic range of the aplomado falcon (Figure 5).

2. The proposed action does not result in the destruction of wetland areas within the historic range of the falcon in southeastern Arizona.

3. The Bureau will reinitiate consultation if any aplomado falcons are confirmed in any of the allotments during the life of the project.

Bald Eagle

STATUS OF THE SPECIES

The bald eagle south of the 40th parallel was listed as endangered under the Endangered Species Act of 1966 on March 11, 1967 (Service 1967). It was reclassified to threatened status on July 12, 1995 (Service 1995b). No critical habitat has been designated for this species. The bald eagle is a large hawk that historically ranged throughout North America except extreme northern Alaska and Canada and central and southern Mexico. Bald eagles nested on both coasts of the United States, from Florida to Baja California in the south and from Labrador, New Foundland, to the Aleutian Islands, Alaska, in the north.

The bald eagle occurs in association with aquatic ecosystems, frequenting estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. Suitable habitat for bald eagles includes those areas with an adequate food base, perching areas, and nesting sites. In winter, bald eagles often congregate at specific wintering sites that are generally close to open water and that offer good perch trees and night roosts (Service 1995b).

There were an estimated one-quarter to one-half million bald eagles on the North American continent when Europeans first arrived. Initial population declines probably began in the late 1800s, and coincided with declines in the number of waterfowl, shorebirds, and other prey species. Direct killing of bald eagles was also prevalent. Additionally, there was a lost of nesting habitat. These factors reduced bald eagle numbers until the 1940s when protection for the bald eagle was provided through the Bald Eagle Protection Act (16 U.S.C. 668). The Act

accomplished protection and a slower decline in bald eagle populations by prohibiting numerous activities adversely affecting bald eagles and increasing public awareness of bald eagles. The widespread use of dichloro-diphenyl-trichloroethane (DDT) and other organochlorine compounds in the 1940s for mosquito control and as a general insecticide caused additional declines in bald eagle populations. DDT accumulated in individual birds following ingestion of contaminated food. DDT breaks down into dichlorophenyl-dichloroethylene (DDE) and accumulates in the fatty tissues of adult females, leading to impaired calcium release necessary for egg shell formation. Thinner egg shells led to reproductive failure, and is considered a primary cause of declines in the bald eagle population. DDT was banned in the United States in 1972 (Service 1995b).

Since listing, bald eagles have increased in number and expanded in range due to the banning of DDT and other persistent organochlorine compounds, habitat protection, and recovery efforts. Surveys in 1963 indicated 417 active nests in the lower 48 states with an average of 0.59 young produced per nest. In 1994, 4,450 occupied breeding areas were reported with an estimated average of 1.17 young produced per occupied nest (Service 1995b).

Hunt et al. (1992) summarized the earliest records of bald eagles in the literature for Arizona. Coues noted bald eagles in the vicinity of Fort Whipple (now Prescott) in 1866, and Henshaw reported bald eagles south of Fort Apache in 1875. The first bald eagle breeding information was recorded in 1890 near Stoneman Lake by S.A. Mearns. Additionally, Bent reported breeding eagles at Fort Whipple in 1866 and on the Salt River Bird Reservation (since inundated by Roosevelt Lake) in 1911. Additionally, there are reports of bald eagles along rivers in the White Mountains from 1937, and reports of nesting bald eagles along the Salt and Verde Rivers as early as 1930.

From 1970 to 1990, 226 known eaglets fledged in Arizona, for an average of 10.8 young produced per year. Successful nests contained an average of 1.6 young per year (Hunt et al. 1992). In 1995, there were 36 known breeding areas, with 30 of those being occupied. Within those breeding areas, 22 nests were active, and six nests failed. Sixteen of the 22 nests were successful in producing young, and a total of 28 young hatched. Twenty-five of these young survived to fledge (Beatty et al. 1995). Results for the 1996 breeding season are not yet available.

In addition to breeding bald eagles, Arizona provides habitat for wintering bald eagles, which migrate through the state between October and April each year. For 1996, the standardized statewide Arizona winter count totalled 361 bald eagles, including 232 adults, 127 subadults, and two of unknown age. The most concentrated population of wintering bald eagles is found at Lake Mary and Mormon Lake, where 69 birds were located (Beatty and Driscoll 1996). Perch and roost trees that are sheltered from extreme weather and are close to abundant prey are especially important habitat features for wintering bald eagles (Grugg et al. 1989). Perch or roost sites at Navajo Lake, New Mexico included leafless mature cottonwoods, young saplings, live and dead ponderosa pine, douglas fir, pinyon pine, and juniper (Grugg 1984).

Perches were typically in the upper half of trees. Wintering bald eagles also perched on rocks or outcrops, especially along ridgelines, and also perched on ice.

It is not known if the population of bald eagle in Arizona declined as a result of DDT contamination because records were not consistently kept during this time period. However, the possibility for contamination was present as DDT was used in Arizona and Mexico. Use of DDT in Mexico could potentially have contaminated waterfowl that then migrated through Arizona in addition to directly affecting juvenile and subadult eagles that travelled into Mexico. Many of the nest sites in Arizona are in rugged terrain not suitable for agricultural development, and may therefore have avoided the direct effects of DDT (Hunt et al. 1992).

Bald eagle breeding areas in Arizona are predominantly located in the upper and lower Sonoran life zones. The Luna Lake breeding area is unique in Arizona in that it is found in coniferous forests at Luna Lake, as opposed to occurring in Sonoran vegetation communities. All breeding areas in Arizona are located in close proximity to a variety of aquatic habitats including reservoirs, regulated river systems, and free-flowing rivers and creeks. The alteration of natural river systems has been both beneficial and detrimental to the bald eagle. While large portions of riparian forests were inundated or otherwise destroyed following construction of dams and other water developments, the reservoirs created by these structures enhance habitat for the waterfowl and fish species on which bald eagles prey.

Arizona bald eagles are considered distinct behaviorally from bald eagles in the remaining lower 48 states in that they frequently construct nests on cliffs. Of 111 nests known in 1992, 46 were in trees, 36 on cliffs, 17 on pinnacles, 11 in snags, and one on an artificial platform. However, while there were more nests in trees, one study found that cliff nests were selected 73 percent of the time, while tree nests were selected 27 percent of the time. Additionally, eagles nesting on cliffs were found to be marginally more successful at reproducing. Bald eagles in the southwest are additionally unique in that they lay eggs in January or February, which is early compared with bald eagles in other areas. It is believed that this is a behavioral adaptation to allow chicks to avoid the extreme desert heat of midsummer. Young eagles will remain in the vicinity of the nest until June (Hunt et al. 1992).

Bald eagles in Arizona consume a diversity of food items, including some invertebrates. However, their primary food is fish, which are generally consumed twice as often as birds, and four times as often as mammals. Bald eagles are known to catch live prey, steal prey from other predators (especially osprey), and use carrion. Carrion constitutes a higher proportion of the diet for juveniles and subadults than it does for adult eagles. Diet varies depending on what species are available locally. This can be affected by the type of water system on which the breeding area is based (Hunt et al. 1992).

A recovery plan was developed for bald eagles in the southwest recovery region in 1982. Goals of the recovery plan were to achieve an overall reproductive output of 10 to 12 young per year and to determine occupancy of one or more pairs on a drainage other than the Salt or Verde Rivers. These goals have been met, and the bald eagle was reclassified nationwide to

threatened status. While bald eagles in the southwest were initially considered a distinct population, the final rule notes that the Service has determined that bald eagles in the southwestern recovery region are part of the same bald eagle population found in the remaining lower 48 states.

While the bald eagle has been reclassified to threatened, and although the status of the birds in the southwest recovery region is on an upward trend, the population remains small and under threat from a variety of factors. Threats persist largely due to the proximity of bald eagle breeding areas to major human population centers. Additionally, because water is a scarce resource in the southwest recovery region, recreation is concentrated along available water courses. Some of the threats and disturbances to bald eagle include entanglement in monofilament (fishing line) and fishing hooks, overgrazing and related degradation of riparian vegetation, shooting, alteration of water systems for water distribution systems, maintenance of existing water development features such as dams or diversion structures, and disturbance from recreation. The use of breeding area closures and close monitoring through the Bald Eagle Nestwatch program have been and will continue to be essential to the recovery of this species.

ENVIRONMENTAL BASELINE

Surveys for bald eagles in the project area have been conducted since the early 1970's (Forbis 1986). No nesting sites are known to occur in the project area, but reports of wintering or migrating bald eagles are not uncommon (Bureau 1996a). The entire project area is considered potential wintering or migrating habitat (Busch 1986); but birds are expected to occur primarily near water. Beatty and Driscoll (1996) report finding the following numbers of bald eagles (in parentheses) at the following localities in the project area during surveys in January 1996: upper and lower Gila River (15), Eagle Creek (16), Bonita Creek (5), and lower San Francisco River (8). The Bureau (1996a) reports wintering or migrating bald eagles have been sighted on the Morenci allotment (Gila River), the Turtle Mountain allotment (Eagle Creek), Bonita Creek allotment (Bonita Creek), and the Empire Cienega allotment (Cienega Creek). Other allotments that are likely to support wintering or migrating bald eagles include the San Francisco, Smuggler Peak, Gila, Twin C, South Rim, Brandenburg Mountain, Johnny Creek, and Bullgap allotments (Bureau 1996a). Bald eagles are expected to occur in winter on the San Pedro River NRCA, as well (Bureau 1989).

EFFECTS OF THE ACTION

Steenhoff (1978) and Martell (1992) reviewed the habitat requirements of wintering bald eagles and developed guidelines for land management practices that would encourage use by wintering bald eagles. Steenhoff (1978) found that "grazing activities rarely interfere with wintering bald eagles." No management guidelines were developed in regard to grazing activities; however, the Steenhoff makes the following recommendations that are relevant to activities proposed in the Safford/Tucson grazing program:

1. Manage and maintain food sources throughout the winter during all weather conditions,
2. do not allow open bait trapping or use of poisoned bait within the area used by eagles,
3. do not remove trees that are within 100 ft of a riverbank or lakeshore if they have diameters exceeding 12 in,
4. establish new trees in areas devoid of tree reproduction. New plantings should be within 100 ft of the riverbank or lakeshore, and
5. terminate construction and habitat improvement activities during periods of eagle use.

Martell's (1992) recommendations are similar, but adds that large trees that serve as "buffers" for perch or roost trees should also be maintained. These trees buffer perch or roost trees from wind damage, noise, and disturbance, and are important in determining whether an area is suitable for occupation during the winter. Roost trees are an especially important habitat feature for wintering bald eagles. Platt (1976) found "The entire population of bald eagles roosted in four well-defined roost sites...Nightafter night the same trees were selected for use by birds." Also, "Eagles can be found in the roost trees throughout the afternoon but the bulk of the birds arrive during the last two hours of light."

Recommendations 1, 3, and 4 of Steenhoff (above) address habitat conditions in riparian/aquatic systems. As discussed elsewhere in this document, grazing can inhibit development of riparian vegetation, and adversely affect fish habitat. However, mitigation measures proposed for the razorback sucker, southwestern willow flycatcher, cactus ferruginous pygmy owl, Huachuca water umbel, spikedace, and loach minnow all should ensure that effects of grazing along rivers and streams with potential habitat is minimized. No adverse effects to existing perch trees, development of perch trees, or aquatic food sources (fish, waterfowl) are expected. Any construction activities that are near bald eagle roosts or perches, particularly if they are loud or of long duration, may disturb wintering birds or cause them to abandon wintering habitat (Steenhoff 1978). New access or maintenance of existing trails or roads may encourage human use of wintering bald eagle habitat and result in increased disturbance to birds or habitat abandonment.

Animal Damage Control (ADC) of APHIS requested reinitiation of formal consultation with the Service on their activities in 1990. In a July 28, 1992, biological opinion, the Service found that ADC activities were likely to jeopardize the Southwestern population of the bald eagle. Reasonable and prudent alternatives included:

1. In concert with the Environmental Protection Agency, ADC personnel must develop new label and use restrictions that would prohibit the aboveground use of strychnine within a 10-mile radius of known bald eagle nest sites in Arizona and New Mexico during the aforementioned nesting period (mid-November through mid-July) and at known roost sites year-round or;

2. ADC personnel must contact the Service's Albuquerque and New Mexico Field Offices for specific bald eagle habitat locations and nesting periods. If the proposed application is within eagle habitat when the birds may be nesting or roosting, the use of strychnine shall be prohibited. If it is determined that the use is outside of the delineated habitat, the chemical could be applied.

With application of the reasonable and prudent alternative, no take of bald eagles was anticipated. Strychnine is used primarily for control of rodents, rabbits, and "nuisance birds." Control activities associated with the grazing program typically target predators; thus little or no strychnine application is anticipated as part of the grazing program. ADC-APHIS has requested reinitiation of consultation; a biological opinion is currently in preparation.

Although no bald eagles are currently known to nest in the project area, nesting could occur during the life of the project. The Bureau has proposed to reinitiate consultation if any breeding bald eagles are found in the project area during the life of the project.

CONCLUSION

The Service concurs with the Bureau's determination that the proposed Safford/Tucson grazing program may affect, but is not likely to adversely affect the bald eagle. Our concurrence is conditioned upon the following:

1. Mitigation measures for the razorback sucker, spikedace, loach minnow, Huachuca water umbel, southwestern willow flycatcher, and cactus ferruginous pygmy-owl that address riparian area protection will be implemented.

2. Bureau-authorized ADC-APHIS activities shall adhere to the reasonable and prudent measures outlined above from the Service's July 28, 1992, biological opinion.

3. The Bureau shall reinitiate consultation if breeding bald eagles are found in any of the allotments during the life of the project (through December 31, 2006).

4. Mitigation plans shall be developed by the Bureau in coordination with the Service for any new access or maintenance of existing access to areas that are used by wintering bald eagles, and for construction projects within 0.5 mi of areas used by wintering bald eagles that may disturb eagles. Mitigation measures shall ensure that adverse effects do not occur to bald eagles. Mitigation measures shall be approved by the Service.

Mexican Spotted Owl

STATUS OF THE SPECIES

The Mexican spotted owl was proposed for listing on November 4, 1995 (56 CFR 56344) and was listed as threatened on March 16, 1993 (58 FR 14248). Critical habitat was designated for the species on June 6, 1995 (60 FR 29914), but has been set aside and enjoined from enforcement pending compliance with the National Environmental Policy Act, as a result of a 1996 10th Circuit Court decision. No Bureau administered lands in Arizona were designated critical habitat in the 1995 final rule. The Mexican spotted owl was originally described from a specimen collected at Mount Tancitaro, Michoacan, Mexico, and named *Syrnium occidentale lucidum*. The spotted owl was later assigned to the genus *Strix*. Specific and subspecific names were changed to conform to taxonomic standards and the subspecies became *S. o. lucida*. The American Ornithologists' Union currently recognizes three spotted owl subspecies, including the California, *S. o. occidentalis*; Mexican, *S. o. lucida*; and Northern, *S. o. caurina*. The Mexican spotted owl is mottled in appearance with irregular white and brown spots on its abdomen, back, and head. The spots of the Mexican spotted owl are larger and more numerous than in the other two subspecies giving it a lighter appearance. Several thin white bands mark an otherwise brown tail. Unlike most owls, spotted owls have dark eyes.

The Mexican spotted owl is distinguished from the California and Northern subspecies chiefly by geographic distribution and plumage. The Mexican spotted owl has the largest geographic range of the three subspecies. The range extends from the southern Rocky Mountains in Colorado and the Colorado Plateau in southern Utah southward through Arizona and New Mexico and, discontinuously through the Sierra Madre Occidental and Oriental to the mountains at the southern end of the Mexican Plateau.

Using starch-gel electrophoresis to examine genetic variability among the three subspecies of spotted owls, Barrowclough and Gutierrez (1990) found the Mexican spotted owl to be distinguishable from the other two subspecies by a significant variation, which suggests prolonged geographic isolation of the Mexican subspecies and indicates that the Mexican spotted owl may represent a species distinct from the California and Northern spotted owls.

The current known range of the spotted owl extends north from Aguascalientes, Mexico through the mountains of Arizona, New Mexico, and western Texas, to the canyons of southern Utah and southwestern Colorado, and the Front Range of central Colorado. Although this range covers á broad area of the southwestern United States and Mexico, much remains unknown about the species' distribution within this range. This is especially true in Mexico where much of the owl's range has not been surveyed. Information gaps also appear for the species' distribution within the United States. It is apparent that the owl occupies a fragmented distribution throughout its United States range corresponding to the availability of forested mountains and canyons, and in some cases, rocky canyon lands.

The primary administrator of lands supporting owls in the United States is the Forest Service. According to the Recovery Plan, 91 percent of owls known to exist in the United States between 1990 and 1993 occur on land administered by the Forest Service (Service 1995b). The majority of known owls have been found within Region 3 of the Forest Service, which includes 11 National Forests in New Mexico and Arizona. Forest Service Regions 2 and 4, including two national forests in Colorado and three in Utah, support fewer owls.

The range of the Mexican spotted owl in the United States has been divided into six recovery units (RUs) as discussed in part II.B. of the Recovery Plan for the Mexican Spotted Owl (Recovery Plan) (Service 1995b). An additional five RUs were designated in Mexico. While the Recovery Plan provides distribution, abundance, and density estimates by RU, a reliable estimate of the numbers of owls throughout its entire range is not currently available due to the availability of only limited information. Owl surveys conducted through 1990 through 1993 indicate that the species persists in most locations reported prior to 1989, with the exception of riparian habitats in the lowlands of Arizona and New Mexico, and all previously occupied areas in the southern states of Mexico. Increased survey efforts have resulted in additional sightings for all recovery units.

Fletcher (1990) calculated that 2,074 owls existed in Arizona and New Mexico in 1990 using information gathered by Region 3 of the Forest Service. Fletcher's calculations were modified by McDonald et al. (1991), who estimated that there were a total of 2,160 owls in the United States. However, these numbers are not reliable estimates of current population size for a variety of statistical reasons. While the number of owls throughout its range is currently not available, the Recovery Plan reports an estimate of owl sites based on 1990 - 1993 data. An owl "site" is defined as a visual sighting of at least one adult owl or a minimum of two auditory detections in the same vicinity in the same year. Surveys from 1990 through 1993 indicate one or more owls have been observed at a minimum of 758 sites in the United States and 19 sites in Mexico. The greatest concentration of known owl sites in the United States occurs in the Upper Gila Mountain (55.9 percent), followed by the Basin and Range-East (16.0 percent), Basin and Range-West (13.6 percent), Colorado Plateau (8.2 percent), Southern Rocky Mountain-New Mexico (4.5 percent) and southern Rocky Mountain-Colorado (1.8 percent) RUs. At best, total numbers in the United States range from 777 individuals assuming each known site was occupied by a single owl, to 1,554 individuals assuming each known site was occupied by a pair of owls.

Past, current, and future timber-harvest practices in the Region 3 of the Forest Service, in addition to catastrophic wildfire, were cited as the primary factors leading to listing of the spotted owl as a threatened species. Fletcher (1990) estimates that 1,037,000 acres of habitat were converted from suitable (providing all requirements of the owl, e.g., nesting, roosting, and foraging) to capable (once suitable, but no longer so). Of this, about 78.7 percent, or 816,000 acres, was a result of human management activities, whereas the remainder was converted more or less naturally, primarily by wildfire. Other factors which have or may lead to the decline of this species include a lack of adequate regulatory mechanisms. In addition, the Recovery Plan notes that forest management has created ecotones favored by great horned

owls, and there is, as a result, an increased likelihood of contact between spotted owls and great horned owls (a potential competitor and predator). Increases in scientific research, birding, educational field trips, and agency trips are also likely to occur. Finally, there is a potential for increasing malicious and accidental anthropogenic harm. Based on short-term population and radio-tracking studies, and longer-term monitoring studies, the probability of an adult Mexican spotted owl surviving from one year to the nest is 0.8 to 0.9. Juvenile survival is considerably lower at 0.06 to 0.29, although it is believed these estimates may be artificially low due to the high likelihood of permanent dispersal from the study area and the lag of several years before marked juveniles reappear as territory holders and are detected as survivors through recapture efforts (White et al. 1995). Little research has been conducted on the causes of mortality of the spotted owl, but predation by great horned owls, northern goshawks, red-tailed hawks, and golden eagles, starvation, and accidents or collisions may all be contributing factors.

Little is known about the reproductive output for the spotted owl. It varies both spatially and temporally (White et al. 1995), but the subspecies demonstrates an average annual rate of 1.001 young per pair. There is inadequate data at this time to estimate population trend. Little confidence in initial estimates has been expressed, and is due to its reliance on juvenile survival rates which are believed to be biased low, and due to the insufficient time period over which studies have been conducted.

ENVIRONMENTAL BASELINE

The Forest Service has formally consulted on a number of timber sales and other projects in Arizona and New Mexico since August 1993. In addition, the Bureau of Indian Affairs has consulted on one timber sale on the Navajo Reservation which resulted in an anticipated take of four owls, and a highway reconstruction project which resulted in the anticipated take of two owls. The Federal Highway Administration in Arizona has consulted on one highway construction project that resulted in an undetermined amount of incidental take.

The proposed project lies within the Basin and Range-West RU, as described in the Recovery Plan. This RU includes most of southern Arizona and a small portion of southwestern New Mexico. Owl territories occur in both heavily forested terrain and in areas with hardwood and conifer stringers dominated by Madrean Evergreen woodland. The subpopulation occurs in widely distributed territory clusters of varying sizes. The Sky Island Division may represent an important demographic link between the Mogollon Province demes and those in the Sierra Madre Occidental. Demographic persistence and connectivity within the Division and between divisions may be hindered by the compounding factors of naturally disjunct habitat and long dispersal distances.

The risk of habitat loss due to catastrophic wildfire is moderately high. In the past four years, the Noon, Arcadia, Clark Peak and Lone Fires have resulted in the loss of MSO habitat within this RU. Although the Coronado National Forest does not have an active timber program, localized projects such as road construction, mining, and other construction may adversely

affect individual PACs established for known owl sites and restricted habitat, as defined by the Recovery Plan.

Within the Basin and Range-West RU, spotted owls were located in rocky canyons or in several forest types at elevations ranging from 3,690 to 9,610 ft of the Atascosa-Pajarito, Santa Rita, Santa Catalina, Patagonia, Whetstone, Galiuro, Huachuca, Chiricahua, Pinaleno, Superstition, Sierra Ancha, Mazatzal, and Bradshaw Mountains, Arizona. Below 4,264 ft spotted owls were found in steep canyons containing cliffs and stands of live oak, Mexican pine, and broad-leaved riparian vegetation (Ganey and Balda 1989). Above 5,904 ft spotted owls were found in mixed conifer and pine-oak forests. Mid-elevation observations included sites with Arizona cypress and the other forest types previously mentioned (Service 1995b).

EFFECTS OF THE PROPOSED ACTION

The recovery plan for the Mexican spotted owl provides no specific guidance on grazing within Mexican spotted owl habitat. However, as a means to reduce potential adverse effects, the recovery plan recommends that where grazing may occur within Mexican spotted owl habitat, grazing be monitored within key grazing areas, such as riparian areas, meadows, and oak vegetation communities. The monitoring should be designed to detect any changes in the relative composition of herbaceous and woody plants. The intent should be to maintain good to excellent range conditions in key areas while accommodating the needs of the owl and its prey.

The recovery plan further recommends that grazing utilization standards be implemented and enforced in order to attain good to excellent range condition within key grazing areas. Additionally, the recovery plan recommends implementing management strategies that will restore good conditions to degraded riparian communities as soon as possible.

Service personnel met with Safford District personnel to determine whether suitable spotted owl nesting/roosting habitat occurred on Bureau allotments under consultation. On June 19, 1997, a field trip was conducted to the Dos Cabezas Mountains where Service personnel determined that no suitable nesting/roosting habitat exists. Additionally, Bureau personnel clarified that most of the allotments in the Peloncillo Mountains do not support suitable Mexican spotted owl habitat, with the exception of the Guadalupe W., AZ (5344) and Sycamore (5254) allotments. The Guadalupe W., AZ allotment is in long term non-use, and grazing at elevations above 5600 ft in the Peloncillo Mountains in negligible (see New Mexico ridgenose rattlesnake discussion). The only other allotment known to support Mexican spotted owl habitat at this time is the Muleshoe allotment (4401). The permittee on the allotment is the Nature Conservancy, and currently the allotment is in non-use. If potential habitat in the Peloncillo Mountains or at Muleshoe were grazed during the life of the project, the Arizona Standards and Guidelines, Upland Livestock Utilization Standard, Riparian Area Policy, and other aspects of the Bureau's proposal would reduce or eliminate potential effects of the proposed action.

CONCLUSION

The Service concurs with the Bureau's finding that the proposed action may affect but is unlikely to adversely affect the Mexican spotted owl. Because critical habitat has been set aside and enjoined from enforcement by a Federal Court ruling, for the purposes of this consultation, no critical habitat exists for the Mexican spotted owl, and thus none will be affected.

CLOSING STATEMENT

This concludes formal consultation on the Bureau's proposed Safford and Tucson Field Offices' grazing program in southeastern Arizona. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may adversely affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by this action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation, if it is determined that the impact of such taking will cause an irreversible and adverse impact to the species. Any questions or comments should be directed to Jim Rorabaugh or Angie Brooks of my staff.

Sam F. Spiller

Sam F. Spiller

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (GMA)(ES)
Field Supervisor, Fish and Wildlife Service, Albuquerque, NM
Chief, Ecological Services, Fish and Wildlife Service, Washington, D.C. (attn. R. Lohoefner)
State Director, Bureau of Land Management, Phoenix, AZ
Field Manager, Bureau of Land Management, Tucson, AZ
Office Manager, Bureau of Land Management, Sierra Vista, AZ
Chrisy Perry, Department of Justice, Washington D.C.
Richard Greenfield, Department of the Interior, Office of the Solicitor, Phoenix, AZ
Tonianne Baca Green, Department of the Interior, Office of the Regional Solicitor, Albuquerque, NM

Director, Arizona Game and Fish Department, Phoenix, AZ
Regional Manager, Arizona Game and Fish Department, Tucson, AZ

Forest Supervisor, Coronado National Forest, Tucson, AZ
Gretchen Kent, USAG, ATZS-EHB, Fort Huachuca, AZ
Director, Arizona Department of Agriculture, Phoenix, AZ

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